



utp maintenance
by voestalpine

Filler Metals for Repair, Hardfacing and Cladding Applications



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Filler Metals for Repair, Hardfacing and Cladding Applications

UTP Maintenance
Global Brand Management
T. +49 7633 409-01
utp.maintenance@voestalpine.com

voestalpine

ONE STEP AHEAD.



Tailor-made Protectivity™

UTP Maintenance – provides lasting “protection” and “productivity” of the plant.
“Protectivity” is the result of supporting our customers with maximum performance.

Decades of industry experience and application know-how in the areas of repair as well as wear and surface protection, combined with innovative and tailored products, guarantee the customers increased productivity and in addition protection and the highest performance of their components under the UTP Maintenance brand.

Solutions for demanding industries

Products of UTP Maintenance are focused on industries with high technical requirements and specialized applications.

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Metallurgical know-how for research & development

International customers and distributors are supported by experienced welding engineers by voestalpine Böhler Welding.

In addition our ambition to be best in class motivates constant evolution through our total dedication to research and development and guarantees our customers are using the most technically advanced welding products available today.

The product portfolio of UTP Maintenance comprises of innovative and tailored welding consumables from own production facilities as follows ...

- Stick electrodes
- Solid wires and rods
- Flux cored wires
- Submerged arc wires and fluxes
- Submerged arc strips and fluxes
- Spraying- and PTA-powders

Our product range is comprehensive and covers the following steel alloys:

Unalloyed and fine-grained steels, Low-alloy steels, Stainless and heat-resistant steels, Nickel-base alloys, Cast-iron, Copper and Copper-base alloys, Manganese steels, Tool steels and Cobalt steels.

Böhler Welding know-how joins steel.

Customers in over 120 countries join the expertise of voestalpine Böhler Welding (formerly the Böhler Welding Group). Focused on filler metals voestalpine Böhler Welding offers extensive technical consultation and individual solutions for industrial welding and soldering applications. Customer proximity is guaranteed by 40 subsidiaries in 28 countries with the support of 2200 employees as well as through more than 1000 distribution partners world-wide.

Three competencies – three brands

Joint Welding, Welding for Repair & Maintenance, and Brazing and Soldering. The proven products and solutions are combined under three brands in these three competency categories.

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Böhler Welding – More than 2000 products for joint welding in all conventional arc welding processes are united in a product portfolio that is unique throughout the world. Creating lasting connections is the brands' philosophy for both, in welding and between people.



UTP Maintenance – Decades of industry experience and application know-how in the areas of repair as well as wear and surface protection, combined with innovative and tailored products, guarantee customers an increase in the productivity and protection of their components.



Fontargen Brazing – Through deep insight into processing methods and understand how to apply Fontargen Brazing provides the best brazing and soldering solutions. The expertise of this brand's application engineers has been formulated over many years of experience from countless application cases based on proven products with German technology.

www.voestalpine.com/welding



AEO-Certification



Customers of UTP Maintenance, with its headquarters in Bad Krozingen and Seneffe, can now enjoy an even more reliable supply chain and streamlined customs clearing.

With the award of the AEO-F certificate (Authorized Economic Operator), valid from December 27, 2012, the Bielefeld chief customs office has acknowledged Boehler Schweisstechnik Deutschland GmbH's secure and reliable handling of international trade. On January 7th 2010, the Belgian Administration of Customs and Excise (regional office of Mons), delivered Soudokay s.a., based in Seneffe (Belgium) the AEO-F certification (Authorized Economic Operator), certifying secure and reliable international companies.

AEO-F certification, and hence, the customs office's lower risk classification, mean our customers now benefit from accelerated and more reliable supply processes beyond the borders of the EU. AEO-F (full) status includes the status AEO-C (customs), which entails the simplification of customs regulations, as well as the security conditions of the AEO-S (security).

We understand ...

In today's fast-moving and competition-defining world it is more important than ever before to have a partner by your side on which you can rely, who listens, understands the challenges and is ready to face them together with you.

In particular in the field of maintenance and repair we are almost always outside the standards and are continually faced with the most diverse requirements and tasks. It is therefore all the more important to have an extensive wealth of experience and a network of experienced colleagues in order to be able to face any challenge, any time.

You can rely on us!

We offer you 60 years of experience, expertise and passion, combined with maximum quality. We demand no less than that of ourselves.

We're there, wherever you need us!

With a worldwide network of technical employees and marketing companies as well as direct contact, we guarantee that we can always work out the best possible solution together with you.

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We face the challenges !

... **in steelworks** – welding on of continuous casting rollers where particularly high demands are placed on temperature and wear resistance with our specially conceived and proven flux-cored wires.

... **in the cement industry** – high mineral wear/abrasion combined with a heavy impact load. Our stick electrodes were developed especially for use on vertical mills, crushers & hammers.

... **in the mining industry** – the most diverse minerals present big challenges. Here in particular it is important to be present on-site by a network of technical dealers and field service employees in order to select the right products together with the customer.


... **in the railway industry** – our products have the necessary approvals and thus meet the highest safety requirements in addition to guaranteeing constant high quality.

... **in the construction of pumps, valves & fittings** – we have the largest team of international welding engineers in Europe who, thanks to their many years of experience are very familiar with different materials such as cobalt or nickel-based alloys. In particular in consideration of the environmental aspect is it of the utmost importance that valves, for example for subsea applications, work defect-free.

Maintenance and repair offers a broad field and a virtually inexhaustible range of applications, for example in the fields of recycling & waste management, agriculture & food, earth moving, pulp & paper, glass & tool construction.

Please get in contact with us! Together we'll find a solution !

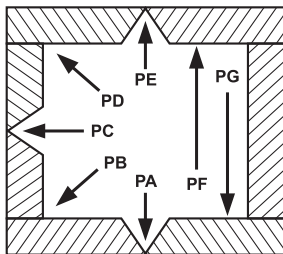
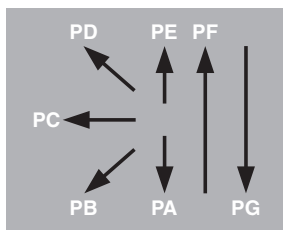
Product page structure

| | | | | |
|---------------------------|--|--|--|--|
| SMAW – covered electrodes | UTP 614 Kb | unalloyed, fine grained and low alloyed steels | | |
| | Classifications | basic coated stick electrode, AC-weldable | | |
| | EN ISO 2560-A | AWS A5.1 | | |
| | E 42 3 B32 H10 | E 7018 | | |
| | Characteristics and field of use | UTP 614 Kb is a double coated stick electrode with a universally suited application field. It is used in industry, trade, as well as in production and repair welds for diverse base materials. Due to a special coating formula UTP 614 Kb shows a smooth and finely rippled weld seam, a stable arc, easy slag removal, and a very slight increase of the weld, as well as a notch-free seam. The weld metal is little affected by steel impurities. Due to the double coating the stick electrode is excellently suited for root- and out-of-position welding. Recovery 120%, H ₂ content < 8 ml/100g. | | |
| | Base materials | Unalloyed construction steels S235JRG2 – S355J2; E295, E335, St35, St 45, St 35.8, St45.8, St50.2 Boiler steels P235GH, P265GH, P295GH Fine-grained steels up to S355N Shipbuilding steels A – E, AH – EH Cast steels C 35, G5-38, G5-45 | | |
| | Typical analysis in % | C 0,06 Si 0,7 Mn 0,9 Fe balance | | |
| | Mechanical properties of the weld metal | Yield strength R _{0,2} MPa > 420 Tensile strength R _m MPa > 510 Elongation A % > 22 Impact strength K _v J > 100 –30°C > 47 | | |
| | Welding instruction | Ignites the electrodes and stay at the ignition point until the electric arc is fully stabilised. Keep a short arc during the welding process. Hold stick electrode vertical to the weldment with slight weaving. Re-drying: 2 – 3 h at 250 – 300 °C. Only use dry stick electrodes | | |
| | Welding positions |  Current type DC (+) / AC | | |
| | Approvals | TÜV (No. 10571), DB (No. 10.138.03), GL, BV, DNV, ABS, LR | | |
| | Form of delivery and recommended welding parameters | Electrodes Ø mm x L 2,5 x 350 3,2 x 350 3,2 x 450 4,0 x 450 5,0 x 450 Amperage 60 – 90 100 – 140 100 – 140 140 – 180 190 – 250 | | |
| | utpmaintenance by voestalpine ■ 09/13 | | | |

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- ① **Product form** – Different product forms are marked in colour for easy selection
- ② **Product specification** – Type of alloy
- ③ **Covering type**
Coating material for stick electrodes
- ④ **Product name** – Product designation
- ⑤ **Name of standard**
EN ISO and AWS classification, material number if applicable
- ⑥ **Properties and application areas**
Properties to be emphasised such as resistance to corrosion or redrying data and typical areas of application
- ⑦ **Base materials** – e.g. base materials whose suitability has been tested by TÜV
- ⑧ **Reference analysis of the weld metal**
Chemical composition by weight %
- ⑨ **Mechanical properties of the weld metal**
Min. values at a room temperature of 20 °C
- ⑩ **Instructions for welding**
- ⑪ **Welding positions**
- ⑫ **Type of current and shielding gas**
Recommended electrical polarity and shielding gas
- ⑬ **Approval** – Existing approvals
- ⑭ **Delivery units** – Product form giving length and diameter, electrical current data

Signs and symbols



Welding positions acc. to EN ISO 6947

- PA** Horizontal welding of butt weld and fillet weld in flat position
- PB** Horizontal welding of fillet weld (downhand position)
- PC** Transverse position
- PD** Horizontal overhead position
- PE** Overhead position
- PF** Vertical up position
- PG** Vertical down position

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Covered electrodes for repair of cracked material

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5. Copper alloys 54

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Covered electrodes for repair of cracked material

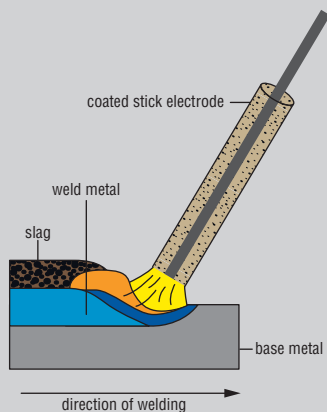
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Description of the SMAW process

SMAW = Shielded Metal-Arc Welding

Shielded metal-arc welding is one of the oldest and most versatile welding methods, and is considered to be both simple and reliable.



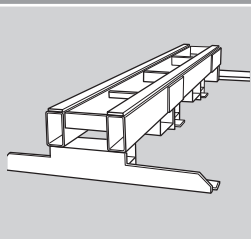
In this technique, an electric arc is struck between a covered electrode and the workpiece; the electrode acts both as the carrier of electric current and as the welding consumable that will be melted. The electrode is melted in the high temperature of the arc, and transfers to the weld pool in the form of drops. As this happens, gases that stabilise the arc and shield the weld pool from oxidation, and slag that floats on the weld pool as protective layer, are formed. This fulfils a number of functions: it protects both against the influence of the surrounding atmosphere (primarily oxidation), binds contamination, and reduces stresses by slowing the rate at which the weld pool cools down. A wide range of different electrodes for shielded metal-arc welding are available. Their alloying elements allow the strength and toughness of the weld seam to be accurately controlled. It is mainly used in steel construction and pipeline construction, as well as for work in the open air and on assembly jobs, since the necessary equipment is compact and can easily be transported.

Covered electrodes for repair of cracked material

1. Unalloyed, fine grained and low alloyed steels

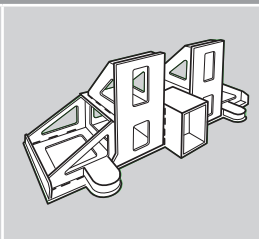
| Product name | EN ISO | | AWS | | Page |
|--------------|--------|----------------|------|-----------------|------|
| UTP 610 | 2560-A | E 38 0 RC 11 | A5.1 | E 6013 | 19 |
| UTP 611 | 2560-A | E 38 0 RR 12 | A5.1 | ~ E 6013 | 20 |
| UTP 613 Kb | 2560-A | E 42 5 B42 H5 | A5.1 | ~ E 7018-1 H4 R | 21 |
| UTP 614 Kb | 2560-A | E 42 3 B32 H10 | A5.1 | E 7018 | 22 |

Solution examples



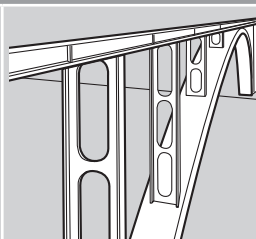
Steel construction repair

UTP 610



Steel construction repair

UTP 611



Bridge construction repair

UTP 614 Kb

Classifications

stick electrode, unalloyed, rutile cellulose coated

EN ISO 2560-A

AWS A5.1

E38 0 RC 11

E6013

Characteristics and field of use

Rutile cellulose coated stick electrode with very good weldability in all positions, including vertical down.

Universal electrode, particularly for small transformers. Bendable covering. Versatile application in steel, vehicle, boiler, container and ship construction, as well as for galvanised components.

Base materials

Steels up to a yield strength of 380 MPa (52 ksi)

S235JR-S355JR, S235JO-S355JO, P195TR1-P265TR1, P195GH-P265GH, L245NB-L360NB, L245MBL360MB, shipbuilding steels: A, B, D

ASTM A 106, Gr. A, B; A 283 Gr. A, C; A 285 Gr. A, B, C; A 501, Gr. B; A 573, Gr. 58, 65; A 633, Gr. A, C; A 711 Gr. 1013; API 5 L Gr. B, X42, X52

Typical analysis in %

| C | Si | Mn | |
|------|-----|------|--|
| 0,06 | 0,4 | 0,45 | |

Mechanical properties of the weld metal

| Heat-treatment | Yield strength | Tensile strength | Elongation | Impact strength | | |
|----------------|----------------|------------------|------------|-----------------|---------------------------|-----------------------------|
| | $R_{p0,2}$ | R_m | A | K_V | $0\text{ }^\circ\text{C}$ | $-10\text{ }^\circ\text{C}$ |
| | MPa | MPa | % | J | $0\text{ }^\circ\text{C}$ | $-10\text{ }^\circ\text{C}$ |
| untreated | 430 | 490 | 25 | 75 | 60 | 47 |
| | ≥ 380 | 470 – 600 | ≥ 20 | | ≥ 47 | |

Welding positions



Current type DC (-) / AC

Approvals

TÜV (5687.), DB (10.014.12), ABS (2), DNV (2), LR (2), LTSS, SEPROZ, CE

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,0 x 250 | 2,5 x 250/350 | 3,2 x 350 | 4,0 x 350/450 | 5,0 x 450 |
|---------------------------------|-----------|---------------|-----------|---------------|-----------|
| Amperage | 45 – 80 | 60 – 100 | 90 – 130 | 110 – 170 | 170 – 240 |

UTP 611

unalloyed, fine grained and low alloyed steels

Classifications rutile, strongly coated stick electrode, universal applicable

EN ISO 2560-A AWS A5.1

E 38 0 RR 12 ~ E 6013

Characteristics and field of use

UTP 611 is a strongly coated stick electrode for joining and surfacing on all kind of steel constructions. It is used in autobody- and wagon industry, boiler construction and shipbuilding.

UTP 611 is very easy weldable in all positions except vertical down. It possesses excellent welding properties. Very easy slag removal. Smooth, finely rippled weld seam surface. The stick electrode can be applied within a wide amperage range.

Base materials

| | |
|--------------------|--|
| Construction steel | St 34 - St 52 |
| Boiler steels | H I - H II, WStE 255, 17 Mn 4 |
| Tube steels | St 35 , St 45, St 35.8, St 45.8, StE 210.7 - StE 360.7 |

Typical analysis in %

| | | | |
|------|-----|-----|---------|
| C | Si | Mn | Fe |
| 0,07 | 0,5 | 0,6 | balance |

Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{P0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_V |
| MPa | MPa | % | J |
| > 380 | > 510 | > 22 | > 47 |

Welding instruction

UTP 611 is welded with a short to medium-long arc with slight weaving. It is also very good suited as contact electrode for string beads. The stick electrode should be held at a slight angle to the base material.

Re-drying: 2 – 3 h at 250 – 300 °C.

Welding positions

Current type DC (-) / AC

Approvals

TÜV (No. 02180), DB (No. 10.138.08), DNV

Form of delivery and recommended welding parameters

| | | | | | | |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| <i>Electrodes</i> \varnothing mm x L | 2,0 x 300 | 2,5 x 350 | 3,2 x 350 | 3,2 x 450 | 4,0 x 450 | 5,0 x 450 |
| <i>Amperage</i> | 40 – 70 | 60 – 90 | 90 – 140 | 90 – 140 | 140 – 190 | 190 – 230 |

Classifications

basic coated stick electrode

EN ISO 2560-A

AWS A5.1

E 42 5 B42 H5

~ E 7018-1 H4 R

Characteristics and field of use

UTP 613 Kb is a basis-coated stick electrode for construction-, boiler-, tube- and fine-grained steels as well as for steels with up to 0,35% C-content. It is recommended especially for the following base metal.

UTP 613 Kb has a good weldability and a stable arc. The weld metal is resistant to ageing, crack resistant and is little affected by steel impurities.

Base materials

| | |
|---------------------|---------------------------------|
| Construction steels | St 34 - St 60 |
| Fine-grained-steels | St E 255 - 355 |
| Boiler steels | H I - H II, 17 Mn 4 |
| Tube steels | St 35 - St 55, St 35.8, St 45.8 |
| Cast steels | GS 38 - GS 52 |

Typical analysis in %

| | | | |
|------|-----|-----|---------|
| C | Si | Mn | Fe |
| 0,07 | 0,4 | 1,1 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 420 | > 510 | > 25 | > 120 |

Welding instruction

Keep a short arc during the welding process. Weld dry stick electrodes only. Re-drying: 2 – 3 h at 250 – 300 °C. Preheat weldment if necessary

Welding positions



Current type DC (+)

Approvals

TÜV (No. 00794), DB (No. 10.138.02), ABS, BV, DNV

Form of delivery and recommended welding parameters

| | | | | |
|---------------------------------|-----------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 350 | 5,0 x 450 |
| Amperage | 80 – 100 | 110 – 150 | 140 – 200 | 170 – 210 |

UTP 614 Kb

unalloyed, fine grained and low alloyed steels

Classifications basic coated stick electrode, AC-weldable

EN ISO 2560-A

AWS A5.1

E 42 3 B32 H10

E 7018

Characteristics and field of use

UTP 614 Kb is a double coated stick electrode with a universally suited application field. It is used in industry, trade, as well as in production and repair welds for diverse base materials.

Due to a special coating formula UTP 614 Kb shows a smooth and finely rippled weld seam, a stable arc, easy slag removal, and a very slight increase of the weld, as well as a notch-free seam. The weld metal is little affected by steel impurities. Due to the double coating the stick electrode is excellently suited for root- and out-of-position welding. Recovery 120%, H_2 content < 8 ml/100g.

Base materials

| | |
|-------------------------------|---|
| Unalloyed construction steels | S235JRG2 – S355J2; E295, E335, St35, St 45, St 35.8, St45.8, St50-2 |
| Boiler steels | P235GH, P265GH, P295GH |
| Fine-grained | steels up to S355N |
| Shipbuilding | steels A – E, AH - EH |
| Cast steels | C 35, GS-38, GS-45 |

Typical analysis in %

| | | | |
|------|-----|-----|---------|
| C | Si | Mn | Fe |
| 0,06 | 0,7 | 0,9 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{P0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | |
|---------------------------|------------------------|----------------|-----------------------|-------|
| MPa | MPa | % | J | -30°C |
| > 420 | > 510 | > 22 | >100 | > 47 |

Welding instruction

Ignite the electrode and stay at the ignition point until the electric arc is fully stabilised. Keep a short arc during the welding process. Hold stick electrode vertical to the weldment with slight weaving. Re-drying: 2 – 3 h at 250 – 300 °C. Only use dry stick electrodes

Welding positions

Current type DC (+) / AC

Approvals

TÜV (No. 10571), DB (No. 10.138.03), GL, BV, DNV, ABS, LR

Form of delivery and recommended welding parameters

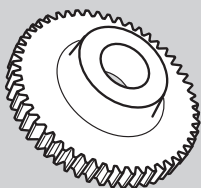
| | | | | | |
|---------------------------------|-----------|-----------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 350 | 3,2 x 350 | 3,2 x 450 | 4,0 x 450 | 5,0 x 450 |
| Amperage | 60 – 90 | 100 – 140 | 100 – 140 | 140 – 180 | 190 – 250 |

Covered electrodes for repair of cracked material

2. Stainless steels

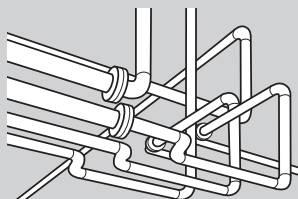
| Product name | EN ISO | | AWS | | Mat.-No. | Page |
|----------------|---------|-------------------|------|------------|----------|------|
| UTP 63 | 3581-A | E 18 8 Mn R 32 | | | 1.4370 | 24 |
| UTP 65 D | 3581-A | ~E 29 9 R 12 | | | 1.4337 | 25 |
| UTP 68 | 3581-A | E 19 9 Nb R 32 | A5.4 | E 347-17 | 1.4551 | 26 |
| UTP 68 H | 3581-A | E 25 20 R 32 | A5.4 | E 310-16 | 1.4842 | 27 |
| UTP 68 LC | 3581-A | E 19 9 L R 32 | A5.4 | E 308 L-17 | 1.4316 | 28 |
| UTP 68 Mo | 3581-A | E 19 12 3 Nb R 32 | A5.4 | E 318-16 | 1.4576 | 29 |
| UTP 68 MoLC | 3581-A | E 19 12 3 L R 32 | A5.4 | E 316 L-17 | 1.4430 | 30 |
| UTP 253 MA | | | | | | 31 |
| UTP 2205 | EN 1600 | E 22 9 3 N L R | A5.4 | E 2209-17 | | 32 |
| UTP 2205 Basic | EN 1600 | E 22 9 3 N L B | A5.4 | E 2209-15 | | 33 |
| UTP 6635 | 3581-A | E 13 4 B 42 | A5.4 | E 410 NiMo | 1.4351 | 34 |
| UTP 6824 LC | 3581-A | E 23 12 L R 32 | A5.4 | E 309L-17 | ~ 1.4332 | 35 |

Solution examples



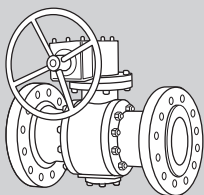
Gear wheel

UTP 65 D



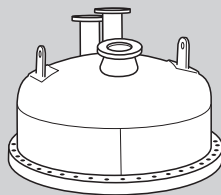
Piping

UTP 63



Valve

UTP 68 H



Pressure vessel

UTP 68 LC

UTP 63

stainless steels

Classifications rutile coated, fully austenitic CrNiMnstick electrode

EN ISO 3581-A

EN 14700

Material-No

E 18 8 Mn R 32

E Fe10

1.4370

Characteristics and field of use

With the fully austenitic UTP 63, non-alloy structural and heat-treatable steels can be welded, also in combination with austenitic CrNi steels. Furthermore scale-resisting steels for operating temperatures up to 850 °C as well as higher carbon materials and high manganese steel can be joined, also in combination with other steels, with UTP 63. For surfacing on workpieces exposed to impact, pressure and rolling wear, such as curved rails, points, crusher and excavator teeth. Moreover it provides crack-proof buffer layers under hard alloys.

UTP 63 has good welding properties, stable arc, finely rippled bead appearance. The weld deposit resists to scaling, rust and cracks, work-hardened.

Hardness of the pure weld metal

untreated:

approx. 200 HB

work-hardened:

approx. 350 HB

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|-----|-----|-----|------|-----|---------|
| 0,1 | 0,5 | 5,5 | 19,0 | 8,5 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 350 | > 600 | > 40 | > 60 |

Welding instruction

Clean welding area thoroughly. Pre-heating of thick-walled ferritic parts to 150 – 250 °C. Hold stick electrode vertically with a short arc. Re-dry stick electrodes that have got damp for 2 h / 250 – 300 °C.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 250 | 3,2 x 350 | 4,0 x 400 | 5,0 x 450 |
|---------------------------------|-----------|-----------|-----------|-----------|
| Amperage | 50 – 70 | 70 – 100 | 100 – 130 | 150 – 180 |

Classifications rutile coated austenitic-ferritic special stick electrode

| | | |
|---------------|----------|--------------|
| EN ISO 3581-A | EN 14700 | Material-No. |
| ~ E 29 9 R 12 | E Z Fe11 | 1.4337 |

Characteristics and field of use

UTP 65 D has been developed to satisfy the highest requirements for joining and surfacing. It is extremely crack-resistant when joining steels of difficult weldability, such as e.g. hard manganese steels, tool steels, spring steels, high speed steels as well as dissimilar metal joints. Due to the good corrosion and abrasion resistance and high tensile strength UTP 65 D finds its application particularly in repair and maintenance of machine and drive components, such as gears, cams, shafts, hot cuts, hot trim plates and dies. Also ideally suited as an elastic cushioning layer for very hard surfacings.

UTP 65 D has outstanding welding properties. Stable arc, spatterfree. The finely rippled seam has a homogeneous structure, very good slag removal, self-lifting on parts. Good weldability in awkward positions. Stainless, creep resistant and workhardening.

Hardness of the pure weld metal: approx. 260 HB

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|-----|-----|-----|------|-----|---------|
| 0,1 | 1,0 | 1,0 | 30,0 | 9,5 | balance |

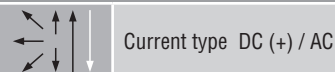
Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A |
|---------------------------|------------------------|----------------|
| MPa | MPa | % |
| > 640 | > 800 | > 20 |

Welding instruction

Clean the welding zone thoroughly. Prepare X-, V- or U-groove on thickwalled workpieces with an angle of 60 - 80°. Preheat high-C-containing steels and solid workpieces to appr. 250 °C. Keep stick electrode vertical and weld with a short arc, use stringer beads or slight weaving, as applicable. Re-dry stick electrodes that have got damp for 2 h / 120 - 200 °C.

Welding positions



Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 1,5 x 250* | 2,0 x 250 | 2,5 x 250 | 3,2 x 350 | 4,0 x 350 | 5,0 x 350 |
|---------------------------------|------------|-----------|-----------|-----------|-----------|-----------|
| Amperage | 35 - 45 | 45 - 60 | 55 - 75 | 75 - 115 | 100 - 145 | 120 - 195 |

*available on request

UTP 68

stainless steels

Classifications

stabilized stick electrode

EN ISO 3581-A

AWS A5.4

Material-No.

E 19 9 Nb R 3 2

E 347-17

1.4551

Characteristics and field of use

The rutile coated welding stick electrode UTP 68 is suitable for joining and surfacing of stabilized and non stabilized CrNi steels and CrNi cast steels. The deposit is IC resistant with stabilized base material up to + 400°C working temperature. The stick electrode is also applicable for the 2nd layer on clad CrNi steels.

The stick electrode is weldable in all positions except vertical down. It has a stable arc and is spatter free. Easy ignition and re-ignition, self detaching slag. Clean and finely rippled bead without undercutting.

Base materials

1.4301, 1.4312, 1.4541, 1.4550, 1.4552

Typical analysis in %

| C | Si | Mn | Cr | Ni | Nb | Fe |
|------|-----|-----|------|------|------|---------|
| 0,03 | 0,8 | 0,5 | 19,0 | 10,0 | 0,25 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 380 | > 590 | > 30 | > 47 |

Welding instruction

Weld stick electrode slightly inclined with a short arc. Re-drying 2 hours at 120 – 200°C.

Welding positions



Current type DC (+) / AC

Approvals

TÜV (No. 02592), ABS, GL

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,0 x 300 | 2,5 x 350 | 3,2 x 350 | 4,0 x 350 |
|---------------------------------|-----------|-----------|-----------|-----------|
| Amperage | 40 – 60 | 50 – 90 | 80 – 110 | 110 – 140 |

Classifications fully austenitic CrNi stick electrode

| | | |
|---------------|----------|--------------|
| EN ISO 3581-A | AWS A5.4 | Material-No. |
| E 25 20 R 32 | E 310-16 | 1.4842 |

Characteristics and field of use

The rutile coated stick electrode UTP 68 H is suitable for joining and surfacing of heat resistant Cr-, CrSi-, CrAl-, CrNi-steels/cast steels. It is used for operating temperatures up to 1100 °C in low-sulphur combustion gas. Application fields are in the engineering of furnaces, pipework and fittings.

UTP 68 H is weldable in all positions except vertical down. Fine droplet. The surface of the seams is smooth and finely rippled. Easy slag removal free from residues.

Base materials

| | | | |
|--------------|--------------------|--------------|---------------------|
| Material-No. | DIN | Material-No. | DIN |
| 1.4710 | G-X30 CrSi 6 | 1.4837 | G- X40 CrNiSi 25 12 |
| 1.4713 | X10 CrAl 7 | 1.4840 | G- X15 CrNi 25 20 |
| 1.4762 | X10 CrAl 24 | 1.4841 | X15 CrNiSi 25 20 |
| 1.4828 | X15 CrNiSi 20 12 | 1.4845 | X12 CrNi 25 21 |
| 1.4832 | G-X25 CrNiSi 20 14 | 1.4848 | G- X40 CrNiSi 25 20 |

Joining these materials with non- and low alloyed steels is possible.

Typical analysis in %

| | | | | | |
|------|-----|-----|------|------|---------|
| C | Si | Mn | Cr | Ni | Fe |
| 0,10 | 0,6 | 1,5 | 25,0 | 20,0 | balance |

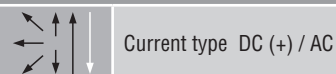
Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v |
| MPa | MPa | % | J |
| > 350 | > 550 | > 30 | > 47 |

Welding instruction

Weld stick electrode with slight tilt and with a short arc. Re-dry the stick electrodes 2 h at 120 – 200 °C.

Welding positions



Form of delivery and recommended welding parameters

| | | | | | |
|----------------------------|------------|------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 1,5 x 250* | 2,0 x 250* | 2,5 x 250 | 3,2 x 350 | 4,0 x 400 |
| <i>Amperage</i> | 25 – 40 | 40 – 60 | 50 – 80 | 80 – 110 | 130 – 140 |

*available on request

UTP 68 LC

stainless steels

Classifications

low carbon stick electrode

EN ISO 3581-A

AWS A5.4

Material-No.

E 19 9 L R 3 2

E 308 L - 17

1.4316

Characteristics and field of use

The rutile coated stick electrode UTP 68 LC, with a low carbon content, is used for joining and building up of identical low carbon, austenitic CrNi steels and CrNi cast steels. Due to the low C-content the deposit is highly resistant to intercrystalline corrosion and can be used for working temperatures up to +350 °C.

The stick electrode is weldable in all positions except vertical down. It has a smooth drop transfer and the deposit is finely rippled and without undercut. Slag removal is easy and without residues.

Base materials

1.4301, 1.4306, 1.4311, 1.4312, 1.4541

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|-------|-----|-----|------|------|---------|
| 0,025 | 0,8 | 0,5 | 19,0 | 10,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 350 | > 520 | > 35 | > 47 |

Welding instruction

The stick electrode should be welded slightly inclined and with a short arc. Re-drying 2 hours at 120 – 200 °C.

Welding positions



Current type DC (+) / AC

Approvals

TÜV (No. 00100), ABS, GL

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,0 x 300 | 2,5 x 350 | 3,2 x 350 | 4,0 x 350 | 5,0 x 450 |
|---------------------------------|-----------|-----------|-----------|-----------|-----------|
| Amperage | 40 – 60 | 50 – 90 | 80 – 120 | 110 – 160 | 140 – 200 |

Classifications stabilized stick electrode

| | | |
|--------------------|------------|--------------|
| EN ISO 3581-A | AWS A5.4 | Material-No. |
| E 19 12 3 Nb R 3 2 | E 318 - 16 | 1.4576 |

Characteristics and field of use

The rutile coated stick electrode UTP 68 Mo is used for joining and surfacing of stabilized and non stabilized CrNiMo steels and CrNiMo cast steels. The deposit is IC resistant with stabilized base material up to +400 °C working temperature.

The stick electrode is weldable in all positions except vertical down. Even flow, very easy slag removal. Smooth, notch-free seam surface.

Base materials

1.4401, 1.4404, 1.4408, 1.4436, 1.4571, 1.4580, 1.4581, 1.4583

Typical analysis in %

| | | | | | | | |
|-------|-----|-----|------|-----|------|------|---------|
| C | Si | Mn | Cr | Mo | Ni | Nb | Fe |
| 0,025 | 0,8 | 0,6 | 18,0 | 2,7 | 12,0 | 0,25 | balance |

Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v |
| MPa | MPa | % | J |
| 380 | 560 | 30 | 55 |

Welding instruction

Clean the weld zone and above all degrease it. Keep a short arc. Weld with dry stick electrodes. Re-dry for 2 hours at 120 – 200 °C.

Welding positions


Current type DC (+) / AC

Approvals

TÜV (No. 02593)

Form of delivery and recommended welding parameters

| | | | | | | |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| <i>Electrodes</i> \varnothing mm x L | 1,5 x 250 | 2,0 x 300 | 2,5 x 350 | 3,2 x 350 | 4,0 x 350 | 5,0 x 450 |
| <i>Amperage</i> | 25 – 40 | 40 – 60 | 50 – 90 | 80 – 120 | 120 – 160 | 140 – 200 |

UTP 68 MoLC

stainless steels

Classifications low carbon stick electrode

| | | |
|-------------------|------------|--------------|
| EN ISO 3581-A | AWS A5.4 | Material-No. |
| E 19 12 3 L R 3 2 | E 316 L-17 | 1.4430 |

Characteristics and field of use

The rutile coated stick electrode UTP 68 MoLC, with a low C content, is used for joining and surfacing of identical, low carbon, austenitic CrNiMo steels and CrNiMo cast steels. The weld deposit has, due to the low C content, a high resistance to intercrystalline corrosion and can be used for working temperatures up to +400 °C.

The stick electrode is weldable in all positions except vertical down. The weld deposit is smooth and fine rippled. Slag removal is very easy and without residues.

Base materials

1.4401, 1.4404, 1.4436, 1.4571, 1.4573, 1.4580, 1.4583

Typical analysis in %

| | | | | | | |
|-------|-----|-----|------|------|-----|---------|
| C | Si | Mn | Cr | Ni | Mo | Fe |
| 0,025 | 0,8 | 0,5 | 18,0 | 12,0 | 2,8 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| 380 | 560 | 30 | 60 |

Welding instruction

The stick electrode should be welded slightly inclined and with a short arc. Re-drying 2 hours at 120 – 200 °C.

Welding positions



Current type DC (+) / AC

Approvals

TÜV (No. 00101), ABS, DB (No. 30.138.03), GL, DNV

Form of delivery and recommended welding parameters

| | | | | | | |
|---------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 1,5 x 250 | 2,0 x 300 | 2,5 x 350 | 3,2 x 350 | 4,0 x 350 | 5,0 x 450 |
| Amperage | 25 – 40 | 40 – 60 | 50 – 90 | 80 – 120 | 120 – 160 | 140 – 200 |

Classifications

stick electrode

Characteristics and field of use

UTP 253 MA is primarily designed for welding the high temperature stainless steel Outokumpu 253 MA with excellent resistance to oxidation up to 1100 °C. The electrode has a ferrite content of approx. 10 %, which gives high resistance to hot cracking.

| | |
|------------------------|--|
| Interpass temperature: | Max. 150 °C. |
| Heat input: | Max. 1.5 kJ/mm. |
| Heat treatment: | Generally none. |
| Structure: | Austenite with 3 – 10 % ferrite. |
| Scaling temperature: | Approx. 1150 °C (air). |
| Corrosion resistance: | Excellent resistance to high temperature corrosion. Not intended for applications exposed to wet corrosion. |

Typical analysis in %

| C | Si | Mn | Cr | Ni | N |
|------|-----|-----|------|------|------|
| 0,08 | 1,5 | 0,7 | 22,0 | 10,5 | 0,18 |

Ferrite 10 FN DeLong

Mechanical properties of the weld metal

| Values | Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | Hardness Brinell |
|---------------|---------------------------|------------------------|--------------|-----------------------|------------------|
| | MPa | MPa | % | J | HB |
| typical (IIW) | 535 | 725 | 37 | 60 | approx. 215 |

Welding positions

| | | | |
|--|--|--|--------------------------|
| | | | Current type DC (+) / AC |
|--|--|--|--------------------------|

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,0 x 300 | 2,5 x 350 | 3,25 x 350 | 4,0 x 400 | 5,0 x 400 |
|---------------------------------|-----------|-----------|------------|-----------|-----------|
| Amperage | 30 – 65 | 45 – 80 | 55 – 120 | 100 – 140 | 150 – 200 |

Classifications

Cr-Ni-Mo alloyed duplex stick electrode

EN 1600

AWS A5.4

E 22 9 3 N L R

E2209-17

Characteristics and field of use

UTP 2205 is a Cr-Ni-Mo alloyed duplex electrode for welding duplex steels such as 2205. For light to moderate thickness material, welding should be carried out as for ordinary austenitic stainless steel. However, the somewhat lower penetration and fluidity of the weld should be considered. Very high quench rates and excessive times at red heat or above should be avoided to prevent excessive ferrite or formation of intermetallic phases.

Interpass temp.: Max. 150 °C.

Heat input: 0,5 – 2,5 kJ/mm.

Heat treatment: Generally none
(in special cases quench annealing at 1100 – 1150 °C).

Structure: Austenite with approx. 30 % ferrite.

Scaling temperature: Approx. 850 °C (air).

Corrosion resistance: Very good resistance to pitting and stress corrosion cracking in chloride containing environments.

Weld deposit data: Metal recovery approx. 110 %.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Mo | N |
|------|-----|-----|------|-----|-----|------|
| 0,02 | 0,8 | 0,7 | 23,0 | 9,5 | 3,0 | 0,15 |

Ferrite 35 FN WRC-92

Mechanical properties of the weld metal

| Values | Yield strength $R_{p0.2}$ | Tensile strength R_m | Elongation A | Impact strength K_v | | Hardness Brinell |
|----------------|---------------------------|------------------------|----------------|-----------------------|--------|------------------|
| | MPa | MPa | % | J | -40 °C | HB |
| typical (IIW) | 620 | 810 | 25 | 45 | 35 | approx. 240 |
| min. (EN 1600) | 450 | 550 | 20 | | | |

Welding positions

| | | | |
|--|---|---|--------------------------|
|  Ø 2,0 - 3,25 |  Ø 4,0 |  Ø 5,0 | Current type DC (+) / AC |
|--|---|---|--------------------------|

Approvals

CE, CWB, DB, LR (only butt welding), TÜV

Form of delivery and recommended welding parameters

| | | | | |
|---------------------|-----------|-----------|-----------|-----------|
| Electrodes Ø mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 450 | 5,0 x 450 |
| Amperage | 45 – 80 | 50 – 120 | 70 – 160 | 150 – 220 |

UTP 2205 basic

stainless steels

Classifications

duplex stick electrode

EN 1600

AWS A5.4

E 22 9 3 N L B

E2209-15

Characteristics and field of use

UTP 2205 basic provides somewhat better impact properties and position welding properties than the UTP 2205. It is primarily designed for welding duplex steel of the 2205 type but can also be used for the welding of 2304. The weldability of duplex steels is excellent. However, welding should be adapted to the material as far as fluidity, edge preparation, heat input etc. are concerned.

| | |
|------------------------|--|
| Interpass temperature: | Max. 150 °C. |
| Heat input: | 0,5 – 2,5 kJ/mm |
| Heat treatment: | Generally none. (in special cases quench annealing at 1100 – 1150 °C) |
| Structure: | Duplex (austenite with approx. 40 % ferrite). |
| Scaling temperature: | Approx. 850 °C (air). |
| Corrosion resistance: | Very good resistance to pitting and stress corrosion cracking in chloride containing environments. |
| Weld deposit data: | Metal recovery approx. 110 %. |

Typical analysis in %

| | | | | | | |
|------|-----|-----|------|-----|-----|------|
| C | Si | Mn | Cr | Ni | Mo | N |
| 0,03 | 0,5 | 1,2 | 23,5 | 9,0 | 3,0 | 0,16 |

Ferrite 40 FN WRC-92

Mechanical properties of the weld metal

| Values | Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | | | Hardness Brinell |
|----------------|---------------------------|------------------------|--------------|-----------------------|--------|--------|------------------|
| | MPa | MPa | % | J | -46 °C | -60 °C | HB |
| typical (IIW) | 645 | 840 | 26 | 100 | 80 | 50 | approx. 240 |
| min. (EN 1600) | 450 | 550 | 20 | | | | |

Welding positions



Current type DC (+)

Form of delivery and recommended welding parameters

| | | | |
|---------------------------------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 350 |
| Amperage | 45 – 70 | 55 – 110 | 100 – 140 |

UTP 6635

stainless steels

Classifications

basic coated stick electrode

EN ISO 3581-A

AWS A5.4

Material-No.

E 13 4 B 4 2

E 410 NiMo

1.4351

Characteristics and field of use

UTP 6635 is a basic-coated stick electrode for joinings and surfacings on corrosion resistant martensitic CrNi-steels and corresponding cast steels. The application field is in the armatures- and power station construction. The weld deposit has an increased resistance to cavitation and erosion also at working temperatures up to 350 °C.

UTP 6635 is weldable in all positions, except vertical-down. Easy slag removal, smooth and notch-free welding surface. Recovery: 130 %.

Base materials

1.4313, 1.4407, 1.4413, 1.4414

Typical analysis in %

| C | Si | Mn | Cr | Ni | Mo | Fe |
|------|------|-----|------|-----|------|---------|
| 0,03 | 0,25 | 0,8 | 13,0 | 4,0 | 0,45 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| 650 | 760 | 15 | 55 |

Welding instruction

Weld stick electrode slightly inclined with a short arc. For a wall thickness > 10 mm, a preheating of max. 150 °C is recommended. Re-drying 2 – 3 hours at 250 – 350 °C.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 05067)

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 450 | 5,0 x 450 |
|---------------------------------|-----------|-----------|-----------|-----------|
| Amperage | 60 – 80 | 70 – 100 | 110 – 160 | 150 – 190 |

Classifications

low carbon CrNi-stick electrode

EN ISO 3581-A

AWS A5.4

Material-No.

E 23 12 L R 32

E 309 L-17

~ 1.4332

Characteristics and field of use

The rutile coated stick electrode UTP 6824 LC is used for joining and surfacing of stainless and heat resistant steels / cast steels as well as for dissimilar metal joints (heterogeneous joints) and for buffer layers on corrosion - or wear resistant claddings on C-steels. The weld deposit is scale resistant up to + 1000 °C.

The stick electrode is weldable in all positions except vertical-down. It is distinguished by a stable arc, minimal spatter, and very good slag removal. The weld seam is regularly marked and free of pores.

Base materials

1.4541, 1.4550, 1.4583, 1.4712, 1.4724, 1.4742, 1.4825, 1.4826, 1.4828
 Joining these materials with unalloyed and low-alloyed steels is possible.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|-------|-----|-----|------|------|---------|
| 0,025 | 0,8 | 0,8 | 22,5 | 12,5 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|--------------|-----------------------|
| MPa | MPa | % | J |
| > 390 | > 550 | > 30 | > 47 |

Welding instruction

Weld the stick electrode slightly inclined with a short arc. For claddings, the pre-heating and interpass temperature should be adjusted according to the base material. Re-drying 2 hours at 120 – 200 °C.

Welding positions


Current type DC (+) / AC

Approvals

TÜV (No. 04074), GL, DNV

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 450 | 5,0 x 450* |
|---------------------------------|-----------|-----------|-----------|------------|
| Amperage | 60 – 80 | 80 – 110 | 110 – 140 | 140 – 180 |

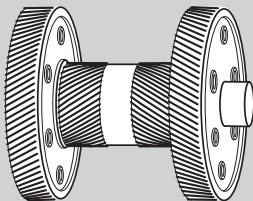
*available on request

Covered electrodes for repair of cracked material

3. Nickel alloys

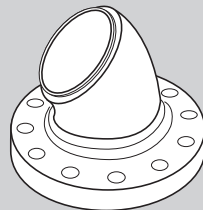
| Product name | EN ISO | AWS | Mat. - No. | Page |
|--------------|---------------------------------------|---------------------------------|------------|------|
| UTP 80 M | 14172 E Ni 4060 (NiCu30Mn3Ti) | A5.11 E NiCu-7 | 2.4366 | 37 |
| UTP 80 Ni | 14172 E Ni 2061 (NiTi3) | A5.11 E Ni-1 | 2.4156 | 38 |
| UTP 068 HH | 14172 E Ni 6082 (NiCr20Mn3Nb) | A5.11 E NiCrFe-3 (mod.) | 2.4648 | 39 |
| UTP 759 Kb | 14172 E Ni 6059 (NiCr23Mo16) | A5.11 E NiCrMo-13 | 2.4609 | 40 |
| UTP 2133 Mn | 3581-A EZ 2133 B42 | | ~ 1.4850 | 41 |
| UTP 2535 Nb | 3581-A EZ 2535 Nb B62 | | 1.4853 | 42 |
| UTP 6170 Co | 14172 E Ni 6117 (NiCr22Co12Mo) | A5.11 E NiCrCoMo-1 (mod.) | 2.4628 | 43 |
| UTP 6222 Mo | 14172 E Ni 6625 (NiCr22Mo9Nb) | A5.11 E NiCrMo-3 | 2.4621 | 44 |
| UTP 6225 Al | 14172 E Ni 6025 (NiCr25Fe10AlY) | A5.11 E NiCrFe-12 | 2.4649 | 45 |
| UTP 7015 | 14172 E Ni 6182 (NiCr15Fe6Mn) | A5.11 E NiCrFe-3 | 2.4807 | 46 |

Solution examples



Gear wheel

UTP 068 HH



Flange

UTP 80 M

Classifications basic coated nickel-copper stick electrode

| | | |
|-------------------------|-----------|--------------|
| EN ISO 14172 | AWS A5.11 | Material-No. |
| E Ni 4060 (NiCu30Mn3Ti) | E NiCu-7 | 2.4366 |

Characteristics and field of use

UTP 80 M is suitable for joining and surfacing of nickel-copper alloys and of nickel-copper-clad steels. Particularly suited for the following materials: 2.4360 NiCu30Fe, 2.4375 NiCu30Al. UTP 80 M is also used for joining different materials, such as steel to copper and copper alloys, steel to nickel-copper alloys. These materials are employed in high-grade apparatus construction, primarily for the chemical and petrochemical industries. A special application field is the fabrication of seawater evaporation plants and marine equipment.

UTP 80 M is weldable in all positions, except vertical-down. Smooth, stable arc. The slag is easily removed, the seam surface is smooth. The weld metal withstands sea water.

Typical analysis in %

| | | | | | | | |
|--------|-----|-----|---------|------|-----|-----|-----|
| C | Si | Mn | Ni | Cu | Ti | Al | Fe |
| < 0,05 | 0,7 | 3,0 | balance | 29,0 | 0,7 | 0,3 | 1,0 |

Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_V |
| MPa | MPa | % | J |
| > 300 | > 480 | > 30 | > 80 |

Welding instruction

Thorough cleaning of the weld zone is essential to avoid porosity. V angle of seam about 70°, weld string beads if possible.

Weld with dry stick electrodes only! Re-dry stick electrodes 2 – 3 hours at 200 °C.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 00248), ABS, GL

Form of delivery and recommended welding parameters

| | | | | |
|--|-----------|-----------|-----------|-----------|
| <i>Electrodes</i> \varnothing mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 350 | 5,0 x 400 |
| <i>Amperage</i> | 55 – 70 | 75 – 110 | 90 – 130 | 135 – 160 |

UTP 80 Ni

nickel alloys

Classifications

basic coated pure nickel stick electrode

EN ISO 14172

AWS A5.11

Material-No.

E Ni 2061 (NiTi3)

E Ni-1

2.4156

Characteristics and field of use

UTP 80 Ni is suited for joining and surfacing on commercial pure nickel grades, including LC nickel, nickel alloys and nickel-clad steels. These materials are employed primarily in the construction of pressure vessels and apparatus in the chemical industry, in the food industry and for power generation, where good behaviour under corrosion and temperature is demanded.

UTP 80 Ni is weldable in all positions, except vertical-down, and gives smooth, notch-free seams.

Typical analysis in %

| C | Si | Mn | Ni | Ti | Al | Fe |
|--------|-----|------|---------|-----|-----|-----|
| < 0,02 | 0,8 | 0,25 | balance | 2,0 | 0,2 | 0,1 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 300 | > 450 | > 30 | > 160 |

Welding instruction

Weld with dry stick electrodes only! Prior to welding the stick electrodes must be dried 2 – 3 hours at 250 – 300 °C. Clean the weld zone thoroughly. The V angle of the seam should not be less than 70°. Weld with short arc, avoiding weaving as much as possible.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 00190)

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 300* | 3,2 x 300 | 4,0 x 350 |
|---------------------------------|------------|-----------|-----------|
| Amperage | 60 – 85 | 90 – 130 | 110 – 150 |

*available on request

Classifications

basic coated NiCrFe stick electrode

EN ISO 14172

AWS A5.11

Material-No.

E Ni 6082 (NiCr20Mn3Nb)

E NiCrFe-3 (mod.)

2.4648

Characteristics and field of use

UTP 068 HH is predominantly used for joining identical or similar heat resistant Ni-base alloys, heat resistant austenites, cold tough Ni-steel, and for joining heat resistant austenitic-ferritic materials, such as 2.4817 (LC NiCr15Fe), 1.4876 (X10 NiCrTiAl 32 20), 1.4941 (X8 CrNTi 18 10). Specially also used for joinings of high C content 25/35 CrNi cast steel to 1.4859 or 1.4876 for petrochemical installations with working temperatures up to 900 °C. The welding deposit is hot cracking resistant and does not tend to embrittlement.

The welding deposit of UTP 068 HH is hot cracking resistant, does not tend to embrittlement and is scale resistant at high temperatures.

Typical analysis in %

| C | Si | Mn | Cr | Mo | Nb | Ni | Fe |
|-------|-----|-----|------|-----|-----|---------|-----|
| 0,025 | 0,4 | 5,0 | 19,0 | 1,5 | 2,2 | balance | 3,0 |

Mechanical properties of the weld metal

| Heat-treatment | Yield strength | Tensile strength | Elongation | Impact strength K_V | |
|-------------------|----------------|------------------|------------|-----------------------|---------|
| | $R_{p0,2}$ | R_m | A | J | -196 °C |
| | MPa | MPa | % | | |
| As welded | 420 | 680 | 40 | 120 | 80 |
| 15 h 650 °C / air | | | | 120 | 70 |

Welding instruction

Hold stick electrode as vertically as possible, only very little weaving. Fill end crater carefully. Interpass temperature max. 150 °C. Re-dry electrode for 2 – 3 hours / 250 – 300 °C.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 00230), KTA, ABS, GL, BV, DNV

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,0 x 250 | 2,5 x 300 | 3,2 x 300 | 4,0 x 350 | 5,0 x 400 |
|---------------------------------|-----------|-----------|-----------|-----------|-----------|
| Amperage | 35 – 50 | 50 – 70 | 70 – 95 | 90 – 120 | 120 – 160 |

UTP 759 Kb

nickel alloys

Classifications

basic coated NiCrMo stick electrode

EN ISO 14172

AWS A5.11

Material-No.

E Ni 6059 (NiCr23Mo16)

E NiCrMo-13

2.4609

Characteristics and field of use

UTP 759 Kb is employed primarily for welding components in environmental plants and plants for chemical processes with highly corrosive media. Joint welding of matching base materials as Material-No. 2.4605 or similar matching materials as material No 2.4602 NiCr-21Mo14W. Joint welding of these materials with low-alloyed steels. Cladding on low-alloyed steels.

In addition to its good resistance to contaminated oxidating mineral acids, acetic acids and acetic anhydrides, hot contaminated sulphuric – and phosphoric acid, UTP 759 Kb has an excellent resistance against pitting and crevice corrosion. The special composition of the coating extensively prevents the precipitation of intermetallic phases.

UTP 759 Kb can be welded in all positions except vertical down. Stable arc, easy slag removal.

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Fe |
|--------|-------|-----|------|------|---------|-----|
| < 0,02 | < 0,2 | 0,5 | 22,5 | 15,5 | balance | 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 450 | > 720 | > 30 | > 60 |

Welding instruction

Opening angle of the prepared seam approx. 70 °C, root gap approx. 2 mm. Weld stick electrode with slight tilt and with a short arc. String beads are welded. The interpass temperature of 150 °C and a max. weaving width 2,5 x diameter of the stick electrode core wire should not be exceeded. Re-dry the stick electrodes 2 – 3 hours at 250 – 300 °C before use and weld them out of a warm stick electrode carrier.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 06687)

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 250 | 3,2 x 300 | 4,0 x 350 |
|---------------------------------|-----------|-----------|-----------|
| Amperage | 50 – 70 | 70 – 100 | 90 – 130 |

Classifications

basic coated CrNi stick electrode

EN ISO 3581-A

Material-No.

EZ 21 33 B 4 2

~ 1.4850

Characteristics and field of use

UTP 2133 Mn is suitable for joining and surfacing of heat-resistant steels and cast steels of the same or of similar nature, such as

| | | | |
|--------|--------------------|-----|---------|
| 1.4876 | X10 NiCrAlTi 32 20 | UNS | N 08800 |
| 1.4859 | G-X10 NiCrNb 32 20 | | |
| 1.4958 | X 5 NiCrAlTi 31 20 | UNS | N 08810 |
| 1.4959 | X 8 NiCrAlTi 31 21 | UNS | N 08811 |

It is used for operating temperatures up to 1050 °C in carburized low-sulphur combustion gas, e.g. in petrochemical plants.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Nb | Fe |
|------|-----|-----|------|------|-----|---------|
| 0,14 | 0,5 | 4,5 | 21,0 | 33,0 | 1,3 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|--------------|-----------------------|
| MPa | MPa | % | J |
| > 410 | > 600 | > 25 | > 50 |

Welding instruction

Hold stick electrode vertically with a short arc and lowest heat input. String beads are welded. The interpass temperature of 150 °C should not be exceeded.

Re-dry stick electrodes for 2 – 3 hours at 250 – 300 °C.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 07713)

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 400 |
|---------------------------------|-----------|-----------|-----------|
| Amperage | 50 – 75 | 70 – 110 | 90 – 140 |

UTP 2535 Nb

nickel alloys

Classifications basic coated stick electrode with high carbon content

EN ISO 3581-A

Material-No.

EZ 25 35 Nb B 6 2

1.4853

Characteristics and field of use

UTP 2535 Nb is suitable for joining and surfacing of heat resistant CrNi-cast steels (centrifugal- and mouldcast parts) of the same or of similar nature, such as

| | |
|--------|-----------------------|
| 1.4848 | G-X 40 CrNiSi 25 20 |
| 1.4852 | G-X 40 NiCrSiNb 35 26 |
| 1.4857 | G-X 40 NiCrSi 35 26 |

It is used for operating temperatures up to 1150 °C in carburized low-sulphur combustion gas, e.g. reforming ovens in petrochemical plants.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Nb | Ti | Fe |
|-----|-----|-----|------|------|-----|-----|---------|
| 0,4 | 1,0 | 1,5 | 25,0 | 35,0 | 1,2 | 0,1 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A |
|---------------------------|------------------------|----------------|
| MPa | MPa | % |
| > 480 | > 700 | > 8 |

Welding instruction

Hold stick electrode vertically with a short arc and lowest heat input. String beads are welded. The interpass temperature of 150 °C should not be exceeded. Re-dry stick electrodes for 2 – 3 hours at 250 – 300 °C

Welding positions

Current type DC (+)

Form of delivery and recommended welding parameters

| | | | | |
|---------------------------------|-----------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 400 | 5,0 x 400 |
| Amperage | 50 – 70 | 70 – 120 | 100 – 140 | |

Classifications

basic coated NiCrMo stick electrode

EN ISO 14172

AWS A5.11

Material-No.

E Ni 6117 (NiCr22Co12Mo)

ENiCrCoMo-1 (mod.)

2.4628

Characteristics and field of use

UTP 6170 Co is suitable for joining high-temperature and similar nickel-base alloys, heat resistant austenitic and cast alloys, such as 2.4663 (NiCr23Co12Mo), 2.4851 (NiCr23Fe), 1.4876 (X10 NiCrAlTi 32 21), 1.4859 (GX10 NiCrSiNb 32 20). The weld metal is resistant to hot-cracking and is used for service temperatures up to 1100 °C. Scale-resistance up to 1100 °C in oxidizing and carburized atmospheres, e.g. gasturbines, ethylene production plants.

UTP 6170 Co can be welded in all positions except vertical-down. It has a stable arc. The seam is finely rippled and notch-free. Easy slag removal.

Preheating temperature should be adjusted to the base material. Post weld heat treatments can be applied independently of the weld metal.

Typical analysis in %

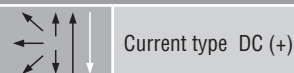
| C | Si | Mn | Cr | Mo | Ni | Co | Al | Ti | Fe |
|------|-----|-----|------|-----|---------|------|-----|-----|-----|
| 0,06 | 0,7 | 0,1 | 21,0 | 9,0 | balance | 11,0 | 0,7 | 0,3 | 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 450 | > 700 | > 35 | > 80 |

Welding instruction

Hold stick electrode as vertically as possible, keep a short arc. Use string bead technique. Fill end crater carefully. Interpass temperature max. 150 °C. Re-dry stick electrodes for 2 – 3 hours / 250 – 300 °C.

Welding positions

Approvals

TÜV (No. 04661)

Form of delivery and recommended welding parameters

| | | | |
|---------------------------------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 250 | 3,2 x 300 | 4,0 x 350 |
| Amperage | 55 – 75 | 70 – 90 | 90 – 110 |

UTP 6222 Mo

nickel alloys

Classifications

basic coated NiCrMo-stick electrode

EN ISO 14172

AWS A5.11

Material-No.

E Ni 6625 (NiCr22Mo9Nb)

E NiCrMo-3

2.4621

Characteristics and field of use

UTP 6222 Mo is particularly suited for joining and surfacing on nickel alloys, austenitic steels, low temperature nickel steels, austenitic-ferritic-joints and claddings of the same or similar nature, like 2.4856 (NiCr22Mo 9 Nb), 1.4876 (X30 NiCrAlTi 32 20), 1.4529 (X2 NiCrMoCu 25 20 5).

The weld metal is heat resistant and suitable for operating temperatures up to 1000 °C. It must be noted that a slight decrease in ductility will occur if prolonged heat treatment is given within the temperature range 600 – 800 °C. Scale-resisting in low-sulphur atmosphere up to 1100 °C. High creep strength.

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Nb | Fe |
|------|-----|-----|------|-----|---------|-----|-----|
| 0,03 | 0,4 | 0,6 | 22,0 | 9,0 | balance | 3,3 | < 1 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | |
|---------------------------|------------------------|----------------|-----------------------|---------|
| MPa | MPa | % | J | -196 °C |
| > 450 | > 760 | > 30 | > 75 | 45 |

Welding instruction

Opening angle of the prepared seam approx. 70°, root gap approx. 2 mm. Weld stick electrode with slight tilt and short arc. String beads are welded. The interpass temperature of 150 °C and a max. weaving with 2,5 x diameter of the stick electrode core wire should not be exceeded. Re-dry the stick electrodes 2 – 3 hours at 250 – 300 °C before use and weld them out of a warm electrode carrier.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 03610), DNV, ABS, GL, BV

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 250 | 3,2 x 300 | 4,0 x 350 | 5,0 x 400 |
|---------------------------------|-----------|-----------|-----------|-----------|
| Amperage | 50 – 70 | 70 – 95 | 90 – 120 | 120 – 160 |

Classifications

basic coated NiCrFe stick electrode

EN ISO 14172

AWS A5.11

Material-No.

E Ni 6025 (NiCr25Fe10AlY)

E NiCrFe-12

2.4649

Characteristics and field of use

UTP 6225 AI is suitable for joining high-temperature and heat resistant nickel-base alloys of identical and similar nature, such as 2.4633 (NiCr25-FeAlY), 2.4851 (NiCr23Fe) and high nickel containing cast alloys.

The special features of the weld metal include an excellent resistance against oxidation and carburization and a good creep rupture strength. For service temperature up to 1200 °C, e.g. steel tubes, rolls and baffles in ovens, ethylene cracking tubes, muffles.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Ti | Zr | Al | Fe | Y |
|-----|-----|-----|------|---------|-----|------|-----|------|------|
| 0,2 | 0,6 | 0,1 | 25,0 | balance | 0,1 | 0,03 | 1,8 | 10,0 | 0,02 |

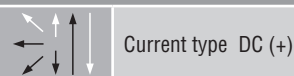
Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 500 | > 700 | > 15 | > 30 |

Welding instruction

Hold stick electrode as vertically as possible, keep a short arc. Use string beads technique and fill end crater carefully. Interpass temperature max. 150 °C. Re-dry stick electrodes for 2 – 3 hours / 250 – 300 °C.

Welding positions



Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 250 | 3,2 x 300 | 4,0 x 350 |
|---------------------------------|-----------|-----------|-----------|
| Amperage | 50 – 65 | 80 – 95 | 90 – 120 |

UTP 7015

nickel alloys

Classifications basic coated stick electrode

| | | |
|-------------------------|------------|--------------|
| EN ISO 14172 | AWS A5.11 | Material-No. |
| E Ni 6182 (NiCr15Fe6Mn) | E NiCrFe-3 | 2.4807 |

Characteristics and field of use

UTP 7015 is employed for joining and surfacing of nickel-base materials. UTP 7015 is also recommended for welding different materials, such as austenitic to ferritic steels, as well as for weld claddings on unalloyed and low-alloyed steels, e.g. for reactor construction.

Weldable in all positions, except vertical down. Stable arc, good slag removability. The seam is finely rippled and notch-free. The weld deposit has a fully austenitic structure and is high-temperature resistant. Not prone to embrittlement either at high or low temperatures

The preheating must be matched to the parent metal. Any thermal post-treatments can be applied without regard for the weld metal.

Typical analysis in %

| | | | | | | |
|-------|-----|-----|------|---------|-----|-----|
| C | Si | Mn | Cr | Ni | Nb | Fe |
| 0,025 | 0,4 | 6,0 | 16,0 | balance | 2,2 | 6,0 |

Mechanical properties of the weld metal

| | | | | | |
|-------------------------------------|----------------------------------|---------------------|------------------------------|---------|----------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_V | | <i>Hardness</i> Brinell |
| MPa | MPa | % | J | -196 °C | HB |
| 400 | 670 | 40 | 120 | 80 | approx. 170 |

Welding instruction

Opening angle of the prepared seam approx. 70°, root gap approx. 2 mm. The stick electrode is welded with a slight tilt and short arc. Use string beads welding technique. The interpass temperature of 150 °C and a max. weaving width 2,5 x diameter of the stick electrode core wire should not be exceeded. Re-dry stick electrode prior welding for 2 – 3 hours at 250 – 300 °C, welding out of a hot stick electrode carrier.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 00875), GL, DNV, KTA (No. 08036)

Form of delivery and recommended welding parameters

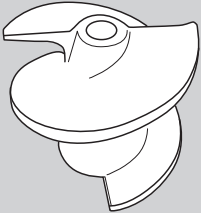
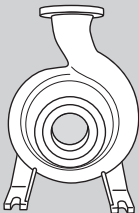
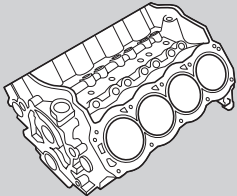
| | | | | |
|----------------------------|-----------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 300 | 3,2 x 300 | 4,0 x 350 | 5,0 x 400 |
| <i>Amperage</i> | 50 – 70 | 70 – 95 | 90 – 120 | 120 – 160 |

Covered electrodes for repair of cracked material

4. Cast iron

| Product name | EN ISO | | AWS | | Page |
|--------------|--------|-------------|-------|-----------|------|
| UTP 5 D | 1071 | EZ FeC-GF | | | 48 |
| UTP 8 | 1071 | E C Ni-C 1 | A5.15 | E Ni-CI | 49 |
| UTP 83 FN | 1071 | E C NiFe-11 | A5.15 | E NiFe-CI | 50 |
| UTP 85 FN | 1071 | E C NiFe-13 | A5.15 | E NiFe-CI | 51 |
| UTP 86 FN | 1071 | E C NiFe-13 | A5.15 | E NiFe-CI | 52 |
| UTP 86 FN-5 | 1071 | E C NiFe-13 | A5.15 | E NiFe-CI | 53 |

Solution examples

| | | |
|---|---|---|
|  |  |  |
| <i>Screw press</i> | <i>Pumb body</i> | <i>Engine block</i> |
| UTP 8 | UTP 83 FN | UTP 86 FN |

UTP 5 D

cast iron

Classifications

graphite-basic coated stick electrode

EN ISO 1071

EZ FeC-GF

Characteristics and field of use

UTP 5 D is suited for cast iron hot welding (identical in colour and structure) nodular cast iron (GJS) and grey cast iron (GJL). The mechanical properties are obtained by heat treatment in accordance with the base metal being used.

UTP 5 D has a smooth arc and little slag, therefore, slag removal on pipe cavity and repair welds is not necessary.

Typical analysis in %

| C | Si | Mn | Fe |
|-----|-----|-----|---------|
| 3,0 | 3,0 | 0,4 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Hardness |
|---------------------------|------------------------|-------------|
| MPa | MPa | HD |
| approx. 350 | approx. 550 | approx. 220 |

Welding instruction

Preheating of weldment to 550 – 650 °C. Interpass temperature at a minimum of 550 °C. Slow cooling of the weldment (< 30 °C / h) or covered cooling.

Welding positions

Current type DC (-) / AC

Form of delivery and recommended welding parameters

| | | | |
|---------------------------------|------------|------------|------------|
| Electrodes \varnothing mm x L | 3,2 x 350* | 4,0 x 450* | 8,0 x 450* |
| Amperage | 75 – 140 | 110 – 160 | 250 – 300 |

*available on request

Classifications graphite-basic coated stick electrode

EN ISO 1071 AWS A5.15

E C Ni-CI 1 E Ni-CI

Characteristics and field of use

UTP 8 is for cold welding of grey and malleable cast iron, cast steel and for joining these base metals to steel, copper and copper alloys, especially for repair and maintenance.

UTP 8 has excellent welding properties. The easily controllable flow permits spatterfree welding in all positions and with minimal amperage. The weld deposit and the transition zones are filable. No undercutting. Ideally suited for the combined welding with the ferro-nickel type UTP 86 FN (buttering with UTP 8 and filling with UTP 86 FN).

Typical analysis in %

| C | Ni | Fe |
|-----|---------|-----|
| 1,2 | balance | 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Hardness |
|---------------------------|-------------|
| MPa | HB |
| approx. 220 | approx. 180 |

Welding instruction

Depending on the wall thickness, the preparation is made in U- or double U-form. The casting skin has to be removed on both sides of the welding area. Hold the stick electrode vertically with a short arc. Thin passes are buttered, their width not more than twice the diameter of the core wire. To avoid over-heating, the beads should not be longer than 10 times the stick electrode diameter. Remove the slag immediately after welding and then peen the deposit carefully. Reignite on the weld deposit and not on the base metal.

Welding positions



Current type DC (-) / AC

Approvals

DB (No. 62.138.01)

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,0 x 300 | 2,5 x 300 | 3,2 x 350 | 4,0 x 350 |
|---------------------------------|-----------|-----------|-----------|-----------|
| Amperage | 45 – 60 | 60 – 80 | 80 – 100 | 110 – 140 |

UTP 83 FN

cast iron

Classifications

graphite-basic coated FeNi stick electrode

EN ISO 1071

AWS A5.15

E C NiFe-11

E NiFe-CI

Characteristics and field of use

UTP 83 FN is suitable for surfacing and joining of all commercial cast iron grades, such as lamellar grey cast iron and nodular cast iron, malleable cast iron and for joining these materials to steel or cast steel. This stick electrode is particularly used where a high deposition rate is needed.

UTP 83 FN has an excellent melting performance and the easily controllable transfer provides a spatterfree deposit of perfect appearance. The weld deposit is easily machinable with cutting tools, tough and crack-resistant.

Hardness of the pure weld metal: approx. 190 HB

Typical analysis in %

| C | Ni | Fe |
|-----|------|---------|
| 1,3 | 52,0 | balance |

Welding instruction

The casting skin and impurities have to be removed from the welding area. Weld with low amper-age and short arc. For the purpose of stress relief in case of difficult weldings, peen the weld metal and reduce the heat input by welding short beads.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 350 |
| <i>Amperage</i> | 50 – 70 | 70 – 100 | 100 – 130 |

Classifications

Graphite-basic coated FeNi stick electrode

EN ISO 1071

AWS A5.15

E C NiFe-1 3

E NiFe-CI

Characteristics and field of use

UTP 85 FN is suitable for surfacing and joining of all grades of cast iron, particularly nodular cast iron (GGG 38-60) and for joining these materials with steel and cast steel.

UTP 85 FN has excellent welding properties and a smooth, regular flow, a high deposition rate and a finely rippled bead appearance. Very economic for construction and production welding on nodular cast iron parts. High current carrying capacity thank to a bimetallic core wire.

Typical analysis in %

| C | Ni | Fe |
|-----|------|---------|
| 1,2 | 54,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Hardness |
|---------------------------|-------------|
| MPa | HB |
| approx. 320 | approx. 200 |

Welding instruction

Prior to welding, the casting skin has to be removed from the welding area. Hold the stick electrode vertically and with a short arc. Apply string beads – if necessary, with very little weaving. Peen the deposit after slag removal for the purpose of stress relief. Avoid high heat concentration.

Welding positions

| | |
|--|--------------------------|
| | Current type DC (+) / AC |
|--|--------------------------|

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 350 | 5,0 x 400 |
|---------------------------------|-----------|-----------|-----------|-----------|
| Amperage | 50 – 70 | 70 – 100 | 100 – 130 | 130 – 160 |

UTP 86 FN

cast iron

Classifications graphite-basic coated FeNi stick electrode

EN ISO 1071

AWS A5.15

E C NiFe-13

E NiFe-CI

Characteristics and field of use

UTP 86 FN is suitable for joining and surfacing of lamellar grey cast iron EN GJL 100 - EN GJL 400, nodular cast iron (spheroidal cast iron) EN GJS 400 - EN GJS 700 and malleable cast iron grades EN GJMB 350 - EN GJMB 650 as well as for joining these materials with each other or with steel and cast steel. Universally applicable for repair, construction and production welding.

UTP 86 FN has excellent buttering characteristics on cast iron. The stick electrode has a stable arc and produces a flat seam structure without undercutting. Particularly for fillet welds an optimal seam structure is achieved (e.g. welding GJS-flanges or sockets to GJS-tubes). Due to the bimetallic core wire, the current carrying capacity and the deposition rate are excellent. The bead appearance is smooth. The weld deposit is highly crack resistant and easily machinable with cutting tools.

Typical analysis in %

| C | Ni | Fe |
|-----|---------|------|
| 1,2 | balance | 45,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Hardness |
|---------------------------|-------------|
| MPa | HB |
| approx. 340 | approx. 220 |

Welding instruction

UTP 86 FN is preferably welded on DC (negative polarity) or on AC. When welding on DC (neg. po-larity), a deep penetration is reached (advantage for fillet welds). Positional weldings are easier with AC. Prior to welding, remove the casting skin. Hold stick electrode vertically and with short arc. When welding cracksusceptible cast iron grades, the deposit may be peened for the purpose of stress relief.

Welding positions

Current type DC (-) / AC

Approvals

DB (No. 62.138.05)

Form of delivery and recommended welding parameters

| | | | |
|---------------------------------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 350 |
| Amperage | 60 – 90 | 90 – 140 | 100 – 170 |

Classifications graphite-basic coated FeNi stick electrode

EN ISO 1071 AWS A 5.15

E C NiFe-1 3 E NiFe-CI

Characteristics and field of use

UTP 86 FN-5 was developed for high-quality production and construction welds of cast iron with nodular graphite (spheroidal cast iron). Dissimilar joints with steel are possible. It is mainly used in production welding of ferritic spheroidal cast iron with specific mechanical properties, such as EN-GJS-400-18-LT

The used NiFe-bimetallic core wire gives the stick electrode a high current carrying capacity and a good deposition rate. Good wetting characteristics on cast iron are achieved by the stable arc and smooth flow. The deposit is highly crack resistant with good strength and toughness. Machining is possible.

Typical analysis in %

| | | | | |
|-----|-----|-----|------|---------|
| C | Si | Mn | Fe | Ni |
| 1,2 | 0,5 | 0,3 | 45,0 | balance |

Mechanical properties* of the pure weld metal after heat treatment 2 h/920 °C


| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation A</i> | <i>Impact strength</i> K_v | <i>Hardness</i> Brinell |
|-------------------------------------|----------------------------------|---------------------|------------------------------|----------------------------|
| MPa | MPa | % | J | HB |
| > 250 | > 480 | > 20 | > 15 | approx. 170 |

* Mechanical properties cannot be guaranteed for diameter 2,5mm

Welding instruction

Prior to welding, clean the weld area, remove casting skin and check for any cracks. Hold the electrode vertically and keep a short arc. Large parts can be preheated to 80°C. For the purpose of stress relieving, it is recommended to peen the deposit directly after welding.

Welding positions



Current type DC (-) / AC

Form of delivery and recommended welding parameters

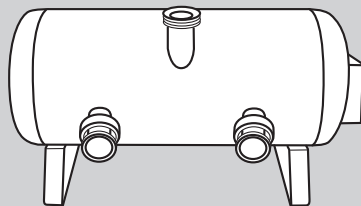
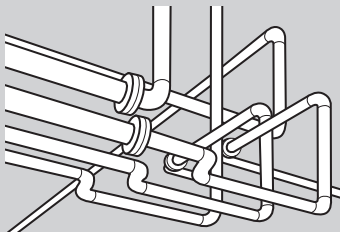
| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 350 |
| <i>Amperage</i> | 65 – 90 | 90 – 140 | 100 – 170 |

Covered electrodes for repair of cracked material

5. Copper alloys

| Product name | DIN | | AWS | | Mat.-No. | Page |
|--------------|------|-------------|------|-----------------|----------|------|
| UTP 32 | 1733 | EL-CuSn7 | A5.6 | E CuSn-C (mod.) | 2.1025 | 55 |
| UTP 387 | 1733 | EL-CuNi30Mn | A5.6 | E CuNi | 2.0837 | 56 |

Solution examples



Piping

Pressure vessel

UTP 32

UTP 387

Classifications

basic-coated tin-bronze stick electrode

DIN 1733

AWS A5.6

Material-No.

EL-CuSn7

E CuSn-C (mod.)

2.1025

Characteristics and field of use

UTP 32 is a basic-coated tin-bronze stick electrode for joining and surfacing on copper tin alloys with 6 – 8 % Sn, copper-tin alloys and for weld claddings on cast iron materials and on steel.

UTP 320 is easy weldable and the slag removal is also easy. The corrosion resistance is corresponding to identical or similar base metals. Seawater resistant. Very good gliding properties.

Typical analysis in %

| | |
|---------|-----|
| Cu | SN |
| balance | 7,0 |

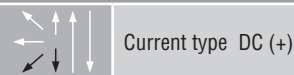
Mechanical properties of the weld metal

| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Hardness</i> | <i>Elongation conductivity</i> | <i>Melting range</i> |
|-------------------------------------|----------------------------------|-----------------|--------------------------------|----------------------|
| MPa | MPa | HD | $S \times m / mm^2$ | °C |
| approx. 300 | > 30 | approx. 100 | approx. 7 | 910 – 1040 |

Welding instruction

Clean welding area thoroughly. Ignite stick electrode inclined with scratch start. For wall thickness of > 8 mm a preheating of 100 – 250 °C is necessary. Hold stick electrode vertically and weave slightly. Use only dry stick electrodes. Re-drying 2 – 3 h at 150 °C.

Welding positions



Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 350 |
| <i>Amperage</i> | 60 – 80 | 80 – 100 | 100 – 120 |

UTP 387

copper alloys

Classifications

basic coated copper-nickel stick electrode 70/30

DIN 1733

AWS A5.6

Material-No.

EL-CuNi30Mn

E CuNi

2.0837

Characteristics and field of use

The copper-nickel base stick electrode UTP 387 is used for joining and surfacing alloys of similar com-positions with up to 30 % nickel, as well as non-ferrous alloys and steels of different nature. The seawater-resistant weld metal enables this special stick electrode to be employed in ship-building, oil refineries, the food industry and in the engineering of corrosion-proof vessels and equipment generally.

UTP 387 can be welded in all positions, except vertical-down, seawater resistant.

Typical analysis in %

| C | Si | Mn | Ni | Cu | Fe |
|------|-----|-----|------|---------|-----|
| 0,03 | 0,3 | 1,2 | 30,0 | balance | 0,6 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 240 | > 390 | > 30 | > 80 |

Welding instruction

Groove out a V seam with min. 70 °C and provide a root gap of 2 mm. Remove the oxide skin about 10 mm beside the joint, on the reverse side too. The weld zone must be bare and properly de-greased. Fuse the arc strike point again by bringing the stick electrode back, in order to obtain a good bond. Keep the arc short.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 01626), GL

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x300* | 3,2 x 350 | 4,0 x 350* |
|---------------------------------|-----------|-----------|------------|
| Amperage | 60 – 80 | 80 – 105 | 110 – 130 |

*available on request

Surfacing electrodes for anti-wear and anti-corrosion applications

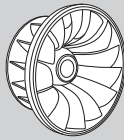
| Product name | DIN | | AWS | | Abrasion | Corrosion | Erosion | Cavitation | Heat | Impact | Metal to Earth | Metal to Metal | Page |
|----------------|-------|----------|-------|----------------|----------|-----------|---------|------------|------|--------|----------------|----------------|------|
| | | | | | | | | | | | | | |
| UTP 34 N | 14700 | E Cu1 | A5.13 | E CuMnNiAl 1 | | ■ | | ■ | | | | | 58 |
| UTP 73 G 2 | 14700 | E Fe8 | | | ■ | | ■ | | | ■ | | | 59 |
| UTP 73 G 3 | 14700 | E Fe3 | | | ■ | | ■ | | ■ | ■ | | | 60 |
| UTP 73 G 4 | 14700 | E Z Fe3 | | | ■ | | ■ | | ■ | ■ | | | 61 |
| UTP 665 | 14700 | E Fe7 | | | | ■ | | | | ■ | | | 62 |
| UTP 673 | 14700 | E Z Fe3 | | | ■ | | ■ | | ■ | ■ | | | 63 |
| UTP 690 | 14700 | E Fe4 | A5.13 | E Fe 5-B(mod.) | | | | | ■ | | | | 64 |
| UTP 702 | 14700 | E Fe5 | | | | | | | ■ | ■ | | | 65 |
| UTP 750 | 14700 | E Z Fe6 | | | | ■ | | | ■ | ■ | | | 66 |
| UTP 7000 | 14700 | E Z Ni2 | | | | ■ | | | ■ | ■ | | | 67 |
| UTP 7008 | 14700 | E Z Ni2 | | | | | | | | | | | 68 |
| UTP 7200 | 14700 | E Z Fe9 | A5.13 | ~ E FeMn-A | | | | | | ■ | | | 69 |
| UTP BMC | 14700 | E Fe9 | | | | | | | | ■ | | | 70 |
| UTP CELSIT 706 | 14700 | E Z Co2 | A5.13 | E CoCr-A | ■ | ■ | ■ | ■ | ■ | ■ | | | 71 |
| UTP CELSIT 721 | 14700 | E Co1 | A5.13 | E CoCr-E | ■ | ■ | ■ | ■ | ■ | ■ | | | 72 |
| UTP DUR 250 | 14700 | E Fe1 | | | | | | | | | | ■ | 73 |
| UTP DUR 350 | 14700 | E Fe1 | | | | | | | | ■ | | | 74 |
| UTP DUR 600 | 14700 | E Fe8 | | | ■ | | ■ | | | ■ | ■ | | 75 |
| UTP DUR 650 Kb | 14700 | E Fe8 | | | ■ | | ■ | | ■ | ■ | ■ | | 76 |
| UTP HydroCav | 14700 | E Z Fe9 | | | | ■ | ■ | ■ | | ■ | | | 77 |
| UTP LEDURIT 61 | 14700 | E Z Fe14 | A5.13 | ~ E FeCr-A 1 | ■ | | ■ | | | | ■ | | 78 |
| UTP LEDURIT 65 | 14700 | E Fe16 | | | ■ | | ■ | | ■ | | ■ | | 79 |

Solution examples



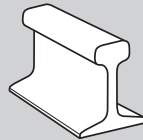
Crushing hammer

UTP DUR 600



Turbine

UTP HydroCav



Rail

UTP BMC

UTP 34 N

anti-wear & anti-corrosion

Classifications

basic coated complex aluminiumbronze stick electrode

DIN 8555

EN 14700

AWS A5.13

E 31-UM-200-CN

E Cu1

E CuMnNiAl

Characteristics and field of use

UTP 34 N is suitable for joinings and surfacings on copper-aluminium alloys, specially with high Mn-content as well as for claddings on cast iron materials and steel. Main application fields are in the shipbuilding (propeller, pumps, armatures) and in the chemical industry. The good friction coefficient permits claddings on shafts, bearings, stamps, drawing tools and all kind of gliding surface.

UTP 34 N has excellent welding properties, spatterfree welding, good slag removal. The weld deposit has high mechanical values, a good corrosion resistance in oxidizing media, best gliding properties and a very good machinability. Crack resistant and pore-free.

Typical analysis in %

| Mn | Ni | Cu | Al | Fe |
|------|-----|---------|-----|-----|
| 13,0 | 2,5 | balance | 7,0 | 2,5 |

Mechanical properties of the weld metal

| Yield strength $R_{P0,2}$ | Tensile strength R_m | Elongation A | Hardness |
|---------------------------|------------------------|----------------|----------|
| MPa | MPa | % | HB |
| 400 | 650 | 15 | 220 |

Welding instruction

Clean welding area thoroughly. Pre-heating of thick-walled parts to 150 – 250 °C. Hold electrode as vertically as possible and weld with slight weaving. Weld with dry stick electrodes only! Re-drying: 2 – 3 hours at 150 °C.

Welding positions

Current type DC (+)

Form of delivery and recommended welding parameters

| | | | |
|---------------------------------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 350 |
| Amperage | 50 – 70 | 70 – 90 | 90 – 110 |

Classifications

basic coated stick electrode

DIN 8555

EN 14700

E 3-UM-55-ST

E Fe8

Characteristics and field of use

UTP 73 G 2 is, due to its high hardness, toughness and heat resistance ideally suited for buildups on parts subject to severe friction, compression and moderate impact loads at elevated temperatures, such as back centers, gripping pliers, gliding and guiding surfaces, hot and cold punching tools, valves, slides, hot-shear blades, extrusion press pistons, forging tools, stripping columns, trimming tools, roll mandrils, punching tools for sheet metals. UTP 73 G 2 is used to good advantage for the production of new cold and hot working tools. In such cases cladding is made on base material with an accordingly high tensile strength.

The stick electrode has excellent welding properties, a stable and regular flow, good bead appearance and very easy slag removal. Heat resistant up to 550 °C

Hardness of the pure weld metal: 55 – 58 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,2 | 0,5 | 1,3 | 7,0 | 2,5 | balance |

Welding instruction

Preheat the workpiece to 400 °C. Hold stick electrode as vertically as possible and with a short arc. Allow the workpiece to cool down slowly. Finishing by grinding. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions


Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | | |
|----------------------------|-----------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 400 | 5,0 x 400 |
| <i>Amperage</i> | 60 – 90 | 80 – 110 | 100 – 140 | 130 – 170 |

UTP 73 G 3

anti-wear

Classifications

basic coated stick electrode

DIN 8555

EN 14700

E 3-UM-45-T

E Fe3

Characteristics and field of use

UTP 73 G 3 is, due to its high strength, toughness and heat resistance ideally suited for buildups on parts subject to friction, compression and impact at elevated temperatures, such as hot shears blades, gate shear, forging saddles, hammers, forging dies, Al-die cast moulds. UTP 73 G 3 is also used to good advantage for the production of new cold and hot working tools with low-alloy base materials.

The stick electrode has excellent welding properties, a stable and regular flow, good bead appearance and very easy slag removal. Heat resistant up to 550 °C.

Hardness of the pure weld metal: approx. 45 – 50 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,2 | 0,5 | 0,6 | 5,0 | 4,0 | balance |

Welding instruction

Preheat the workpiece to 400 °C. Hold stick electrode as vertically as possible and with a short arc. Take care of a slow cooling of the workpiece. Finishing by grinding or hard metal alloys. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| Electrodes Ø mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 400 | 5,0 x 400* |
|---------------------|-----------|-----------|-----------|------------|
| Amperage | 60 – 90 | 80 – 100 | 100 – 140 | 130 – 170 |

*available on request

Classifications

basic coated stick electrode

DIN 8555

EN 14700

E 3-UM-40-PT

E Z Fe3

Characteristics and field of use

UTP 73 G 4 is, due to its toughness and heat resistance, ideally suited for surfacings on parts and tools subject to abrasion, compression and impact at elevated temperatures. Particularly for buildups on forging dies, die cast moulds, rollers, wobbler drives, hot-shear blades. UTP 73 G 4 also offers an economic solution for the production of new tools, for which a base material with an adequate tensile strength is recommended.

The stick electrode has excellent welding properties, a stable and regular flow, good bead appearance and very easy slag removal. Heat resistant up to 550 °C.

Hardness of the pure weld metal: approx. 38 – 42 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,1 | 0,5 | 0,6 | 6,5 | 3,5 | balance |

Welding instruction

Preheat the workpiece to 400 °C. Hold stick electrode as vertically as possible and with a short arc. Take care of a slow cooling of the workpiece. Machining is possible with tungstene carbide tools. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions



Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | | |
|---------------------|-----------|-----------|-----------|------------|
| Electrodes Ø mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 400 | 5,0 x 400* |
| Amperage | 60 – 90 | 80 – 100 | 100 – 140 | 130 – 170 |

*available on request

UTP 665

anti-wear & anti-corrosion

Classifications

high Cr-alloyed special stick electrode

EN 14700

E Fe7

Characteristics and field of use

UTP 665 is especially suitable for repairs on tool steels, particularly cutting tools made of 12-% chromium cutting steels, such as 1.2601, 1.2080, 1.2436, 1.2376, 1.2379, on broken or fatigued areas. Modification of moulds can also be done. The mentioned tool steels are particularly used in the car industry as stamping - and pressing tools.

UTP 665 has excellent welding properties. Smooth, stable arc, spatterfree and fine rippled seams without undercutting. Very good slag removal. The weld deposit is equivalent to high alloyed chromium steel, crack - and pore resistant, stainless.

Hardness of the pure weld metal: approx. 250 HB
on Cr cutting steel 1 – 2 layers 55 – 57 HRC

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|-----|-----|------|---------|
| 0,06 | 0,8 | 0,6 | 17,0 | balance |

Welding instruction

Pre-heat 12-% chromium cutting steels to 400 – 450 °C in hardened as well as in soft annealed conditions. Soft-annealing and throughout preheating is recommended at massive tools and prolonged working. Generally a local preheating and peening of the welding bead will be enough for smaller repair works. Slow cooling in oven or under a cover.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| Electrodes Ø mm x L | 2,5 x 250* | 3,2 x 350* | 4,0 x 350* |
|---------------------|------------|------------|------------|
| Amperage | 50 – 70 | 70 – 100 | 100 – 130 |

*available on request

Classifications

rutile coated stick electrode

DIN 8555

EN 14700

E 3-UM-60-ST

E Z Fe3

Characteristics and field of use

UTP 673 is used for wear resistant buildups on cold and hot working tools, particularly for cutting-edges on hot cutting tools, hot-shear blades, trimming tools and cold cutting knives. The production of new cutting tools by welding on non-alloy or low-alloy base materials is also possible.

UTP 673 has excellent welding properties, a homogeneous, finely rippled bead appearance due to the spray arc and very easy slag removal. This stick electrode is weldable with very low amperage settings (advantage for edge buildup).

Heat resistant up to 550 °C Hardness of the pure weld metal: approx. 58 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | V | W | Fe |
|-----|-----|-----|-----|-----|-----|-----|---------|
| 0,3 | 0,8 | 0,4 | 5,0 | 1,5 | 0,3 | 1,3 | balance |

Welding instruction

Preheat high-alloy tool steels to 400 – 450 °C and maintain this temperature during the whole welding process. Hold stick electrode vertically with a short arc and lowest possible amperage setting. Machining only by grinding. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions



Current type DC (-) / DC (+) / AC

Form of delivery and recommended welding parameters

| Electrodes Ø mm x L | 2,0 x 300* | 2,5 x 300 | 3,2 x 350 | 4,0 x 400 |
|---------------------|------------|-----------|-----------|-----------|
| Amperage | 30 – 50 | 50 – 70 | 90 – 120 | 130 – 160 |

*available on request

UTP 690

anti-wear

Classifications

rutile coated high efficiency stick electrode

DIN 8555

EN 14700

AWS A5.13

E 4-UM-60-ST

E Fe4

E Fe 5-B (mod.)

Characteristics and field of use

UTP 690 is used for repair and production of cutting tools, particularly for building-up cutting edges and working surfaces. The deposit is highly resistant to friction, compression and impact, also at elevated temperatures up to 550 °C. The production of new tools by welding on non-alloy and low-alloy base metals is also possible (cladding of cutting edges).

UTP 690 has excellent welding properties, a smooth, finely rippled bead appearance due to the spray arc and very easy slag removal. The weld deposit is equivalent to a high speed steel with increased Mo-content.

Hardness of the pure weld metal:
soft annealed 800 – 840 °C
hardened 1180 – 1240 °C and
tempered 2 x 550 °C

approx. 62 HRC

approx. 25 HRC

approx. 64 – 66 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | V | W | Fe |
|-----|-----|-----|-----|-----|-----|-----|---------|
| 0,9 | 0,8 | 0,5 | 4,5 | 8,0 | 1,2 | 2,0 | balance |

Welding instruction

Clean the welding area and preheat high-speed steel tools to 400 – 600 °C, maintain this temperature during the whole welding process, followed by slow cooling. Machining by grinding is possible. Hold stick electrode vertically and with a short arc. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 450 |
| <i>Amperage</i> | 70 – 90 | 90 – 110 | 110 – 130 |

Classifications

basic coated martensitic stick electrode

DIN 8555

EN 14700

E 3-UM-350-T

E Fe5

Characteristics and field of use

Due to its high-grade structure, UTP 702 is used for repair, preventive maintenance and production of highly stressed cold and hot working tools, such as punching tools, cold shears for thick materials, drawing -, stamping - and trimming tools, hot cutting tools, AI-die cast moulds, plastic moulds, cold forging tools. The weld deposit is, in as-welded condition, easily machinable and the subsequent age hardening optimises the resistance to wear and alternating temperatures.

UTP 702 has excellent welding properties, a smooth and regular drop transfer, good bead appearance and easy slag removal.

Hardness of the pure weld metal:

untreated:

34 – 37 HRC

After age hardening 3 – 4 h / 480 °C

50 – 54 HRC

Typical analysis in %

| C | Si | Mn | Mo | Ni | Co | Ti | Fe |
|-------|-----|-----|-----|------|------|-----|---------|
| 0,025 | 0,2 | 0,6 | 4,0 | 20,0 | 12,0 | 0,3 | balance |

Welding instruction

Clean welding area to metallic bright. Only massive tools should be preheated to 100 – 150 °C. On lowalloy steels at least 3 – 4 layers should be applied. Keep heat input as low as possible.

Welding positions



Current type DC (+)

Form of delivery and recommended welding parameters

| Electrodes Ø mm x L | 2,5 x 250 | 3,2 x 350 | 4,0 x 350 |
|---------------------|-----------|-----------|-----------|
| Amperage | 70 – 90 | 100 – 120 | 120 – 140 |

UTP 750

anti-wear & anti-corrosion

Classifications

rutile coated stick electrode, stainless

DIN 8555

EN 14700

E 3-UM-50-CTZ

E Z Fe6

Characteristics and field of use

UTP 750 is suited for heat resistant buildups on hot working steels particularly exposed to metallic gliding wear and elevated thermal shock stress, such as diecast moulds for brass, aluminium and magnesium, hot-pressed mandrils, trimming tools, hot-shear blades, extruding tools, forging dies and hot flow pressing tools for steel. Due to the excellent metal-to-metal gliding properties, also suitable for buildups on guiding and gliding surfaces. Tempering resistant up to 650 °C, scale-resisting up to 900 °C, it can be nitrided and is stainless.

UTP 750 has excellent welding properties, a homogeneous, finely rippled seam and a self-lifting slag, good bead appearance.

Hardness of the pure weld deposit:

untreated

48 – 52 HRC

soft annealed 850 – 900 °C

approx. 35 HRC

hardened 1000 – 1150 °C /air

48 – 52 HRC

tempered 700 °C

approx. 40 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Co | Fe |
|-----|-----|-----|------|-----|-----|------|---------|
| 0,2 | 0,5 | 0,2 | 11,5 | 4,5 | 1,0 | 12,5 | balance |

Welding instruction

Clean welding area to metallic bright. Preheating temperature depends on the welding application (150 – 400 °C). On low-alloy steels at least 3 – 4 layers should be applied.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | |
|---------------------------------|------------|------------|------------|
| Electrodes \varnothing mm x L | 2,5 x 250* | 3,2 x 350* | 4,0 x 350* |
| Amperage | 60 – 90 | 80 – 120 | 120 – 160 |

*available on request

Classifications rutile basic coated high efficiency electrode

DIN 8555

EN 14700

E 23-UM-200-CKTZ

E Z Ni 2

Characteristics and field of use

UTP 7000 is particularly suited for wear resisting cladding on working surfaces of hot working tools subject to thermal load, such as forging jaws, forging dies, forging saddles, hot piercing plugs, hot cutting tools, hot trimming tools, roll mandrils, hot moulding plugs.

UTP 7000 has excellent welding properties, a regular and finely rippled bead appearance due to spray arc. Very easy slag removal. The weld deposit is highly corrosion resistant, scale resistant and workhardening. Machinable with cutting tools.

Hardness of the pure weld deposit : approx. 220 HB
after workhardening approx. 450 HB

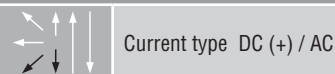
Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | W | Co | Fe |
|------|-----|-----|------|------|---------|-----|-----|-----|
| 0,04 | 0,3 | 0,9 | 16,0 | 17,0 | balance | 5,0 | 1,5 | 5,0 |

Welding instruction

Clean welding area, preheat tools to 350 – 400 °C and maintain this temperature during the whole welding process. Slow cooling in an oven. Hold stick electrode vertically and with a short arc. Select lowest possible amperage, in order to reduce dilution with the base metal. Cracks in the tool have to be gouged out completely and welded with UTP 7015 HL or UTP 068 HH. Final layers have to be welded with UTP 7000. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions



Form of delivery and recommended welding parameters

| | | | | |
|----------------------------|-----------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 350 | 5,0 x 450 |
| <i>Amperage</i> | 80 – 100 | 100 – 120 | 130 – 160 | 180 – 220 |

UTP 7008

anti-wear & anti-corrosion

Classifications

rutile basic coated high efficiency electrode

DIN 8555

EN 14700

E 23-UM-250-CKTZ

E Z Ni2

Characteristics and field of use

UTP 7008 is particularly suited for wear resisting cladding on hot working tools subject to thermal load, such as forging saddles, forging jaws, forging dies, hot piercing plugs, hot cutting knives, hot trimming tools and hot press rams.

UTP 7008 has excellent welding properties, a homogeneous, finely rippled bead appearance due to the spray arc, very easy slag removal. The weld deposit is highly corrosion resistant, scale resistant and workhardening. Machinable with cutting tools.

Hardness of the pure weld deposit : approx. 260 HB
workhardened approx. 500 HB

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | V | W | Fe |
|------|-----|-----|------|------|---------|-----|-----|-----|
| 0,04 | 0,5 | 1,3 | 16,0 | 16,0 | balance | 1,0 | 7,0 | 6,0 |

Welding instruction

Clean welding area. Preheat tools to 350 – 400 °C, temperature should be maintained during the welding process. Slow cooling in oven. Hold stick electrode as vertically as possible and with a short arc. Select lowest possible amperage, in order to reduce dilution with the base metal. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 350 |
| <i>Amperage</i> | 60 – 90 | 80 – 120 | 110 – 150 |

Classifications basic coated, CrNi alloyed, Mn-hardsteel stick electrode

DIN 8555

EN 14700

AWS A5.13

~ E 7-UM-250-KP

EZ Fe9

~ E FeMn-A

Characteristics and field of use

UTP 7200 is predominantly suited for tough and crack resistant joinings and surfacings on parts of high Mn-steel subject to extreme impact, compression and shock. Buildups on C-steel are also possible. The main application areas are the building industry, quarries and mines for surfacing worn high Mn steel parts, e.g. excavator pins, buckets and teeth, mill hammers, crusher jaws, cones and beaters, impeller bars, railway building machinery, shunts, heart and cross pieces.

The high Mn-content produces a fully austenitic deposit. The deposit is highly workhardening and hardens during service from originally 200 – 250 HB to 450 HB. Machining is possible with tung-stene carbide tools.

Hardness of the pure weld deposit

After welding:

200 – 250 HB

After workhardening:

48 – 53 HRC

Typical analysis in %

| C | Mn | Ni | Cr | Fe |
|-----|------|-----|-----|---------|
| 0,7 | 13,0 | 4,0 | 4,5 | balance |

Welding instruction

Hold stick electrode as vertically as possible. Welding should be done at low temperature. Interpass temperature should not exceed 250 °C. It is therefore recommended to weld short beads and to allow for continuous cooling during welding or to place the workpiece in a cold water bath with only the welding area ticking out of water.

Welding positions



Current type DC (+) / AC

Approvals

DB (No. 20.138.08)

Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 3,2 x 350 | 4,0 x 450 | 5,0 x 450 |
| <i>Amperage</i> | 110 – 140 | 150 – 180 | 180 – 210 |

UTP BMC

anti-wear

Classifications basic coated Chromium alloyed Mn-steel stick electrode

DIN 8555

EN 14700

E 7-UM-250-KPR

E Fe9

Characteristics and field of use

UTP BMC is suitable for claddings on parts subject to highest pressure and shock in combination with abrasion. Surfacing can be made on ferritic steel as well as austenitic hard Mn-steel and joints of hard Mn-steel can be welded. Main application fields are in the mining- and cement industry, crushing plants, rail lines and steel works, where working parts are regenerated, such as breaker jaws, paving breakers and beating arms, frogs and cross pieces, roll shafts, flight pushers and wobbler drives.

Fully austenitic structure. Due to the addition of Cr, increased resistance against friction and corrosion. Very high workhardening and high toughness.

Hardness of the pure weld deposit

After welding: approx. 260 HB

After work hardening: 48 - 53 HRC

Typical analysis in %

| C | Si | Mn | Cr | Fe |
|-----|-----|------|------|---------|
| 0,6 | 0,8 | 16,5 | 13,5 | balance |

Welding instruction

Hold the stick electrode nearly vertical. Welding should be done at low temperature. Interpass temperature should not exceed 250 °C. It is therefore recommended to weld short beads and to allow for continuous cooling or to place the workpiece in a cold water bath with only the welding area sticking out of water. Re-drying: 2 hours at 300 °C

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 3,2 x 450 | 4,0 x 450 | 5,0 x 450 |
| <i>Amperage</i> | 110 – 150 | 140 – 190 | 190 – 240 |

UTP CELSIT 706

anti-wear & anti-corrosion

| | | | |
|------------------------|---|-----------|--|
| Classifications | rutile coated stick electrode on Cobalt base, core wire alloyed | | |
| DIN 8555 | EN 14700 | AWS A5.13 | |
| E 20-UM-40-CSTZ | E Z Co2 | E CoCr-A | |

Characteristics and field of use

UTP CELSIT 706 is used for hardfacing on parts subject to a combination of erosion, corrosion, cavitation, impact, pressure, abrasion and high temperatures up to 900 °C, such as tight surfaces on fittings, valve seats and cones for combustion engines, gliding surfaces metal-metal, highly stressed hot working tools without thermal shock, milling mixers and drilling tools.

Excellent gliding characteristics, easy polishability, good toughness, nonmagnetic. Machining by grinding or with tungsten carbide cutting tools.

UTP CELSIT 706 has excellent welding properties and a homogenous, finely rippled seam due to spray arc. Very easy slag removal.

| | |
|-----------------------------------|----------------|
| Hardness of the pure weld deposit | 40 – 42 HRC |
| Hardness at 500°C | approx. 30 HRC |
| Hardness at 700°C | approx. 160 HB |

Typical analysis in %

| | | | |
|-----|------|-----|---------|
| C | Cr | W | Co |
| 1,1 | 27,5 | 4,5 | balance |

Welding instruction

Clean welding area, preheating temperature 450 – 600 °C, very slow cooling. Hold stick electrode vertically and with a short arc and lowest possible amperage. Re-dry stick electrodes that have become damp for 2 hours at 300 °C.

Welding positions



Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | |
|---------------------|-----------|-----------|------------|
| Electrodes Ø mm x L | 3,2 x 350 | 4,0 x 350 | 5,0 x 350* |
| Amperage | 70 – 110 | 90 – 130 | 110 – 150 |

*available on request

UTP CELSIT 721

anti-wear & anti-corrosion

Classifications rutile coated stick electrode on Cobalt base, core wire alloyed

DIN 8555

EN 14700

AWS A5.13

E 20-UM-350-CTZ

E Co1

E CoCr-E

Characteristics and field of use

UTP CELSIT 721 is used for crack resistant hardfacing on parts subject to a combination of impact, pressure, abrasion, corrosion and high temperatures up to 900 °C, such as running and sealing faces on gas, water, steam and acid fittings and pumps, valve seats and cones for combustion engines, working parts in gas and power plants, hot working tools with changing thermal load.

Excellent gliding characteristics, good polishability and toughness, highly workhardening, nonmagnetic, machinable with cutting tools.

UTP CELSIT 721 has excellent welding properties and a homogenous, finely rippled seam due to spray arc. Very easy slag removal.

Hardness of the pure weld metal
workhardened

31 – 37 HRC
approx. 245 HRC

Hardness at 600 °C

approx. 240 HB

Typical analysis in %

| C | Cr | Mo | Ni | Co |
|-----|------|-----|-----|---------|
| 0,3 | 31,0 | 5,0 | 3,5 | balance |

Welding instruction

Clean welding area, preheating temperature 150 – 400 °C, depending on the size of the workpiece and the base material. Slow cooling. Hold stick electrode vertically and with a short arc and lowest possible amperage. Re-dry stick electrodes that have become damp for 2 hours at 300 °C.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | |
|----------------------------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 3,2 x 350 | 4,0 x 350 |
| <i>Amperage</i> | 80 – 120 | 110 – 140 |

Classifications

basic coated stick electrode

DIN 8555

EN 14700

E 1-UM-250

E Fe1

Characteristics and field of use

UTP DUR 250 is used for surfacing on parts, where a tough and easily machinable deposit is required, such as rails, gear wheels, shafts and other parts on farming and building machineries. Also suitable as cushion and filler layer on non-alloyed and low-alloyed steels and cast steels.

Hardness of the pure weld deposit
1 layer on steel with C = 0,5 %

approx. 270 HB
approx. 320 HB

UTP DUR 250 has a very good resistance against compression and rolling strain. The weld metal is easily machinable.

Typical analysis in %

| C | Si | Mn | Cr | Fe |
|------|-----|-----|-----|---------|
| 0,15 | 1,1 | 1,2 | 0,8 | balance |

Welding instruction

Hold stick electrode as vertically as possible and with a short arc. Preheat heavy parts and higher-carbon steel qualities to 150 – 300 °C. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions



Current type DC (+) / AC

Form of delivery and recommended welding parameters

| Electrodes Ø mm x L | 3,2 x 450 | 4,0 x 450 | 5,0 x 450 | 6,0 x 450* |
|---------------------|-----------|-----------|-----------|------------|
| Amperage | 100 – 140 | 140 – 180 | 180 – 230 | 230 – 300 |

*available on request

UTP DUR 350

anti-wear

Classifications

basic coated stick electrode

DIN 8555

EN 14700

E 1-UM-350

E Fe1

Characteristics and field of use

UTP DUR 350 is particularly suited for wear resistant surfacings on Mn-Cr-V alloyed parts, such as frogs, track rollers, chain support rolls, sprocket wheels, guide rolls etc. The deposit is still machinable with tungstene carbide tools.

UTP DUR 350 has a very good resistance against compression and rolling strain in combination with slight abrasion. The weld metal is machinable with tungstene carbide tools.

Hardness of the pure weld deposit
1 layer on steel with C = 0,5 %

approx. 370 HB
approx. 420 HB

Typical analysis in %

| C | Si | Mn | Cr | Fe |
|-----|-----|-----|-----|---------|
| 0,2 | 1,2 | 1,4 | 1,8 | balance |

Welding instruction

Hold stick electrode as vertically as possible and with a short arc. Preheat heavy parts and higher-tensile steels to 250 – 350 °C. Stick electrodes that have got damp should be re-dried for 2 hours at 300 °C.

Welding positions

Current type DC (+) / AC

Approvals

DB (No. 82.138.03)

Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 3,2 x 450 | 4,0 x 450 | 5,0 x 450 |
| <i>Amperage</i> | 100 – 140 | 140 – 180 | 180 – 230 |

Classifications basic coated hardfacing stick electrode

DIN 8555 EN 14700

E 6-UM-60 E Fe8

Characteristics and field of use

UTP DUR 600 is universally applicable for cladding on parts of steel, cast steel and high Mn-steel, subject simultaneously to abrasion, impact and compression. Typical application fields are the earth moving and stone treatment industry, e.g. excavator teeth, bucket knives, crusher jaws and cones, mill hammers etc., but also for cutting edges on cold cutting tools.

| | |
|--|----------------|
| Hardness of the pure weld deposit | 56 – 58 HRC |
| After soft-annealing 780 – 820 °C / oven | approx. 25 HRC |
| After hardening 1000 – 1050 °C / oil | approx. 60 HRC |
| 1 layer on high Mn-steel | approx. 22 HRC |
| 2 layers on high Mn-steel | approx. 40 HRC |

UTP DUR 600 has excellent welding properties due to a quiet arc, an even flow and a good weld buildup, easy slag removal. Machining of the weld metal possible by grinding.

Typical analysis in %

| C | Si | Mn | Cr | Fe |
|-----|-----|-----|-----|---------|
| 0,5 | 2,3 | 0,4 | 9,0 | balance |

Welding instruction

Hold stick electrode as vertically as possible and with a short arc. Preheat heavy parts and high-tensile steels to 200 – 300 °C. On high Mn-steel, cold welding (max. 250 °C) is recommended, if necessary, intermediate cooling. On parts tending to hardening cracks, a cushion layer with UTP 630 is welded. UTP 630 should also be used for welding cracks under hardfacings. If more than 3 – 4 layers are needed, apply the softer stick electrodes UTP DUR 250 or UTP DUR 300 for build-up. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions


Current type DC (+) / AC

Approvals

DB (No. 20.138.07)

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | 2,5 x 300 | 3,2 x 350 | 4,0 x 450 | 5,0 x 450 |
|---------------------------------|-----------|-----------|-----------|-----------|
| Amperage | 80 – 100 | 100 – 140 | 140 – 180 | 180 – 210 |

UTP DUR 650 Kb

anti-wear

Classifications

basic coated hardfacing stick electrode

DIN 8555

EN 14700

E 6-UM-60

E Fe8

Characteristics and field of use

UTP DUR 650 Kb is suitable for cladding structural parts subject to abrasion combined with impact. The main applications are tools in the earth moving industry and crushing plants as well as cold and hot working tools. The deposit is only machinable by grinding.

UTP DUR 650 Kb is a martensitic alloy. The stick electrode is suited in impact an pressure stress situations. Machining of the weld metal only by grinding.

Hardness of the pure weld deposit

58 – 60 HRC

1 layer on high Mn-steel

approx. 24 HRC

2 layers on high Mn-steel

approx. 45 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | Nb | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 0,5 | 0,8 | 1,3 | 7,0 | 1,3 | 0,5 | balance |

Welding instruction

Hold stick electrode as vertically as possible, keep a short arc. Preheating of non-alloyed steels is not necessary. Preheat heavy parts and high-tensile base materials to 250 – 350 °C. If more than 3 – 4 layers are needed, apply the softer stick electrodes UTP DUR 250 or UTP DUR 300 for buildup. On high Mn-steel, UTP BMC should be used. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| Electrodes Ø mm x L | 3,2 x 450 | 4,0 x 450 | 5,0 x 450 | 6,0 x 450* |
|---------------------|-----------|-----------|-----------|------------|
| Amperage | 80 – 110 | 130 – 170 | 160 – 200 | 190 – 230 |

*available on request

Classifications basic-coated stick electrode against cavitation wear, stainless

DIN 8555

EN 14700

E 5-UM-250-CKZT

EZ Fe9

Characteristics and field of use

UTP HydroCav is suitable for wear-resistant surfacings on weldments where high resistance to cavitation pitting, corrosion, pressure and impact is required, as for example in water turbine construction and pump construction. Due to the strong ability of work-hardening the weld deposit hardness under impact stress can be doubled. The main application field are surfacing on soft martensitic 13/4 CrNi-steels on Kaplan turbine blades.

UTP HydroCav has good welding properties and is weldable in all positions, except vertical-down. It has a stable arc, even weld build-up, and good slag removability.

Hardness of the pure weld deposit

as-welding condition

approx. 21 HRC

After cold hardening

approx. 50 HRC

Typical analysis in %

| C | Si | Mn | Cr | Ni | Co | Fe |
|-----|-----|------|------|------|------|---------|
| 0,2 | 0,7 | 10,0 | 20,0 | 0,15 | 13,0 | balance |

Welding instruction

Clean welding area thoroughly to metallic bright. The interpass temperature should not exceed 250 °C. Preheating of solid work pieces to 80 – 100 °C is advantageous. Weld stick electrode with short arc and steep guidance. Re-drying: 2 hours at 300 °C

Welding positions



Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 350 |
| <i>Amperage</i> | 70 – 90 | 90 – 120 | 120 – 150 |

UTP LEDURIT 61

anti-wear

Classifications rutile-basic coated hardfacing stick electrode

DIN 8555

EN 14700

AWS A5.13

E 10-UM-60-GRZ

EZ Fe14

~ E FeCr-A 1

Characteristics and field of use

UTP LEDURIT 61 is suited for highly wear resistant claddings on parts subject to strong grinding abrasion combined with medium impact, such as conveyor screws, scraper blades, digging teeth, mixer wings, sand pumps. Also as a final layer on crusher jaws.

Welding properties

UTP LEDURIT 61 has excellent welding characteristics and a very easy slag removal. The homogeneous and finely rippled seam surface does, for most applications, not require any finish-ing by grinding.

Hardness of the pure weld deposit

approx. 60 HRC

1 layer on steel with C = 0,15 %

approx. 55 HRC

1 layer on high Mn-steel

approx. 52 HRC

Typical analysis in %

| C | Si | Cr | Fe |
|-----|-----|------|---------|
| 3,2 | 1,3 | 32,0 | balance |

Welding instruction

Hold stick electrode as vertically as possible, keep a short arc. Preheating is in general not necessary. On multipass-applications a cushion layer with UTP 630 is recommended in order to prevent hardening cracks in the weld deposit. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions

Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | | |
|----------------------------|-----------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 350 | 3,2 x 350 | 4,0 x 450 | 5,0 x 450 |
| <i>Amperage</i> | 80 – 100 | 90 – 130 | 130 – 180 | 140 – 190 |

| | |
|------------------------|--|
| Classifications | high-efficiency stick electrode without slag |
| DIN 8555 | EN 14700 |
| E 10-UM-65-GRZ | E Fe16 |

Characteristics and field of use

UTP LEDURIT 65 is suited for highly abrasion resistant claddings on parts subject to extreme sliding mineral abrasion, also at elevated temperatures up to 500 °C. The extremely high abrasion resistance is reached by the very high content of special carbides (Mo, V, W, Nb). Main application fields are surfacings on earth moving equipment, working parts in the cement and brick industry as well as in steel mills for radial breakers and revolving-bar screens of sintering plants.

UTP LEDURIT 65 has an even droplet transfer in the spray arc. The smooth welding bead is without slag covering. In general there is no need for any finishing by grinding.

Recovery approx. 265 %.

| | |
|-----------------------------------|----------------|
| Hardness of the pure weld deposit | approx. 65 HRC |
| 1 layer on steel with C = 0,15 % | approx. 58 HRC |
| 1 layer on high Mn-steel | approx. 55 HRC |

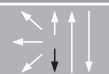
Typical analysis in %

| C | Cr | Mo | Nb | V | W | Fe |
|-----|------|-----|-----|-----|-----|---------|
| 4,5 | 23,5 | 6,5 | 5,5 | 1,5 | 2,2 | balance |

Welding instruction

Hold stick electrode as vertically as possible, keep a short arc. For multipass applications a cushion layer with UTP 630 is recommended. Re-dry stick electrodes that have got damp for 2 hours at 300 °C.

Welding positions



Current type DC (+) / AC

Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 3,2 x 350 | 4,0 x 450 | 5,0 x 450 |
| <i>Amperage</i> | 110 – 150 | 140 – 200 | 190 – 250 |

List of contents

GTAW – TIG rods

Description of the GTAW process **81**

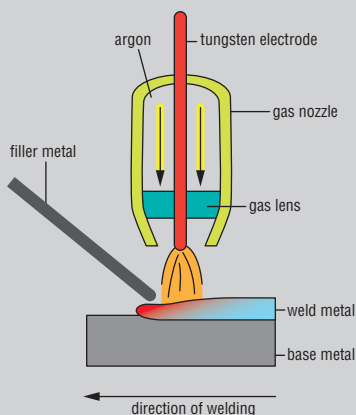
TIG rods for repair of cracked material

| | |
|---|-----|
| 1. Unalloyed, fine grained and low alloyed steels | 82 |
| 2. Stainless steels | 85 |
| 3. Nickel alloys | 95 |
| 4. Cast iron | 106 |
| 5. Copper alloys | 108 |

Description of the GTAW process

GTAW = Gas Tungsten Arc Welding
TIG = Tungsten-Inert-Gas

In TIG welding an electric arc is struck between a tungsten electrode, which does not melt away, and the workpiece (contact or high-frequency ignition).



If a welding consumable is needed, it is supplied as a cold wire, and is melted in the arc in front of the molten pool. The electrode, the arc and the molten pool are protected from the effects of the atmosphere by an inert shielding gas – argon is usually used, or, more rarely, the relatively expensive helium or a mixture of gases. The welding equipment consists of a source of electrical current (DC or AC) and a welding torch connected through a hose assembly. This assembly contains the cable for the welding current, the supply of shielding gas, the control line and, in larger equipment, a feed and return line for cooling water.

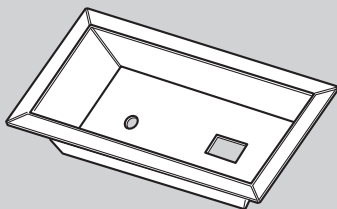
The decoupling of the supply of electricity from the welding consumables, which is typical for TIG welding, allows highly individual adjustment of the parameters, so leading to very clean, high-quality welded joints for root passes and position welding. There is hardly any splatter and only a little welding fume, in addition to which lack of fusion, undercuts and pores are easily avoided. TIG welding is therefore used wherever weld seams of particularly high quality are needed, such as in the construction of pipelines and apparatus, power station building, aerospace engineering, and in the chemical and food industries. The TIG technique can be applied manually or mechanically (whether semi or fully automatic), and can be used to process any metal that is suitable for welding.

TIG rods for repair of cracked material

1. Unalloyed, fine grained and low alloyed steels

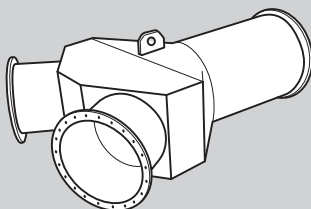
| Product name | EN ISO | | AWS | | Mat. - No. | Page |
|--------------|---------|--------------|-------|-------------------------------|------------|------|
| UTP A 118 | 636-A | W 42 5 W3Si1 | A5.18 | ER 70S-6 | | 83 |
| UTP A 641 | 21952-A | W CrMo1Si | A5.28 | ER 80S-G [ER 80S-B2(mod.)] | 1.7339 | 84 |

Solution examples



Sheet metal tray

UTP A 118



Piping

UTP A 641

UTP A 118

unalloyed, fine grained and low alloyed steels

Classifications

TIG rod

EN ISO 636-A

AWS A5.18

W 42 5 W3Si1

ER70S-6

Characteristics and field of use

GTAW solid rod for the welding with argon.

Typical fields of use: boiler, tank and pipeline constructions and apparatus engineering.

Base materials

Unalloyed structural steels acc. to EN 10025: S185, S235JR, S235JRG1, S235JRG2, S275JR, S235J0, S275J0, S355J0. Boiler steels P235GH, P265GH, P295GH, P355GH.

Fine grained structural steels up to S420N. ASTM A27 and A36 Gr. all; A214; A242 Gr. 1-5; A266 Gr. 1, 2, 4; A283 Gr. A, B, C, D; A285 Gr. A, B, C; A299 Gr. A, B; A328; A366; A515 Gr. 60, 65, 70; A516 Gr. 55; A570 Gr. 30, 33, 36, 40, 45; A572 Gr. 42, 50; A606 Gr. all; A607 Gr. 45; A656 Gr. 50, 60; A668 Gr. A, B; A907 Gr. 30, 33, 36, 40, A841; A851 Gr. 1, 2; A935 Gr. 45; A936 Gr. 50; API 5 L Gr. B, X42-X56.

Typical analysis in %

| | | |
|------|------|-----|
| C | Si | Mn |
| 0,08 | 0,85 | 1,5 |

Mechanical properties of the weld metal

| Heat-treatment | Yield strength | Tensile strength | Elongation A | Impact strength | |
|----------------|----------------|------------------|-----------------|-----------------|--------|
| | $R_{p0,2}$ | R_m | | K_v | |
| | MPa | MPa | % | J [RT] | -50 °C |
| as welded | 440 | 560 | 25 | 130 | 50 |

Approvals

TÜV (No. 01656), DB (No. 42.132.119), DNV

Form of delivery

| Rod diameter x length (mm) | Current type | Shielding gas |
|----------------------------|--------------|---------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

UTP A 641

unalloyed, fine grained and low alloyed steels

Classifications

TIG rod

EN ISO 21952-A

AWS A5.28

Material-No.

W CrMo1Si

ER80S-G [ER80S-B2(mod.)]

1.7339

Characteristics and field of use

Welding rod for the welding with argon. Suitable for manufacturing creep resistant steels in boiler, tank, pipeline and nuclear reactor construction.

Base materials

1.7335 – 13CrMo4-5, ASTM A193 Gr. B7;
1.7357 – G17CrMo5-5 – A217 Gr. WC6;
A335 Gr. P11 u. P12

Typical analysis of rod and wire in %

| C | Si | Mn | Cr | Mo |
|-----|-----|-----|-----|-----|
| 0,1 | 0,6 | 1,0 | 1,1 | 0,5 |

Mechanical properties of the weld metal

| Heat-treatment | Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|----------------|------------------------------|---------------------------|-----------------|--------------------------|
| | MPa | MPa | % | J [RT] |
| annealed | 450 | 560 | 22 | 90 |

Approvals

TÜV (No. 00906), DB (No. 42.132.44)

Form of delivery

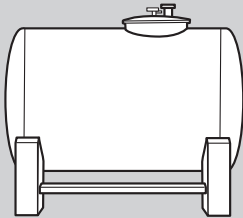
| Rod diameter x length (mm) | Current type | Shielding gas |
|----------------------------|--------------|---------------|
| 2,0 x 1000 | DC (-) | I 1 |
| 2,5 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

TIG rods for repair of cracked material

2. Stainless steels

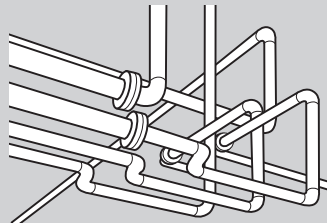
| Product name | EN ISO | AWS | Mat. - No. | Page |
|---------------|---------------------------|--------------------|------------|------|
| UTP A 63 | 14343-A W 18 8 Mn | A5.9 ER 307 (mod.) | 1.4370 | 86 |
| UTP A 68 | 14343-A W 19 9 Nb Si | A5.9 ER 347 (Si) | 1.4551 | 87 |
| UTP A 68 LC | 14343-A W 19 9 L (Si) | A5.9 ER 308 L (Si) | 1.4316 | 88 |
| UTP A 68 Mo | 14343-A W 19 12 3 Nb (Si) | A5.9 ER 318 (Si) | 1.4576 | 89 |
| UTP A 68 MoLC | 14343-A W 19 12 3 L (Si) | A5.9 ER 316 L (Si) | 1.4430 | 90 |
| UTP A 651 | 14343-A W 29 9 | A5.9 ER 312 | 1.4337 | 91 |
| UTP A 6635 | 14343-A W 13 4 (Si) | A5.9 ~ ER 410 NiMo | 1.4351 | 92 |
| UTP A 6808 Mo | 14343-A W 22 9 3 N L | A5.9 ER 2209 | ~ 1.4462 | 93 |
| UTP A 6824 LC | 14343-A W 23 12 L (Si) | A5.9 ER 309 L (Si) | 1.4332 | 94 |

Solution examples



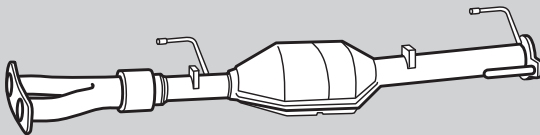
Vessel

UTP A 68 LC



Piping

UTP A 68 MoLC



Catalytic converter

UTP A 63

Classifications

TIG rod

EN ISO 14343-A

AWS A5.9

Material-No.

W 18 8 Mn

ER 307 (mod.)

1.4370

Characteristics and field of use

UTP A 63 is suitable for particularly crack resistant joining and surfacing of high-strength ferritic and austenitic steels, hard manganese steels and cold-tough steels, as cushioning layer under hard alloys, dissimilar metal joints.

The weld metal of UTP A 63 is scale resistant up to 850 °C, cold-tough to –110 °C. Work hardening.

Hardness of the pure weld metal: approx. 200 HB

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|------|-----|-----|------|-----|---------|
| 0,08 | 0,8 | 6,5 | 19,5 | 9,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{P0,2}$ | Tensile strength R_m | Elongation A |
|---------------------------|------------------------|----------------|
| MPa | MPa | % |
| > 370 | > 600 | > 30 |

Welding instruction

Clean weld area thoroughly. Thick walled, ferritic elements have to be preheated to approx. 150 – 250 °C.

Approvals

TÜV (No. 04097)

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,2 x 1000* | DC (–) | I 1 |
| 1,6 x 1000 | DC (–) | I 1 |
| 2,0 x 1000 | DC (–) | I 1 |
| 2,4 x 1000 | DC (–) | I 1 |
| 3,2 x 1000 | DC (–) | I 1 |

*available on request

Classifications

TIG rod

| | | |
|----------------|-------------|--------------|
| EN ISO 14343-A | AWS A5.9 | Material-No. |
| W 19 9 Nb Si | ER 347 (Si) | 1.4551 |

Characteristics and field of use

UTP A 68 is suitable for joining and surfacing in chem. apparatus and vessel construction for working temperatures of $-196\text{ }^{\circ}\text{C}$ up to $400\text{ }^{\circ}\text{C}$.

Base materials

| | |
|--------|-------------------|
| 1.4550 | X6 CrNiNb 18-10 |
| 1.4541 | X6CrNiTi 18-10 |
| 1.4552 | G-X5 CrNiNb 18-10 |
| 1.4311 | X2 CrNiN 18-10 |
| 1.4306 | X2 CrNi 19-11 |

AlSi 347, 321, 302, 304, 3046, 304LN
ASTM A 296 Gr. CF 8 C, A 157 Gr. C 9

Typical analysis in %

| | | | | | | |
|------|-----|-----|------|-----|------|---------|
| C | Si | Mn | Cr | Ni | Nb | Fe |
| 0,05 | 0,4 | 1,5 | 19,5 | 9,5 | 0,55 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|--------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 420 | 600 | 30 | 100 |

Welding instruction

Degrease and clean weld area thoroughly (metallic bright). Preheating and post heat treatment are usually not necessary.

Approvals

TÜV (No. 04866)

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,0 x 1000* | DC (-) | I 1 |
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000* | DC (-) | I 1 |

*available on request

Classifications

TIG rod

EN ISO 14343-A

AWS A5.9

Material-No.

W 19 9 L (Si)

ER 308 L (Si)

1.4316

Characteristics and field of use

UTP A 68 LC is suitable for joining and surfacing in chem. apparatus and vessel construction for working temperatures of $-196\text{ }^{\circ}\text{C}$ up to $350\text{ }^{\circ}\text{C}$.

Base materials

| | |
|--------|-----------------|
| 1.4301 | X5 CrNiNi 18-10 |
| 1.4306 | X2 CrNi 19-11 |
| 1.4311 | X2 CrNiN 18-10 |
| 1.4312 | G-X10 CrNi 18-8 |
| 1.4541 | X6 CrNiTi 18-10 |
| 1.4546 | X5 CrNiNb 18-10 |
| 1.4550 | X6 CrNiNb 18-10 |

AISI 304; 304L; 302; 321; 347
 ASTM A 1576 Gr. C 9; A 320 Gr. B 8 C or D

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|------|-----|-----|------|------|---------|
| 0,02 | 0,4 | 1,5 | 20,0 | 10,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 400 | 600 | 35 | 100 |

Approvals

TÜV (No. 05831)

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,0 x 1000* | DC (-) | I 1 |
| 1,2 x 1000* | DC (-) | I 1 |
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

*available on request

Classifications

TIG rod

| | | |
|-------------------|-------------|--------------|
| EN ISO 14343-A | AWS A5.9 | Material-No. |
| W 19 12 3 Nb (Si) | ER 318 (Si) | 1.4576 |

Characteristics and field of use

UTP A 68 Mo is applicable for joinings and surfacings of stabilized, corrosion resistant CrNiMo steels of similar nature in the construction of chemical apparatus and vessels up to working temperatures of 120 °C up to 400 °C.

Base materials

| | |
|--------|---------------------|
| 1.4401 | X5 CrNiMo 17-12-2 |
| 1.4404 | X2 CrNiMo 17-12-2 |
| 1.4435 | X2 CrNiMo 18-14-3 |
| 1.4436 | X3 CrNiMo 17-13-3 |
| 1.4571 | X6 CrNiMoTi 17-12-2 |
| 1.4580 | X6 CrNiMoNb 17-12-2 |
| 1.4583 | X10 CrNiMoNb 18-12 |
| 1.4409 | G-X2 CrNiMo 19-112 |

UNS S31653; AISi 361L; 316Ti; 316Cb

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Nb | Fe |
|------|-----|-----|------|-----|------|------|---------|
| 0,03 | 0,4 | 1,5 | 19,0 | 2,8 | 11,5 | 0,55 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 460 | 680 | 35 | 100 |

Welding instruction

Degrease and clean weld area thoroughly (metallic bright). Preheating and post heat treatment are usually not necessary.

Approvals

TÜV (No. 04868)

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |
| 4,0 x 1000* | DC (-) | I 1 |

*available on request

Classifications

TIG rod

| | | |
|------------------|---------------|--------------|
| EN ISO 14343-A | AWS A5.9 | Material-No. |
| W 19 12 3 L (Si) | ER 316 L (Si) | 1.4430 |

Characteristics and field of use

UTP A 68 MoLC is used for joining and surfacing of low-carbon, corrosion resistant CrNiMo steels exposed to high corrosion for working temperatures up to +350 °C. Application fields are chemical apparatus and vessels.

Base materials

| | |
|--------------|------------------------------------|
| Material-No. | EN Symbol |
| 1.4401 | X5 CrNiMo 17-12-2 |
| 1.4404 | X2 CrNiMo 17-12-2 |
| 1.4435 | X2 CrNiMo 18-14-3 |
| 1.4436 | X3 CrNiMo 17-13-3 |
| 1.4571 | X6 CrNiMoTi 17-12-2 |
| 1.4580 | X6 CrNiMoNb 17-12-2 |
| 1.4583 | X10 CrNiMoNb 18-12 |
| 1.4409 | GX2 CrNiMo 19-11-2 |
| | S31653, AlSi 316 L, 316 Ti, 316 Cb |

Typical analysis in %

| | | | | | | |
|------|-----|-----|------|-----|------|---------|
| C | Si | Mn | Cr | Mo | Ni | Fe |
| 0,02 | 0,4 | 1,5 | 18,5 | 2,8 | 12,0 | balance |

Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v |
| MPa | MPa | % | J [RT] |
| 420 | 600 | 35 | 100 |

Welding instruction

Degrease and clean weld area thoroughly (metallic bright). Preheating and post heat treatment are usually not necessary.

Approvals

TÜV (No. 05832), GL

Form of delivery and recommended welding parameters

| | | |
|-----------------------------------|---------------------|-------------------------------------|
| <i>Rod diameter x length (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> |
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |
| 4,0 x 1000* | DC (-) | I 1 |

*available on request

Classifications

TIG rod

| | | |
|----------------|----------|--------------|
| EN ISO 14343-A | AWS A5.9 | Material-No. |
| W 29 9 | ER 312 | 1.4337 |

Characteristics and field of use

UTP A 651 is suitable for joining and surfacing of steels of difficult weldability, repair of hot and cold working steels, cushioning layers.

The weld metal of UTP A 651 is scale resistant up to 1150 °C. Crack and wear resistant, stainless and work hardening.

Hardness of the pure weld metal: approx. 240 HB

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|-----|-----|-----|------|-----|---------|
| 0,1 | 0,4 | 1,6 | 30,0 | 9,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 650 | 750 | 25 | 27 |

Welding instruction

Clean weld area thoroughly. High carboned and solid work pieces depending on shape and size have to be preheated up to 150-250 °C. Steady guidance during welding process.

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,2 x 1000 | DC (-) | I 1 |
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

EN ISO 14343-A

AWS A5.9

Material-No.

W 13 4 (Si)

~ ER 410 NiMo

1.4351

Characteristics and field of use

UTP A 6635 is used for joining and building up on identical and similar martensitic CrNi cast steels for the water turbine- and compressor construction with steels.

The weld deposit of UTP A 6635 is stainless and corrosion resistant as 13 %-Cr(Ni)-steels. It presents a high resistance to corrosion fatigue.

Base materials

| | |
|--------|------------------|
| 1.4317 | G-X4 CrNi 13-4 |
| 1.4313 | X3 CrNiMo 13-4 |
| 1.4351 | X3 CrNi 13-4 |
| 1.4414 | G-X4 CrNiMo 13-4 |

ACI Gr. CA6NM

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Fe |
|------|-----|-----|------|------|-----|---------|
| 0,03 | 0,7 | 0,7 | 13,5 | 0,55 | 4,5 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| > 600 | > 800 | 15 | > 40 |

Welding instruction

For similar materials up to 10 mm wall thickness, preheating is not necessary. From 10 mm wall thickness and up, preheating at 100 – 150 °C should be provided.

Approvals

TÜV (No. 10434)

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 2,0 x 1000* | DC (-) | I 1 |
| 2,4 x 1000* | DC (-) | I 1 |

*available on request

Classifications

TIG rod

| | | |
|----------------|----------|--------------|
| EN ISO 14343-A | AWS A5.9 | Material-No. |
| W 22 9 3 N L | ER 2209 | ~ 1.4462 |

Characteristics and field of use

UTP A 6808 Mo is used for joining and surfacing of corrosion resistant steels as well as cast steel with austenitic-ferritic structure (Duplex steel). Working temperature: up to 250 °C

The weld deposit of UTP A 6808 Mo has an excellence resistance against pitting and stress corrosion cracking next to high strength- and toughness-properties. Very good weld- and flow characteristics.

Base materials

| | | | |
|--------------------|------------------------|---|--------------------|
| 1.4462 | X2 CrNiMoN 22-5-3 | | |
| 1.4362 | X2 CrNiN 23-4 | | |
| 1.4462 | X2 CrNiMoN 22-5-3 with | 1.4583 | X10 CrNiMoNb 18-12 |
| 1.4462 | X2 CrNiMoN 22-5-3 with | P2356H/ P265GH/ S255H/ P2956H/ S355N/ 16Mo3 | |
| UNS S31803; S32205 | | | |

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | N | Fe |
|-------|------|-----|------|-----|-----|------|---------|
| 0,015 | 0,35 | 1,5 | 22,8 | 3,0 | 9,0 | 0,14 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 600 | 800 | 30 | 80 |

Welding instruction

Welding area must be thoroughly cleaned to metallic bright and degreased. Preheating and post heat treatment are usually not necessary. The interpass temperature should not exceed 150 °C.

Approvals

TÜV (No. 05550), GL

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

EN ISO 14343-A

AWS A5.9

Material-No.

W 23 12 L (Si)

ER 309 L (Si)

1.4332

Characteristics and field of use

UTP A 6824 LC ist used for joining and surfacing in chem. apparatus and vessel construction for working temperatures up to +300 °C. Weld cladding of non- and low-alloyed base materials. Dissimilar joints.

Base materials

| | |
|--------|---------------------|
| 1.4306 | X2 CrNi 19-11 |
| 1.4401 | X5 CrNiMo 17-12-2 |
| 1.4404 | X2 CrNiMo 17-13-2 |
| 1.4541 | X6 CrNiTi 18-10 |
| 1.4550 | X6 CrNiNb 18-10 |
| 1.4571 | X6 CrNiMoTi 17-12-2 |
| 1.4580 | X6 CrNiMoNb 17-12-2 |

Joining these materials with unalloyed and low-alloyed steels is possible.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|------|-----|-----|------|------|---------|
| 0,02 | 0,4 | 1,8 | 23,0 | 13,5 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|--------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 400 | 590 | 30 | 140 |

Welding instruction

Welding area must be thoroughly cleaned to metallic bright and degreased. Heat-resistant Cr-steels or cast steels have to be preheated according to the base metal. No preheating for similar austenitic steels.

Approvals

TÜV (No. 05391)

Form of delivery and recommended welding parameters

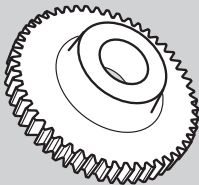
| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

TIG rods for repair of cracked material

3. Nickel alloys

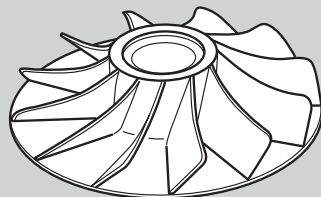
| Product name | EN ISO | AWS | Mat. - No. | Page |
|--------------------|---------------------------------|---------------------|------------|------|
| UTP A 80 M | 18274 S Ni 4060 (NiCu30Mn3Ti) | A5.14 ER NiCu-7 | 2.4377 | 96 |
| UTP A 80 Ni | 18274 S Ni 2061 (NiTi3) | A5.14 ER Ni-1 | 2.4155 | 97 |
| UTP A 068 HH | 18274 S Ni 6082 (NiCr20Mn3Nb) | A5.14 ER NiCr-3 | 2.4806 | 98 |
| UTP A 759 | 18274 S Ni 6059 (NiCr23Mo16) | A5.14 ER NiCrMo-13 | 2.4607 | 99 |
| UTP A 2133 Mn | 14343 WZ 21 33 Mn Nb | | ~ 1.4850 | 100 |
| UTP A 2535 Nb | 14343-A WZ 25 35 Zr | | 1.4853 | 101 |
| UTP A 6170 Co mod. | 18274 S Ni 6617 (NiCr22Co12Mo9) | A5.14 ER NiCrCoMo-1 | 2.4627 | 102 |
| UTP A 6222 Mo | 18274 S Ni 6625 (NiCr22Mo9Nb) | A5.14 ER NiCrMo-3 | 2.4831 | 103 |
| UTP A 6225 AL | 18274 S Ni 6025 (NiCr25Fe10AlY) | A5.14 ER NiCrFe-12 | 2.4649 | 104 |
| UTP A 8036 S | Special alloy | | | 105 |

Solution examples



Gear wheel

UTP A 068 HH



Turbine

UTP A 6170 Co mod.

Classifications

TIG rod

| | | |
|-------------------------|-----------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 4060 (NiCu30Mn3Ti) | ER NiCu-7 | 2.4377 |

Characteristics and field of use

UTP A 80 M is suitable for joining and surfacing of nickel-copper alloys and of nickel-copper-clad steels. Particularly suited for the following materials: 2.4360 NiCu30Fe, 2.4375 NiCu30Al.

UTP A 80 M is also used for joining different materials, such as steel to copper and copper alloys, steel to nickel-copper alloys. These materials are employed in high-grade apparatus construction, primarily for the chemical and petrochemical industries. A special application field is the fabrication of seawater evaporation plants and marine equipment.

The weld metal has an excellent resistance to a large amount of corrosive medias, from pure water to nonoxidising mineral acids, alkali and salt solutions.

Typical analysis in %

| C | Si | Mn | Cu | Ni | Ti | Fe |
|--------|-----|-----|------|---------|-----|-----|
| < 0,02 | 0,3 | 3,2 | 29,0 | balance | 2,4 | 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| > 300 | > 480 | > 30 | > 80 |

Welding instruction

Clean the weld area thoroughly to avoid porosity. Opening groove angle about 70°. Weld stringer beads.

Approvals

TÜV (No. 00249), ABS, GL

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

| | | |
|-------------------|-----------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 2061 (NiTi3) | ER Ni-1 | 2.4155 |

Characteristics and field of use

UTP A 80 Ni is suited for joining and surfacing on commercial pure nickel grades, including LC nickel, nickel alloys and nickel-clad steels.

Such materials are employed primarily in the construction of pressure vessels and apparatus in the chemical industry, in the food industry and for power generation, where good behaviour under corrosion and temperature is demanded.

The weld metal has an excellent resistance in a lot of corrosive medias, from acid to alkali solutions.

Typical analysis in %

| | | | | | |
|--------|-------|-----|---------|-----|-------|
| C | Si | Mn | Ni | Ti | Fe |
| < 0,02 | < 0,3 | 0,3 | balance | 3,3 | < 0,1 |

Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|---------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v |
| MPa | MPa | % | J [RT] |
| > 300 | > 450 | > 30 | > 160 |

Welding instruction

Clean the weld area thoroughly to avoid porosity. Groove angle about 70°. To be welded by stringer bead technique.

Approvals

TÜV (No. 00951), ABS

Form of delivery and recommended welding parameters

| | | |
|-----------------------------------|---------------------|-------------------------------------|
| <i>Rod diameter x length (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> |
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

EN ISO 18274

AWS A5.14

Material-No.

S Ni 6082 (NiCr20Mn3Nb)

ER NiCr-3

2.4806

Characteristics and field of use

UTP A 068 HH is predominantly used for joining identical or similar high heat resistant Ni-base alloys, heat resistant austenites, and for joining heat resistant austenitic-ferritic materials such as

| | | |
|--------|--------------------|------------|
| 2.4816 | NiCr15Fe | UNS N06600 |
| 2.4817 | LC- NiCr15Fe | UNS N10665 |
| 1.4876 | X10 NiCrAlTi 32 20 | UNS N08800 |
| 1.6907 | X3 CrNiN 18 10 | |

Also used for joinings of high C content 25/35 CrNi cast steel to 1.4859 or 1.4876 for petrochemical installations with service temperatures up to 900 °C.

The welding deposit is hot cracking resistant and does not tend to embrittlement.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Nb | Fe |
|--------|-------|-----|------|---------|-----|-----|
| < 0,02 | < 0,2 | 3,0 | 20,0 | balance | 2,7 | 0,8 |

Mechanical properties of the weld metal according to EN ISO 15792-1 (min. values at RT)

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v | |
|---------------------------|------------------------|----------------|-----------------------|---------|
| MPa | MPa | % | J [RT] | -196 °C |
| > 380 | > 640 | > 35 | 160 | 80 |

Welding instruction

Clean weld area thoroughly. Keep heat input as low as possible and interpass temperature at approx. 150 °C.

Approvals

TÜV (No. 00883), KTA, ABS, GL, DNV

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) | |
|----------------------------|--------------|------------------------------|-----|
| 1,6 x 1000 | DC (-) | I 1 | R 1 |
| 2,0 x 1000 | DC (-) | I 1 | R 1 |
| 2,4 x 1000 | DC (-) | I 1 | R 1 |
| 3,2 x 1000 | DC (-) | I 1 | R 1 |

Classifications

TIG rod

| | | |
|------------------------|--------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6059 (NiCr23Mo16) | ER NiCrMo-13 | 2.4607 |

Characteristics and field of use

UTP A 759 is suitable for welding components in plants for chemical processes with highly corrosive media.

For joining materials of the same or similar natures, e.g.

| | | |
|--------|--------------|------------|
| 2.4602 | NiCr21Mo14W | UNS N06022 |
| 2.4605 | NiCr23Mo16Al | UNS N06059 |
| 2.4610 | NiMo16Cr16Ti | UNS N06455 |
| 2.4819 | NiMo16Cr15W | UNS N10276 |

and these materials with low alloyed steels such as for surfacing on low alloyed steels.

Good corrosion resistance against acetic acid and acetic hydride, hot contaminated sulphuric and phosphoric acids and other contaminated oxidising mineral acids. Intermetallic precipitation will be largely avoided.

Typical analysis in %

| | | | | | |
|--------|-----|------|------|---------|-------|
| C | Si | Cr | Mo | Ni | Fe |
| < 0,01 | 0,1 | 22,5 | 15,5 | balance | < 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| > 450 | > 720 | > 35 | > 100 |

Welding instruction

The welding area has to be free from impurities (oil, paint, grease and dust). Minimize heat input. The interpass temperature should not exceed 150 °C. Heat input < 12 kJ/cm

Approvals

TÜV (No. 06068), GL

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) | |
|----------------------------|--------------|------------------------------|-----|
| 1,6 x 1000 | DC (-) | I 1 | R 1 |
| 2,0 x 1000 | DC (-) | I 1 | R 1 |
| 2,4 x 1000 | DC (-) | I 1 | R 1 |
| 3,2 x 1000* | DC (-) | I 1 | R 1 |

*available on request

Classifications

TIG rod

EN ISO 14343

Material-No.

WZ 21 33 Mn Nb

~ 1.4850

Characteristics and field of use

UTP A 2133 Mn is suitable for joining and surfacing heat resistant base materials of identical and of similar nature, such as

| | | |
|--------|---------------------|------------|
| 1.4859 | G X 10 NiCrNb 32 20 | |
| 1.4876 | X 10 NiCrAlTi 32 21 | UNS N08800 |
| 1.4958 | X 5 NiCrAlTi 31 20 | UNS N08810 |
| 1.4959 | X 8 NiCrAlTi 31 21 | UNS N08811 |

A typical application is the root welding of centrifugally cast pipes in the petrochemical industry for operation temperatures up to 1050 °C in dependence with the atmosphere.

Scale resistant up to 1050 °C. Good resistance to carburising atmosphere.

Typical analysis in %

| | | | | | | |
|------|-----|-----|------|------|-----|---------|
| C | Si | Mn | Cr | Ni | Nb | Fe |
| 0,12 | 0,3 | 4,5 | 21,0 | 33,0 | 1,2 | balance |

Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v |
| <i>MPa</i> | <i>MPa</i> | <i>%</i> | <i>J [RT]</i> |
| 400 | 600 | 20 | 70 |

Welding instruction

Clean the weld area thoroughly. Low heat input. Max. interpass temperature 150 °C

Approvals

TÜV (No. 10451)

Form of delivery and recommended welding parameters

| | | |
|-----------------------------------|---------------------|-------------------------------------|
| <i>Rod diameter x length (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

UTP A 2535 Nb

nickel alloys

Classifications

TIG rod

EN ISO 14343-A

Material-No.

WZ 25 35 Zr

1.4853

Characteristics and field of use

UTP A 2535 Nb is suitable for joinings and building up on identical and similar high heat resistant CrNi cast steel (centrifugal- and mould cast parts), such as

| | |
|--------|-----------------------|
| 1.4848 | G-X 40 CrNiSi 25 20 |
| 1.4852 | G-X 40 NiCrSiNb 35 25 |
| 1.4857 | G-X 40 NiCrSi 35 25 |

The weld deposit is applicable in a low sulphur, carbon enriching atmosphere up to 1150 °C, such as reformer ovens in petrochemical installations.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Nb | Ti | Zr | Fe |
|-----|-----|-----|------|------|-----|----|----|---------|
| 0,4 | 1,0 | 1,7 | 25,5 | 35,5 | 1,2 | + | + | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A |
|---------------------------|------------------------|----------------|
| MPa | MPa | % |
| > 480 | > 680 | > 8 |

Welding instruction

Clean welding area carefully. No pre-heating or post weld heat treatment. Keep heat input as low as possible and interpass temperature at max. 150 °C.

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

UTP A 6170 Co mod.

nickel alloys

Classifications

TIG rod

| | | |
|---------------------------|---------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6617 (NiCr22Co12Mo9) | ER NiCrCoMo-1 | 2.4627 |

Characteristics and field of use

UTP A 6170 Co mod. is particularly used for joining alloys of group NiCr23Co12Mo (material-no. 2.4663), and NiCr23Fe (material-no. 2.4851) which are used in power plant construction (materials HR3C, S 304 H, DMV 310 N). Special application fields are in oxidizing resp. carburizing atmospheres, e.g. gas turbines, ethylene production plants.

| | | |
|--------|------------------|------------|
| 1.4958 | X5NiCrAlTi 31 20 | UNS N08810 |
| 1.4959 | X8NiCrAlTi 32 21 | UNS N08811 |
| 2.4663 | NiCr23Co12Mo | UNS N06617 |

The weld metal is resistant to hot-cracking. It is used for operating temperatures up to 1000 °C. Scale-resistant at temperatures up to 1000 °C.

Typical analysis in %

| C | Si | Cr | Mo | Ni | Co | Ti | Al | Fe |
|------|------|------|-----|---------|------|-----|-----|-----|
| 0,06 | 0,15 | 22,0 | 9,0 | balance | 10,5 | 0,3 | 1,2 | 0,9 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|--------------|-----------------------|
| MPa | MPa | % | J [RT] |
| > 450 | > 750 | > 30 | > 80 |

Welding instruction

Clean welding area carefully. Keep heat input as low as possible and interpass temperature at max. 150 °C.

Approvals

TÜV (No. 10993)

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) | |
|----------------------------|--------------|------------------------------|-----|
| 1,6 x 1000 | DC (-) | I 1 | R 1 |
| 2,0 x 1000 | DC (-) | I 1 | R 1 |
| 2,4 x 1000 | DC (-) | I 1 | R 1 |
| 3,2 x 1000 | DC (-) | I 1 | R 1 |

Classifications

TIG rod

| | | |
|-------------------------|-------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6625 (NiCr22Mo9Nb) | ER NiCrMo-3 | 2.4831 |

Characteristics and field of use

UTP A 6222 Mo has a high nickel content and is suitable for welding high-strength and high-corrosion resistant nickel-base alloys, e.g.

| | | |
|-------------------|--------|------------|
| X1 NiCrMoCuN25206 | 1.4529 | UNS N08926 |
| X1 NiCrMoCuN25205 | 1.4539 | UNS N08904 |
| NiCr21Mo | 2.4858 | UNS N08825 |
| NiCr22Mo9Nb | 2.4856 | UNS N06625 |

It can be used for joining ferritic steel to austenitic steel as well as for surfacing on steel. It is also possible to weld 9 % nickel steels using this wire due to its high yield strength. Its wide range of uses is of particular significance in aviation, in chemical industry and in applications involving seawater.

The special features of the weld metal of UTP A 6222 Mo include a good creep rupture strength, corrosion resistance, resistance to stress and hot cracking. It is highly resistant and tough even at working temperatures up to 1100 °C. It has an extremely good fatigue resistance due to the alloying elements Mo and Nb in the NiCr-matrix. The weld metal is highly resistant to oxidation and is almost immune to stress corrosion cracking. It resists intergranular penetration without having been heat-treated.

Typical analysis in %

| | | | | | | |
|--------|-------|------|-----|---------|-----|-----|
| C | Si | Cr | Mo | Ni | Nb | Fe |
| < 0,02 | < 0,2 | 22,0 | 9,0 | balance | 3,5 | 1,0 |

Mechanical properties of the weld metal

| | | | | |
|----------------------------------|-------------------------------|-----------------------|---------------------------------|---------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_{Iv} | |
| MPa | MPa | % | J [RT] | -196 °C |
| > 460 | > 740 | > 30 | > 100 | > 85 |

Welding instruction

The welding area has to be free from impurities (oil, paint, grease). Minimize heat input. The interpass temperature should not exceed 150 °C. Heat input < 12 kJ/cm

Approvals

TÜV (No. 03461), GL, DNV, ABS

Form of delivery and recommended welding parameters

| | | | |
|-----------------------------------|---------------------|-------------------------------------|-----|
| <i>Rod diameter x length (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> | |
| 1,6 x 1000 | DC (-) | I 1 | R 1 |
| 2,0 x 1000 | DC (-) | I 1 | R 1 |
| 2,4 x 1000 | DC (-) | I 1 | R 1 |
| 3,2 x 1000* | DC (-) | I 1 | R 1 |

*available on request

Classifications

TIG rod

| | | |
|---------------------------|--------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6025 (NiCr25Fe10AlY) | ER NiCrFe-12 | 2.4649 |

Characteristics and field of use

UTP A 6225 Al is suitable for welding of identical and similar alloys, such as NiCr25FeAlY, Material-No. 2.4633. These alloys are applicable for working temperatures up to 1200 °C, particularly for thermal treatment ovens.

High oxidation resistance at high temperatures (also in cyclic conditions), very good corrosion resistance in carburized medias, excellent high temperature resistance.

Typical analysis in %

| | | | | | | | | | |
|-----|-----|-----|------|---------|------|------|-----|------|------|
| C | Si | Mn | Cr | Ni | Ti | Zr | Al | Fe | Y |
| 0,2 | 0,5 | 0,1 | 25,0 | balance | 0,15 | 0,05 | 2,0 | 10,0 | 0,08 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 500 | 720 | 25 | 50 |

Welding instruction

Clean the weld area thoroughly (free of oil, scale, markings). UTP A 6225 Al is welded in TIG- and Plasmaproces (with external cold wire feeding). Use stringer bead technique. Keep heat input as low as possible (TIG max. 6,5 kJ/cm, TIG-Plasma max. 11 kJ/cm) and interpass temperature at max. 150 °C. UTP A 6225 Al should only be welded by using the below recommended gas.

Approvals

TÜV (No. 10145)

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | N2-ArN-2 |
| 2,0 x 1000 | DC (-) | N2-ArN-2 |
| 2,4 x 1000 | DC (-) | N2-ArN-2 |

Classifications

TIG rod

Special alloy

Characteristics and field of use

UTP A 8036 S is an alloy of the same composition as the base material and used for welding cast alloys with a nickel content of 34 – 40 % (INVAR qualities). The special operational area is the structural welding of housings made of plate and cast pieces with a nickel content of 36 %. Application field: air plane construction.

The weld metal contains high mechanical properties and a very low expansion coefficient.

Typical analysis in %

| C | Si | Mn | P | S | Ni | Fe |
|-------------|-----|-----|--------|--------|-----------|---------|
| 0,015-0,025 | 0,1 | 0,3 | < 0,01 | < 0,01 | 34,0-38,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | Hardness |
|------------------------------|---------------------------|--------------|--------------------------|-----------|
| MPa | MPa | % | J | HB |
| > 280 | > 350 | > 25 | > 80 | appr. 150 |

Welding instruction

Thorough cleaning of welding area is essential. Welding parameters need to be adjusted to each individual application. Pay attention to a low heat input. The weld should be performed by applying a pulsed technique.

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 2,0 x 1000* | DC (-) | I 1 |
| 2,4 x 1000* | DC (-) | I 1 |

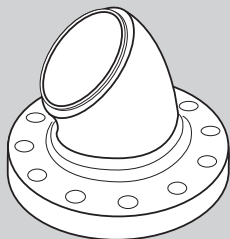
*available on request

TIG rods for repair of cracked material

4. Cast iron

| Product name | EN ISO | | AWS | | Page |
|---------------|--------|------------|-----|--|------|
| UTP A 8051 Ti | 1071 | S C NiFe-2 | | | 107 |

Solution example



Flange

UTP A 8051 Ti

UTP A 8051 Ti

cast iron

Classifications

TIG rod

EN ISO 1071

S C NiFe-2

Characteristics and field of use

UTP A 8051 Ti is particularly suited for welding of ferritic and austenitic nodular cast iron as well as for joining it with unalloyed and high-alloyed steels, copper and nickel alloys. Build-up layers on grey cast iron qualities are also possible. Special applications are construction welding of ductile centrifugal casting tubes, such as joggles and flange joints, fittings, pumps.

The deposit is tough, crack resistant and easily machinable with cutting tools.

Typical analysis of rod and wire in %

| C | Mn | Ni | Ti | Fe |
|-----|-----|------|-----|---------|
| 0,1 | 3,5 | 55,0 | 0,5 | balance |

Mechanical properties of the weld metal

| Yield strength R_e | Tensile strength R_m | Elongation A_5 | Hardness |
|----------------------|------------------------|------------------|-------------|
| MPa | MPa | % | HB |
| > 300 | > 500 | > 25 | approx. 200 |

Welding instruction

Machine welding area to metallic bright. Preheat massive cast iron pieces to 150 – 250 °C. Weld preferably with TIG-pulsed arc, in order to reduce the dilution with the base metal.

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000* | DC (-) | I 1 |
| 2,4 x 1000* | DC (-) | I 1 |

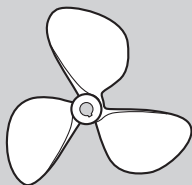
*available on request

TIG rods for repair of cracked material

5. Copper alloys

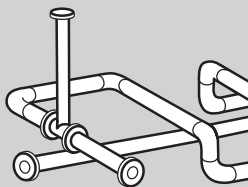
| Product name | EN ISO | | AWS | | Mat.-No. | Page |
|---------------|-------------|--------------------------------|------|-------------|----------|------|
| UTP A 34 | 24373 | S Cu 6100 (CuAl7) | A5.7 | ER CuAl-A 1 | 2.0921 | 109 |
| UTP A 34 N | 24373 | S Cu 6338 (CuMn13Al8Fe3Ni2) | A5.7 | ER CuMnNiAl | 2.1367 | 110 |
| UTP A 38 | 24373 | S Cu 1897 (CuAg1) | A5.7 | ER Cu | 2.1211 | 111 |
| UTP A 381 | 24373 | S Cu 1898 (CuSn1) | A5.7 | ER Cu | 2.1006 | 112 |
| UTP A 384 | 24373 | S Cu 6560 (CuSi3Mn1) | A5.7 | ER CuSi-A | 2.1461 | 113 |
| UTP A 387 | 24373 | S Cu 7158 (CuNi30Mn1FeTi) | A5.7 | ER CuNi | 2.0837 | 114 |
| UTP A 389 | 24373 | S Cu 7061 (CuNi10) | | | 2.0873 | 115 |
| UTP A 3422 | 24373 | S Cu 6327 (CuAl8Ni2Fe2Mn2) | | | 2.0922 | 116 |
| UTP A 3422 MR | DIN 1733 | SG-CuAl8Ni2 | | | 2.0922 | 117 |
| UTP A 3444 | 24373 | S Cu 6328 (CuAl9Ni5Fe3Mn2) | A5.7 | ER CuNiAl | 2.0923 | 118 |

Solution examples



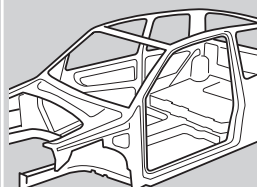
Ship propeller

UTP A 34 N



Piping

UTP A 38



Body work

UTP A 384

Classifications

TIG rod

| | | |
|-------------------|-------------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 6100 (CuAl7) | ER CuAl-A 1 | 2.0921 |

Characteristics and field of use

UTP A 34 is used for copper aluminium alloys (aluminium bronzes) with 5 – 9 % Al, copper-zinc alloys (brass and special brass). Weld cladding on cast iron materials and steel.

The weld deposit of UTP A 34 is resistant to corrosion and seawater and has good gliding properties metal-metal. UTP A 34 is easy weldable and obtains a clean weld surface.

Typical analysis of rod and wire in %

| | | | | |
|-------|-------|---------|-----|-------|
| Mn | Ni | Cu | Al | Fe |
| < 0,5 | < 0,5 | balance | 8,0 | < 0,5 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness HB | El. conductivity $\frac{S \cdot m}{mm^2}$ | Melting range $^{\circ}C$ |
|------------------------------|---------------------------|---------------------|------------------|--|------------------------------|
| MPa | MPa | % | HB | | $^{\circ}C$ |
| 180 | 400 | 40 | 120 | 8 | 1030 – 1040 |

Welding instruction

The weld seam area has to be machined to a metallic bright by grinding, sand blasting or pickling in order to avoid crack formation or the development of pores. To avoid oxyd formation, UTP Flux 34 Sp needs to be deposited onto the base rods prior to the welding process.

Approvals

GL

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

UTP A 34 N

copper alloys

Classifications

TIG rod

EN ISO 24373

AWS A5.7

Material-No.

S Cu 6338 (CuMn13Al8Fe3Ni2)

ER CuMnNiAl

2.1367

Characteristics and field of use

UTP A 34 N is applied in TIG joining and surfacing on complex aluminium bronzes mainly on such materials with a high Mn content as well as on steel and cast steel by using a nodular iron rod. Because of the excellent resistance to seawater and general corrosion resistance, the alloy is excellently suited in the shipbuilding industry (propellers, pumps and armatures) and in the chemical industry (valves, slides, pumps) and is mainly for applications subjected to chemical attacks combined with erosion. Because of the good friction coefficient it is suited for surfacing on waves, gliding surfaces, bearing and matrix of all sorts.

UTP A 34 N is very good weldable in the TIG process. The weld deposit has excellent mechanical properties and is tough and crack resistant. Very good chip removal machining, corrosion resistant and non magnetic.

Typical analysis of rod and wire in %

| Mn | Ni | Cu | Al | Fe |
|------|-----|---------|-----|-----|
| 13,0 | 2,5 | balance | 7,5 | 2,5 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness HB | El. conductivity $\frac{S \cdot m}{mm^2}$ | Melting range $^{\circ}C$ |
|------------------------------|---------------------------|---------------------|------------------|--|------------------------------|
| MPa | MPa | % | HB | | $^{\circ}C$ |
| 400 | 650 | 15 | 220 | 3 – 5 | 945 – 985 |

Welding instruction

Clean weld area thoroughly (metallic bright). Preheating temperature of large weldments to approx. 150 °C. Heat-input should be kept low and the interpass temperature should not exceed 150 °C.

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

| | | |
|-------------------|----------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 1897 (CuAg1) | ER Cu | 2.1211 |

Characteristics and field of use

UTP A 38 is used for oxygen free copper types according to DIN 1787 OF-Cu, SE-Cu, SW-Cu, SF-Cu. The main applications are in the electrical industry e.g. for conductor rails or other applications where high electricity is required.

Viscous weld puddle, fine grained structure, high electrical conductivity.

Typical analysis in %

| | | | |
|-------|-------|---------|-----|
| Mn | Ni | Cu | Ag |
| < 0,2 | < 0,3 | balance | 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness HB | El. conductivity $\frac{S \cdot m}{mm^2}$ | Melting range $^{\circ}C$ |
|------------------------------|---------------------------|---------------------|------------------|--|------------------------------|
| 80 | 200 | 20 | 60 | 30 – 45 | 1070 – 1080 |

Welding instruction

Clean welding area thoroughly. For wall thickness of > 3 mm a preheating is necessary (max 600 °C).

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

| | | |
|-------------------|----------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 1898 (CuSn1) | ER Cu | 2.1006 |

Characteristics and field of use

UTP A 381 is used for oxygen free copper types according to DIN 1787 OF-Cu, SE-Cu, SW-Cu, SF-Cu. The main applicational fields are in the apparatus- and pipeline construction.

Fluid weld pool.

Typical analysis of rod and wire in %

| | | | | |
|-----|------|-------|---------|-----|
| Si | Mn | Ni | Cu | Sn |
| 0,3 | 0,25 | < 0,3 | balance | 0,8 |

Mechanical properties of the weld metal

| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A_5 | <i>Hardness</i> HB | <i>El. conductivity</i> $\frac{S \cdot m}{mm^2}$ | <i>Melting range</i> $^{\circ}C$ |
|-------------------------------------|----------------------------------|----------------------------|-------------------------|---|-------------------------------------|
| MPa | MPa | % | | | |
| 50 | 200 | 30 | approx. 60 | 15 – 20 | 1020 – 1050 |

Welding instruction

Clean weld area thoroughly. For each application field the parameters must be optimized. In a wall thickness > 3 mm, preheating to maximal 600 °C is necessary.

Form of delivery and recommended welding parameters

| <i>Rod diameter x length (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> |
|-----------------------------------|---------------------|-------------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

| | | |
|----------------------|-----------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 6560 (CuSi3Mn1) | ER CuSi-A | 2.1461 |

Characteristics and field of use

UTP A 384 is especially suited for joints of coated steel plates according to the TIG welding for repair welding of motor vehicle bodies and plate constructions of all sorts. The alloy is also especially suited for hot galvanized and hot dip galvanized plates. Same joints on copper-silicon and copper-manganese alloys according to DIN 1766, as for example CuSi2Mn, CuSi3Mn, CuMn5, brass and red brass (tombac).

The low hardness of UTP A 384 allows a relatively easy machining of the visible weld seam in comparison to the iron base weld metal.

Typical analysis of rod and wire in %

| | | | | |
|-----|-----|---------|-------|-------|
| Si | Mn | Cu | Sn | Fe |
| 3,0 | 1,0 | balance | < 0,2 | < 0,3 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness HB | El. conductivity $\frac{S \cdot m}{mm^2}$ | Melting range $^{\circ}C$ |
|------------------------------|---------------------------|---------------------|------------------|--|------------------------------|
| MPa | MPa | % | | | |
| 120 | 350 | 40 | 80 | 3 – 4 | 965 – 1035 |

Welding instruction

Clean weld area thoroughly. Welding parameters have to be optimised for each usage. Pay attention to a low heat input. (short arc / TIG pulsed arc)

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

| | | |
|---------------------------|----------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 7158 (CuNi30Mn1FeTi) | ER CuNi | 2.0837 |

Characteristics and field of use

UTP A 387 is used for copper nickel alloys with up to 30 % nickel according to DIN 17664, such as CuNi20Fe (2.0878), CuNi30Fe (2.0882). Chemical industry, seawater desalination plants, ship building, offshore technique.

The weld metal of UTP A 387 is resistant to seawater and cavitation.

Typical analysis in %

| | | | | | |
|--------|-----|------|---------|-------|-----|
| C | Mn | Ni | Cu | Ti | Fe |
| < 0,05 | 0,8 | 30,0 | balance | < 0,5 | 0,6 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness HB | El. conductivity $\frac{S \cdot m}{mm^2}$ | Melting range $^{\circ}C$ |
|------------------------------|---------------------------|---------------------|------------------|--|------------------------------|
| MPa | MPa | % | | | |
| > 200 | > 360 | > 30 | 120 | 3 | 1180 – 1240 |

Welding instruction

V-butt weld with 70° included angle and root gap of 2 mm. Remove oxide skin to approx. 10 mm to the joint groove also on the backside of the weld.

Approvals

TÜV (No. 01625), GL

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,2 x 1000* | DC (-) | I 1 |
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

*available on request

Classifications

TIG rod

EN ISO 24373

Material-No.

S Cu 7061 (CuNi10)

2.0873

Characteristics and field of use

UTP A 389 is used for copper nickel alloys with 5-10 % nickel according to DIN 17664, for example CuNi5Fe (2.0862), CuNi10Fe (2.0872). Chemical plant industry, seawater desalination plants, ship building, offshore technique.

The weld deposit of UTP A 389 is highly corrosion resistant, for example against non oxidizing, organic acids and salt solutions and seawater.

Typical analysis in %

| C | Mn | Ni | Cu | Ti | Fe |
|--------|-----|------|---------|--------|------|
| < 0,05 | 0,8 | 10,0 | balance | < 0,05 | 1,35 |

Mechanical properties of the weld metal

| Yield strength $R_{p0.2}$ | Tensile strength R_m | Elongation A_5 | Hardness HB | El. conductivity $\frac{S \cdot m}{mm^2}$ | Melting range $^{\circ}C$ |
|------------------------------|---------------------------|---------------------|------------------|--|------------------------------|
| > 150 | > 300 | > 30 | 100 | 5 | 1100 – 1145 |

Welding instruction

Degrease and clean weld area to metallic bright. Remove oxide skin to 10 mm next to welding groove, also on the backside of the weld. Pay attention to low energy input. The interpass temperature should not exceed 120 °C. Preheating and postweld heat treatment is not intended.

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | I 1 |
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

EN ISO 24373

Material-No.

S Cu 6327 (CuAl8Ni2Fe2Mn2)

2.0922

Characteristics and field of use

UTP A 3422 is used for copper-aluminium alloys with Ni and Fe addition. Weld cladding on cast iron materials and steel. Mixed joints of aluminium bronze steel. It is resistant to seawater, and cavitation resistant.

The weld metal of UTP A 3422 is resistant to seawater and cavitation. Good suitability for simultaneous stress strain caused by seawater, cavitation and erosion.

Typical analysis of rod and wire in %

| Mn | Ni | Cu | Al | Fe |
|-----|-----|---------|-----|-----|
| 1,8 | 2,5 | balance | 8,5 | 1,5 |

Mechanical properties of the weld metal

| Yield strength $R_{p0.2}$ | Tensile strength R_m | Elongation A_5 | Hardness HB | El. conductivity $\frac{S \cdot m}{mm^2}$ | Melting range $^{\circ}C$ |
|------------------------------|---------------------------|---------------------|------------------|--|------------------------------|
| 300 | 650 | 25 | 160 | 5 | 1030 – 1050 |

Welding instruction

The weld seam area has to be machined to a metallic bright by grinding, sand blasting or pickling in order to avoid crack formation or the development of pores. To avoid oxyd formation, UTP Flux 34 Sp needs to be deposited onto the base rods prior to the welding process.

Approvals

GL

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000* | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |

*available on request

UTP A 3422 MR

copper alloys

Classifications

flux coated TIG rod

DIN 1733

Material-No.

SG-CuAl8Ni2

2.0922

Characteristics and field of use

UTP A 3422 MR TIG rods are especially designed for cladding applications on cast parts made of multicomponent aluminium bronze. The complex alloy has high resistance against erosion and cavitation pitting.

Because of the good corrosion resistance against seawater, the most common applications are in shipbuilding industry (propeller, pumps, and armatures) and seawater desalination plants.

The welding rods are provided with grooves, which are then filled with a suitable flux, so that an additional flux is not necessary and the optimum amount of flux is ensured for the processing.

Typical analysis of rod and wire in %

| Mn | Ni | Fe | Al | Cu |
|-----|-----|-----|-----|---------|
| 1,5 | 2,0 | 2,0 | 8,0 | balance |

Mechanical properties of the weld metal

| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Hardness</i> | <i>Melting range</i> |
|-------------------------------------|----------------------------------|--------------------------|-----------------|----------------------|
| <i>MPa</i> | <i>MPa</i> | <i>%</i> | <i>HB</i> | <i>°C</i> |
| 300 | 550 | 25 | approx. 160 | 1030 – 1040 |

Welding instruction

Prior to welding grind and clean the welding area. The surface should be free from any dust, oil or grease. Set the welding parameters as low as applicable in order to keep heat input low.

Approvals

GL

Form of delivery and recommended welding parameters

| <i>Rod diameter x length (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> |
|-----------------------------------|---------------------|-------------------------------------|
| 3,0 x 1000 | DC (-) | I 1 |

Classifications

TIG rod

EN ISO 24373

AWS A5.7

Material-No.

S Cu 6328 (CuAl9Ni5Fe3Mn2)

ER CuNiAl

2.0923

Characteristics and field of use

UTP A 3444 is a copper aluminium multi bronzes with a high Ni and Fe addition. Weld cladding on cast iron materials and steel. Mixed joints with aluminium bronze steel. It is resistant to seawater and cavitation resistant.

The weld metal of UTP A 3444 is resistant to seawater and cavitation. Good suitability for simultaneous stress strain caused by seawater, cavitation and erosion.

Typical analysis of rod and wire in %

| Mn | Ni | Cu | Al | Fe |
|-----|-----|---------|-----|-----|
| 1,0 | 4,5 | balance | 9,0 | 3,5 |

Mechanical properties of the weld metal

| <i>Yield strength</i> $R_{p0.2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A_5 | <i>Hardness</i> HB | <i>El. conductivity</i> $\frac{S \cdot m}{mm^2}$ | <i>Melting range</i> $^{\circ}C$ |
|-------------------------------------|----------------------------------|----------------------------|-------------------------|---|-------------------------------------|
| 400 | 700 | 15 | 200 | 4 | 1015 – 1045 |

Welding instruction

The weld seam area has to be machined to a metallic bright by grinding, sand blasting or pickling in order to avoid crack formation or the development of pores. To avoid oxyd formation, UTP Flux 34 Sp needs to be deposited onto the base rods prior to the welding process.

Approvals

TÜV (No. 01896), GL

Form of delivery and recommended welding parameters

| <i>Rod diameter x length (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> |
|-----------------------------------|---------------------|-------------------------------------|
| 2,0 x 1000 | DC (-) | I 1 |
| 2,4 x 1000 | DC (-) | I 1 |
| 3,2 x 1000 | DC (-) | I 1 |



List of contents

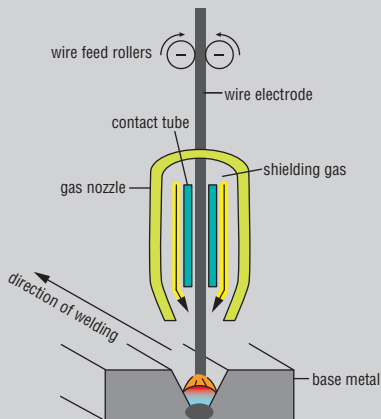
GMAW – solid wires

| | |
|--|------------|
| Description of the GMAW process | 121 |
| Solid wires for repair of cracked material | |
| 1. Unalloyed, fine grained and low alloyed steels | 122 |
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| 3. Nickel alloys | 137 |
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| Surfacing solid wires for anti-wear and anti-corrosion applications | 160 |

Description of the GMAW process

MIG = Metal Inert Gas
MAG = Metal Active Gas

Metal shielding gas welding is an economic welding procedure which is well-suited to uniform welding sequences.



The weld metal demonstrates good properties, and the method features high productivity, whether applied manually or automatically.

The arc burns between the welding wire and the workpiece in gas shielded metal arc welding. The solid wire is automatically fed through the centre of the welding torch. The shielding gas is also passed through the welding torch, and encloses the weld pool during the welding process. The weld seam is therefore shielded from the surroundings. The gases used in MAG welding are active. Carbon dioxide, or a gas mixture, is used. In practice, MAG welding under a mixture of gases has prevailed, as it has a lower tendency to spatter and a higher deposition rate than welding using 100 % carbon dioxide.

In MIG welding, inert gases such as argon, helium, and their mixtures are used. These shielding gases do not react with either the base materials or the welding consumables.

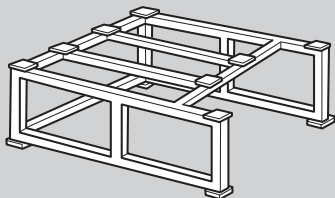
The MSG method can be used with a wide range of materials, welding position and degrees of mechanisation. It permits welding with a manually held torch as well as fully automated robot methods. The deposition rate is very high, and productivity is high too.

Solid wires for repair of cracked material

1. Unalloyed, fine grained and low alloyed steels

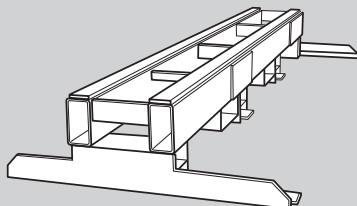
| Product name | EN ISO | | AWS | | Mat. - No. | Page |
|--------------|---------|----------------------------|-------|-----------|------------|------|
| UTP A 118 | 14341-A | G 42 2 C1 3Si1 | A5.18 | ER 70S-G | | 123 |
| UTP A 119 | 14341-A | G 46 2 C1 4Si1 | A5.18 | ER 70S-6 | | 124 |
| UTP A 641 | 21952-A | G CrMo1Si | A5.28 | ER 80S-G | 1.7339 | 125 |
| UTP A 643 | 16834-A | G 69 6 M21 Mn4Ni1,5CrMo | A5.28 | ER 100S-G | | 126 |

Solution examples



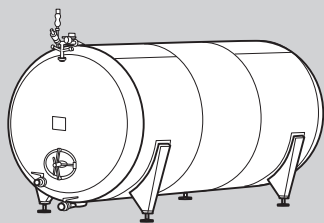
Steel construction repair

UTP A 118



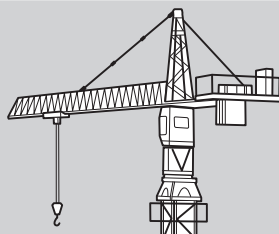
Steel construction repair

UTP A 119



Vessel

UTP A 641



Crane construction repair

UTP A 643

UTP A 118

unalloyed, fine grained and low alloyed steels

Classifications

solid wire

EN ISO 14341-A

AWS A5.18

G 42 2 C1 3Si1 / G 46 4 M21 3Si1

ER70S-6

Characteristics and field of use

GMAW solid wire electrode for welding unalloyed and low alloy steels with shielding gas. All-purpose useable with gas mixture or CO₂, low-spatter transfer in the short and spray arc range. Used in boiler and pipeline construction, shipbuilding, vehicle manufacturing and structural engineering.

Base materials

S235JRG2 – S355J2; boiler steels P235GH, P265GH, P295GH; fine grained structural steels up to S420N and armour steels. ASTM A27 u. A36 Gr. all; A106 Gr. A, B; A214; A242 Gr. 1-5; A266 Gr. 1, 2, 4; A283 Gr. A, B, C, D; A285 Gr. A, B, C; A299 Gr. A, B; A328; A366; A515 Gr. 60, 65, 70; A516 Gr. 55; A556 Gr. B2A; A570 Gr. 30, 33, 36, 40, 45; A572 Gr. 42, 50; A606 Gr. alle; A607 Gr. 45; A656 Gr. 50, 60; A668 Gr. A, B; A907 Gr. 30, 33, 36, 40; A851 Gr. 1, 2; A935 Gr. 45; A936 Gr. 50

Typical analysis in %

| | | |
|------|------|------|
| C | Si | Mn |
| 0,08 | 0,85 | 1,50 |

Mechanical properties of the weld metal

| Heat-treatment | Shielding gas | 0,2%-Yield strength | Tensile strength | Elongation (L ₀ =5d ₀) | Impact values CVN | | |
|----------------|-----------------|---------------------|------------------|---|-------------------|--------|--------|
| | | MPa | MPa | % | J | -20 °C | -40 °C |
| AW | CO ₂ | 420 | 540 | 25 | 85 | 47 | |
| AW | M 21 | 440 | 560 | 24 | 95 | 60 | 47 |

Approvals

TÜV (No. 00106), DB (No. 42.132.02), ABS, DNV, GL, LR

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | | |
|--------------------|--------------|------------------------------|-----|-----|-----|
| 0,8 | DC (+) | M 1 | M 2 | M 3 | C 1 |
| 1,0 | DC (+) | M 1 | M 2 | M 3 | C 1 |
| 1,2 | DC (+) | M 1 | M 2 | M 3 | C 1 |
| 1,6 | DC (+) | M 1 | M 2 | M 3 | C 1 |

Other spool types on request.

UTP A 119

unalloyed, fine grained and low alloyed steels

Classifications

solid wire

EN ISO 14341-A

AWS A5.18

G 46 2 C1 4Si1 / G 46 4 M21 4Si1

ER70S-6

Characteristics and field of use

GMAW solid wire electrode for welding unalloyed and low alloy steels with CO₂ or gas mixture.

Low spatter transfer in short and spray arc range. High arc stability also at high welding current amperage. Large application range; specially suited for steels of higher strength in boiler and pipeline construction, shipbuilding, vehicle manufacturing and structural engineering.

Base materials

S235JRG2 – S355J2; boiler steels P235GH, P265GH, P295GH, P355GH; fine grained structural steels up to S460N; ASTM A27 u. A36 Gr. alle; A106 Gr. A, B; A214; A242 Gr. 1-5; A266 Gr. 1, 2, 4; A283 Gr. A, B, C, D; A285 Gr. A, B, C; A299 Gr. A, B; A328; A366; A515 Gr. 60, 65, 70; A516 Gr. 55; A556 Gr. B2A; A570 Gr. 30, 33, 36, 40, 45; A572 Gr. 42, 50; A606 Gr. all; A607 Gr. 45; A656 Gr. 50, 60; A668 Gr. A, B; A907 Gr. 30, 33, 36, 40; A851 Gr. 1, 2; A935 Gr. 45; A936 Gr. 50

Typical analyses in %

| C | Si | Mn |
|------|------|------|
| 0.08 | 1.05 | 1.65 |

Mechanical properties of the weld metal

| Heat-treatment | Shielding gas | 0,2%-Yield strength | Tensile strength | Elongation (L ₀ =5d ₀) | Impact values CVN | | |
|----------------|-----------------|---------------------|------------------|---|-------------------|--------|--------|
| | | MPa | MPa | % | J | -20 °C | -40 °C |
| AW | CO ₂ | 450 | 550 | 25 | 90 | 47 | |
| AW | M 21 | 480 | 580 | 24 | 95 | 65 | 47 |

Approvals

TÜV (No. 00376), DB (No. 42.132.01), ABS, BV, DNV, GL, LR

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | |
|--------------------|--------------|------------------------------|-----|-----|
| 0,8 | DC (+) | M 2 | M 3 | C 1 |
| 1,0 | DC (+) | M 2 | M 3 | C 1 |
| 1,2 | DC (+) | M 2 | M 3 | C 1 |
| 1,6 | DC (+) | M 2 | M 3 | C 1 |

Other spool types on request.

Classifications

solid wire

| | | |
|----------------|-----------|--------------|
| EN ISO 21952-A | AWS A5.28 | Material-No. |
| G CrMo1Si | ER80S-G | 1.7339 |

Characteristics and field of use

Medium alloy solid wire electrode useable both with CO₂ and with gas mixture. Applications include the welding of creep resistant steels in boiler, tank, pipeline and reactor construction.

Base materials

1.7335 – 13CrMo4-5; ASTM A193 Gr. B7; A335 Gr. P11 und P12;
1.7357 – G17CrMo5-5 – A217 Gr. WC6

Typical analysis in %

| | | | | |
|------|-----|------|-----|-----|
| C | Si | Mn | Cr | Mo |
| 0,09 | 0,6 | 1,05 | 1,1 | 0,5 |

Mechanical properties of the weld metal

| Heat-treatment | Shielding gas | 0,2%-Yield strength | Tensile strength | Elongation (L ₀ =5d ₀) | Impact values CVN |
|----------------|---------------|---------------------|------------------|---|-------------------|
| | | MPa | MPa | % | J |
| A | M 21* | 450 | 560 | 22 | 80 |

*) Also weldable with CO₂.
In this case the mechanical properties will change.

Approvals

TÜV (No. 00905), DB (No. 42.132.19)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | | |
|--------------------|--------------|------------------------------|-----|-----|-----|
| 0,8 | DC (+) | M 1 | M 2 | M 3 | C 1 |
| 1,0 | DC (+) | M 1 | M 2 | M 3 | C 1 |
| 1,2 | DC (+) | M 1 | M 2 | M 3 | C 1 |

Other spool types on request.

UTP A 643

unalloyed, fine grained and low alloyed steels

Classifications

solid wire

EN ISO 16834-A

AWS A5.28

G 69 6 M21 Mn4Ni1,5CrMo

ER100S-G [ER100S-1(mod.)]

Characteristics and field of use

Medium alloy solid wire electrode for shielded arc welding of quenched and tempered and thermomechanically treated fine grained structural steels; for joint welding of wear resistant steels. For use with CO₂ and gas mixture. Outstanding toughness of the weld metal at low temperatures. For use in crane and vehicle manufacturing.

Base materials

S690QL1 (alform 700 M; aldur 700 QL1; Dillimax 690; N-A-XTRA 70; Weldox 700),
 S620QL1 (Dillimax 620; N-A-XTRA 63),
 S700MC (alform 700 M; Domex 700 MC; PAS 70)

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni |
|------|-----|-----|-----|-----|-----|
| 0,08 | 0,6 | 1,7 | 0,2 | 0,5 | 1,5 |

Mechanical properties of the weld metal

| Heat treatment | Shielding gas | 0,2%-Yield strength | Tensile strength | Elongation (L ₀ =5d ₀) | Impact values CVN | | |
|----------------|-----------------|---------------------|------------------|---|-------------------|--------|--------|
| | | MPa | MPa | % | J | -40 °C | -60 °C |
| U | CO ₂ | 680 | 740 | 18 | 80 | 47 | |
| U | M 21 | 720 | 780 | 16 | 100 | | 47 |

Approvals

TÜV (No. 02760), DB (No. 42.132.08), ABS, BV, DNV, GL, LR

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|------------------------------|-----|
| 0,8 | DC (+) | M 21 | C 1 |
| 1,0 | DC (+) | M 21 | C 1 |
| 1,2 | DC (+) | M 21 | C 1 |

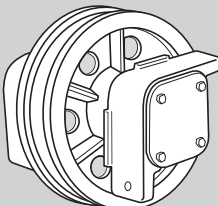
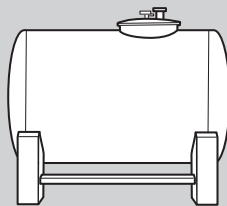
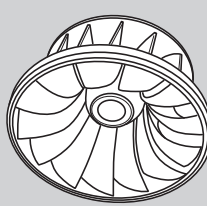
Other spool types on request.

Solid wires for repair of cracked material

2. Stainless steels

| Product name | EN ISO | AWS | Mat.-No. | Page |
|---------------|---------------------------|--------------------|----------|------|
| UTP A 63 | 14343-A G 18 8 Mn | A5.9 ER307 (mod.) | 1.4370 | 128 |
| UTP A 68 | 14343-A G 19 9 Nb Si | A5.9 ER 347 (Si) | 1.4551 | 129 |
| UTP A 68 LC | 14343-A G 19 9 L (Si) | A5.9 ER 308 L (Si) | 1.4316 | 130 |
| UTP A 68 Mo | 14343-A G 19 12 3 Nb (Si) | A5.9 ER 318 (Si) | 1.4576 | 131 |
| UTP A 68 MoLC | 14343-A G 19 12 3 L (Si) | A5.9 ER 316 L (Si) | 1.4430 | 132 |
| UTP A 651 | 14343-A G 29 9 | A5.9 ER 312 | 1.4337 | 133 |
| UTP A 6635 | 14343-A G 13 4 (Si) | A5.9 ~ER 410 NiMo | 1.4351 | 134 |
| UTP A 6808 Mo | 14343-A G 22 9 3 N L | A5.9 ER 2209 | ~1.4462 | 135 |
| UTP A 6824 LC | 14343-A G 23 12 L (Si) | A5.9 ER 309 L (Si) | 1.4332 | 136 |

Solution examples

| | | |
|---|---|---|
|  |  |  |
| <i>Crane wheel</i> | <i>Pressure vessel</i> | <i>Turbine</i> |
| UTP A 63 | UTP A 68 LC | UTP A 6635 |

Classifications

solid wire

EN ISO 14343-A

AWS A5.9

Material-No.

G 18 8 Mn

ER 307 (mod.)

1.4370

Characteristics and field of use

UTP A 63 is suitable for particularly crack resistant joining and surfacing of high-strength ferritic and austenitic steels, hard manganese steels and cold-tough steels, as cushioning layer under hard alloys, dissimilar metal joints.

The weld metal of UTP A 63 is scale resistant up to 850 °C, cold-tough to –110 °C. Work hardening.

Hardness of the pure weld metal: approx. 200 HB

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|------|-----|-----|------|-----|---------|
| 0,08 | 0,8 | 6,5 | 19,5 | 9,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{P0,2}$ | Tensile strength R_m | Elongation A |
|---------------------------|------------------------|----------------|
| MPa | MPa | % |
| > 370 | > 600 | > 30 |

Welding instruction

Clean weld area thoroughly. Thick walled, ferritic elements have to be preheated to approx. 150 – 250 °C.

Approvals

TÜV (No. 04096), DB (No. 43.138.02)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 0,8 | DC (+) | M 12 |
| 1,0 | DC (+) | M 12 |
| 1,2 | DC (+) | M 12 |
| 1,6 | DC (+) | M 12 |

Classifications

solid wire

| | | |
|----------------|-------------|--------------|
| EN ISO 14343-A | AWS A5.9 | Material-No. |
| G 19 9 Nb Si | ER 347 (Si) | 1.4551 |

Characteristics and field of use

UTP A 68 is suitable for joining and surfacing in chem. apparatus and vessel construction for working temperatures of $-196\text{ }^{\circ}\text{C}$ up to $400\text{ }^{\circ}\text{C}$.

Base materials

| | |
|--------|-------------------|
| 1.4550 | X6 CrNiNb 18-10 |
| 1.4541 | X6CrNiTi 18-10 |
| 1.4552 | G-X5 CrNiNb 18-10 |
| 1.4311 | X2 CrNiN 18-10 |
| 1.4306 | X2 CrNi 19-11 |

AlSi 347, 321, 302, 304, 304LN

ASTM A 296 Gr. CF 8 C, A 157 Gr. C 9

Typical analysis in %

| | | | | | | |
|------|------------|-----|------|-----|------|---------|
| C | Si | Mn | Cr | Ni | Nb | Fe |
| 0,05 | 0,65 – 1,0 | 1,5 | 19,5 | 9,5 | 0,55 | balance |

Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v |
| <i>MPa</i> | <i>MPa</i> | <i>%</i> | <i>J (RT)</i> |
| 420 | 600 | 30 | 100 |

Welding instruction

Degrease and clean weld area thoroughly (metallic bright).
Preheating and post heat treatment are usually not necessary.

Approvals

TÜV (No. 04865)

Form of delivery and recommended welding parameters

| | | | |
|---------------------------|---------------------|-------------------------------------|------|
| <i>Wire diameter (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> | |
| 0,8 | DC (+) | M 11 | M 12 |
| 1,0 | DC (+) | M 11 | M 12 |
| 1,2 | DC (+) | M 11 | M 12 |

Classifications

solid wire

EN ISO 14343-A

AWS A5.9

Material-No.

G 19 9 L (Si)

ER 308 L (Si)

1.4316

Characteristics and field of use

UTP A 68 LC is suitable for joining and surfacing in chem. apparatus and vessel construction for working temperatures of $-196\text{ }^{\circ}\text{C}$ up to $350\text{ }^{\circ}\text{C}$.

Base materials

1.4306 X2 CrNi 19-11
 1.4311 X2 CrNiN 18-10
 1.4312 G-X10 CrNi 18-8
 1.4541 X6 CrNiTi 18-10
 1.4546 X5 CrNiNb 18-10
 1.4550 X6 CrNiNb 18-10

AISI 304; 304L; 302; 321; 347

ASTM A 1576 Gr. C 9; A 320 Gr. B 8 C oder D

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|------|------------|-----|------|------|---------|
| 0,02 | 0,65 – 1,0 | 1,5 | 20,0 | 10,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| 400 | 600 | 35 | 100 |

Approvals

TÜV (No. 00184)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | |
|--------------------|--------------|------------------------------|------|------|
| 0,8 | DC (+) | M 11 | M 12 | M 13 |
| 1,0 | DC (+) | M 11 | M 12 | M 13 |
| 1,2 | DC (+) | M 11 | M 12 | M 13 |

Classifications

solid wire

| | | |
|-------------------|-------------|--------------|
| EN ISO 14343-A | AWS A5.9 | Material-No. |
| G 19 12 3 Nb (Si) | ER 318 (Si) | 1.4576 |

Characteristics and field of use

UTP A 68 Mo is applicable for joinings and surfacings of stabilized, corrosion resistant CrNiMo steels of similar nature in the construction of chemical apparatus and vessels up to working temperatures of 120 °C up to 400 °C.

Base materials

| | |
|--------|---------------------|
| 1.4404 | X2 CrNiMo 17-12-2 |
| 1.4435 | X2 CrNiMo 18-14-3 |
| 1.4436 | X3 CrNiMo 17-13-3 |
| 1.4571 | X6 CrNiMoTi 17-12-2 |
| 1.4580 | X6 CrNiMoNb 17-12-2 |
| 1.4583 | X10 CrNiMoNb 18-12 |
| 1.4409 | G-X2 CrNiMo 19-112 |

UNS S31653; AISi 361L; 316Ti; 316Cb

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Nb | Fe |
|------|------------|-----|------|-----|------|------|---------|
| 0,03 | 0,65 – 1,0 | 1,5 | 19,0 | 2,8 | 11,5 | 0,55 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| 460 | 680 | 35 | 100 |

Welding instruction

Degrease and clean weld area thoroughly (metallic bright).
Preheating and post heat treatment are usually not necessary.

Approvals

TÜV (No. 04867)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | |
|--------------------|--------------|------------------------------|------|------|
| 0,8 | DC (+) | M 11 | M 12 | M 13 |
| 1,0 | DC (+) | M 11 | M 12 | M 13 |
| 1,2 | DC (+) | M 11 | M 12 | M 13 |

Classifications

solid wire

EN ISO 14343-A

AWS A5.9

Material-No.

G 19 12 3 L (Si)

ER 316 L (Si)

1.4430

Characteristics and field of use

UTP A 68 MoLC is used for joining and surfacing of low-carbon, corrosion resistant CrNiMo steels exposed to high corrosion environments. For service temperatures up to +350 °C. Application fields are chemical apparatus and vessels.

Base materials

| | |
|--------|---------------------|
| 1.4401 | X5 CrNiMo 17-12-2 |
| 1.4404 | X2 CrNiMo 17-12-2 |
| 1.4435 | X2 CrNiMo 18-14-3 |
| 1.4436 | X3 CrNiMo 17-13-3 |
| 1.4571 | X6 CrNiMoTi 17-12-2 |
| 1.4580 | X6 CrNiMoNb 17-12-2 |
| 1.4583 | X10 CrNiMoNb 18-12 |
| 1.4409 | GX2 CrNiMo 19-11-2 |

S31653, AISi 316 L, 316 Ti, 316 Cb

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Fe |
|------|------------|-----|------|-----|------|---------|
| 0,02 | 0,65 – 1,0 | 1,5 | 18,5 | 2,8 | 12,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| 420 | 600 | 35 | 100 |

Welding instruction

Degrease and clean weld area thoroughly (metallic bright).
Preheating and post heat treatment are usually not necessary.

Approvals

TÜV (No. 00188), GL

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | |
|--------------------|--------------|------------------------------|------|------|
| 0,8 | DC (+) | M 11 | M 12 | M 13 |
| 1,0 | DC (+) | M 11 | M 12 | M 13 |
| 1,2 | DC (+) | M 11 | M 12 | M 13 |

Classifications

solid wire

| | | |
|----------------|----------|--------------|
| EN ISO 14343-A | AWS A5.9 | Material-No. |
| G 29 9 | ER 312 | 1.4337 |

Characteristics and field of use

UTP A 651 is suitable for joining and surfacing of steels of difficult weldability, repair of hot and cold working steels, cushioning layers.

The weld metal of UTP A 651 is scale resistant up to 1150 °C. Crack and wear resistant, stainless and work hardening.

Hardness of the pure weld metal: approx. 240 HB.

Typical analysis in %

| | | | | | |
|-----|-----|-----|------|-----|---------|
| C | Si | Mn | Cr | Ni | Fe |
| 0,1 | 0,4 | 1,6 | 30,0 | 9,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| 650 | 750 | 25 | 27 |

Welding instruction

Clean weld area thoroughly. High carboned and solid work pieces depending on shape and size have to be preheated up to 150 – 250 °C. Steady guidance during welding process.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|------------------------------|------|
| 0,8* | DC (+) | M 12 | M 13 |
| 1,0* | DC (+) | M 12 | M 13 |
| 1,2 | DC (+) | M 12 | M 13 |

*available on request

UTP A 6635

stainless steels

Classifications

solid wire

EN ISO 14343-A

AWS A5.9

Material-No.

G 13 4 (Si)

~ ER 410 NiMo

1.4351

Characteristics and field of use

UTP A 6635 is used for joining and building up on identical and similar martensitic CrNi cast steels for the water turbine- and compressor construction with steels.

The weld deposit of UTP A 6635 is stainless and corrosion resistant as 13 %-Cr(Ni)-steels. It presents a high resistance to corrosion fatigue.

Base materials

1.4317 G-X4 CrNi 13-4

1.4313 X3 CrNiMo 13-4

1.4351 X3 CrNi 13-4

1.4414 G-X4 CrNiMo 13-4

ACI Gr. CA6NM

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Fe |
|------|-----|-----|------|------|-----|---------|
| 0,03 | 0,7 | 0,7 | 13,5 | 0,55 | 4,5 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| > 600 | > 800 | 15 | > 40 |

Welding instruction

For similar materials up to 10 mm wall thickness, preheating is not necessary. From 10 mm wall thickness and up, preheating at 100 – 150 °C should be provided.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,2 | DC (+) | M 12 |

UTP A 6808 Mo

stainless steels

Classifications

solid wire

EN ISO 14343-A

AWS A5.9

Material-No.

G 22 9 3 N L

ER 2209

~ 1.4462

Characteristics and field of use

UTP A 6808 Mo is used for joining and surfacing of corrosion resistant steels as well as cast steel with austenitic-ferritic structure (Duplex steel). Working temperature: up to 250 °C.

The weld deposit of UTP A 6808 Mo has an excellence resistance against pitting and stress corrosion cracking next to high strength- and toughness-properties. Very good weld- and flow characteristics.

Base materials

1.4462 X2 CrNiMoN 22-5-3

1.4362 X2 CrNiN 23-4

1.4462 X2 CrNiMoN 22-5-3 mit 1.4583 X10 CrNiMoNb 18-12

1.4462 X2 CrNiMoN 22-5-3 mit P2356H/ P265GH/ S255H/ P2956H/ S355N/ 16Mo3

UNS S31803; S32205

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | N | Fe |
|-------|------|-----|------|-----|-----|------|---------|
| 0,015 | 0,35 | 1,5 | 22,8 | 3,0 | 9,0 | 0,14 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| 600 | 800 | 30 | 80 |

Welding instruction

Welding area must be thoroughly cleaned to metallic bright and degreased. Preheating and post heat treatment are usually not necessary. The interpass temperature should not exceed 150 °C.

Approvals

TÜV (No. 05551), GL

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,0 | DC (+) | M 12 |
| 1,2 | DC (+) | M 12 |

Classifications

solid wire

EN ISO 14343-A

AWS A5.9

Material-No.

G 23 12 L (Si)

ER 309 L (Si)

1.4332

Characteristics and field of use

UTP A 6824 LC ist used for joining and surfacing in chem. apparatus and vessel construction for working temperatures up to +300 °C. Weld cladding of non- and low-alloyed base materials. Dissimilar joints.

Base materials

| | |
|--------|---------------------|
| 1.4306 | X2 CrNi 19-11 |
| 1.4401 | X5 CrNiMo 17-12-2 |
| 1.4404 | X2 CrNiMo 17-13-2 |
| 1.4541 | X6 CrNiTi 18-10 |
| 1.4550 | X6 CrNiNb 18-10 |
| 1.4571 | X6 CrNiMoTi 17-12-2 |
| 1.4580 | X6 CrNiMoNb 17-12-2 |

Joining these materials with unalloyed and low-alloyed steels is possible.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|------|----------|-----|------|------|---------|
| 0,02 | 0,65-1,0 | 1,8 | 23,0 | 13,5 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| 400 | 590 | 30 | 140 |

Welding instruction

Welding area must be thoroughly cleaned to metallic bright and degreased. Heat-resistant Cr-steels or cast steels have to be preheated according to the base metal. No preheating for similar austenitic steels.

Approvals

TÜV (No. 05392)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|------------------------------|------|
| 0,8* | DC (+) | M 12 | M 13 |
| 1,0 | DC (+) | M 12 | M 13 |
| 1,2 | DC (+) | M 12 | M 13 |

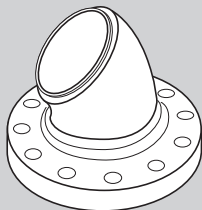
*available on request

Solid wires for repair of cracked material

3. Nickel alloys

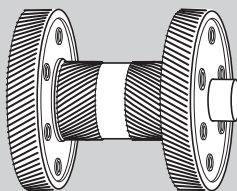
| Product name | EN ISO | | AWS | | Mat.-No. | Page |
|--------------------|---------------|----------------|-------|---------------|----------|------|
| UTP A 80 M | 18274 | S Ni 4060 | A5.14 | ER NiCu-7 | 2.4377 | 138 |
| UTP A 80 Ni | 18274 | S Ni 2061 | A5.14 | ER Ni-1 | 2.4155 | 139 |
| UTP A 068 HH | 18274 | S Ni 6082 | A5.14 | ER NiCr-3 | 2.4806 | 140 |
| UTP A 759 | 18274 | S Ni 6059 | A5.14 | ER NiCrMo-13 | 2.4607 | 141 |
| UTP A 2133 Mn | 14343 | GZ 21 33 Mn Nb | | | ~1.4850 | 142 |
| UTP A 2535 Nb | 14343-A | GZ 25 35 Zr | | | 1.4853 | 143 |
| UTP A 6170 Co mod. | 18274 | S Ni 6617 | A5.14 | ER NiCrCoMo-1 | 2.4627 | 144 |
| UTP A 6222 Mo | 18274 | S Ni 6625 | A5.14 | ER NiCrMo-3 | 2.4831 | 145 |
| UTP A 6225 AL | 18274 | S Ni 6025 | A5.14 | ER NiCrFe-12 | 2.4649 | 146 |
| UTP A 8036 S | Special alloy | | | | | 147 |

Solution examples



Flange

UTP A 80 M



Gear wheel

UTP A 068 HH

UTP A 80 M

nickel alloys

Classifications

solid wire

| | | |
|-------------------------|-----------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 4060 (NiCu30Mn3Ti) | ER NiCu-7 | 2.4377 |

Characteristics and field of use

UTP A 80 M is suitable for joining and surfacing of nickel-copper alloys and of nickel-copper-clad steels. Particularly suited for the following materials: 2.4360 NiCu30Fe, 2.4375 NiCu30Al.

UTP A 80 M is also used for joining different materials, such as steel to copper and copper alloys, steel to nickel-copper alloys. These materials are employed in high-grade apparatus construction, primarily for the chemical and petrochemical industries. A special application field is the fabrication of seawater evaporation plants and marine equipment.

The weld metal has an excellent resistance to a large amount of corrosive medias, from pure water to nonoxidising mineral acids, alkali and salt solutions.

Typical analysis in %

| C | Si | Mn | Cu | Ni | Ti | Fe |
|--------|-----|-----|------|---------|-----|-----|
| < 0,02 | 0,3 | 3,2 | 29,0 | balance | 2,4 | 1,0 |

Mechanical properties of the weld metal according to EN ISO 15792-1 (min. values at RT)

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|--------------|-----------------------|
| MPa | MPa | % | J (RT) |
| > 300 | > 480 | > 30 | > 80 |

Welding instruction

Clean the weld area thoroughly to avoid porosity. Opening groove angle about 70°. Weld stringer beads.

Approvals

TÜV (No. 00250), ABS, GL

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | |
|--------------------|--------------|------------------------------|-----|--------------------|
| 0,8* | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |
| 1,0 | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |
| 1,2 | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |

*available on request

Classifications

solid wire

| | | |
|-------------------|-----------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 2061 (NiTi3) | ER Ni-1 | 2.4155 |

Characteristics and field of use

UTP A 80 Ni is suited for joining and surfacing on commercial pure nickel grades, including LC nickel, nickel alloys and nickel-clad steels.

Such materials are employed primarily in the construction of pressure vessels and apparatus in the chemical industry, in the food industry and for power generation, where good behaviour under corrosion and temperature is demanded.

The weld metal has an excellent resistance in a lot of corrosive medias, from acid to alkali solutions.

Typical analysis in %

| | | | | | |
|--------|-------|-----|---------|-----|-------|
| C | Si | Mn | Ni | Ti | Fe |
| < 0,02 | < 0,3 | 0,3 | balance | 3,3 | < 0,1 |

Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v |
| MPa | MPa | % | J (RT) |
| > 300 | > 450 | > 30 | > 160 |

Welding instruction

Clean the weld area thoroughly to avoid porosity. Groove angle about 70°. To be welded by stringer bead technique.

Approvals

TÜV (No. 00950), ABS

Form of delivery and recommended welding parameters

| | | | | |
|---------------------------|---------------------|-------------------------------------|-----|--------------------|
| <i>Wire diameter</i> (mm) | <i>Current type</i> | <i>Shielding gas</i> (EN ISO 14175) | | |
| 0,8 | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |
| 1,0 | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |
| 1,2 | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |

Classifications

solid wire

| | | |
|--------------------------|-----------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| Si Ni 6082 (NiCr20Mn3Nb) | ER NiCr-3 | 2.4806 |

Characteristics and field of use

UTP A 068 HH is predominantly used for joining identical or similar high heat resistant Ni-base alloys, heat resistant austenites, and for joining heat resistant austenitic-ferritic materials such as

| | | |
|--------|--------------------|------------|
| 2.4816 | NiCr15Fe | UNS N06600 |
| 2.4817 | LC- NiCr15Fe | UNS N10665 |
| 1.4876 | X10 NiCrAlTi 32 20 | UNS N08800 |
| 1.6907 | X3 CrNiN 18 10 | |

Also used for joinings of high C content 25/35 CrNi cast steel to 1.4859 or 1.4876 for petrochemical installations with service temperatures up to 900 °C.

The welding deposit is hot cracking resistant and does not tend to embrittlement.

Typical analysis in %

| | | | | | | |
|--------|-------|-----|------|---------|-----|-----|
| C | Si | Mn | Cr | Ni | Nb | Fe |
| < 0,02 | < 0,2 | 3,0 | 20,0 | balance | 2,7 | 0,8 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v | |
|---------------------------|------------------------|----------------|-----------------------|---------|
| MPa | MPa | % | J (RT) | -196 °C |
| > 380 | > 640 | > 35 | 160 | 80 |

Welding instruction

Clean weld area thoroughly. Keep heat input as low as possible and interpass temperature at approx. 150 °C.

Approvals

TÜV (No. 00882), KTA, ABS, GL, DNV

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | |
|--------------------|--------------|------------------------------|-----|--------------------|
| 0,8 | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |
| 1,0 | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |
| 1,2 | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |
| 1,6 | DC (+) | I 1 | I 3 | Z-ArHeHC-30/2/0,05 |

Classifications

solid wire

| | | |
|------------------------|--------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6059 (NiCr23Mo16) | ER NiCrMo-13 | 2.4607 |

Characteristics and field of use

UTP A 759 is suitable for welding components in plants for chemical processes with highly corrosive media.

For joining materials of the same or similar natures, e.g.

| | | |
|--------|--------------|------------|
| 2.4602 | NiCr21Mo14W | UNS N06022 |
| 2.4605 | NiCr23Mo16Al | UNS N06059 |
| 2.4610 | NiMo16Cr16Ti | UNS N06455 |
| 2.4819 | NiMo16Cr15W | UNS N10276 |

and these materials with low alloyed steels such as for surfacing on low alloyed steels.

Good corrosion resistance against acetic acid and acetic hydride, hot contaminated sulphuric and phosphoric acids and other contaminated oxidising mineral acids. Intermetallic precipitation will be largely avoided.

Typical analysis in %

| | | | | | |
|--------|-----|------|------|---------|-------|
| C | Si | Cr | Mo | Ni | Fe |
| < 0,01 | 0,1 | 22,5 | 15,5 | balance | < 0,1 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|--------------|-----------------------|
| MPa | MPa | % | J (RT) |
| > 450 | > 720 | > 35 | > 100 |

Welding instruction

Welding instruction The welding area has to be free from impurities (oil, paint, grease and dust). Minimize heat input. The interpass temperature should not exceed 150 °C. Heat input < 12 kJ/cm.

Approvals

TÜV (No. 06065), GL

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 0,8* | DC (+) | Z-ArHeHC-30/2/0,05 |
| 1,0 | DC (+) | Z-ArHeHC-30/2/0,05 |
| 1,2 | DC (+) | Z-ArHeHC-30/2/0,05 |
| 1,6* | DC (+) | Z-ArHeHC-30/2/0,05 |

*available on request

UTP A 2133 Mn

nickel alloys

Classifications

solid wire

EN ISO 14343

Material-No.

GZ 21 33 Mn Nb

~ 1.4850

Characteristics and field of use

UTP A 2133 Mn is suitable for joining and surfacing heat resistant base materials of identical and of similar nature, such as

| | |
|--------|--------------------------------|
| 1.4859 | G X 10 NiCrNb 32 20 |
| 1.4876 | X 10 NiCrAlTi 32 21 UNS N08800 |
| 1.4958 | X 5 NiCrAlTi 31 20 UNS N08810 |
| 1.4959 | X 8 NiCrAlTi 31 21 UNS N08811 |

A typical application is the root welding of centrifugally cast pipes in the petrochemical industry for operation temperatures up to 1050 °C in dependence with the atmosphere.

Scale resistant up to 1050 °C. Good resistance to carburising atmosphere.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Nb | Fe |
|------|-----|-----|------|------|-----|---------|
| 0,12 | 0,3 | 4,5 | 21,0 | 33,0 | 1,2 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| 400 | 600 | 20 | 70 |

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 0,8 | DC (+) | I 1 |
| 1,0 | DC (+) | I 1 |
| 1,2 | DC (+) | I 1 |

UTP A 2535 Nb

nickel alloys

Classifications

solid wire

EN ISO 14343

Material-No.

GZ 25 35 Zr

1.4853

Characteristics and field of use

UTP A 2535 Nb is suitable for joinings and building up on identical and similar high heat resistant CrNi cast steel (centrifugal- and mould cast parts), such as

| | |
|--------|-----------------------|
| 1.4848 | G-X 40 CrNiSi 25 20 |
| 1.4852 | G-X 40 NiCrSiNb 35 25 |
| 1.4857 | G-X 40 NiCrSi 35 25 |

The weld deposit is applicable in a low sulphur, carbon enriching atmosphere up to 1150 °C, such as reformer ovens in petrochemical installations.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Nb | Ti | Zr | Fe |
|-----|-----|-----|------|------|-----|----|----|---------|
| 0,4 | 1,0 | 1,7 | 25,5 | 35,5 | 1,2 | + | + | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A |
|---------------------------|------------------------|----------------|
| MPa | MPa | % |
| > 480 | > 680 | > 8 |

Welding instruction

Clean welding area carefully. No pre-heating or post weld heat treatment. Keep heat input as low as possible and interpass temperature at max. 150 °C.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,0 | DC (+) | I 1 |
| 1,2 | DC (+) | I 1 |

Classifications

solid wire

| | | |
|---------------------------|---------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6617 (NiCr22Co12Mo9) | ER NiCrCoMo-1 | 2.4627 |

Characteristics and field of use

UTP A 6170 Co mod. is particularly used for joining alloys of group NiCr23Co12Mo (material-no. 2.4663), and NiCr23Fe (material-no. 2.4851) which are used in power plant construction (materials like Sanicro 25, HR3C, S 304 H, DMV 310 N).

Special application fields are in oxidizing resp. carburizing atmospheres, e.g. gas turbines, ethylene production plants.

| | | |
|--------|------------------|------------|
| 1.4958 | X5NiCrAlTi 31 20 | UNS N08810 |
| 1.4959 | X8NiCrAlTi 32 21 | UNS N08811 |
| 2.4663 | NiCr23Co12Mo | UNS N06617 |

The weld metal is resistant to hot-cracking. It is used for operating temperatures up to 1000 °C. Scale-resistant at temperatures up to 1000 °C.

Typical analysis in %

| C | Si | Cr | Mo | Ni | Co | Ti | Al | Fe |
|------|------|------|-----|---------|------|-----|-----|-----|
| 0,06 | 0,15 | 22,0 | 9,0 | balance | 10,5 | 0,3 | 1,2 | 0,9 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| > 450 | > 750 | > 30 | > 80 |

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 0,8 | DC (+) | Z-ArHeHC-30/2/0,05 I 1 |
| 1,0 | DC (+) | Z-ArHeHC-30/2/0,05 I 1 |
| 1,2 | DC (+) | Z-ArHeHC-30/2/0,05 I 1 |
| 1,6 | DC (+) | Z-ArHeHC-30/2/0,05 I 1 |

Classifications

solid wire

| | | |
|-------------------------|-------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6625 (NiCr22Mo9Nb) | ER NiCrMo-3 | 2.4831 |

Characteristics and field of use

UTP A 6222 Mo has a high nickel content and is suitable for welding high-strength and high-corrosion resistant nickel-base alloys, e.g.

| | | |
|-------------------|--------|------------|
| X1 NiCrMoCuN25206 | 1.4529 | UNS N08926 |
| X1 NiCrMoCuN25205 | 1.4539 | UNS N08904 |
| NiCr21Mo | 2.4858 | UNS N08825 |
| NiCr22Mo9Nb | 2.4856 | UNS N06625 |

It can be used for joining ferritic steel to austenitic steel as well as for surfacing on steel. It is also possible to weld 9 % nickel steels using this wire due to its high yield strength. Its wide range of uses is of particular significance in aviation, in chemical industry and in applications involving seawater.

The special features of the weld metal of UTP A 6222 Mo include a good creep rupture strength, corrosion resistance, resistance to stress and hot cracking. It is highly resistant and tough even at working temperatures up to 1100 °C. It has an extremely good fatigue resistance due to the alloying elements Mo and Nb in the NiCr-matrix. The weld metal is highly resistant to oxidation and is almost immune to stress corrosion cracking. It resists intergranular penetration without having been heat-treated.

Typical analysis in %

| | | | | | | |
|--------|-------|------|-----|---------|-----|-----|
| C | Si | Cr | Mo | Ni | Nb | Fe |
| < 0,02 | < 0,2 | 22,0 | 9,0 | balance | 3,5 | 1,0 |

Mechanical properties of the weld metal

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v |
| MPa | MPa | % | J (RT) / -196 °C |
| > 460 | > 740 | > 30 | > 100 / > 85 |

Welding instruction

The welding area has to be free from impurities (oil, paint, grease and dust). Minimize heat input. The interpass temperature should not exceed 150 °C. Heat input < 12 kJ/cm.

Approvals

TÜV (No. 03460), GL, DNV, ABS

Form of delivery and recommended welding parameters

| | | | |
|---------------------------|---------------------|-------------------------------------|--------------------|
| <i>Wire diameter (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> | |
| 0,8* | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |
| 1,0 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |
| 1,2 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |
| 1,6 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |

*available on request

Classifications

solid wire

EN ISO 18274

AWS A5.14

Material-No.

S Ni 6025 (NiCr25Fe10AlY)

ER NiCrFe-12

2.4649

Characteristics and field of use

UTP A 6225 Al is suitable for welding of identical and similar alloys, such as NiCr25FeAlY, Material-No. 2.4633. These alloys are applicable for working temperatures up to 1200 °C, particularly for thermal treatment ovens.

High oxidation resistance at high temperatures (also in cyclic conditions), very good corrosion resistance in carburized medias, excellent high temperature resistance.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Ti | Zr | Al | Fe | Y |
|-----|-----|-----|------|---------|------|------|-----|------|------|
| 0,2 | 0,5 | 0,1 | 25,0 | balance | 0,15 | 0,05 | 2,0 | 10,0 | 0,08 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| 500 | 720 | 25 | 50 |

Welding instruction

Clean the weld area thoroughly (free of oil, scale, markings). Use stringer bead technique. Keep heat input as low as possible and interpass temperature at max. 150 °C. UTP A 6225 Al should only be welded by using the below recommended gas.

Approvals

TÜV (No. 10135)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,2 | DC (+) | Z-ArHeNC-5/5/0,05 |

Classifications

solid wire

Special alloy

Characteristics and field of use

UTP A 8036 S is an alloy of the same composition as the base material and used for welding cast alloys with a nickel content of 34 – 40 % (INVAR qualities). The special operational area is the structural welding of housings made of plate and cast pieces with a nickel content of 36 %. Application field: air plane construction.

The weld metal contains high mechanical properties and a very low expansion coefficient.

Typical analysis in %

| C | Si | Mn | P | S | Ni | Fe |
|-------------|-----|-----|--------|--------|-----------|---------|
| 0,015-0,025 | 0,1 | 0,3 | < 0,01 | < 0,01 | 34,0-38,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v | Hardness |
|---------------------------|------------------------|--------------|-----------------------|-----------|
| MPa | MPa | % | J (RT) | HB |
| > 280 | > 350 | > 25 | > 80 | appr. 150 |

Welding instruction

Thorough cleaning of welding area is essential. Welding parameters need to be adjusted to each individual application. Pay attention to a low heat input. The weld should be performed by applying a pulsed arc technique.

Form of delivery and recommended welding parameters

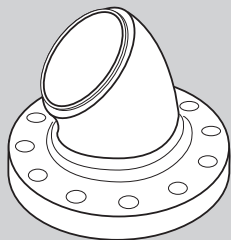
| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,2 | DC (+) | M 12 |

Solid wires for repair of cracked material

4. Cast iron

| Product name | EN ISO | | AWS | | Page |
|---------------|--------|------------|-----|--|------|
| UTP A 8051 Ti | 1071 | S C NiFe-2 | | | 149 |

Solution example



Flange

UTP A 8051 Ti

UTP A 8051 Ti

cast iron

Classifications

solid wire

EN ISO 1071

S C NiFe-2

Characteristics and field of use

UTP A 8051 Ti is particularly suited for MIG/MAG welding of ferritic and austenitic nodular cast iron as well as for joining it with unalloyed and high-alloyed steels, copper and nickel alloys. Build-up layers on grey cast iron qualities are also possible. Special applications are construction welding of ductile centrifugal casting tubes, such as joggles and flange joints, fittings, pumps.

The deposit is tough, crack resistant and easily machinable with cutting tools.

Typical analysis in %

| C | Mn | Ni | Ti | Fe |
|-----|-----|------|-----|---------|
| 0,1 | 3,5 | 55,0 | 0,5 | balance |

Mechanical properties of the weld metal

| Yield strength R_e | Tensile strength R_m | Elongation A_5 | Hardness |
|----------------------|------------------------|------------------|-------------|
| MPa | MPa | % | HB |
| > 300 | > 500 | > 25 | approx. 200 |

Welding instruction

Welding area shall be metallic bright. UTP A 8051 Ti is usually welded by the cold-welding technique, keeping heat input <12 kJ/cm and interpass temperature <120 °C. Massive cast iron pieces to ~150 – 200 °C, depending on their geometry. Weld preferably with MIG-pulsed arc, in order to reduce the dilution with the base metal.

Form of delivery and recommended welding parameters

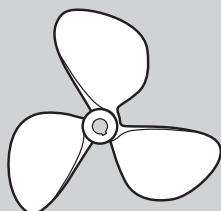
| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 0,8 | DC (+) | M 12 |
| 1,0 | DC (+) | M 12 |
| 1,2 | DC (+) | M 12 |

Solid wires for repair of cracked material

5. Copper alloys

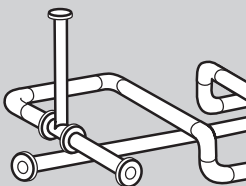
| Product name | EN ISO | | AWS | | Mat.-No. | Page |
|--------------|--------|-----------|------|-------------|----------|------|
| UTP A 34 | 24373 | S Cu 6100 | A5.7 | ER CuAl-A 1 | 2.0921 | 151 |
| UTP A 34 N | 24373 | S Cu 6338 | A5.7 | ER CuMnNiAl | 2.1367 | 152 |
| UTP A 38 | 24373 | S Cu 1897 | A5.7 | ER Cu | 2.1211 | 153 |
| UTP A 381 | 24373 | S Cu 1898 | A5.7 | ER Cu | 2.1006 | 154 |
| UTP A 384 | 24373 | S Cu 6560 | A5.7 | ER CuSi-A | 2.1461 | 155 |
| UTP A 387 | 24373 | S Cu 7158 | A5.7 | ER CuNi | 2.0837 | 156 |
| UTP A 389 | 24373 | S Cu 7061 | | | 2.0873 | 157 |
| UTP A 3422 | 24373 | S Cu 6327 | | | 2.0922 | 158 |
| UTP A 3444 | 24373 | S Cu 6328 | A5.7 | ER CUNiAl | 2.0923 | 159 |

Solution examples



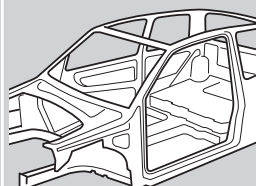
Ship propeller

UTP A 34 N



Piping

UTP A 38



Body work

UTP A 384

UTP A 34

copper alloys

Classifications

solid wire

| | | |
|-------------------|-------------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 6100 (CuAl7) | ER CuAl-A 1 | 2.0921 |

Characteristics and field of use

UTP A 34 is used for copper aluminium alloys (aluminium bronzes) with 5 – 9 % Al, copper-zinc alloys (brass and special brass). Weld cladding on cast iron materials and steel.

The weld deposit of UTP A 34 is resistant to corrosion and seawater and has good gliding properties metal-metal. UTP A 34 is easy weldable and obtains a clean weld surface.

Typical analysis in %

| | | | | |
|-------|-------|---------|-----|-------|
| Mn | Ni | Cu | Al | Fe |
| < 0,5 | < 0,5 | balance | 8,0 | < 0,5 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness | El. conductivity | Melting range |
|---------------------------|------------------------|------------------|----------|---------------------|---------------|
| MPa | MPa | % | HB | s.m/mm ² | °C |
| 180 | 400 | 40 | 120 | 8 | 1030 – 1040 |

Welding instruction

The weld seam area has to be machined to a metallic bright by grinding, sand blasting or pickling in order to avoid crack formation or the development of pores.

Approvals

GL

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 0,8* | DC (+) | I 1 |
| 1,0 | DC (+) | I 1 |
| 1,2 | DC (+) | I 1 |
| 1,6 | DC (+) | I 1 |

*available on request

UTP A 34 N

copper alloys

Classifications

solid wire

EN ISO 24373

AWS A5.7

Material-No.

S Cu 6338 (CuMn13Al8Fe3Ni2)

ER CuMnNiAl

2.1367

Characteristics and field of use

UTP A 34 N is applied in MIG joining and surfacing on complex aluminium bronzes mainly on such materials with a high Mn content as well as on steel and cast steel by using a nodular iron rod. Because of the excellent resistance to seawater and general corrosion resistance, the alloy is excellently suited in the shipbuilding industry (propellers, pumps and armatures) and in the chemical industry (valves, slides, pumps) and is mainly for applications subjected to chemical attacks combined with erosion. Because of the good friction coefficient it is suited for surfacing on waves, gliding surfaces, bearing and matrix of all sorts.

UTP A 34 N is very good weldable in the MIG pulsing method. The weld deposit has excellent mechanical properties and is tough and crack resistant. Very good chip removal machining, corrosion resistant and non magnetic.

Typical analysis in %

| Mn | Ni | Cu | Al | Fe |
|------|-----|---------|-----|-----|
| 13,0 | 2,5 | balance | 7,5 | 2,5 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness | El. conductivity | Melting range |
|---------------------------|------------------------|------------------|----------|---------------------|---------------|
| MPa | MPa | % | HB | s·m/mm ² | °C |
| 400 | 650 | 15 | 220 | 3-5 | 945 – 985 |

Welding instruction

Clean weld area thoroughly (metallic bright). Preheating temperature of large weldments to approx. 150 °C. Heat-input should be kept low and the interpass temperature should not exceed 150 °C.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,0 | DC (+) | I 1 |
| 1,2 | DC (+) | I 1 |
| 1,6 | DC (+) | I 1 |

UTP A 38

copper alloys

Classifications

solid wire

| | | |
|-------------------|----------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 1897 (CuAg1) | ER Cu | 2.1211 |

Characteristics and field of use

UTP A 38 is used for oxygen free copper types according to DIN 1787 OF-Cu, SE-Cu, SW-Cu, SF-Cu. The main applications are in the electrical industry e.g. for conductor rails or other applications where high electricity is required.

Viscous weld puddle, fine grained structure, high electrical conductivity.

Typical analysis in %

| | | | |
|-------|-------|---------|-----|
| Mn | Ni | Cu | Ag |
| < 0,2 | < 0,3 | balance | 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness | El. conductivity | Melting range |
|---------------------------|------------------------|------------------|----------|---------------------|---------------|
| MPa | MPa | % | HB | s.m/mm ² | °C |
| 80 | 200 | 20 | 60 | 30 – 45 | 1070 – 1080 |

Welding instruction

Clean welding area thoroughly. For wall thickness of > 3 mm a preheating is necessary (max 600 °C).

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|------------------------------|-----|
| 1,0* | DC (+) | I 1 | I 3 |
| 1,2* | DC (+) | I 1 | I 3 |
| 1,6* | DC (+) | I 1 | I 3 |

*available on request

Classifications

solid wire

| | | |
|-------------------|----------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 1898 (CuSn1) | ER Cu | 2.1006 |

Characteristics and field of use

UTP A 381 is used for oxygen free copper types according to DIN 1787 OF-Cu, SE-Cu, SW-Cu, SF-Cu. The main applicational fields are in the apparatus- and pipeline construction.

Fluid weld pool.

Typical analysis in %

| | | | | |
|-----|------|-------|---------|-----|
| Si | Mn | Ni | Cu | Sn |
| 0,3 | 0,25 | < 0,3 | balance | 0,8 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness | El. conductivity | Melting range |
|---------------------------|------------------------|------------------|------------|---------------------|---------------|
| MPa | MPa | % | HB | s-m/mm ² | °C |
| 50 | 200 | 30 | approx. 60 | 15 – 20 | 1020 – 1050 |

Welding instruction

Clean weld area thoroughly. For each application field the parameters must be optimized. In a wall thickness > 3 mm, preheating to maximal 600 °C is necessary.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|------------------------------|-----|
| 1,0* | DC (+) | I 1 | I 3 |
| 1,2 | DC (+) | I 1 | I 3 |
| 1,6 | DC (+) | I 1 | I 3 |

*available on request

Classifications

solid wire

| | | |
|----------------------|-----------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 6560 (CuSi3Mn1) | ER CuSi-A | 2.1461 |

Characteristics and field of use

UTP A 384 is especially suited for joints of coated steel plates according to the MIG welding for repair welding of motor vehicle bodies and plate constructions of all sorts. The alloy is also especially suited for hot galvanized and hot dip galvanized plates. Same joints on copper-silicon and copper-manganese alloys according to DIN 1766, as for example CuSi2Mn, CuSi3Mn, CuMn5, brass and red brass (tombac).

The low hardness of UTP A 384 allows a relatively easy machining of the visible weld seam in comparison to the iron base weld metal.

Typical analysis in %

| | | | | |
|-----|-----|---------|-------|-------|
| Si | Mn | Cu | Sn | Fe |
| 3,0 | 1,0 | balance | < 0,2 | < 0,3 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness | El. conductivity | Melting range |
|---------------------------|------------------------|------------------|----------|---------------------|---------------|
| MPa | MPa | % | HB | s·m/mm ² | °C |
| 120 | 350 | 40 | 80 | 3 – 4 | 965 – 1035 |

Welding instruction

Clean weld area thoroughly. Welding parameters have to be optimised for each usage. Pay attention to a low heat input. (short arc / MIG pulsed arc)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|------------------------------|-----|
| 0,8* | DC (+) | I 1 | I 3 |
| 1,0 | DC (+) | I 1 | I 3 |
| 1,2 | DC (+) | I 1 | I 3 |
| 1,6* | DC (+) | I 1 | I 3 |

*available on request

UTP A 387

copper alloys

Classifications

solid wire

| | | |
|---------------------------|----------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 7158 (CuNi30Mn1FeTi) | ER CuNi | 2.0837 |

Characteristics and field of use

UTP A 387 is used for copper nickel alloys with up to 30 % nickel according to DIN 17664, such as CuNi20Fe (2.0878), CuNi30Fe (2.0882). Chemical industry, seawater desalination plants, ship building, offshore technique.

The weld metal of UTP A 387 is resistant to seawater and cavitation.

Typical analysis in %

| | | | | | |
|--------|-----|------|---------|-------|-----|
| C | Mn | Ni | Cu | Ti | Fe |
| < 0,05 | 0,8 | 30,0 | balance | < 0,5 | 0,6 |

Mechanical properties of the weld metal

| Yield strength $R_{P0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness | El. conductivity | Melting range |
|---------------------------|------------------------|------------------|----------|---------------------|---------------|
| MPa | MPa | % | HB | s-m/mm ² | °C |
| > 200 | > 360 | > 30 | 120 | 3 | 1180 – 1240 |

Welding instruction

V-butt weld with 70° included angle and root gap of 2 mm. Remove oxide skin to approx. 10 mm to the joint groove also on the backside of the weld.

Approvals

TÜV (No. 01624), GL

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|------------------------------|-----|
| 0,8* | DC (+) | I 1 | I 3 |
| 1,0* | DC (+) | I 1 | I 3 |
| 1,2 | DC (+) | I 1 | I 3 |
| 1,6* | DC (+) | I 1 | I 3 |

*available on request

UTP A 389

copper alloys

Classifications

solid wire

EN ISO 24373

Material-No.

S Cu 7061 (CuNi10)

2.0873

Characteristics and field of use

UTP A 389 is used for copper nickel alloys with 5 – 10 % nickel according to DIN 17664, for example CuNi5Fe (2.0862), CuNi10Fe (2.0872). Chemical plant industry, seawater desalination plants, ship building, offshore technique.

The weld deposit of UTP A 389 is highly corrosion resistant, for example against non oxidizing, organic acids and salt solutions and seawater.

Typical analysis in %

| C | Mn | Ni | Cu | Ti | Fe |
|--------|-----|------|---------|-------|------|
| < 0,05 | 0,8 | 10,0 | balance | < 0,5 | 1,35 |

Mechanical properties of the weld metal

| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A_5 | <i>Hardness</i> | <i>El. conductivity</i> | <i>Melting range</i> |
|----------------------------------|-------------------------------|-------------------------|-----------------|-------------------------|----------------------|
| MPa | MPa | % | HB | s.m/mm ² | °C |
| > 150 | > 300 | > 30 | 100 | 5 | 1100 – 1145 |

Welding instruction

Degrease and clean weld area to metallic bright. Remove oxide skin to 10 mm next to welding groove, also on the backside of the weld. Pay attention to low energy input. The interpass temperature should not exceed 120 °C. Preheating and postweld heat treatment is not intended.

Form of delivery and recommended welding parameters

| <i>Wire diameter</i> (mm) | <i>Current type</i> | <i>Shielding gas</i> (EN ISO 14175) | |
|---------------------------|---------------------|-------------------------------------|-----|
| 1,0* | DC (+) | I 1 | I 3 |
| 1,2 | DC (+) | I 1 | I 3 |

*available on request

Classifications

solid wire

EN ISO 24373

Material-No.

S Cu 6327 (CuAl8Ni2Fe2Mn2)

2.0922

Characteristics and field of use

UTP A 3422 is used for copper-aluminium alloys with Ni and Fe addition. Weld cladding on cast iron materials and steel. Mixed joints of aluminium bronze steel. It is resistant to seawater, and cavitation resistant.

The weld metal of UTP A 3422 is resistant to seawater and cavitation. Good suitability for simultaneous stress strain caused by seawater, cavitation and erosion.

Typical analysis in %

| Mn | Ni | Cu | Al | Fe |
|-----|-----|---------|-----|-----|
| 1,8 | 2,5 | balance | 8,5 | 1,5 |

Mechanical properties of the weld metal

| Yield strength $R_{P0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness | El. conductivity | Melting range |
|---------------------------|------------------------|------------------|----------|---------------------|---------------|
| MPa | MPa | % | HB | s·m/mm ² | °C |
| 300 | 650 | 25 | 160 | 5 | 1030 – 1050 |

Welding instruction

The weld seam area has to be machined to a metallic bright by grinding, sand blasting or pickling in order to avoid crack formation or the development of pores.

Approvals

GL

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,0 | DC (+) | I 1 |
| 1,2 | DC (+) | I 1 |
| 1,6 | DC (+) | I 1 |

Classifications

solid wire

| | | |
|----------------------------|-----------|--------------|
| EN ISO 24373 | AWS A5.7 | Material-No. |
| S Cu 6328 (CuAl9Ni5Fe3Mn2) | ER CuNiAl | 2.0923 |

Characteristics and field of use

UTP A 3444 is a copper aluminium multi bronzes with a high Ni and Fe addition. Weld cladding on cast iron materials and steel. Mixed joints with aluminium bronze steel. It is resistant to seawater and cavitation resistant.

The weld metal of UTP A 3444 is resistant to seawater and cavitation. Good suitability for simultaneous stress strain caused by seawater, cavitation and erosion.

Typical analysis in %

| | | | | |
|-----|-----|---------|-----|-----|
| Mn | Ni | Cu | Al | Fe |
| 1,0 | 4,5 | balance | 9,0 | 3,5 |

Mechanical properties of the weld metal

| <i>Yield strength $R_{p0,2}$</i> | <i>Tensile strength R_m</i> | <i>Elongation A_5</i> | <i>Hardness</i> | <i>El. conductivity</i> | <i>Melting range</i> |
|---|--|------------------------------------|-----------------|---------------------------|----------------------|
| <i>MPa</i> | <i>MPa</i> | <i>%</i> | <i>HB</i> | <i>s.m/mm²</i> | <i>°C</i> |
| 400 | 700 | 15 | 200 | 4 | 1015 – 1045 |

Welding instruction

The weld seam area has to be machined to a metallic bright by grinding, sand blasting or pickling in order to avoid crack formation or the development of pores.

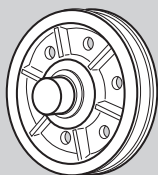
Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> |
|---------------------------|---------------------|-------------------------------------|
| 1,0 | DC (+) | I 1 |
| 1,2 | DC (+) | I 1 |
| 1,6 | DC (+) | I 1 |

Surfacing solid wires for anti-wear and anti-corrosion applications

| Product name | EN ISO | | AWS | |
|-----------------|----------|------------|-------|---------------|
| | | | | |
| UTP A 34 N | 24373 | S Cu 6338 | A5.7 | ER CuMnNiAl |
| UTP A 73 G 2 | EN 14700 | S Fe8 | | |
| UTP A 73 G 3 | EN 14700 | S Z Fe3 | | |
| UTP A 73 G 4 | EN 14700 | S Z Fe3 | | |
| UTP A 661 | 14343-A | GZ 17 Mo H | | |
| UTP A 702 | EN 14700 | S Z Fe5 | | |
| UTP A 6170 Co | 18274 | S Ni 6617 | A5.14 | ER NiCrCoMo-1 |
| UTP A 6222 Mo-3 | 18274 | S Ni 6625 | A5.14 | ER NiCrMo-3 |
| UTP A DUR 250 | EN 14700 | S Z Fe1 | | |
| UTP A DUR 350 | EN 14700 | S Z Fe2 | | |
| UTP A DUR 600 | EN 14700 | S Fe8 | | |
| UTP A DUR 650 | EN 14700 | S Fe8 | | |

Solution examples



Crane wheel

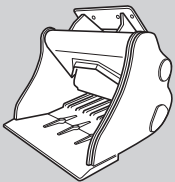
UTP A DUR 250



Drive tumbler

UTP A DUR 350

| Mat. - No. | Abrasion | Corrosion | Erosion | Cavitation | Heat | Impact | Metal to Earth | Metal to Metal | Page |
|---------------|----------|-----------|---------|------------|------|--------|----------------|----------------|------|
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| 1.4718 | ■ | | ■ | | | ■ | ■ | ■ | 172 |
| | ■ | | ■ | | ■ | ■ | ■ | ■ | 173 |



Excavator bucket

UTP A DUR 600

UTP A 34 N

anti-wear & anti-corrosion

Classifications

solid wire

EN ISO 24373

AWS A5.7

Material-No.

S Cu 6338 (CuMn13Al8Fe3Ni2)

ER CuMnNiAl

2.1367

Characteristics and field of use

UTP A 34 N is applied in MIG joining and surfacing on complex aluminium bronzes mainly on such materials with a high Mn content as well as on steel and cast steel by using a nodular iron rod. Because of the excellent resistance to seawater and general corrosion resistance, the alloy is excellently suited in the shipbuilding industry (propellers, pumps and armatures) and in the chemical industry (valves, slides, pumps) and is mainly for applications subjected to chemical attacks combined with erosion. Because of the good friction coefficient it is suited for surfacing on waves, gliding surfaces, bearing and matrix of all sorts.

UTP A 34 N is very good weldable in the MIG pulsing method. The weld deposit has excellent mechanical properties and is tough and crack resistant. Very good chip removal machining, corrosion resistant and non magnetic.

Typical analysis in %

| Mn | Ni | Cu | Al | Fe |
|------|-----|---------|-----|-----|
| 13,0 | 2,5 | balance | 7,5 | 2,5 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A_5 | Hardness | El. conductivity | Melting range |
|---------------------------|------------------------|------------------|----------|---------------------|---------------|
| MPa | MPa | % | HB | s·m/mm ² | °C |
| 400 | 650 | 15 | 220 | 3 – 5 | 945 – 985 |

Welding instruction

Clean weld area thoroughly (metallic bright). Preheating temperature of large weldments to approx. 150 °C. Heat-input should be kept low and the interpass temperature should not exceed 150 °C.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,0 | DC (+) | I 1 |
| 1,2 | DC (+) | I 1 |
| 1,6 | DC (+) | I 1 |

Classifications

solid wire

| | | |
|----------|----------------|---------------|
| EN 14700 | DIN 8555 | Material-No. |
| S Fe8 | MSG 3-GZ-55-ST | Special alloy |

Characteristics and field of use

UTP A 73 G 2 is used for highly wear resistant buildups on machine parts and tools, subject to heavy abrasion and compression combined with moderate impact at elevated temperatures, such as forging tools, roll mandrils, hot trimming knives, mangle and axial rolls as well as for the production of high-quality working surfaces by cladding non- or low-alloy base material.

Machinable by grinding or with tungstene carbide tools.

Hardness of the pure weld deposit:

| | |
|------------------------------|----------------|
| untreated | 53 – 58 HRC |
| soft-annealed 820 °C | approx. 200 HB |
| hardened 1050 °C/oil | approx. 58 HRC |
| tempered 600 °C | approx. 53 HRC |
| 1 layer on non-alloyed steel | approx. 45 HRC |

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ti | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,35 | 0,3 | 1,2 | 7,0 | 2,0 | 0,3 | balance |

Welding instruction

Clean welding area to metallic bright. Cracks in the base material have to be gouged out completely. Preheating temperature of 400 °C on tools should be maintained. Stress relief/annealing is recommended at 550 °C.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | | |
|--------------------|--------------|------------------------------|------|------|-----|
| 0,8* | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,0 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,2 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,6 | DC (+) | M 12 | M 13 | M 21 | C 1 |

*available on request

UTP A 73 G 3

anti-wear

Classifications

solid wire

EN 14700

DIN 8555

Material-No.

S Z Fe3

MSG 3-GZ-45-T

Special alloy

Characteristics and field of use

UTP A 73 G 3 is, due to the excellent hot wear resistance and toughness, used for highly stressed hot working tools, which are simultaneously subject to high mechanical, thermal and abrasive loads, such as e.g. forging dies for hammers and presses, forging dies, Al-die cast moulds, plastic moulds, hot-shear blades and for filling engravings by using cheaper base metals.

Machining is possible with tungstene carbide tools.

Hardness of the pure weld deposit:

| | |
|----------------------------|----------------|
| untreated | 42 – 46 HRC |
| soft-annealed 780 °C | approx. 230 HB |
| hardened 1030 °C/oil | approx. 48 HRC |
| tempered 600 °C | approx. 45 HRC |
| 1 layer on non-alloy steel | approx. 35 HRC |

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ti | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,25 | 0,5 | 0,7 | 5,0 | 4,0 | 0,6 | balance |

Welding instruction

Machine welding area to metallic bright. Cracks in the base material have to be gouged out completely. Preheating temperature of 400 °C on tools should be maintained. Stress relief/annealing is recommended at 550 °C.

Approvals

TÜV (No. 06741)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | | |
|--------------------|--------------|------------------------------|------|------|-----|
| 0,8 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,0 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,6 | DC (+) | M 12 | M 13 | M 21 | C 1 |

UTP A 73 G 4

anti-wear

Classifications

solid wire

EN 14700

DIN 8555

S Z Fe3

MSG 3-GZ-40-T

Characteristics and field of use

UTP A 73 G 4 is, due to its excellent hot wear resistance and toughness, used for buildups on hot working tools and structural parts subject to impact, compression and abrasion at elevated temperatures, such as forging dies, die cast moulds, plastic moulds, guides, recipients, continuous casting rolls. Hot wear resistant claddings can be made on non-alloy or low-alloy base materials, such as e.g. boiler tubes in coal burning power stations. The deposit is machinable with cutting tools.

UTP A 73 G4 has very good welding properties, good weld buildup and an even flow of the weld pool.

Hardness of the pure weld deposit:

| | |
|----------------------------|----------------|
| untreated | 38 – 42 HRC |
| soft-annealed 800 °C | approx. 230 HB |
| hardened 1030 °C/oil | approx. 48 HRC |
| tempered 550 °C | approx. 42 HRC |
| 1 layer on non-alloy steel | approx. 30 HRC |

Typical analysis in %

| C | Si | Mn | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,1 | 0,4 | 0,6 | 6,5 | 3,3 | balance |

Welding instruction

Machine welding area to metallic bright. Cracks in the base material have to be gouged out completely. Preheating temperature of 400 °C on tools should be maintained. Stress relief/annealing is recommended at 550 °C. Preheating on non- and low-alloy materials is generally not required.

Approvals

TÜV (No. 06742)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | | |
|--------------------|--------------|------------------------------|------|------|-----|
| 1,0 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,2 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,6 | DC (+) | M 12 | M 13 | M 21 | C 1 |

UTP A 661

anti-wear

Classifications

solid wire

EN ISO 14343-A

EN 14700

Material-No.

G Z 17 Mo H

S Fe7

1.4115

Characteristics and field of use

UTP A 661 is used for wear resistant claddings on construction parts made of non-alloyed or low-alloyed steels and cast steels, hot working steels, high alloyed steels and cast steels, particularly for one-layer-welding. Special application fields are claddings on machine parts made of high tensile steel for hardening and tempering, hot working tools, continuous casting rolls and dummy blocks, membrane sides in coal burning power stations and parts resistant against high temperature up to 900 °C.

The martensitic weld deposit is wear resistant also at elevated temperatures. It is resistant against water, seawater, steam and diluted organic acids. High thermal strength.

Hardness of the pure weld deposit:

untreated

approx. 40 HRC

one-layer-welding on C 45

approx. 55 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | Fe |
|------|-----|-----|------|-----|---------|
| 0,22 | 0,7 | 0,7 | 17,5 | 1,2 | balance |

Welding instruction

Welding with MIG pulsed current provides a low-in-spatter deposit of perfect appearance. The preheating must be matched to the parent metal and the welding scope, generally between 150 °C – 400 °C. Slow cooling in still air or under a cover resp. in an oven. Tempering, if necessary.

Approvals

TÜV (No. 06743)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | | |
|--------------------|--------------|------------------------------|------|------|-----|
| 1,0* | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,2 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,6 | DC (+) | M 12 | M 13 | M 21 | C 1 |

*available on request

UTP A 702

anti-wear

Classifications

solid wire

| | | |
|----------|----------------|--------------|
| EN 14700 | DIN 8555 | Material-No. |
| S Z Fe5 | MSG 3-GZ-350-T | 1.6356 |

Characteristics and field of use

UTP A 702 is used for repair, preventive maintenance and production of highly stressed cold and hot working tools, such as punching dies, cold and hot cutting knives, AI-die cast moulds, cold forging dies, drawing-, stamping- and chamfering tools. The weld deposit is, in as-welded condition, machinable, and the subsequent artificial aging optimises the resistance to hot wear and alternating temperatures.

The weld deposit of UTP A 702 has high strength and good toughness.

Hardness of the pure weld deposit:

| | |
|---------------------------|-------------|
| untreated | 32 – 35 HRC |
| hot-aged 3 – 4 h / 480 °C | 50 – 54 HRC |

Typical analysis in %

| C | Mo | Ni | Co | Ti | Al | Fe |
|------|-----|------|------|-----|-----|---------|
| 0,02 | 4,0 | 18,0 | 12,0 | 1,6 | 0,1 | balance |

Welding instruction

Machine welding area has to be metallic bright. Preheat massive pieces to 100 – 150 °C, on low-alloyed base metal apply min. 3 – 4 layer. Weld with lowest possible heat input.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | | |
|--------------------|--------------|------------------------------|------|------|------|
| 1,0* | DC (+) | M 12 | M 13 | M 20 | M 21 |
| 1,2 | DC (+) | M 12 | M 13 | M 20 | M 21 |

*available on request

UTP A 6170 Co

anti-wear

Classifications

solid wire

EN ISO 18274

AWS A5.14

Material-No.

S Ni 6617 (NiCr22Co12Mo9)

ER NiCrCoMo-1

2.4627

Characteristics and field of use

UTP A 6170 Co is particularly used for joining heat resistant and creep resistant nickel base alloys of identical and similar nature, high temperature austenitic and cast alloys, such as

1.4958 X5NiCrAlTi 31 20 UNS N08810

1.4959 X8NiCrAlTi 32 21 UNS N08811

2.4663 NiCr23Co12Mo UNS N06617

The weld metal is resistant to hot-cracking. It is used for operating temperatures up to 1100 °C. Scale-resistant at temperatures up to 1100 °C in oxidizing resp. carburizing atmospheres, e. g. gas turbines, ethylene production plants.

Typical analysis in %

| C | Si | Cr | Mo | Ni | Co | Ti | Al | Fe |
|------|-------|------|-----|---------|------|-----|-----|-----|
| 0,06 | < 0,3 | 22,0 | 8,5 | balance | 11,5 | 0,4 | 1,0 | 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{P0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| > 450 | > 750 | > 30 | > 120 |

Welding instruction

Clean welding area carefully. Keep heat input as low as possible and interpass temperature at max. 150 °C.

Approvals

TÜV (No. 05450)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|------------------------------|--------------------|
| 0,8 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |
| 1,0 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |
| 1,2 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |
| 1,6 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |

Classifications

solid wire

| | | |
|-------------------------|-------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6625 (NiCr22Mo9Nb) | ER NiCrMo-3 | 2.4831 |

Characteristics and field of use

UTP A 6222 Mo-3 has been developed for applications in the oil & gas industry, and is mainly used for cladding and joining of unalloyed and high strength low alloyed steel (HSLA) components. Typical applications are internal cladding of tubes & pipes, risers, and subsea components such as manifolds, BOPs, Christmas trees, well heads, flanges, valve bodies, blocks etc. to improve corrosion resistance to surfaces exposed to hydrocarbon and hydrogen sulphide.

Typical base metals for these applications are SAE 4130, SAE 8630, F 22, F 65. UTP A 6222 Mo-3 has excellent dissimilar materials welding characteristics and can be used for joining components produced from a variety of clad and base metal alloys such as austenitic, super austenitic, martensitic, Duplex and Super Duplex stainless steels.

UTP A 6222 Mo-3 is manufactured to optimise wire-feed and weld pool delivery characteristics, via consistent metallurgical quality raw material and physical control of wire processing, pre-requisites for successful cold and hot wire GTAW/TIG applications where the highest quality standards have to be fulfilled. The wire can also be successfully applied using the GMAW/MIG process.

UTP A 6222 Mo-3 can be welded with either cold- or hot wire automated TIG (GTAW) or MIG (GMAW) processes.

Typical analysis in %

| | | | | | | |
|--------|-------|------|-----|-----|-------|---------|
| C | Si | Cr | Mo | Nb | Fe | Ni |
| ≤ 0,02 | ≤ 0,2 | 22,0 | 9,0 | 3,5 | < 1,0 | balance |

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|--------|------------------------------|-------------------|
| | TIG | MIG | | |
| 0,9 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |
| 1,0 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |
| 1,14 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |
| 1,2 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |
| 1,6 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |

UTP A DUR 250

anti-wear

Classifications

solid wire

EN 14700

DIN 8555

Material-No.

SZ Fe 1

MSG 1-GZ-250

1.8401

Characteristics and field of use

UTP A DUR 250 is used for MAG buildups on structural parts subject to rolling wear and where a good machinability is required, such as rails and rail crossings, crane wheels, rollers, couplings, shafts and gear parts.

UTP A DUR 250 has a very good resistance against compression and rolling strain. The weld metal is easily machinable.

Hardness of the pure weld deposit: approx. 250 HB

Typical analysis in %

| C | Si | Mn | Cr | Ti | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,3 | 0,5 | 1,0 | 1,0 | 0,2 | balance |

Welding instruction

Machine welding area has to be metallic bright. Massive parts have to be preheated to 300 °C.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | |
|--------------------|--------------|------------------------------|------|------|
| 1,2 | DC (+) | M 12 | M 13 | M 21 |
| 1,6* | DC (+) | M 12 | M 13 | M 21 |

*available on request

Classifications

solid wire

| | | |
|----------|--------------|--------------|
| EN 14700 | DIN 8555 | Material-No. |
| SZ Fe 2 | MSG 2-GZ-400 | 1.8405 |

Characteristics and field of use

UTP A DUR 350 is suited for MAG buildups on structural parts subject to compression, impact and abrasion, such as caterpillar track components, machine and gear parts, stamps.

The weld deposit of UTP A DUR 350 may be soft annealed and hardened.
Post-weld machining by grinding is possible.

Hardness of the pure weld deposit :

| | |
|------------------------------|----------------|
| untreated | approx. 450 HB |
| hardened 820 – 850 °C/oil | approx. 62 HRC |
| soft annealed 720 – 740 °C | approx. 200 HB |
| 1 layer on non-alloyed steel | approx. 350 HB |

Typical analysis in %

| C | Si | Mn | Cr | Ti | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,7 | 0,3 | 2,0 | 1,0 | 0,2 | balance |

Welding instruction

Machine welding area has to be metallic bright. Massive parts have to be preheated to 200 – 300 °C.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | |
|--------------------|--------------|------------------------------|------|------|
| 1,0 | DC (+) | M 12 | M 13 | M 21 |
| 1,2 | DC (+) | M 12 | M 13 | M 21 |

UTP A DUR 600

anti-wear

Classifications

solid wire

EN 14700

DIN 8555

Material-No.

S Fe 8

MSG 6-GZ-60-S

1.4718

Characteristics and field of use

UTP A DUR 600 is universally applicable for MAG buildups on structural parts subject to high impact and medium abrasion. Main applications are found in quarries, crushing plants, mines, steel works, cement works as well as cutting tools and dies in the car industry. Despite the high hardness, the deposit is very tough, crack resistant and has an excellent cutting behaviour.

Despite the high hardness, the weld deposit of UTP A DUR 600 is tough, crack resistant and has a good cutting capacity. Machining by grinding possible.

Hardness of the pure weld deposit

| | |
|------------------------------|----------------|
| untreated | 54 – 60 HRC |
| soft annealed 800 °C | approx. 250 HB |
| hardened 1000 °C/oil | approx. 62 HRC |
| 1 layer on non-alloyed steel | approx. 53 HRC |

Typical analysis in %

| C | Si | Mn | Cr | Fe |
|-----|-----|-----|-----|---------|
| 0,5 | 3,0 | 0,5 | 9,5 | balance |

Welding instruction

Grind the welding area to metallic bright. Generally, only tool steels have to be preheated to 450 °C.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | | |
|--------------------|--------------|------------------------------|------|------|-----|
| 0,8 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,0 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,2 | DC (+) | M 12 | M 13 | M 21 | C 1 |
| 1,6 | DC (+) | M 12 | M 13 | M 21 | C 1 |

UTP A DUR 650

anti-wear

Classifications

solid wire

EN 14700

DIN 8555

S Fe 8

MSG 3-GZ-60

Characteristics and field of use

UTP A DUR 650 is universally used for MAG buildups on structural parts subject to high impact and abrasion. Main applications are rail tamping tools, percussion tools, tool holders, shredder hammers, parts of stone treatment industry, press moulds for production of abrasive parts. Also as final layer on hard Mn-steel. Machining by grinding is possible.

UTP A DUR 650 has excellent welding properties, even and finely rippled bead formation and a very good slag removal. Welding with low current settings if possible (e.g. cutting edges). Service temperature up to 550 °C.

Hardness of the pure weld deposit: 55 – 60 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | V | W | Fe |
|------|-----|-----|-----|-----|-----|-----|---------|
| 0,36 | 1,1 | 0,4 | 5,2 | 1,4 | 0,3 | 1,3 | balance |

Welding instruction

Grind welding area. Preheating up to 450 °C, depending on the base material and wall thickness. If more than 3 layers are needed, weld buffer layers or buildups with UTP A DUR 250.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) | | |
|--------------------|--------------|------------------------------|------|------|
| 1,0* | DC (+) | M 12 | M 13 | M 21 |
| 1,2 | DC (+) | M 12 | M 13 | M 21 |
| 1,6* | DC (+) | M 12 | M 13 | M 21 |

*available on request

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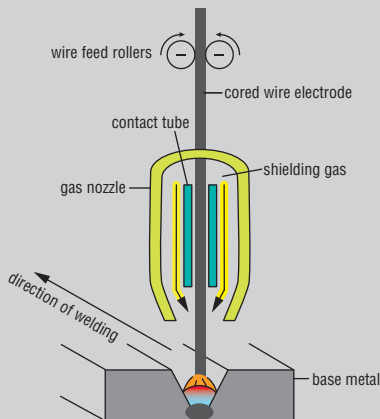
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Description of the FCAW process

FCAW = Flux Cored Arc Welding

Flux cored arc welding is a flexible method that offers high deposition rates, good weldability and excellent weld appearance.



FCAW is commonly used for welding thicker sections (>5 mm). The high deposition rate also makes it suitable for overlay welding of mild and low-alloy steel components. FCAW is closely related to Gas Metal-Arc Welding (GMAW). The flux filled wire is automatically fed through the centre of the gun using the same equipment as when GMAW. The shielding gas is supplied through the gun and protects the weld pool from oxidation during welding. The flux inside the wire will protect the weld from the atmosphere since it forms a slag which covers the weld.

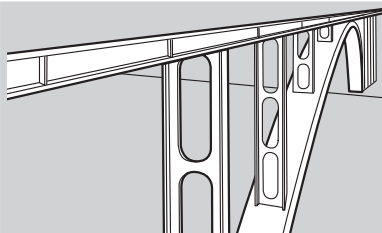
We recommend a shielding gas of either 75% Ar + 25% CO₂ or pure CO₂. The difference between these concerns mainly the weldability, Ar + CO₂ being the best in horizontal welding and CO₂ in vertical welding. The FCAW process can easily be made automatic or semi-automatic. The method is very economical due to its high weld deposit rate. Just like any other gas-shielded process FCAW is sensitive to draughts. Arrangements to avoid draughts should therefore be made when site welding.

Flux cored wires for repair of cracked material

1. Unalloyed, fine grained and low alloyed steels

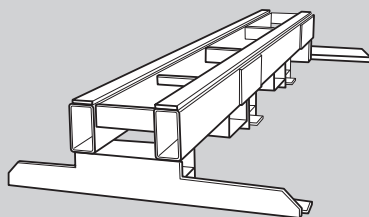
| Product name | EN ISO | AWS | Page |
|--------------|--|--|------|
| UTP AF 152 | 17632-A T 46 4 P M 1 H10 T 42 2 P C 1 H5 | A5.36 E71T1-M21A4-CS1-H8 E71T1-C1A2-CS1-H4 | 177 |
| UTP AF 155 | 17632-A T 46 4 M M 1 H5 | A5.18 E70C-6MH4 | 178 |
| UTP AF 160 | 17632-A T 50 6 1Ni P M 1 H5 | A5.36 E81T1-M21A8-Ni1-H4 | 179 |

Solution examples



Bridge construction repair

UTP AF 152



Steel construction repair

UTP AF 155

UTP AF 152

unalloyed, fine grained and low alloyed steels

Classifications

gas shielded flux cored wire

EN ISO 17632-A

AWS A5.36

T 46 4 P M 1 H10 / T 42 2 P C 1 H5

E71T1-M21A4-CS1-H8 / E71T1-C1A2-CS1-H4

Characteristics and field of use

Rutile flux cored wire with fast freezing slag. Outstanding welding properties in all positions. Excellent mechanical properties and good slag detachability, low spatter losses, smooth, finely rippled seam surface, high X-ray security, notch-free weld toes. Out-of-position welding can be carried out with increased welding current, and therefore very economically with increased deposition rate.

Base materials

Steels up to a yield strength of 460 MPa (67 ksi) (shielding gas M21)
S235JR-S355JR, S235JO-S355JO, S450JO, S235J2-S355J2, S275N-S460N, S275M-S460M, P235GHP355GH, P275NL1-P460NL1, P215NL, P265NL, P355N, P285NH-P460NH, P195TR1-P265TR1, P195TR2-P265TR2, P195GH-P265GH, L245NB-L415NB, L450QB, L245MB-L450MB, GE200-GE240, shipbuilding steels: A, B, D, E, A 32-E 36
ASTM A 106 Gr.A,B,C; A181 Gr.60,70; A283 Gr.A,C; A285 Gr.A,B,C; A350 Gr.LF1; A414 Gr.; A,B,C,D,E,F,G; A501 Gr.B; A513 Gr.1018; A516 Gr.55,60,65,70; A573 Gr.58,65,70; A588; Gr. A,B; A633 Gr.C,E; A662 Gr.B; A711 Gr.1013; A841 Gr.A; API 5 L Gr.B,X42,X52,X56,X60,X65

Typical analysis in %

| C | Si | Mn | Ti |
|------|-----|-----|------|
| 0,06 | 0,5 | 1,2 | 0,05 |

Mechanical properties of the weld metal

| Welded condition | Yield strength | Tensile strength | Elongation | Impact strength | | |
|-------------------------|----------------|------------------|------------|-----------------|-----------------------------|-----------------------------|
| | $R_{p0,2}$ | R_m | A | K_V | $-20\text{ }^\circ\text{C}$ | $-40\text{ }^\circ\text{C}$ |
| | MPa | MPa | % | J [RT] | | |
| untreated ¹⁾ | 500 | 580 | 26 | 180 | 130 | 90 |
| untreated ²⁾ | 480 | 550 | 25 | 160 | 110 | |

¹⁾shielding gas Ar + 15–25 % CO₂²⁾shielding gas 100 % CO₂

Welding instruction

Redrying: – / if necessary: 150 °C/ 24 h / Welding with conventional MAG devices.

Welding positions



Current type DC (+)

Shielding gases: Argon + 15 – 25 % CO₂ / 100 % CO₂

Approvals

TÜV (No.11164), DB (No. 42.014.35), ABS, GL, LR, DNV, BV, CRS, CE

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Wire feed (m/min) |
|--------------------|-----------|---------|-------------------|
| 1,2 | 150 – 300 | 18 – 35 | 5 – 15 |
| 1,6 | 160 – 400 | 23 – 35 | 3,5 – 12 |

UTP AF 155

unalloyed, fine grained and low alloyed steels

Classifications

gas shielded flux cored wire

EN ISO 17632-A

AWS A5.18

T 46 4 M M 1 H5

E70C-6MH4

Characteristics and field of use

UTP AF 155 is a high-efficiency flux cored wire with metal powder filling, for all position welding with mixed gas M21 acc. to EN ISO 14175. It features outstanding mechanical properties in temperature range down to $-40\text{ }^{\circ}\text{C}$ with very low fume level and oxide build up. The stable arc, the smooth droplet transfer, the secure penetration, its high deposition rate in the spray arc range and the high deposition efficiency of 98 % approx. are only some of the positive properties of this wire. It is characterized by almost spatter-free welding with good wall wetting, flat and concave weld shape, radiographical soundness and porosity free weld metal. It is suited for manual and mechanized welding for single and multilayers and root pass welding is proven in all positions.

Base materials

S185, S235J2G3, S275JR, S355J2G3, E295, P235GH, P265GH, P295GH, P355GH (HI, HII, 17 Mn 4, 19 Mn 6), P275N, P355N, P355NL2, P460N, S275N, S275NL, S355N, S355NL, S460N, L210, L240, L290, L360, L290NB, L360MB, L415MB, X42 – X65 / StE 445.7 TM (API-5LX), GS-38 – GS-52, shipbuilding steels grade A – E, A32 – F32, A36 – F36, A40 – F40

Typical analyses in %

| C | Si | Mn | P | S |
|------|-----|-----|--------|--------|
| 0,06 | 0,6 | 1,4 | ≤ 0,02 | ≤ 0,02 |

Mechanical properties of the weld metal

| Heatreatment | Shielding gas | 0.2%-Yield strength | Tensile strength | Elongation ($L_0=5d_0$) | Impact values CVN | |
|--------------|---------------|---------------------|------------------|---------------------------|-------------------|-------------------------------|
| | | MPa | MPa | % | J | $-40\text{ }^{\circ}\text{C}$ |
| AW | M 21 | 460 | 560 | 22 | 130 | 50 |
| 580 °C / 2h | M 21 | 460 | 560 | 22 | 120 | 50 |

Welding position



Current type DC (+)
Shielding gas (EN ISO 14175) M 21
Consumption: 15 – 18 l/min

Approvals

TÜV (No. 11193), DB (No. 42.132.48), BV, DNV, GL, LR

Form of delivery and recommended welding parameters

| Diameter (mm) | Amperage | Voltage |
|---------------|-----------|---------|
| 1,2 | 120 – 350 | 18 – 33 |

Other diameters upon request

Classifications

gas shielded flux cored wire

EN ISO 17632-A

AWS A5.36

T 50 6 1Ni P M 1 H5

E81T1-M21A8-Ni1-H4

Characteristics and field of use

Rutile flux cored wire with fast freezing slag for welding low-temperature steels. Outstanding welding properties in all positions. Exceptional mechanical strength and good slag detachability, low spatter losses, smooth, finely rippled seam surface, notch-free weld toes.

Out-of-position welding can be carried out with increased welding current, and therefore very economically with increased deposition rate. For high-quality welding in shipbuilding, for offshore applications and steel structures with high strength requirements, as well as for low-temperature applications down to -60°C .

Base materials

General structural steels, pipe and boiler steels, cryogenic fine-grained structural steels and special qualities. S355JR, S355J0, S355J2, S450J0, S355N-S460N, S355NL-S460NL, S355M-S460M, S355ML-S460ML, S460Q, S500Q, S460QL, S500QL, S460QL1, S500QL1, P355GH, P355NH, P420NH, P460NH, P355NP460N, P355NH-P460NH, P355NL1-P460NL1, P355NL2-P460NL2, L245NB-L415NB, L245MBL485MB, L360QB-L485QB, aldur 500Q, aldur 500QL, aldur 500QL1

ASTM A 350 Gr. LF2; A 516 Gr. 65, 70; A 572 Gr. 42, 50, 60, 65; A 573 Gr. 70; A 588 Gr. B, C, K; A 633 Gr. A, C, D, E; A 662 Gr. B, C; A 678 Gr. B; A 707 Gr. L2, L3; A 841 Gr. A, B, C; API 5 L X42, X52, X60, X65, X70, X52Q, X60Q, X65Q, X70Q

Typical analysis in %

| C | Si | Mn | Ni |
|------|------|-----|-----|
| 0,06 | 0,45 | 1,3 | 0,9 |

Mechanical properties of the weld metal

| Welded condition | Yield strength | Tensile strength | Elongation A | Impact strength | | | |
|------------------|----------------|------------------|--------------|-----------------|-----------------------|-----------------------|-----------------------|
| | $R_{p0.2}$ | R_m | | K_V | | | |
| | MPa | MPa | % | J [RT] | -20°C | -40°C | -60°C |
| untreated | 530 | 570 | 27 | 140 | 120 | 100 | 60 |

Welding instruction

Welding with conventional MAG devices. Adapt the preheating and interpass temperatures to the base material.

Welding positions

| | |
|--|---|
| | Current type DC (+) Shielding gas: Argon + 15 – 25 % CO ₂ |
|--|---|

Form of delivery and recommended welding parameters

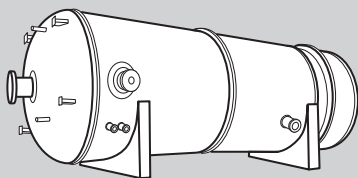
| Wire diameter (mm) | Amperage | Voltage | Wire feed (m/min) |
|--------------------|-----------|---------|-------------------|
| 1,2 | 150 – 300 | 18 – 35 | 5 – 15 |

Flux cored wires for repair of cracked material

2. Stainless steels

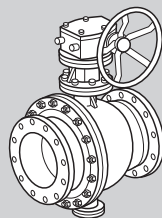
| Product name | EN ISO | AWS | Mat. -No. | Page |
|-------------------|--|-------|----------------------------|------------|
| UTP AF 68 LC | 17633-A T 19 9 L RM3 T 19 9 L RC3 | A5.22 | E308LT-0-1 E308LT-0-4 | 1.4316 181 |
| UTP AF 68 LC PW | 17633-A T 19 9 L P M21 1 T 19 9 L P C1 1 | A5.22 | E308LT1-4 E308LT1-1 | 182 |
| UTP AF 68 MoLC | 17633-A T 19 12 3 L RM3 T 19 12 3 L RC3 | A5.22 | E 316 LT0-1 E 316 LT0-4 | 1.4430 183 |
| UTP AF 68 MoLC PW | 17633-A T 19 12 3 L P M21 1 T 19 12 3 L P C1 1 | A5.22 | E316LT1-4 E316LT1-1 | 184 |
| UTP AF 6222 MoPW | 12153 T Ni 6625 PM 2 | A5.34 | ENiCrMo3 T1-4 | 2.4621 185 |
| UTP AF 6808 Mo | 17633-A T 22 9 3 N L R M21 3 | A5.22 | E2209T0-4 E2209T0-1 | 186 |
| UTP AF 6808 Mo PW | 17633-A T 22 9 3 N L P M21 1 T 22 9 3 N L P C1 1 | A5.22 | E2209T1-4 E2209T1-1 | 188 |
| UTP AF 6824 LC | 17633-A T 23 12 L RM3 T 23 12 L RC3 | A5.22 | E309LT0-1 E309LT0-4 | 1.4332 190 |
| UTP AF 6824 LC PW | 17633-A T 23 12 L P M21 1 T 23 12 L P C1 1 | A5.22 | E309LT1-4 E309LT1-1 | 192 |

Solution examples



Pressure vessel

UTP AF 68 LC



Pump

UTP AF 68 MoLC

Classifications gas shielded flux cored wire

| | | |
|-----------------------------|-----------------------------|--------------|
| EN ISO 17633-A | AWS A5.22 | Material-No. |
| T 19 9 L RM3 / T 19 9 L RC3 | E 308 LT-0-1 / E 308 LT-0-4 | 1.4316 |

Characteristics and field of use

UTP AF 68 LC is a low carbon, CrNi flux-cored wire with rutile slag used for joint-welding of alloyed CrNi-steels and cast steels.
The weld metal shows sufficient grain stability up to 350 °C and is scaling resistant up to 800 °C.

Base materials

| Material-No.55 | AISI | UNS | EN Symbol |
|----------------|-------|--------|-----------------|
| 1.4300 | 302 | S30200 | X12 CrNi 18 8 |
| 1.4301 | 304 | S30400 | X5 CrNi 18 10 |
| 1.4306 | 304L | S30403 | X2 CrNi19 11 |
| 1.4311 | 304LN | S30453 | X2 CrNiN 18 10 |
| 1.4312 | 305 | J92701 | GX10 CrNi 18 8 |
| 1.4303 | 308 | S30800 | X4 CrNi 18 12 |
| 1.4541 | 321 | S32100 | X6 CrNiTi 18 10 |
| 1.4550 | 347 | S34700 | X6 CrNiNb 18 10 |

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|-------|-----|-----|------|------|---------|
| 0,025 | 0,6 | 1,5 | 19,5 | 10,0 | balance |


Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 380 | 560 | 35 | 70 |

Welding instruction

Clean weld area thoroughly. Welding torch should be held slightly inclined, using the pushing technique. Possibly weaving.

Welding positions

| | |
|---|---|
|  | Current type DC (+) Shielding gases: M 20, M 21, C 1 |
|---|---|

Approvals

TÜV (No. 06365)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage |
|--------------------|-----------|---------|
| 0,9* | 100 – 160 | 22 – 27 |
| 1,2 | 125 – 270 | 20 – 33 |
| 1,6* | 200 – 350 | 25 – 35 |

*available on request

UTP AF 68 LC PW

stainless steels

Classifications

gas shielded flux cored wire

EN ISO 17633-A

AWS A5.22

T 19 9 L P M21 1 / T 19 9 L P C 1

E308LT1-4 / E308LT1-1

Characteristics and field of use

UTP AF 68 LC PW is a strip alloyed flux cored wire with a rutile slag characteristic for position welding of austenitic CrNi steels. The support provided by the fast-hardening slag allows out-of-position welding with high current magnitudes and high welding speeds. The fine droplet, low-spatter, very powerfully welding spray arc, the reliable fusion penetration, the self-releasing slag and the effectively wetting seam formation result in a high weld quality at the same time as short welding times. Additional advantages to its application result from the ease of handling, the low heat input due to the high welding speed, and the small amounts of cleaning and pickling required. UTP AF 68 LC PW is preferred for flat and horizontal welding positions (PA, PB). The weld metal is cryogenic down to -196 °C and resists intergranular corrosion up to $+350\text{ °C}$.

Base materials

1.4306 X2CrNi19-11, 1.4301 X5CrNi18-10, 1.4311 X2CrNiN18-10, 1.4312 GX10CrNi18-8, 1.4541 X6CrNiTi18-10, 1.4546 X5CrNiNb18-10, 1.4550 X6CrNiNb18-10
AISI 304, 304L, 304LN, 302, 321, 347, ASTM A157 Gr. C9, A320 Gr. B8C or D

Typical analysis in %

| C | Si | Mn | Cr | Ni |
|------|-----|-----|------|------|
| 0,03 | 0,7 | 1,5 | 19,8 | 10,5 |

Mechanical properties of the weld metal

| Welded condition | Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | |
|------------------|------------------------------|---------------------------|-----------------|--------------------------|------------------|
| | MPa | MPa | % | J [RT] | -196 °C |
| untreated | 380 | 560 | 40 | 70 | 40 |

shielding gas Ar + 18 % CO₂

Welding instruction

Welding with conventional MAG devices, slightly trailing torch position (angle of incidence about 80 °), slight weaving of the torch is recommended in all positions. With 100 % CO₂ the voltage must be raised by 2V. The gas quantity should be 15 – 18 l/min.

Welding positions



Current type DC (+)
Shielding gases: M 1 – M 3, C 1

Approvals

TÜV (09117.), DB (43.014.23), CWB (E308LT1-1(4)), GL (4550S (C1,M21)), SEPROZ, CE

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage |
|--------------------|-----------|---------|
| 1,2 | 100 – 220 | 20 – 31 |
| 1,6 | 175 – 260 | 21 – 29 |

Classifications gas shielded flux cored wire

| | | |
|-----------------------------------|---------------------------|--------------|
| EN ISO 17633-A | AWS A5.22 | Material-No. |
| T 19 12 3 L RM3 / T 19 12 3 L RC3 | E 316 LT0-1 / E 316 LT0-4 | 1.4430 |

Characteristics and field of use

UTP AF 68 LC is a low carbon, CrNi flux-cored wire with rutile slag for joining and surfacing of CrNisteels and cast steel.

The weld metal shows sufficient grain stability up to 350 °C and is scaling resistant up to 800 °C.

Base materials

| Material-No. | AISI | UNS | EN |
|--------------|-------|--------|---------------------|
| 1.4401 | 316 | S31600 | X5 CrNiMo 17-12-2 |
| 1.4404 | 316L | S31603 | X2 CrNiMo 17-12-2 |
| 1.4406 | 316LN | S31653 | X2 CrNiMoN 17-12-2 |
| 1.4571 | 316Ti | S31635 | X6 CrNiMoTi 17-12-2 |
| 1.4583 | 318 | S31640 | X10 CrNiMoNb 18-12 |

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Fe |
|-------|-----|-----|------|-----|------|---------|
| 0,025 | 0,6 | 1,5 | 19,5 | 2,7 | 12,5 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|--------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 400 | 560 | 35 | 55 |

Welding instruction

Clean weld area thoroughly. Welding torch should be held slightly inclined, using the push-technique. Possibly weaving.

Welding positions

| | |
|--|---|
| | Current type DC (+) Shielding gases: M 21, C 1 |
|--|---|

Approvals

TÜV (No. 06366)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage |
|--------------------|-----------|---------|
| 0,9* | 100 – 160 | 21 – 30 |
| 1,2 | 125 – 260 | 20 – 34 |
| 1,6* | 200 – 300 | 25 – 35 |

*available on request

UTP AF 68 MoLC PW

stainless steels

Classifications

gas shielded flux cored wire

EN ISO 17633-A

AWS A5.22

T 19 12 3 L P M21 1 / T 19 12 3 L P C1 1

E316LT1-4 / E316LT1-1

Characteristics and field of use

UTP AF 68 MoLC PW is a strip alloyed flux cored wire with a rutile slag characteristic for position welding of austenitic CrNiMo steels. The support provided by the fast-hardening slag allows out-of-position welding with high current magnitudes and high welding speeds. The fine droplet, low-spatter, very powerfully welding spray arc, the reliable fusion penetration, the self-releasing slag and the effectively wetting seam formation result in a high weld quality at the same time as short welding times. Additional advantages to its application result from the ease of handling, the low heat input due to the high welding speed, and the small amounts of cleaning and pickling required. UTP AF 68 MoLC PW is preferred for flat and horizontal welding positions (PA, PB). The weld metal is cryogenic down to $-120\text{ }^{\circ}\text{C}$ and resists intergranular corrosion up to $+400\text{ }^{\circ}\text{C}$.

Base materials

1.4401 X5CrNiMo17-12-2, 1.4404 X2CrNiMo17-12-2, 1.4435 X2CrNiMo18-14-3, 1.4436 X3CrNiMo17-13-3, 1.4571 X6CrNiMoTi17-12-2, 1.4580 X6CrNiMoNb17-12-2, 1.4583 X10CrNiMoNb18-12, 1.4409 GX2CrNiMo 19-11-2, UNS S31603, S31653; AISI 316L, 316Ti, 316Cb

Typical analysis in %

| C | Si | Mn | Cr | Ni | Mo |
|------|-----|-----|------|------|-----|
| 0,03 | 0,7 | 1,5 | 19,0 | 12,0 | 2,7 |

Mechanical properties of the weld metal

| Welded condition | Yield strength | Tensile strength | Elongation | Impact strength | |
|------------------|----------------|------------------|------------|-----------------|--------------------------------|
| | $R_{P0,2}$ | R_m | A | K_V | $-120\text{ }^{\circ}\text{C}$ |
| | MPa | MPa | % | J [RT] | |
| untreated | 400 | 560 | 38 | 65 | 45 |

shielding gas Ar + 18 % CO₂

Welding instruction

Welding with conventional MAG devices, slightly trailing torch position (angle of incidence about 80°), slight weaving of the torch is recommended in all positions. With 100 % CO₂ the voltage must be raised by 2V. The gas quantity should be 15 – 18 l/min.

Welding positions



Current type DC (+)
Shielding gases: M 1 – M 3, C 1

Approvals

TÜV (09118.), DB (43.014.24), CWB (E316LT1-1(4)), LR (DXV and O, BF 316LS), GL (4571S (C1,M21)), SEPROZ, CE, DNV

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage |
|--------------------|-----------|---------|
| 1,2 | 100 – 220 | 20 – 31 |
| 1,6 | 175 – 260 | 21 – 29 |

| | | |
|------------------------|---------------|------------------------------|
| Classifications | | gas shielded flux cored wire |
| EN ISO 12153 | AWS A 5.34 | Material-No. |
| T Ni 6625 PM 2 | ENiCrMo3 T1-4 | 2.4621 |

Characteristics and field of use

The nickel-base-flux-cored wire (NiCrMo) UTP AF 6222 Mo PW is suitable for joining and surfacing on nickel-base materials of the same nature and on C- and CrNi-steels as well as for cladding on C-steels, furthermore in high temperature applications.

| | | | |
|--------|-------------------|---------|-----------------|
| 2.4856 | NiCr22Mo9Nb | N 06625 | Alloy 625 |
| 1.4539 | X NiCrMoCu25 20 5 | N 08904 | Alloy 904 |
| 1.4583 | X NiCrNb18 | | |
| 1.0562 | 12StE 355 | | |
| 1.5662 | X 8Ni9 | | ASTM A553 Typ 1 |

UTP AF 6222 Mo PW distinguishes by a hot cracking resistant and tough weld metal. It is suitable for operating temperatures up to 500 °C and above 800 °C. It must be noted that a slight decrease in ductility will occur if prolonged heat treatment is given within the temperature range 550 – 800 °C.

UTP AF 6222 Mo PW provides excellent positional welding. It has excellent welding properties with a regular and fine drop transfer. The weld seam is finely rippled and the transition from weld to base materials is regular and notch-free. The wide parameter range enables an application on different wall thicknesses.

Typical analysis in %

| C | Si | Mn | P | S | Cr | Mo | Ni | Nb | Fe |
|------|-----|-----|------|------|------|-----|---------|-----|-----|
| 0,03 | 0,4 | 0,4 | 0,01 | 0,01 | 21,5 | 9,0 | balance | 3,5 | 0,5 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | |
|---------------------------|------------------------|----------------|-----------------------|---------|
| MPa | MPa | % | J [RT] | -196 °C |
| 490 | 750 | 30 | 70 | 60 |

Welding instruction

Clean welding area cautiously, slightly trailing torch position.

Welding positions



Approvals

TÜV (No.10991)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage |
|--------------------|-----------|---------|
| 1,2 | 170 – 200 | 26 – 32 |

Classifications

gas shielded flux cored wire

EN ISO 17633-A

AWS A5.22

T 22 9 3 N L R M21 3 / T 22 9 3 N L R C1 3

E2209T0-4 / E2209T0-1

Characteristics and field of use

UTP AF 6808 Mo is a strip alloyed duplex steel rutile flux cored wire for gas shielded arc welding primarily in flat and horizontal welding positions. It can provide an economical and qualitatively advantageous alternative to MAG welding of duplex steels.

The easy handling and high deposition rate of UTP AF 6808 Mo result in high productivity with excellent welding performance, self-releasing slag, very low spatter formation and seam oxidation, finely rippled weld pattern with good wetting behaviour and even, reliable fusion penetration. In addition to the significant savings in time and costs of processing techniques, including the lower requirement for cleaning and pickling, we guarantee a high level of quality and highly reliable avoidance of welding defects.

The structure of the weld metal consists of austenite and ferrite (FN 30 - 50). The pitting resistance equivalent is $PRE_N \geq 35$ (%Cr+3,3%Mo+16%N). In the welded and pickled condition, the weld metal is resistant, according to ASTM A262-93a, Pr.E, Pr.C, Pr.B and ASTM G48/Method A up to 22 °C, and according to ASTM G48/Method A (24 h) in the solution treated and pickled condition up to 30 °C. The welding consumable can be used in a temperature range from -40 °C up to +250 °C.

Base materials

Same-type duplex steels and similar-alloy, ferritic-austenitic materials of increased strength, as well as for dissimilar joints between duplex steels and unalloyed or low-alloy, creep resistant and austenitic steels.

1.4462 X2CrNiMoN22-5-3, 1.4362 X2CrNiN23-4,

1.4462 X2CrNiMoN22-5-3 with 1.4583 X10CrNiMoNb18-12,

1.4462 X2CrNiMoN22-5-3 with P235GH/ P265GH, S255N, P295GH, S460N, 16Mo3

UNS S31803, S32205

Typical analysis in %

| C | Si | Mn | Cr | Ni | Mo | N | PRE _N | Fn |
|-------|-----|-----|------|-----|-----|------|------------------|-------|
| ≤0,03 | 0,8 | 0,9 | 22,7 | 9,0 | 3,2 | 0,13 | 35 | 30-50 |

Mechanical properties of the weld metal

| Welded condition | Yield strength $R_{p0.2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | |
|------------------|------------------------------|---------------------------|-----------------|--------------------------|--------|
| | MPa | MPa | % | J [RT] | -40 °C |
| untreated | 600 | 800 | 27 | 60 | 45 |

shielding gas Ar + 18 % CO₂

UTP AF 6808 Mo

Welding instruction

Welding with conventional MAG devices, slightly trailing torch position (angle of incidence about 80°); with 100 % CO₂ the voltage must be 2V higher.
The gas quantity should be 15 – 18 l/min.

Welding positions



Current type DC (+)
Shielding gases: M 1 – M 3, C 1

Approvals

TÜV (07133.), ABS (E 2209 T0-4), CWB (E2209T0-4), DNV (Duplex (M21)),
GL (4462S (M21,C1)), LR (X (M21)), RINA (2209S), SEPROZ, CE, DB (43.014.31)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage |
|--------------------|-----------|---------|
| 1,2 | 125 – 280 | 22 – 36 |

UTP AF 6808 Mo PW

stainless steels

Classifications

gas shielded flux cored wire

EN ISO 17633-A

AWS A5.22

T 22 9 3 N L P M21 1 / T 22 9 3 N L P C1 1

E2209T1-4 / E2209T1-1

Characteristics and field of use

UTP AF 6808 Mo PW is a strip alloyed, duplex steel rutile flux cored wire for position welding of duplex steels in the chemical apparatus, plant and container construction, for chemical tankers and in the offshore industry. The support provided by the fast-hardening slag allows out-of-position welding with high current magnitudes and high welding speeds. The advantage of the slag is its supporting effect on the weld pool. This permits, for example, welding with the stringer bead technique at a correspondingly high welding speed even in difficult pipe welding positions (5G, 6G). The fine droplet, low-spatter, very powerfully welding spray arc, the reliable fusion penetration, the self-releasing slag and the effectively wetting seam formation result in a high weld quality at the same time as short welding times. Additional advantages to its application result from the ease of handling, the low heat input due to the high welding speed, and the small amounts of cleaning and pickling required.

The structure of the weld metal consists of austenite and ferrite (FN 30–50). The pitting resistance equivalent is $PRE_N \geq 35$ (%Cr+3,3%Mo+16%N). Testing the weld metal in accordance with ASTM G48 Method A resulted in a CPT (critical pitting temperature) of 25 °C. Also suited to joining different materials and to weld cladding. Usable between –46 °C and +250 °C.

Base materials

Same-type duplex steels and similar-alloy, ferritic-austenitic materials of increased strength, as well as for dissimilar joints between duplex steels and unalloyed or low-alloy, creep resistant and austenitic steels.

1.4462 X2CrNiMoN22-5-3,

1.4362 X2CrNiN23-4,

1.4462 X2CrNiMoN22-5-3 with 1.4583 X10CrNiMoNb18-12,

1.4462 X2CrNiMoN22-5-3 with P235GH/ P265GH, S255N, P295GH, S460N, 16Mo3, UNS S31803, S32205

Typical analysis in %

| C | Si | Mn | Cr | Ni | Mo | N | PRE _N | Fn |
|-------|-----|-----|------|-----|-----|------|------------------|-------|
| ≤0,03 | 0,8 | 0,9 | 22,7 | 9,0 | 3,2 | 0,13 | ≥35 | 30–50 |

Mechanical properties of the weld metal

| Welded condition | Yield strength | Tensile strength | Elongation | Impact strength | | | |
|------------------|----------------|------------------|------------|-----------------|--------|--------|--------|
| | $R_{p0,2}$ | R_m | A | K_v | –20 °C | –40 °C | –46 °C |
| | MPa | MPa | % | J [RT] | | | |
| untreated | 600 | 800 | 27 | 80 | 65 | 55 | 45 |

shielding gas Ar + 18 % CO₂

UTP AF 6808 Mo PW

Welding instruction

Welding with conventional MAG devices, slightly trailing torch position (angle of incidence about 80°) ; slight weaving of the torch is recommended in all positions; with 100 % CO₂ the voltage must be 2 V higher. The gas quantity should be 15 – 18l/min.

Welding positions



Current type DC (+)
Shielding gases: M 1 – M 3, C 1

Approvals

TÜV-D (07666.), ABS (E 22 09 T1-4(1)), CWB (E2209T1-1(4)), DNV (X (M21;C1)), GL (4462S (M21)), LR (X (M21,C1)), RINA (2209 S), SEPROZ, CE

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage |
|--------------------|-----------|---------|
| 1,2 | 100 – 220 | 20 – 31 |

UTP AF 6824 LC

stainless steels

Classifications

gas shielded flux cored wire

EN ISO 17633-A

ASME II C SFA 5.22

Material-No.

T 23 12 L RM3 / T 23 12 L RC3

E 309 LT 0-1 / E 309 LT 0-4

1.4332

Characteristics and field of use

UTP AF 6824 LC is a low-carbon flux-cored wire with rutile slag used for joint-welding of alloyed CrNi steels among each other or with other unalloyed or low alloyed steels / cast steels. (b+w joining).

Properties of the weld metal: The weld metal shows sufficient grain stability up to 350 °C and is scaling resistant up to 800 °C.

Base materials

| Material-No. | AISI | UNS | EN Symbol |
|--------------|--------|---------|---------------------|
| 1.4301 | 304 | S 30400 | X5 CrNi 18 10 |
| 1.4306 | 304 L | S 30403 | X2 CrNi 19 11 |
| 1.4311 | 304 LN | S 30453 | X2 CrNiN 18 10 |
| 1.4401 | 316 | S 31600 | X5 CrNiMo 17 12 2 |
| 1.4404 | 316 L | S 31603 | X2 CrNiMo 17 13 2 |
| 1.4541 | 308 | S 30800 | X6 CrNiTi 18 10 |
| 1.4550 | 347 | S 34700 | X6 CrNiNb 18 10 |
| 1.4571 | 316 Ti | S 31635 | X6 CrNiMoTi 17 12 2 |
| 1.4583 | 318 | S 31640 | G-X5 CrNiNb 19 11 |

Joining these materials with unalloyed and low-alloyed steels is possible.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Fe |
|-------|-----|-----|------|------|---------|
| 0,025 | 0,6 | 1,5 | 24,0 | 12,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 400 | 550 | 35 | 60 |

Welding instruction

Clean weld area thoroughly. Welding torch should be held slightly inclined, using the pushing technique. Possibly weaving.

Welding positions



Current type DC (+)
Shielding gases: C 1, M 20, M 21

UTP AF 6824 LC

Approvals

TÜV (No. 06364)

Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> |
|---------------------------|-----------------|----------------|
| 0,9* | 100 – 160 | 21 – 30 |
| 1,2 | 125 – 280 | 20 – 34 |
| 1,6* | 200 – 350 | 25 – 35 |

*available on request

UTP AF 6824 LC PW

stainless steels

Classifications

gas shielded flux cored wire

EN ISO 17633-A

AWS A5.22

T 23 12 L P M21 1 / T 23 12 L P C1 1

E309LT1-4 / E309LT1-1

Characteristics and field of use

Rutile, strip alloyed, flux cored wire with fast freezing slag for position welding of austenite-ferrite joints, and for the first layer of weld claddings of unalloyed and low-alloy base materials. The support provided by the fast-hardening slag allows out-of-position welding with high current magnitudes and high welding speeds.

The fine droplet, lowspatter, very intense spray arc, the reliable fusion penetration, the self-releasing slag and the good wetting behaviour result in a high weld quality at the same time as short welding times. Additional advantages to its application are the ease of handling, the low heat input resulting from the high welding speed, and the small amounts of cleaning and pickling required. UTP AF 6824 LC PW should be used for flat and horizontal welding positions (PA, PB). The weld metal is suitable for operating temperatures between $-60\text{ }^{\circ}\text{C}$ and $+300\text{ }^{\circ}\text{C}$.

Base materials

Joints: of and between high-strength, unalloyed and alloyed quenched and tempered steels, stainless, ferritic Cr and austenitic Cr-Ni steels, austenitic manganese steels and weld claddings: for the first layer of chemically resistant weld claddings on the ferritic-pearlitic steels used for boiler and pressure vessel construction up to finegrained structural steel S500N, and for the creep resistant fine-grained structural steels 22NiMoCr4-7, 20MnMoNi5-5 and GS-18NiMoCr 3 7

Typical analysis in %

| C | Si | Mn | Cr | Ni |
|------|-----|-----|------|------|
| 0,03 | 0,7 | 1,4 | 23,0 | 12,5 |

Mechanical properties of the weld metal

| Welded condition | Yield strength $R_{p0.2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | |
|------------------|------------------------------|---------------------------|-----------------|--------------------------|-------------------------------|
| | MPa | MPa | % | J [RT] | $-60\text{ }^{\circ}\text{C}$ |
| untreated | 400 | 540 | 35 | 65 | 50 |

shielding gas Ar + 18 % CO₂

Welding instruction

The gas quantity should be 15 – 18 l/min. Slightly trailing torch position (angle of incidence about 80°), slight weaving of the torch is recommended in all positions. It is recommended that the voltage is increased by 2V if the shielding gas is 100 % CO₂. Preheating and inter-pass temperatures are to be adapted to the base material.

UTP AF 6824 LC PW

Welding positions



Current type DC (+)

Shielding gases: Argon + 15 – 25 % CO₂, 100 % CO₂

Approvals

TÜV (09115.), DB (43.014.22), ABS (E309 LT 1-1(4)), LR (DXV and O, CMn/SS), GL (4332SiC1, M21), CWB (E309LT0-1(4)), SEPROZ, CE, DNV, RINA

Form of delivery and recommended welding parameters

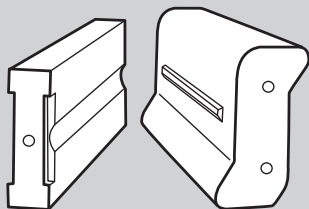
| Wire diameter (mm) | Amperage | Voltage |
|--------------------|-----------|---------|
| 1,2 | 100 – 220 | 20 – 31 |
| 1,6 | 175 – 260 | 21 – 29 |

Gas shielded cored wires for repair, anti-wear and anti-corrosion

1. Manganese steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|--------------|------|----------------|-----|-----|-----|------|-----|------|
| SK 797-G | 8555 | MF 7-GF-200-KP | 185 | | 0,9 | 14,5 | 0,3 | |
| SK AP-G | 8555 | MF 7-GF-200-KP | 200 | | 0,4 | 17,0 | 0,3 | 12,0 |

Solution examples

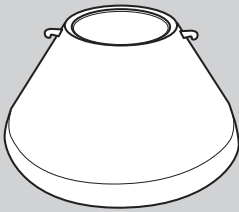


Impactor bar

SK 797-G

applications

| Ni | Mo | Ti | W | V | B | Fe | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Page |
|----|-----|----|---|---|---|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|
| | 0,5 | | | | | Bal. | | | | ■ | | | ■ | 196 |
| | | | | | | Bal. | | | | ■ | ■ | | ■ | 197 |



Gyrotory crusher mantel

SK AP-G

SK 797-G

manganese steels

Classifications

gas shielded flux cored wire

DIN 8555

MF 7-GF-200-KP

Characteristics

Austenitic alloy without Chromium designed for rebuilding 14 % Manganese steel parts where parent metal matching colour is a must.

Microstructure: Austenite

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 82 % + CO₂ 18 %

Field of use

Patching of Hadfield steel castings, crusher cylinders, crusher hammers, impactor bars.

Typical analysis in %

| C | Mn | Si | Ni | Mo | Fe |
|-----|------|-----|-----|-----|---------|
| 0,9 | 14,5 | 0,3 | 2,0 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 185 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK AP-G

manganese steels

Classifications

gas shielded metal cored wire

DIN 8555

ASME IIC SFA 5.21

MF 7-GF-200-KP

FeMn-Cr

Characteristics

Multi-purpose cored wire, mainly used for rebuilding and joining of Carbon and 14 % Manganese steels. Can also be used as buffer layer prior to hard overlay. Work-hardenable alloy.

| | |
|------------------------|---|
| Microstructure: | Austenite |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | As required |
| Shielding gas: | Argon 98 % + Oxygen 2 % |

Field of use

Railway rails and crossovers, mill shaft drive ends, gyratory crusher mantles, repointing of shovel teeth, buffer layer for inter-particles crushers.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|-----|------|-----|------|---------|
| 0,4 | 17,0 | 0,3 | 12,0 | balance |

Typical mechanical properties

Hardness as welded: 200 HB

Form of delivery and recommended welding parameters

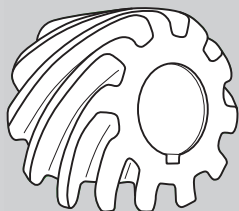
| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 12 – 15 |

Gas shielded cored wire for repair, anti-wear and anti-corrosion

2. Low alloyed steels

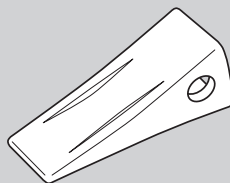
| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|--------------|------|----------------|-----|-----|------|-----|-----|-----|
| SK 250-G | 8555 | MF 1-GF-225-GP | 225 | | 0,09 | 1,2 | 0,5 | 0,4 |
| SK 258-G | 8555 | MF 6-GF-55-GT | | 53 | 0,45 | 1,6 | 0,8 | 5,5 |
| SK 258L-G | 8555 | MF 5-GF-45-GT | | 45 | 0,17 | 1,6 | 0,6 | 5,5 |
| SK 258 TIC-G | 8555 | MF 6-GF-60-GP | | 59 | 1,6 | 0,8 | 0,3 | 5,6 |
| SK 300-G | 8555 | MF 1-GF-300-GP | 300 | | 0,25 | 1,5 | 0,4 | 1,4 |
| SK 350-G | 8555 | MF 1-GF-350-GP | 330 | | 0,35 | 1,5 | 0,4 | 1,8 |
| SK 450-G | 8555 | MF 1-GF-450-GP | | 47 | 0,27 | 1,1 | 0,2 | 2,3 |
| SK 500-G | 8555 | MF 6-GF-50-GT | | 52 | 0,26 | 1,3 | 0,7 | 5,0 |
| SK 600-G | 8555 | MF 6-GF-60-GP | | 59 | 0,52 | 1,5 | 1,2 | 5,9 |
| SK 600C-G | 8555 | MF 6-GF-60-GP | | 60 | 0,4 | 1,2 | 0,8 | 6,0 |
| SK 650-G | 8555 | MF 3-GF-60-GT | | 58 | 0,45 | 0,9 | 0,6 | 5,5 |
| SK A68-G | 8555 | MF 2-GF-65-G | | 62 | 0,5 | 1,3 | 1,0 | |

Solution examples



Gear teeth

SK 350-G

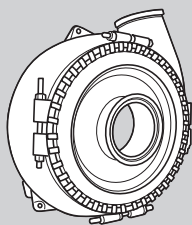


Shovel teeth

SK 500-G

applications

| | Ni | Mo | Ti | W | V | B | Fe | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Page |
|--|-----|-----|------|-----|-----|-----|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|
| | | | | | | | Bal. | | | | ■ | | | | 200 |
| | | 1,3 | | 1,3 | | | Bal. | ■ | | | ■ | | | ■ | 201 |
| | | 1,5 | | 1,5 | | | Bal. | ■ | | | ■ | | | ■ | 202 |
| | | 1,1 | 5,8 | | | | Bal. | ■ | | | ■ | | | ■ | 203 |
| | | | | | | | Bal. | | | | ■ | | | | 204 |
| | | 0,5 | | | | | Bal. | | | | ■ | | | | 205 |
| | | 0,5 | | | | | Bal. | | | | ■ | | | | 206 |
| | | 0,5 | | | | | Bal. | | | | ■ | | | | 207 |
| | | 0,8 | 0,05 | | | | Bal. | ■ | | | ■ | | | ■ | 208 |
| | | 0,7 | | | | | Bal. | ■ | | | ■ | | | ■ | 209 |
| | | 1,4 | | 1,6 | 0,5 | | Bal. | ■ | | | ■ | | | ■ | 210 |
| | 1,6 | | | | | 3,7 | Bal. | ■ | | | ■ | | | ■ | 211 |



Gravel pump

SK 600-G

SK 250-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

ASME IIC SFA 5.21

MF 1-GF-225-GP

ERC Fe-1

Characteristics

Metal-cored wire designed for building-up by welding in horizontal and vertical-up positions under gas shielding.

Microstructure: Ferrite + Perlite

Machinability: Good

Oxy-acetylene cutting: Possible

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 82 % + CO₂ 18 %

Field of use

Conveyor chains, sliding metal parts, gear teeth, shafts.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|-----|-----|-----|---------|
| 0,09 | 1,2 | 0,5 | 0,4 | balance |

Typical mechanical properties

Hardness as welded: 225 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 10 – 18 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 10 – 18 |

SK 258-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 6-GF-55-GT

Characteristics

Martensitic alloy designed to give an outstanding resistance to low stress abrasion with heavy impact and high compressive stresses. The deposit is heat treatable and forgeable.

Microstructure: Martensite

Machinability: Grinding only

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Cable sheaves, bed knives, steel mill rollers, crane wheels, forging dies.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,45 | 1,6 | 0,8 | 5,5 | 1,3 | 1,3 | balance |

Typical mechanical properties

Hardness as welded: 53 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 300 | 20 – 31 | 20 max. | 15 – 18 |
| 2,8 | 300 – 400 | 20 – 31 | 20 max. | 20 – 22 |

SK 258L-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 5-GF-45-GT

Characteristics

Martensitic alloy designed to give an outstanding resistance to low stress abrasion with heavy impact and high compressive stresses. The deposit is heat treatable and forgeable.

Microstructure: Martensite

Machinability: Good with Tungsten carbides or cubic Boron Nitride tipped tools

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Steel mill rollers, blast furnace bells (seat area), dredger-buckets cylinders.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,17 | 1,6 | 0,6 | 5,5 | 1,5 | 1,5 | balance |

Typical mechanical properties

Hardness as welded: 45 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 150 – 250 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 180 – 300 | 20 – 31 | 20 max. | 15 – 18 |
| 2,8 | 300 – 400 | 20 – 31 | 20 max. | 20 – 22 |

SK 258 TIC-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 6-GF-60-GP

Characteristics

Special Chormium-Titanium-Molybdenum martensitic alloy designed to resist high stress abrasion wear with heavy impact.

Microstructure: Finely dispersed Titanium carbides in a Martensitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Up to 6 layers

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Bucket teeth and lips, inter-particles crusher roller, concrete pump parts, augers, crusher hammers, shredder hammers, crusher hammers, asphalt mixers blades, concrete pump parts.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Ti | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 1,6 | 0,8 | 0,3 | 5,6 | 1,1 | 5,8 | balance |

Typical mechanical properties

Hardness as welded: 59 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 150 – 250 | 26 – 29 | 15 – 20 | 12 – 15 |
| 1,6 | 180 – 300 | 26 – 29 | 15 – 20 | 15 – 18 |

SK 300-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 1-GF-300-GP

Characteristics

Build-up alloy designed for welding in horizontal and vertical-up positions under gas shielding.

Microstructure: Bainite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 82 % + CO₂ 18 %

Field of use

Conveyor chains, sliding metal parts, gear teeth, crane wheels, undercarriage links, shafts, buffer layer prior to hardfacing.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|-----|-----|-----|---------|
| 0,25 | 1,5 | 0,4 | 1,4 | balance |

Typical mechanical properties

Hardness as welded: 300 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK 350-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 1-GF-350-GP

Characteristics

Rebuilding and hardfacing alloy for carbon steel parts.

Microstructure: Bainite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 82 % + CO₂ 18 % or CO₂ 100 %**Field of use**

Sliding metal parts, gear teeth, undercarriage links, rollers and idlers, shafts, bushing.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|------|-----|-----|-----|-----|---------|
| 0,35 | 1,5 | 0,4 | 1,8 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 330 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |
| 2,0 | 200 – 325 | 20 – 31 | 20 max. | 15 – 18 |
| 2,4 | 250 – 350 | 20 – 31 | 20 max. | 18 – 20 |

SK 450-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

ASME IIC SFA 5.21

MF 1-GF-450-GP

ERC Fe-2

Characteristics

Rebuilding and hardfacing alloy designed for welding in horizontal and vertical-up positions under gas shielding.

Microstructure: Martensite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 82 % + CO₂ 18 % or CO₂ 100 %

Field of use

Undercarriage rollers and idlers, crane wheels, sealing rings seats.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|------|-----|-----|-----|-----|---------|
| 0,27 | 1,1 | 0,2 | 2,3 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 47 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK 500-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 6-GF-50-GT

Characteristics

Rebuilding and hardfacing alloy designed for welding in horizontal and vertical-up positions under gas shielding.

Microstructure: Martensite

Machinability: Grinding only

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 82 % + CO₂ 18 % or 100 % CO₂

Field of use

Undercarriage rollers and idlers, shovel teeth, shear blades.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|------|-----|-----|-----|-----|---------|
| 0,26 | 1,3 | 0,7 | 5,0 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 52 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK 600-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 6-GF-60-GP

Characteristics

Martensitic steel alloy designed for welding in horizontal and vertical-up positions under gas shielding. Its resistance to friction and low stress abrasive wear with moderate impact is excellent.

Microstructure: Martensite

Machinability: Grinding only

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 82 % + CO₂ 18 % or CO₂ 100 %

Field of use

Bucket teeth, gravel pumps, conveyor chains, sliding metal parts, gear teeth, crusher hammers, rock drills

Typical analysis in %

| C | Mn | Si | Cr | Mo | Ti | Fe |
|------|-----|-----|-----|-----|------|---------|
| 0,52 | 1,5 | 1,2 | 5,9 | 0,8 | 0,05 | balance |

Typical mechanical properties

Hardness as welded: 59 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 0,9 | 80 – 170 | 17 – 30 | 20 max. | 12 – 15 |
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK 600C-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 6-GF-60-GP

Characteristics

Premium martensitic steel alloy designed for welding at low parameters in horizontal positions under gas shielding. Its resistance to friction and low stress abrasion wear with moderate impact is excellent.

| | |
|------------------------|----------------------------------|
| Microstructure: | Martensite |
| Machinability: | Grinding only |
| Oxy-acetylene cutting: | Flame cut is difficult |
| Deposit thickness: | 3,5 – 4,0 mm in one layer |
| Shielding gas: | Argon 82 %+ CO ₂ 18 % |

Field of use

Automatic surfacing of corners and edges of cutting tools.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,4 | 1,2 | 0,8 | 6,0 | 0,7 | balance |

Typical mechanical properties

Hardness as welded: 60 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 130 – 160 | 17 – 20 | 20 max. | 12 – 15 |

SK 650-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 3-GF-60-GT

Characteristics

Martensitic steel alloy designed for welding in horizontal and vertical-up positions under gas shielding. Its resistance to friction and medium stress abrasive wear with moderate impact is excellent.

Microstructure: Martensite

Machinability: Grinding only

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 82 % + CO₂ 18 % or CO₂ 100 %

Field of use

Dies, sliding metal parts, bucket teeth, gear teeth, crusher hammers, impact drills, etc.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | V | Fe |
|------|-----|-----|-----|-----|-----|-----|---------|
| 0,45 | 0,9 | 0,6 | 5,5 | 1,4 | 1,6 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 58 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK A68-G

low alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 2-GF-65-G

Characteristics

Hardfacing alloy giving an excellent resistance to medium stress abrasive wear with moderate impact. A very high hardness is already achieved in the first layer.

Machinability: Grinding only

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends on application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Mixers and scrapers, excavator buckets, press screws parts.

Typical analysis in %

| C | Mn | Si | Ni | B | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,5 | 1,3 | 1,0 | 1,6 | 3,7 | balance |

Typical mechanical properties

Hardness as welded: 62 HRC

Form of delivery and recommended welding parameters

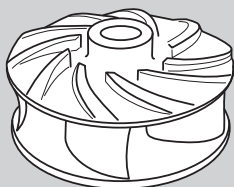
| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 250 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 110 – 300 | 20 – 31 | 20 max. | 15 – 20 |

Gas shielded cored wire for repair, anti-wear and anti-corrosion

3. High alloyed steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr | Ni |
|-----------------|----------|----------------|-----|-----|------|-----|-----|------|-----|
| SK 255-G | 8555 | UP 10-GF-60-G | | 58 | 4,5 | 0,6 | 1,2 | 26,0 | |
| SK 258 NbC-G | 8555 | UP 6-GF-55-G | | 54 | 1,3 | 0,9 | 1,1 | 7,0 | |
| SK A45-G | 8555 | MF 10-GF-65-GT | | 63 | 5,3 | 0,1 | 0,7 | 21,0 | |
| SK A70-O/G | 8555 | MF 10-GF-70-G | | 68 | 2,6 | 1,7 | 0,6 | 14,8 | |
| SK ABRA-MAX-O/G | 8555 | MF 6-GF-70-GT | | 70 | + | + | + | + | |
| SK CuAl10-G | EN 14700 | T Cu1 | 260 | | 0,02 | 0,9 | 0,1 | | 4,2 |
| SK HYDROCAV | 8555 | MF 6-GF-200-K | 220 | | 0,17 | 8,5 | 1,8 | 21,0 | |

Solution examples

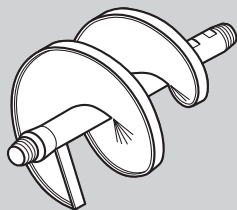


Dredge pump impeller

SK 255-G

applications

| Mo | Nb | W | V | B | Fe | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|------------------------------|-----|-----|------|-----|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | | | | 0,3 | Bal. | | ■ | | | | | | | 214 |
| | 8,5 | 1,4 | | | Bal. | ■ | | | ■ | | | | | 215 |
| 6,3 | 6,0 | 1,8 | 0,75 | | Bal. | | ■ | | | | | | ■ | 216 |
| | 4,7 | | | 2,2 | Bal. | | ■ | | | | | | | 217 |
| + | + | + | + | + | Bal. | | ■ | ■ | | | | | ■ | 218 |
| Other: Al = 10,5 / Cu = Bal. | | | | | 1,5 | | | | | ■ | ■ | | | 219 |
| Other: Co = 12,0 / N = 0,25 | | | | | Bal. | | | ■ | | ■ | ■ | ■ | | 220 |



Auger

SK A70-0/G

SK 255-G

high alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

ASME IIC SFA 5.21

UP 10-GF-60-G

FeCr-A9

Characteristics

Gas shielded cored wire designed to deposit an alloy resistant to high stress grinding abrasion with low impact. The deposits will readily show stress relief cracks.

Microstructure: Primary carbides and eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 10 mm maximum in 2 to 3 layers

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Palm oil expeller screws, groundnut oil expeller screws, cement conveyors screws, catalytic pipes, dredge pump impellers, dredge cutters, shovel bucket teeth.

Typical analysis in %

| C | Mn | Si | Cr | B | Fe |
|-----|-----|-----|------|-----|---------|
| 4,5 | 0,6 | 1,2 | 26,0 | 0,3 | balance |

Typical mechanical properties

Hardness as welded: 58 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK 258 NbC-G

high alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

UP 6-GF-55-G

Characteristics

Gas shielded flux-cored wire designed to deposit a crack-free martensitic alloy.

Microstructure: Martensite, little residual austenite and dispersed NbC carbides

Precautions: Preheating temperature 250 °C
Interpass temperature 300 °C

Stress-relieving: 500 °C for 6 to 8 hours

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Inter-particles crusher rollers.

Typical analysis in %

| C | Mn | Si | Cr | Nb | W | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 1,3 | 0,9 | 1,1 | 7,0 | 8,5 | 1,4 | balance |

Typical mechanical properties

Hardness as welded: 54 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 300 | 20 – 31 | 20 max. | 15 – 18 |

SK A45-G

high alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 10-GF-65-GT

Characteristics

Chromium-Niobium-Molybdenum alloy with addition of Tungsten and Vanadium designed to resist high stress grinding abrasion with low impact and solid erosion at service temperatures up to 650 °C. The deposits will readily show stress relief cracks.

Microstructure: Austenitic matrix with hexagonal primary and eutectic carbides and nodular Nb carbides with complex combined carbides

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 12 mm in 2 or 3 layers

Shielding gas: Argon + 2 % Oxygen

Field of use

Wear plates, sinter finger crushers, exhaust fan blades in pellet plants, perlite crushers, bucket teeth and lips on bucketwheel excavators, boiler fan blades, burden area in blast furnace bells, etc.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Nb | W | V | Fe |
|-----|-----|-----|------|-----|-----|-----|------|---------|
| 5,3 | 0,1 | 0,7 | 21,0 | 6,3 | 6,0 | 1,8 | 0,75 | balance |

Typical mechanical properties

Hardness as welded: 63 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 20 max. |

SK A70-O/G

high alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 10-GF-70-G

Characteristics

Special Chromium-Niobium-Boron alloy designed to give extreme resistance to high stress grinding abrasion without impact. The typical hardness is achieved in the first layer. The deposits will show stress relief cracks.

| | |
|------------------------|---|
| Microstructure: | Borides and Niobium carbides in eutectic matrix |
| Machinability: | Grinding only |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | 6 to 8 mm in 2 layers maximum |
| Shielding gas: | Argon 98 % + Oxygen 2 % (if not used as open-arc) |

Field of use

Extrusion screws, screw conveyors, mixers, scrapers, subsoiler teeth, agriculture and earth moving machinery wear parts, etc.

Typical analysis in %

| C | Mn | Si | Cr | Nb | B | Fe |
|-----|-----|-----|------|-----|-----|---------|
| 2,6 | 1,7 | 0,6 | 14,8 | 4,7 | 2,2 | balance |

Typical mechanical properties

Hardness as welded: 68 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |
| 2,4 | 200 – 300 | 20 – 31 | 20 max. | 18 – 20 |

SK ABRA-MAX O/G

high alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 6-GF-70-GT

Characteristics

Special hardfacing cored wire designed to give an extreme resistance against high stress grinding abrasion and erosion without impact. The typical mechanical properties can be achieved in the first layer. The deposit will readily show stress relief cracks.

| | |
|------------------------|---|
| Microstructure: | Complex carbo-borides and borides homogeneously dispersed in the matrix |
| Machinability: | Grinding only |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | ca. 8 mm in maximum 2 layers |
| Shielding gas: | Argon + 2 % Oxygen (if not used as open arc) |

Field of use

Conveyors screws, crusher plates and rolls, shredder teeth, fan blades, bucket teeth and lips, agricultural machinery, wear plates, etc.

Typical analysis

C + Cr + Mo + Nb + W + V + B (Bal Fe)

Typical mechanical properties

Hardness as welded: 70 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 230 | 26 – 30 | 20 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 20 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 20 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK CuAl10-G

high alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

EN 14700

MSG-31-GF-250-C

T Cu1

Characteristics

Special copper-aluminium especially developed for the building up of aluminium bronze and parts subjected to metal to metal wear under high pressure.

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit Overthickness: Depends upon application and procedure used

Shielding gas: Argon 50 % + Helium 50 %

Liner: A Teflon liner is advised

Field of use

Ship propellers, valves, bearings

Typical analysis in %

| C | Mn | Si | Ni | Al | Fe | Cu |
|------|-----|-----|-----|------|-----|---------|
| 0,02 | 0,9 | 0,1 | 4,2 | 10,5 | 1,5 | balance |

Typical mechanical properties

Hardness as welded: 260 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 200 – 250 | 27 – 29 | 20 max. | 20 – 25 |

SK HYDROCAV

high alloyed steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 6-GF-200-K

Characteristics

The SK Hydrocav is gas shielded metal cored wire suitable for surfacing of parts (especially soft martensitic 13/4 stainless steels) where high resistance to cavitation, corrosion, pressure and impact is required. Work-hardenable alloy.

| | |
|------------------------|----------------------------------|
| Microstructure: | Austenitic type |
| Machinability: | Good |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Shielding gas: | Argon 98 % + CO ₂ 2 % |

Field of use

Turbine blades, pumps.

Typical analysis in %

| C | Mn | Si | Cr | Co | N | Fe |
|------|-----|-----|------|------|------|---------|
| 0,17 | 8,5 | 1,8 | 21,0 | 12,0 | 0,25 | balance |

Typical mechanical properties

Hardness as welded: 220 HB

Hardness after work hard: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 250 | 20 – 31 | 20 max. | 15 – 18 |

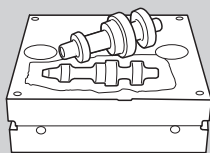


Gas shielded cored wire for repair, anti-wear and anti-corrosion

4. Tool steels

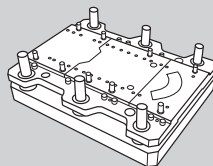
| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|------------------|------|----------------|-----|-----|------|-----|-----|------|
| UTP AF DUR 600 T | 8555 | MSG 6-GT-60-GP | | 59 | 0,45 | 0,4 | 3,0 | 9,0 |
| SK D8-G | 8555 | MF 3-GF-40-T | | 38 | 0,1 | 1,1 | 0,4 | 2,4 |
| SK D8S-G | 8555 | MF 3-GF-45-T | | 38 | 0,1 | 1,1 | 0,5 | 2,4 |
| SK D11-G | 8555 | MF 3-GF-55-T | | 56 | 0,3 | 1,2 | 0,6 | 5,3 |
| SK D12-G | 8555 | MF 3-GF-55-T | | 55 | 0,35 | 1,2 | 0,3 | 7,5 |
| SK D12S-G | 8555 | MF 3-GF-55-T | | 56 | 0,38 | 1,2 | 0,5 | 7,5 |
| SK D15-G | 8555 | MF 3-GF-60-T | | 60 | 0,4 | 0,5 | 0,4 | 1,4 |
| SK D16-G | 8555 | MF 3-GF-50-T | | 51 | 0,28 | 0,5 | 0,4 | 8,5 |
| SK D20-G | 8555 | MF 4-GF-60-S | | 60 | 1,2 | 0,4 | 0,4 | 4,5 |
| SK D33-G | 8555 | MF 6-GF-50-C | | 50 | 0,25 | 1,0 | 0,6 | 11,0 |
| SK D35-G | 8555 | MF 6-GF-50-CT | | 50 | 0,16 | 0,1 | 0,7 | 13,0 |
| SK D37-G | 8555 | MF 3-GF-45-T | | 45 | 0,2 | 0,7 | 0,5 | 10,5 |
| SK D37S-G | 8555 | MF 3-GF-50-T | | 49 | 0,2 | 0,7 | 0,5 | 10,5 |
| SK D40-G | 8555 | MF 3-GF-45-T | | 42 | 0,21 | 0,6 | 0,5 | 5,4 |
| SK D40S-G | 8555 | MF 3-GF-50-T | | 42 | 0,25 | 0,9 | 0,6 | 5,6 |
| SK D52-G | 8555 | MF 3-GF-40-T | | 40 | 0,13 | 1,6 | 0,6 | 2,0 |
| SK D250-G | 8555 | MF 1-GF-350 | 330 | | 0,09 | 0,8 | 0,3 | 2,9 |

Solution examples



Forging die

SK D8-G

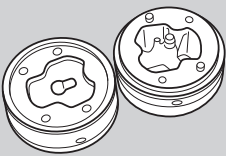


Stamping die

SK D12-G

applications

| Ni | Mo | Ti | W | V | Fe | Co | Low stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|-------------------------------|-----|------|-----|-----|------|------|---------------------|---------|--------|-----------|------------|---------------------|------|------|
| Other: P = <0,025; S = <0,025 | | | | | | | | ■ | ■ | | | | | 224 |
| | | | 3,8 | 0,6 | Bal. | | | | | | | ■ | | 225 |
| | | | 3,5 | 0,6 | Bal. | | | | | | | ■ | | 226 |
| | 1,9 | 0,05 | 1,6 | 0,4 | Bal. | | | | | | | ■ | | 227 |
| | 1,7 | 0,3 | | | Bal. | | | | | | | ■ | | 228 |
| | 1,7 | 0,25 | | | Bal. | | | | | | | ■ | | 229 |
| | 0,5 | | 9,0 | 0,4 | Bal. | 3,0 | ■ | | | | | ■ | ■ | 230 |
| 2,2 | 2,4 | | 0,3 | 0,3 | Bal. | | | | | | | ■ | | 231 |
| | 8,0 | | 1,8 | 1,7 | Bal. | | ■ | | | | | ■ | | 232 |
| 0,3 | 1,1 | | 0,8 | 0,9 | Bal. | 1,7 | | | | ■ | | ■ | | 233 |
| | 2,4 | | | | Bal. | 14,0 | | | | ■ | ■ | ■ | ■ | 234 |
| 3,0 | 2,2 | | | 0,1 | Bal. | | | | | | | ■ | ■ | 235 |
| 3,0 | 2,2 | | | | Bal. | | | | | | | ■ | ■ | 236 |
| | 2,5 | | 2,2 | 0,6 | Bal. | | | | | | | ■ | | 237 |
| | 2,5 | | 2,4 | 0,6 | Bal. | | | | | | | ■ | | 238 |
| 2,7 | 0,9 | | | | Bal. | | | | ■ | | | ■ | | 239 |
| 2,4 | | | | | Bal. | | | | ■ | | | ■ | | 240 |



Hot extrusion die

SK D40-G

UTP AF DUR 600 T

tool steels

Classifications

gas shielded flux cored wire

DIN 8555

EN 14700

MSG 6-GT-60-GP

T Fe 8

Characteristics and field of use

Seamless, Chromium alloyed, metal cored wire for wear resistant surfacing applications with Ar-CO₂ shielding gas. This wire is well indicated for the coating of ceramic tiles. Features include: better arc stability and less noise if compared to similar solid wires, good resistance to abrasion and good weldability on new or restored tiles. Low amount of slag also after several welding beads, the residual slag can be easily removed.

Main applications are coating of new and restored ceramic tiles, parts of earth moving machinery, rollers, mills and supports.

Hardness as welded: 57 – 62 HRC

Flow rate: 14 – 20 l/min

Typical analysis in %

| C | Mn | Si | P | S | Cr |
|------|-----|-----|---------|---------|-----|
| 0,45 | 0,4 | 3,0 | < 0,025 | < 0,025 | 9,0 |

Welding positions



Current type DC (+)
Shielding gas: Argon / CO₂ (EN ISO 14175: M21)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage |
|--------------------|-----------|---------|
| 1,0 | 40 – 270 | 11 – 32 |
| 1,2 | 50 – 320 | 12 – 35 |
| 1,4 | 50 – 380 | 14 – 36 |
| 1,6 | 60 – 420 | 16 – 38 |
| 2,0 | 100 – 450 | 17 – 40 |
| 2,4 | 150 – 500 | 18 – 42 |

SK D8-G

tool steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 3-GF-40-T

Characteristics

Special alloy designed for the repair and the hard surfacing of tools working at low and high temperatures. The resistance to thermal shocks, mechanical stresses and adhesive wear is maintained up to 500 – 550 °C.

| | |
|------------------------|---|
| Microstructure: | Martensite |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Can be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Shielding gas: | Argon 98 % + Oxygen 2 % |

Field of use

Cold shear blades, hot punches, hot extrusion dies, mill guides, moulds, camshafts.

Typical analysis in %

| C | Mn | Si | Cr | W | V | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 0,1 | 1,1 | 0,4 | 2,4 | 3,8 | 0,6 | balance |

Typical mechanical properties

Hardness as welded: 38 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 200 – 300 | 25 – 31 | 20 max. | 12 – 15 |
| 1,6 | 250 – 450 | 25 – 31 | 20 max. | 15 – 18 |

SK D8S-G

tool steels

Classifications

gas shielded flux cored wire

DIN 8555

MF 3-GF-45-T

Characteristics

Special alloy designed for the repair and the hard surfacing of tools working at low and high temperatures. The resistance to thermal shocks, mechanical stresses and adhesive wear is maintained up to 500 – 550 °C.

Microstructure: Martensite

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Cold shear blades, hot punches, hot extrusion dies, mill guides, moulds, camshafts.

Typical analysis in %

| C | Mn | Si | Cr | W | V | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 0,1 | 1,1 | 0,5 | 2,4 | 3,5 | 0,6 | balance |

Typical mechanical properties

Hardness as welded: 38 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 250 – 400 | 25 – 31 | 20 max. | 15 – 18 |
| 2,0 | 275 – 450 | 25 – 31 | 20 max. | 18 – 20 |
| 2,4 | 300 – 500 | 25 – 31 | 20 max. | 20 – 22 |

Classifications

gas shielded metal cored wire

DIN 8555

MF 3-GF-55-T

Characteristics

Special tool steel iron base alloy designed to resist metal-to-metal wear at medium temperature.

Microstructure: Martensite

Machinability: Good with cubic Nitride Boron tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Cutting tools, pushing tools, forming tools, dies, rebuilding of AISI H-12 tool steel.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | V | Ti | Fe |
|-----|-----|-----|-----|-----|-----|-----|------|---------|
| 0,3 | 1,2 | 0,6 | 5,3 | 1,9 | 1,6 | 0,4 | 0,05 | balance |

Typical mechanical properties

Hardness as welded: 56 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 200 – 300 | 25 – 31 | 20 max. | 12 – 15 |

SK D12-G

tool steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 3-GF-55-T

Characteristics

Metal cored wire designed for hardsurfacing of tool steel parts.

Microstructure: Martensite

Machinability: Good with cubic Boron Nitride tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Hot shear blades, hot punches, hot extrusion dies, cutting dies, stamping dies, mill guides, moulds, sheet punching tools, ingot points plier, plastic injection screws, etc.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Ti | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,35 | 1,2 | 0,3 | 7,5 | 1,7 | 0,3 | balance |

Typical mechanical properties

Hardness as welded: 55 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 200 – 300 | 25 – 31 | 20 max. | 12 – 15 |
| 1,6 | 250 – 450 | 25 – 31 | 20 max. | 15 – 18 |

Classifications

gas shielded flux cored wire

DIN 8555

MF 3-GF-55-T

Characteristics

Flux cored wire designed for hardsurfacing of tool steel parts.

Microstructure: Martensite

Machinability: Good with cubic Boron Nitride tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 82 % + CO₂ 18 %**Field of use**

Hot shear blades, hot punches, hot extrusion dies, cutting dies, stamping dies, mill guides, moulds, sheet punching tools, ingot points plier, plastic injection screws.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Ti | Fe |
|------|-----|-----|-----|-----|------|---------|
| 0,38 | 1,2 | 0,5 | 7,5 | 1,7 | 0,25 | balance |

Typical mechanical properties

Hardness as welded: 56 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 2,4 | 275 – 500 | 25 – 31 | 20 max. | 18 – 20 |

SK D15-G

tool steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 3-GF-60-T

Characteristics

Metal cored wire designed to repair and hardface tool steel parts working at high temperature. The high tungsten content allows the hardness to be maintained up to 600 °C.

Microstructure: Martensite

Machinability: Good with cubic Boron Nitride tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Hot forging tools and dies.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Co | W | V | Fe |
|-----|-----|-----|-----|-----|-----|-----|-----|---------|
| 0,4 | 0,5 | 0,4 | 1,4 | 0,5 | 3,0 | 9,0 | 0,4 | balance |

Typical mechanical properties

Hardness as welded: 60 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 200 – 300 | 25 – 31 | 20 max. | 12 – 15 |
| 1,6 | 250 – 450 | 25 – 31 | 20 max. | 15 – 18 |

Classifications

gas shielded metal cored wire

DIN 8555

MF 3-GF-50-T

Characteristics

Special tool steel Iron base alloy designed to resist metal-to-metal wear at medium temperature.

Microstructure: Martensite

Machinability: Good with cubic Nitride Boron tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Cutting tools, punching tools, forming tools, dies.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | W | V | Fe |
|------|-----|-----|-----|-----|-----|-----|-----|---------|
| 0,28 | 0,5 | 0,4 | 8,5 | 2,2 | 2,4 | 0,3 | 0,3 | balance |

Typical mechanical properties

Hardness as welded: 51 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 250 – 450 | 25 – 31 | 20 max. | 15 – 18 |

SK D20-G

tool steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 4-GF-60-S

Characteristics

Special alloy designed to deposit a molybdenum-alloyed high-speed steel. To avoid cracking, a minimum interpass temperature of 300 °C should be applied.

Microstructure: Precipitated fine carbides in a martensitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Cutting edges of carbon steel tools, cold shear blades, lathe tools, guides, milling cutter, punching, drilling and stamping tools.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | V | Fe |
|-----|-----|-----|-----|-----|-----|-----|---------|
| 1,2 | 0,4 | 0,4 | 4,5 | 8,0 | 1,8 | 1,7 | balance |

Typical mechanical properties

Hardness as welded: 60 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 200 – 300 | 26 – 30 | 20 max. | 12 – 15 |
| 1,6 | 250 – 450 | 26 – 30 | 20 max. | 15 – 18 |

Classifications

gas shielded metal cored wire

DIN 8555

MF 6-GF-50-C

Characteristics

Special alloy designed for the repair and the hard surfacing of extrusion tools.

Microstructure: Martensite

Machinability: By grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 %

Field of use

Gum mixer shell.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Co | W | V | Fe |
|------|-----|-----|------|-----|-----|-----|-----|-----|---------|
| 0,25 | 1,0 | 0,6 | 11,0 | 0,3 | 1,1 | 1,7 | 0,8 | 0,9 | balance |

Typical mechanical properties

Hardness as welded: 50 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 250 – 450 | 20 – 31 | 20 max. | 15 – 18 |

SK D35-G

tool steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 6-GF-50-CT

Characteristics

Special Iron-Chromium-Cobalt-Molybdenum alloy designed to resist metal-to-metal wear, fatigue, oxidation, cavitation and corrosion at high temperature. The typical hardness can be achieved in the first layer.

Microstructure: Martensite + 15 % ferrite (in first layer)

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 %

Field of use

Continuous casting driving rollers, dies, mandrels, blanking punches, forming and punching tools, forging dies, swaging dies, pump elements.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Co | Fe |
|------|-----|-----|------|-----|------|---------|
| 0,16 | 0,1 | 0,7 | 13,0 | 2,4 | 14,0 | balance |

Typical mechanical properties

Hardness as welded: 50 HRC

Form of delivery and recommended welding parameters

| <i>D</i> Wire diameter (mm) | <i>A</i> mperage | <i>V</i> oltage | <i>S</i> tick-Out | <i>G</i> as-Rate |
|-----------------------------|------------------|-----------------|-------------------|------------------|
| 1,2 | 200 – 300 | 25 – 31 | 20 max. | 12 – 15 |
| 1,6 | 250 – 450 | 25 – 31 | 20 max. | 15 – 18 |

Classifications

gas shielded metal cored wire

DIN 8555

MF 3-GF-45-T

Characteristics

Special tool steel Iron base alloy designed to refurbish dies in the automobile industry.

Microstructure: Martensite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 82 % + CO₂ 18 %**Field of use**

Punching tools, forming tools, dies.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | V | Fe |
|-----|-----|-----|------|-----|-----|-----|---------|
| 0,2 | 0,7 | 0,5 | 10,5 | 3,0 | 2,2 | 0,1 | balance |

Typical mechanical properties

Hardness as welded: 45 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 200 – 300 | 25 – 31 | 20 max. | 12 – 15 |
| 1,6 | 250 – 450 | 25 – 31 | 20 max. | 15 – 18 |

SK D37S-G

tool steels

Classifications

gas shielded flux cored wire

DIN 8555

MF 3-GF-50-T

Characteristics

Special tool steel Iron base alloy designed to refurbish forging dies in the automotive industry.

Microstructure: Martensite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon + CO₂ 18 %

Field of use

Punching tools, forming tools, dies.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Fe |
|-----|-----|-----|------|-----|-----|---------|
| 0,2 | 0,7 | 0,5 | 10,5 | 3,0 | 2,2 | balance |

Typical mechanical properties

Hardness as welded: 49 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 2,0 | 250 – 400 | 27 – 32 | 20 max. | 15 – 18 |

Classifications

gas shielded metal cored wire

DIN 8555

MF 3-GF-45-T

Characteristics

Special tool steel Iron base alloy designed to refurbish dies in automobile industry.

Microstructure: Martensite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen or Argon 82 % + CO₂ 18 %**Field of use**

Punching tools, forming tools, dies.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | V | Fe |
|------|-----|-----|-----|-----|-----|-----|---------|
| 0,21 | 0,6 | 0,5 | 5,4 | 2,5 | 2,2 | 0,6 | balance |

Typical mechanical properties

Hardness as welded: 42 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 200 – 300 | 25 – 31 | 20 max. | 12 – 15 |

SK D40S-G

tool steels

Classifications

gas shielded flux cored wire

DIN 8555

MF 3-GF-50-T

Characteristics

Special tool steel Iron base alloy designed to refurbish dies in the automobile industry.

Microstructure: Martensite

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 82 %+ CO₂ 18 %

Field of use

Punching tools, forming tools, dies.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | V | Fe |
|------|-----|-----|-----|-----|-----|-----|---------|
| 0,25 | 0,9 | 0,6 | 5,6 | 2,5 | 2,4 | 0,6 | balance |

Typical mechanical properties

Hardness as welded: 42 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 250 – 400 | 25 – 31 | 20 max. | 15 – 18 |
| 2,0 | 275 – 450 | 25 – 31 | 20 max. | 18 – 20 |
| 2,4 | 300 – 500 | 25 – 31 | 20 max. | 20 – 22 |

Classifications

gas shielded metal cored wire

DIN 8555

MF 3-GF-40-T

Characteristics

Special tool steel Iron base alloy designed to overlay and repair forging and hot-working die steels.

Microstructure: Martensite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 82 % + CO₂ 18 %

Field of use

Die shanks, sow blocks, rams and forging hammer bases.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,13 | 1,6 | 0,6 | 2,0 | 2,7 | 0,9 | balance |

Typical mechanical properties

Hardness as welded: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 250 – 400 | 26 – 31 | 20 max. | 18 – 20 |

SK D250-G

tool steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 1-GF-350

Characteristics

Special alloy suitable for repair of tool steel parts working at high temperatures. The deposit is particularly resistant against cracks propagation.

Microstructure: Bainite + Martensite

Machinability: Good

Oxy-acetylene cutting: Possible

Deposit thickness: No restriction

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Large casting parts, forging matrix, etc.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|------|-----|-----|-----|-----|---------|
| 0,09 | 0,8 | 0,3 | 2,9 | 2,4 | balance |

Typical mechanical properties

Hardness as welded: 330 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 200 – 280 | 26 – 31 | 20 max. | 15 – 20 |

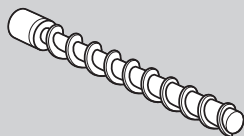


Gas shielded cored wire for repair, anti-wear and anti-corrosion

5. Cobalt steels

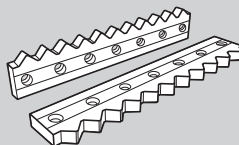
| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|-------------------|------|------------------|-----|-----|------|-----|-----|------|
| SK STELKAY 1-G | 8555 | MF 20-GF-55-CTZ | | 54 | 2,3 | 0,8 | 1,6 | 26,5 |
| SK STELKAY 6-G | 8555 | MF 20-GF-40-CTZ | | 40 | 0,95 | 0,8 | 1,4 | 30,0 |
| SK STELKAY 6 A-G | 8555 | MF 20-GF-45-CTZ | | 43 | 1,35 | 0,8 | 1,5 | 27,0 |
| SK STELKAY 6 L-G | 8555 | MF 20-GF-300-CTZ | | 35 | 0,8 | 0,8 | 1,0 | 28,0 |
| SK STELKAY 6 T-G | 8555 | MF 20-GF-40-CTZ | | 40 | 0,95 | 0,8 | 0,8 | 31,5 |
| SK STELKAY 21-G | 8555 | MF 20-GF-300-CTZ | | 32 | 0,27 | 1,0 | 1,2 | 28,0 |
| SK STELKAY 21 L-G | 8555 | MF 20-GF-300-CTZ | | 28 | 0,18 | 1,0 | 1,2 | 28,0 |
| SK STELKAY 21 T-G | 8555 | MF 20-GF-300-CTZ | | 32 | 0,27 | 1,0 | 1,2 | 28,0 |
| SK STELKAY 25-G | 8555 | MF 20-GF-200-STZ | 195 | | 0,01 | 0,8 | 0,4 | 20,2 |

Solution examples



Extrusion screw

SK STELKAY 1-G

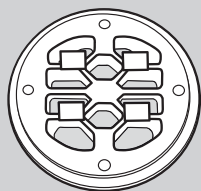


Hot share blade

SK STELKAY 6 A-G

applications

| | Ni | Mo | Ti | W | Fe | Co | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--|------|-----|----|------|-----|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | | | | 11,5 | 3,0 | Bal. | | | | | | | | | 244 |
| | | | | 4,2 | 3,0 | Bal. | | | | | ■ | ■ | ■ | ■ | 245 |
| | | | | 3,5 | 3,0 | Bal. | | | | | ■ | ■ | ■ | ■ | 246 |
| | | | | 4,2 | 3,0 | Bal. | | | | | ■ | ■ | ■ | ■ | 247 |
| | | | | 5,0 | 3,0 | Bal. | | | | | ■ | ■ | ■ | ■ | 248 |
| | 2,4 | 5,0 | | | 3,5 | Bal. | | | | ■ | ■ | ■ | ■ | ■ | 249 |
| | 2,5 | 5,0 | | | 3,5 | Bal. | | | | ■ | ■ | ■ | ■ | ■ | 250 |
| | 2,4 | 5,0 | | | 3,5 | Bal. | | | | ■ | ■ | ■ | ■ | ■ | 251 |
| | 10,0 | | | 13,0 | 3,5 | Bal. | | | | ■ | ■ | ■ | ■ | ■ | 252 |



Extrusion die

SK STELKAY 21-G

SK STELKAY 1-G

cobalt steels

Classifications gas shielded metal cored wire

DIN 8555 ASME IIC SFA 5.21

MF 20-GF-55-CTZ ERC CoCr-C

Characteristics

Cobalt base alloy providing excellent resistance to metal-to-metal wear, oxidation and high stress abrasion wear, in corrosive environments at high temperature. For reduced levels of dilution and an improved weldability, we recommend using a pulsed MIG welding mode.

Microstructure: Cr and W carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 %

Field of use

Mill guides, palm nut oil extruder, plastic extrusion screws, mixer blades, scrapers, rubber mixer.

Typical analysis in %

| C | Mn | Si | Cr | Co | W | Fe |
|-----|-----|-----|------|---------|------|-----|
| 2,3 | 0,8 | 1,6 | 26,5 | balance | 11,5 | 3,0 |

Typical mechanical properties

Hardness as welded: 54 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK STELKAY 6-G

cobalt steels

Classifications

gas shielded metal cored wire

DIN 8555

ASME IIC SFA 5.21

MF 20-GF-40-CTZ

ERC CoCr-A

Characteristics

Cobalt base alloy providing excellent resistance to metal-to-metal wear, oxidation, thermal cycling and impact in corrosive environments at high temperature. For reduced levels of dilution and an improved weldability, we recommend using a pulsed MIG welding mode.

Microstructure: Cr and W carbides in an austenitic matrix

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 %

Welding flux (for dia. 2,4): Record SA

Field of use

Valves, valve seats in motor vehicles, hot shear blades, extruder screws, clack valves and seats, dies, punches.

Typical analysis in %

| C | Mn | Si | Cr | Co | W | Fe |
|------|-----|-----|------|---------|-----|-----|
| 0,95 | 0,8 | 1,4 | 30,0 | balance | 4,2 | 3,0 |

Typical mechanical properties

Hardness as welded: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |
| 2,4 | 300 – 400 | 20 – 31 | 20 max. | 18 – 20 |

SK STELKAY 6 A-G

cobalt steels

Classifications gas shielded metal cored wire

DIN 8555 ASME IIC SFA 5.21

MF 20-GF-45-CTZ ERC CoCr-A

Characteristics

Cobalt base alloy providing excellent resistance to metal-to-metal wear, oxidation, thermal cycling and impact in corrosive environments at high temperature. For reduced levels of dilution and an improved weldability, we recommend using a pulsed MIG welding mode.

Microstructure: Cr and W carbides in an austenitic matrix

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 %

Field of use

Valves, valve seats in motor vehicles, hot shear blades, extruder screws, clack valves and seats, dies, punches.

Typical analysis in %

| C | Mn | Si | Cr | Co | W | Fe |
|------|-----|-----|------|---------|-----|-----|
| 1,35 | 0,8 | 1,5 | 27,0 | balance | 3,5 | 3,0 |

Typical mechanical properties

Hardness as welded: 43 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK STELKAY 6 L-G

cobalt steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 20-GF-300-CTZ

Characteristics

Cobalt base alloy providing excellent resistance to metal-to-metal wear, oxidation, thermal cycling and impact in corrosive environments at high temperature. For reduced levels of dilution and an improved weldability, we recommend using a pulsed MIG welding mode.

| | |
|------------------------|---|
| Microstructure: | Cr and W carbides in an austenitic matrix |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Shielding gas: | Argon 98 % + Oxygen 2 % or Argon 100 % |

Field of use

Valves, valve seats in motor vehicles, hot shear blades, extruder screws, clack valves and seats, dies, punches.

Typical analysis in %

| C | Mn | Si | Cr | Co | W | Fe |
|-----|-----|-----|------|---------|-----|-----|
| 0,8 | 0,8 | 1,0 | 28,0 | balance | 4,2 | 3,0 |

Typical mechanical properties

Hardness as welded: 35 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK STELKAY 6 T-G

cobalt steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 20-GF-40-CTZ

Characteristics

Cobalt base wire designed to be used with the GTAW process (TIG). Alloy providing excellent resistance to metal-to-metal wear, oxidation, thermal cycling and impact in corrosive environments at high temperature.

Microstructure: Cr and W carbides in an austenitic matrix

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 100 %

Field of use

Valves, valve seats in motor vehicles, hot shear blades, extruder screws, clack valves and seats, dies, punches.

Typical analysis in %

| C | Mn | Si | Cr | Co | W | Fe |
|------|-----|-----|------|---------|-----|-----|
| 0,95 | 0,8 | 0,8 | 31,5 | balance | 5,0 | 3,0 |

Typical mechanical properties

Hardness as welded: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK STELKAY 21-G

cobalt steels

Classifications

gas shielded metal cored wire

DIN 8555

ASME IIC SFA 5.21

MF 20-GF-300-CTZ

ERC CoCr-E

Characteristics

Cobalt base alloy providing excellent resistance to metal-to-metal wear, thermal shocks, oxidation in corrosive environments at high temperature. For reduced levels of dilution and an improved weldability, we recommend using a pulsed MIG welding mode.

| | |
|------------------------------|---|
| Microstructure: | Cr and Mo carbides in an austenitic matrix |
| Machinability: | Good |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Shielding gas: | Argon 98 % + Oxygen 2 % or Argon 100 % |
| Welding flux (for dia. 2,4): | Record SA |

Field of use

Extrusion dies, hot working tools, turbine injectors, valve seats, ingot tong bits.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Co | Fe |
|------|-----|-----|------|-----|-----|---------|-----|
| 0,27 | 1,0 | 1,2 | 28,0 | 2,4 | 5,0 | balance | 3,5 |

Typical mechanical properties

Hardness as welded: 32 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |
| 2,4 | 300 – 400 | 20 – 31 | 20 max. | 18 – 20 |

SK STELKAY 21 L-G

cobalt steels

Classifications gas shielded metal cored wire

DIN 8555 ASME IIC SFA 5.21

MF 20-GF-300-CTZ ERC CoCr-E

Characteristics

Cobalt base alloy providing excellent resistance to metal-to-metal wear, thermal shocks, oxidation in corrosive environments at high temperature. For reduced levels of dilution and an improved weldability, we recommend using a pulsed MIG welding mode.

Microstructure: Cr and Mo carbides in an austenitic matrix

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 %

Field of use

Extrusion dies, hot working tools, turbine injectors, valve seats, ingot tong bits.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Co | Fe |
|------|-----|-----|------|-----|-----|---------|-----|
| 0,18 | 1,0 | 1,2 | 28,0 | 2,5 | 5,0 | balance | 3,5 |

Typical mechanical properties

Hardness as welded: 28 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK STELKAY 21 T-G

cobalt steels

Classifications

gas shielded metal cored wire

DIN 8555

ASME IIC SFA 5.21

MF 20-GF-300-CTZ

ERC CoCr-E

Characteristics

Cobalt base wire designed to be used with the GTAW process (TIG). Alloy providing excellent resistance to metal-to-metal wear, thermal shocks, oxidation in corrosive environments at high temperature.

Microstructure: Cr and Mo carbides in an austenitic matrix

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 100 %

Field of use

Extrusion dies, hot working tools, turbine injectors, valve seats, ingot tong bits.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Co | Fe |
|------|-----|-----|------|-----|-----|---------|-----|
| 0,27 | 1,0 | 1,2 | 28,0 | 2,4 | 5,0 | balance | 3,5 |

Typical mechanical properties

Hardness as welded: 32 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK STELKAY 25-G

cobalt steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 20-GF-200-STZ

Characteristics

Cobalt base alloy providing excellent resistance to metal-to-metal wear, thermal shocks, oxidation in corrosive environments at high temperature. For reduced levels of dilution and an improved weldability, we recommend using a pulsed MIG welding mode.

| | |
|------------------------|---|
| Microstructure: | Solution of the austenitic type |
| Machinability: | Good |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Shielding gas: | Argon 98 % + Oxygen 2 % or Argon 100 % |

Field of use

Hot working tools, forging hammers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Co | W | Fe |
|------|-----|-----|------|------|---------|------|-----|
| 0,01 | 0,8 | 0,4 | 20,2 | 10,0 | balance | 13,0 | 3,5 |

Typical mechanical properties

Hardness as welded: 195 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

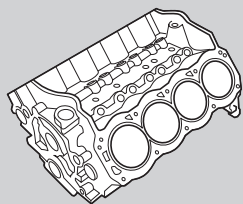


Gas shielded cored wire for repair, anti-wear and anti-corrosion

6. Nickel alloys

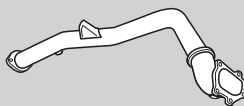
| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|--------------------|------|------------------|-----|-----|------|------|-----|------|
| SK 900 Ni-G | 8555 | MF 22-GF-45-G | | 46 | 1,7 | 0,1 | 0,1 | |
| SK FN-G | 8573 | MF NiFe-1-S | 200 | | 1,1 | 1,8 | 0,4 | |
| SK FNM-G | | | 145 | | 0,2 | 12,0 | 0,4 | |
| SK FNM4-G | 8573 | (ca) MF NiFe-2-S | 140 | | 0,25 | 3,5 | 0,7 | |
| SK FNMS-G | | | 150 | | 0,25 | 10,0 | 0,7 | |
| SK TOOL ALLOY C-G | 8555 | MF 23-GF-200-CKZ | 195 | | 0,05 | 1,0 | 0,2 | 16,0 |
| SK TOOL ALLOY Co-G | 8555 | MF 23-GF-200-CKZ | 220 | | 0,03 | 1,3 | 0,7 | 16,0 |
| SK U 520 Co-G | 8555 | MF 22-GF-200-TZ | 190 | | 0,02 | 0,5 | 0,3 | 19,0 |
| SK U 521-G | 8555 | MF 23-GF-200-TZ | 200 | | 0,01 | | 0,3 | 18,5 |

Solution examples



Engine block

SK FN-G

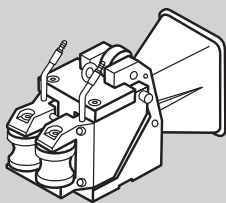


Bellmouth flange

SK FNM-G

applications

| | Ni | Mo | Ti | W | B | Fe | Co | Al | High stress abrasion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--|------|------|-----|------|-----|------|------|-----|----------------------|--------|-----------|------------|---------------------|------|------|
| | Bal. | | | 41,5 | 0,8 | 1,1 | | | ■ | | ■ | | | ■ | 256 |
| | Bal. | | | | | 45,0 | | | | ■ | ■ | | | | 257 |
| | Bal. | | | | | 48,0 | | | | ■ | ■ | | | | 258 |
| | Bal. | | | | | 30,0 | | | | ■ | ■ | | | | 259 |
| | Bal. | | | | | 48,0 | | | | ■ | ■ | | | | 260 |
| | Bal. | 16,0 | | 4,0 | | 7,0 | | | | | ■ | | ■ | ■ | 261 |
| | Bal. | 16,0 | | 4,0 | | 3,0 | 2,5 | | | | ■ | | ■ | ■ | 262 |
| | Bal. | | 2,7 | | | 2,0 | 18,0 | 1,4 | | | ■ | | ■ | ■ | 263 |
| | Bal. | 4,5 | 3,5 | | | 1,8 | 12,5 | 1,0 | | | ■ | | ■ | ■ | 264 |



Rolling entry guide

SK TOOL ALLOY C-G

SK 900 Ni-G

nickel alloys

Classifications

gas shielded metal cored wire

DIN 8555

MF 22-GF-45-G

Characteristics

Hardfacing cored wire containing about 45 % Tungsten carbide particles incorporated in a NiB matrix. This composition gives the best possible combination of toughness and abrasion resistance, also in corrosive conditions.

Microstructure: Tungsten carbides into an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Not possible

Deposit thickness: 6 mm in 2 layers maximum

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Wheel excavator bucket teeth, brick and clay mill augers, wood chipper spout and bed knives in the paper industry and crusher rollers, dredging wear parts, etc.

Typical analysis in %

| C | Mn | Si | Ni | W | B | Fe |
|-----|-----|-----|---------|------|-----|-----|
| 1,7 | 0,1 | 0,1 | balance | 41,5 | 0,8 | 1,1 |

Typical mechanical properties

Hardness as welded: 46 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 170 – 220 | 19 – 23 | 20 max. | 12 – 15 |

Classifications

gas shielded metal cored wire

DIN 8573

MF NiFe-1-S

Characteristics

Ferro-Nickel alloy especially designed for rebuilding and anti-wear protective coating of cast iron parts.

Microstructure: Austenite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 %

Field of use

Repair work on cast iron components.

Typical analysis in %

| C | Mn | Si | Ni | Fe |
|-----|-----|-----|---------|------|
| 1,1 | 1,8 | 0,4 | balance | 45,0 |

Typical mechanical properties

Hardness as welded: 200 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK FNM-G

nickel alloys

Classifications

gas shielded metal cored wire

Characteristics

FeNi alloy with 12 % Manganese designed for joining and surfacing of cast iron pieces. Can also be used for dissimilar welding between cast iron and steel.

Microstructure: Austenitic

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 % or
Argon 82 % + CO₂ 18 %

Field of use

Repair and joining of cast iron parts, joining of steel flanges onto cast iron pipes.

Typical analysis in %

| C | Mn | Si | Ni | Fe |
|-----|------|-----|---------|------|
| 0,2 | 12,0 | 0,4 | balance | 48,0 |

Typical mechanical properties

Hardness as welded: 145 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 12 – 15 |

SK FNM4-G

nickel alloys

Classifications

gas shielded metal cored wire

DIN 8573

(ca) MF NiFe-2-S

Characteristics

FeNi alloy with 4 % Manganese designed for joining and surfacing of cast iron pieces. Can also be used for dissimilar welding between cast iron and steel.

| | |
|------------------------|--|
| Microstructure: | Austenite |
| Machinability: | Good |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Shielding gas: | Argon 98 % + Oxygen 2 % or Argon 100 % or Argon 82 % + CO ₂ 18 % |

Field of use

Repair work on cast iron components.

Typical analysis in %

| C | Mn | Si | Ni | Fe |
|------|-----|-----|---------|------|
| 0,25 | 3,5 | 0,7 | balance | 30,0 |

Typical mechanical properties

Hardness as welded: 140 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |

Classifications

gas shielded flux cored wire

Characteristics

FeNi alloy with 10 % Manganese designed for repairing and surfacing of cast iron pieces.

Microstructure: Austenitic

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon + CO₂ (8 - 18 %)

Field of use

Repair and surfacing of cast iron parts.

Typical analysis in %

| C | Mn | Si | Ni | Fe |
|------|------|-----|---------|------|
| 0,25 | 10,0 | 0,7 | balance | 48,0 |

Typical mechanical properties

Hardness as welded: 150 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 140 – 200 | 23 – 28 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 23 – 28 | 20 max. | 15 – 18 |

SK TOOL ALLOY C-G

nickel alloys

Classifications

gas shielded metal cored wire

DIN 8555

MF 23-GF-200-CKZ

Characteristics

NiCrMo alloy designed for hardsurfacing of parts subject to oxidation, corrosion and mechanical stresses at high temperature (1.100 °C). For reduced levels of dilution and an improved weldability, we recommend using a pulsed MIG welding mode.

Microstructure: Solution of the austenitic type

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 82 % + CO₂ 18 %

Field of use

Hot shear blades, pits points, mill guides, drawing guides, hot extrusion dies, blast furnace bell seats.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | W | Fe |
|------|-----|-----|------|---------|------|-----|-----|
| 0,05 | 1,0 | 0,2 | 16,0 | balance | 16,0 | 4,0 | 7,0 |

Typical mechanical properties

Hardness as welded: 195 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 17 – 32 | 20 max. | 12 – 15 |
| 1,6 | 100 – 250 | 17 – 32 | 20 max. | 15 – 18 |
| 2,4 | 200 – 450 | 20 – 31 | 20 max. | 18 – 20 |

SK TOOL ALLOY Co-G

nickel alloys

Classifications

gas shielded metal cored wire

DIN 8555

MF 23-GF-200-CKZ

Characteristics

NiCrMo alloy with addition of Cobalt designed for hardsurfacing of parts subject to oxidation, corrosion and mechanical stresses at high temperature (1.100 °C). For reduced levels of dilution and an improved weldability, we recommend using a pulsed MIG welding mode.

| | |
|------------------------|--|
| Microstructure: | Solution of the austenitic type |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Shielding gas: | Argon 98 % + Oxygen 2 % or Argon 82 % + CO ₂ 18 % |

Field of use

Punches for extrusion of steel pipes, hot working tools.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Co | W | Fe |
|------|-----|-----|------|---------|------|-----|-----|-----|
| 0,03 | 1,3 | 0,7 | 16,0 | balance | 16,0 | 2,5 | 4,0 | 3,0 |

Typical mechanical properties

Hardness as welded: 220 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |
| 2,4 | 200 – 450 | 20 – 31 | 20 max. | 18 – 20 |

SK U 520 Co-G

nickel alloys

Classifications

gas shielded metal cored wire

DIN 8555

MF 22-GF-200-TZ

Characteristics

Nickel-base super-alloy with high percentage of Cobalt providing the most powerful strengthening effect at high temperature due to the precipitation of Ni₃ (AlTi) phase.

Microstructure: Solid solution matrix containing carbides and Intermetallic precipitated Ni₃ (AlTi)

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 %

Field of use

Rebuilding of GFM forging hammers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Co | Ti | Al | Fe |
|------|-----|-----|------|---------|------|-----|-----|-----|
| 0,02 | 0,5 | 0,3 | 19,0 | balance | 18,0 | 2,7 | 1,4 | 2,0 |

Typical mechanical properties

Hardness as welded: 190 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |
| 2,4 | 300 – 400 | 20 – 31 | 20 max. | 15 – 20 |

SK U 521-G

nickel alloys

Classifications

gas shielded metal cored wire

DIN 8555

MF 23-GF-200-TZ

Characteristics

Nickel-base super-alloy with addition of Cobalt providing the most powerful strengthening effect at high temperature due to the precipitation of Ni₃ (AlTi) phase. Enhanced weldability.

Microstructure: Solid solution with intermetallic precipitates Ni₃ (AlTi)

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Liner: A Teflon liner is advised

Field of use

Rebuilding of forging hammers.

Typical analysis in %

| C | Si | Cr | Ni | Mo | Co | Ti | Al | Fe |
|------|-----|------|---------|-----|------|-----|-----|-----|
| 0,01 | 0,3 | 18,5 | balance | 4,5 | 12,5 | 3,5 | 1,0 | 1,8 |

Typical mechanical properties

Hardness as welded: 200 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 150 – 250 | 27 – 30 | 20 max. | 15 – 20 |
| 1,6 | 200 – 300 | 27 – 30 | 20 max. | 15 – 20 |

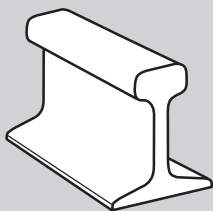


Gas shielded cored wire for repair, anti-wear and anti-corrosion

7. Stainless steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|--------------------|----------|----------------------|-----|-----|------|-----|-----|------|
| SK 307-G | 8555 | MF 8-GF-150-KP | 155 | | 0,1 | 7,1 | 0,8 | 17,9 |
| SK 356-G | 8555 | MF 4-GF-50-ST | | 47 | 0,7 | 1,2 | 0,9 | 12,0 |
| SK 402-G | 8555 | MF 8-GF-150-KP | 170 | | 0,1 | 6,6 | 0,6 | 17,1 |
| SK 410 C-G | 8555 | MF 5-GF-40-C | | 40 | 0,08 | 0,7 | 0,4 | 13,0 |
| SK 420 Mo-G | 8555 | MF 6-GF-55-C | | 54 | 0,24 | 1,0 | 0,4 | 12,0 |
| SK 430-G | 8555 | MF 5-GF-200-C | 190 | | 0,06 | 0,8 | 0,6 | 17,8 |
| SK 430 Mo-G | | | 260 | | 0,25 | 1,0 | 0,6 | 19,0 |
| SK 519-G | EN 12073 | T 20 25 5 Cu L M M 1 | | | 0,02 | 2,8 | 0,5 | 20,5 |
| SK 741-G | 8555 | MF 5-GF-40-C | | 41 | 0,06 | 0,5 | 0,6 | 13,0 |
| SK 768-G | 8555 | MF 5-GF-350-C | | 34 | 0,02 | 0,3 | 0,3 | 14,5 |
| SK ANTINIT DUR 290 | 8555 | MF 9-GF-250-CT | 250 | | 0,06 | 1,9 | 5,6 | 17,0 |
| SK ANTINIT DUR 500 | 8555 | MF 9-GF-45-CT | | 43 | 0,07 | 4,3 | 4,5 | 17,5 |

Solution examples

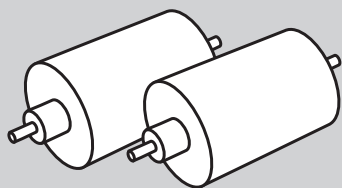


Rail

SK 307-G

applications

| | Ni | Mo | Nb | Ti | W | V | Fe | Cu | Low stress abrasion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--|------|-----|-----------------|-----|-----|-----|------|-----|---------------------|--------|-----------|------------|---------------------|------|------|
| | 8,5 | | | | | | Bal. | 0,2 | | | ■ | | ■ | | 268 |
| | 0,7 | 3,8 | | | 0,9 | 2,0 | Bal. | | ■ | ■ | | | ■ | | 269 |
| | 7,8 | | | | | | Bal. | | | ■ | | | | | 270 |
| | | | | | | | Bal. | | | | ■ | | ■ | | 271 |
| | | 0,7 | | | | | Bal. | | | | ■ | | ■ | | 272 |
| | | | | 0,2 | | | Bal. | | | | ■ | | | | 273 |
| | | 0,9 | | | | | Bal. | | | | ■ | | | | 274 |
| | 24,2 | 5,0 | Other: N = 0,12 | | | | Bal. | 1,1 | | ■ | ■ | | | | 275 |
| | 5,5 | 0,8 | | | | | Bal. | | | | ■ | | ■ | | 276 |
| | 6,3 | 2,5 | | | | | Bal. | | | | ■ | | ■ | | 277 |
| | 8,3 | | | | | | Bal. | | | | ■ | ■ | ■ | ■ | 278 |
| | 8,0 | 5,4 | 1,0 | | | | Bal. | | | | ■ | ■ | ■ | ■ | 279 |



Small-diameter continuous casting roller

SK 741-G – SK 768-G

SK 307-G

stainless steels

Classifications

gas shielded flux cored wire

DIN 8555

MF 8-GF-150-KP

Characteristics

Flux-cored wire for gas shielded arc welding giving a 18 % Cr – 8 % Ni – 7 % Mn deposit. Good weldability with either CO₂ or mixed gas. Weld metal has excellent crack resistance even in restrained conditions.

Microstructure: Austenite + 2% Ferrite

Machinability: Good with metallic carbides tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: As required

Shielding gas: Argon 82 % + CO₂ 18 % (M21) or 100 % CO₂

Field of use

Joining of wear plates on shovel buckets, railways and tramway lines, press rams, joining of stainless steels with carbon manganese steels, building up and buttering before hardfacing, welding of 14 % Mn steels, armour and hard to weld steels.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe | Cu |
|-----|-----|-----|------|-----|---------|-----|
| 0,1 | 7,1 | 0,8 | 17,9 | 8,5 | balance | 0,2 |

Typical mechanical properties

Hardness as welded: 155 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 100 – 250 | 18 – 30 | 20 max. | 12 – 15 |
| 1,6 | 180 – 300 | 23 – 30 | 20 max. | 15 – 18 |

Classifications

gas shielded metal cored wire

DIN 8555

MF 4-GF-50-ST

Characteristics

Special iron base alloy designed to rebuild parts in the rubber industry.

Microstructure: Martensite

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Rubber mixers and blenders.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | W | V | Fe |
|-----|-----|-----|------|-----|-----|-----|-----|---------|
| 0,7 | 1,2 | 0,9 | 12,0 | 0,7 | 3,8 | 0,9 | 2,0 | balance |

Typical mechanical properties

Hardness as welded: 47 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 2,0 | 250 – 350 | 20 – 31 | 20 max. | 15 – 18 |

SK 402-G

stainless steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 8-GF-150-KP

Characteristics

Austenitic alloy type 18Cr8Ni7Mn recommended for build up and buffer layer prior to hardfacing. It can also be used for joining of dissimilar metals.

| | |
|------------------------|--------------------------------|
| Microstructure: | Austenite |
| Machinability: | Good with carbide tipped tools |
| Oxy-acetylene cutting: | Not possible |
| Deposit thickness: | As required |
| Shielding gas: | Argon 98 % + Oxygen 2 % |

Field of use

Joining of wear plates on shovel buckets, railways and tramway lines, press rams, joining stainless steels to carbon manganese steels, building up and buttering before hardfacing, welding of 14% Mn steels, armour and hard to weld steels.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|-----|-----|-----|------|-----|---------|
| 0,1 | 6,6 | 0,6 | 17,1 | 7,8 | balance |

Typical mechanical properties

Hardness as welded: 170 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

Classifications

gas shielded metal cored wire

DIN 8555

MF 5-GF-40-C

Characteristics

Alloy depositing a martensitic steel containing 13 % Chromium giving a very good resistance to friction wear and corrosion.

| | |
|------------------------|---|
| Machinability: | Good with carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Shielding gas: | Argon 98 % + Oxygen 2 % or Argon 100 % |

Field of use

Continuous casting rollers, valve seats, impellers, steam turbine parts, tap-factory.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|-----|-----|------|---------|
| 0,08 | 0,7 | 0,4 | 13,0 | balance |

Typical mechanical properties

Hardness as welded: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |
| 2,4 | 250 – 350 | 20 – 31 | 20 max. | 18 – 20 |

SK 420 Mo-G

stainless steels

Classifications

gas shielded metal cored wire

DIN 8555

MF6-GF-55-C

Characteristics

Alloy depositing a martensitic steel containing 12 % chromium with molybdenum giving a good resistance to metal-to-metal wear and corrosion

Microstructure: Martensite

Machinability: Fair with carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Dredging pump casings, continuous casting rolls...

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|------|-----|-----|------|-----|---------|
| 0,24 | 1,0 | 0,4 | 12,0 | 0,7 | balance |

Typical mechanical properties

Hardness as welded: 54 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 150 – 250 | 20 – 31 | 20 max. | 12 – 15 |

SK 430-G

stainless steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 5-GF-200-C

Characteristics

Alloy depositing a ferritic steel containing 17 % Chromium designed to resist corrosion at high temperatures, particularly in presence of sulphurous gas.

Microstructure: Ferrite and few martensite

Machinability: Verry good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Continuous casting rollers situated at the top of the line, valves, steam and gas turbine parts, valve seats.

Typical analysis in %

| C | Mn | Si | Cr | Ti | Fe |
|------|-----|-----|------|-----|---------|
| 0,06 | 0,8 | 0,6 | 17,8 | 0,2 | balance |

Typical mechanical properties

Hardness as welded: 190 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 12 – 15 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

SK 430 Mo-G

stainless steels

Classifications

gas shielded metal cored wire

Characteristics

Alloy depositing a ferritic steel containing 17 % Chromium enhanced with Molybdenum addition designed to resist corrosion at high temperatures, particularly in presence of sulphurous gas.

| | |
|------------------------|---|
| Microstructure: | Ferrite and few martensite |
| Machinability: | Good |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Shielding gas: | If required Argon 98 % + Oxygen 2 % |

Field of use

Continuous casting rollers, valves, steam and gas turbine parts, valve seats.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|------|-----|-----|------|-----|---------|
| 0,25 | 1,0 | 0,6 | 19,0 | 0,9 | balance |

Typical mechanical properties

Hardness as welded: 260 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 15 – 18 |

Classifications

gas shielded metal cored wire

| | | | |
|----------|----------|----------|------------------|
| DIN 8555 | EN 12073 | DIN 8556 | ASME IIC SFA 5.9 |
|----------|----------|----------|------------------|

| | | | |
|-----------|----------------------|-----------------------|--------|
| MF 8-GF-C | T 20 25 5 Cu L M M 1 | MSG X2-CrNiMoCu 20-25 | EC 385 |
|-----------|----------------------|-----------------------|--------|

Characteristics

Stainless steel metal cored-wire for all positional gas shielded welding. Excellent edge blends, arc stability, penetration, weld bead aspect and minimum spatter. Improved welding speed and quality regarding solid wires of the same composition.

Microstructure: Austenite + few Ferrite

Shielding gas: Argon 98 % + CO₂ 2 % or Argon 100 %

Field of use

For welding and cladding stainless steels of similar composition where corrosion resistance to hot sulphuric and cold hydrochloric acid is required.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | N | Fe | Cu |
|------|-----|-----|------|------|-----|------|---------|-----|
| 0,02 | 2,8 | 0,5 | 20,5 | 24,2 | 5,0 | 0,12 | balance | 1,1 |

Typical mechanical properties

Hardness as welded: NA

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 100 – 200 | 19 – 28 | 20 max. | 15 – 20 |

SK 741-G

stainless steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 5-GF-40-C

Characteristics

Alloy depositing a ferritic-martensitic steel containing 13 % Chromium, 5 % Nickel and 1 % Molybdenum designed to resist metal-to-metal wear, corrosion and thermal fatigue fire cracking.

Microstructure: Martensite + 10 % Ferrite

Machinability: Good with carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Surfacing of continuous casting rollers of very small diameters (< 150 mm).

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Fe |
|------|-----|-----|------|-----|-----|---------|
| 0,06 | 0,5 | 0,6 | 13,0 | 5,5 | 0,8 | balance |

Typical mechanical properties

Hardness as welded: 41 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 110 – 180 | 20 – 31 | 20 max. | 10 – 18 |
| 1,6 | 150 – 250 | 20 – 31 | 20 max. | 10 – 18 |
| 2,4 | 250 – 350 | 20 – 31 | 20 max. | 10 – 18 |

Classifications

gas shielded metal cored wire

DIN 8555

MF 5-GF-350-C

Characteristics

Alloy depositing a ferritic-martensitic steel containing 13 % Chromium, 5 % Nickel and 2 % Molybdenum designed to resist metal-to-metal wear, corrosion and thermal fatigue fire cracking.

| | |
|------------------------|---|
| Microstructure: | Martensite + Ferrite + residual austenite |
| Machinability: | Good with carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Shielding gas: | Argon 98 % + Oxygen 2 % |

Field of use

Surfacing of continuous casting rollers of very small diameters (< 150 mm).

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Fe |
|------|-----|-----|------|-----|-----|---------|
| 0,02 | 0,3 | 0,3 | 14,5 | 6,3 | 2,5 | balance |

Typical mechanical properties

Hardness as welded: 34 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,2 | 200 – 250 | 24 – 28 | 20 max. | 15 – 18 |

SK ANTINIT DUR 290

stainless steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 9-GF-250-CT

Characteristics

Alloy providing a strengthening effect at high temperature due to the precipitation of inter-metallic components. Special hardfacing iron base alloy designed to resist general corrosion, frictional wear, cavitation, high surface pressures and suitable for applications where a low friction coefficient is profitable.

Microstructure: Austenite + Ferrite + some chromium carbides at the grain boundaries

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: As required

Shielding gas: Argon 98 % + Oxygen 2 %

Field of use

Hardfacing of the sealing faces of valves and fittings, casings, chutes, slideways, mixer parts, mixer blades.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|------|-----|-----|------|-----|---------|
| 0,06 | 1,9 | 5,6 | 17,0 | 8,3 | balance |

Typical mechanical properties

Hardness as welded: 250 HB

After PWHT (2 h) at 650 °C: 33 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 200 – 300 | 21 – 30 | 15 – 20 | 15 – 18 |
| 2,8 | 300 – 350 | 21 – 30 | 15 – 20 | 20 – 22 |

SK ANTINIT DUR 500

stainless steels

Classifications

gas shielded metal cored wire

DIN 8555

MF 9-GF-45-CT

Characteristics

For Hardfacing of or austenitic steels exposed to general corrosion, frictional wear, cavitation, or to high surface pressure. For use at temperatures up to 550 °C. Offers additionally enhanced resistance to pitting and intergranular corrosion. Preheating to 450 - 500 °C.

Microstructure: Austenite + Ferrite + some chromium carbides at the grain boundaries

Machinability: Difficult

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: As required if interpass temperature (min. 400 °C) is correctly applied

Shielding gas: Argon 98 % + Oxygen 2 % or Argon 100 %

Field of use

Hardsurfacing of the sealing faces of valves and fittings, casings, chutes, slideways, mixer parts, mixer blades and other parts where a low friction coefficient is called for.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Nb |
|------|-----|-----|------|-----|-----|-----|
| 0,07 | 4,3 | 4,5 | 17,5 | 8,0 | 5,4 | 1,0 |

Typical mechanical properties

Hardness as welded: 43 HRC

After PWHT (2 – 6 h) at 550 °C: 53 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Gas-Rate |
|--------------------|-----------|---------|-----------|----------|
| 1,6 | 200 – 300 | 20 – 21 | 20 max. | 15 – 18 |
| 2,4 | 250 – 350 | 20 – 31 | 20 max. | 15 – 18 |

List of contents

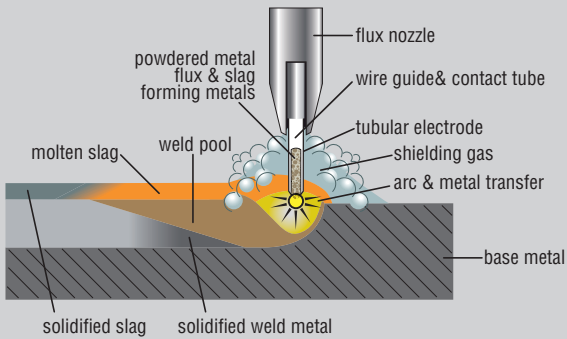
FCAW-O – open arc cored wires

Description of the FCAW-O process **281**

Open arc cored wires for repair, anti-wear and anti-corrosion applications

- | | |
|---|-----|
| 1. Manganese steels | 282 |
| 2. Unalloyed, fine grained and low alloyed steels | 290 |
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Description of the FCAW-O process



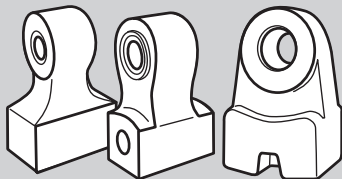
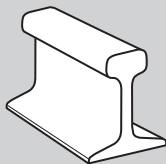
Easy to operate, this welding process guarantees high deposition rates and a good recovery of elements across the arc. Open Arc welding allows the user to get a wide range of alloys and to customize these easily.

Open arc cored wires for repair, anti-wear and anti-corrosion

1. Manganese steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|--------------|------|--------------------|-----|-----|------|------|-----|------|
| SK 14 Mn-O | 8555 | MF 7-GF-200/450-KP | 195 | | 0,90 | 14,0 | 0,5 | 0,5 |
| SK 218-O | 8555 | MF 7-GF-200-KP | 200 | | 0,90 | 14,0 | 0,5 | 3,5 |
| SK 313-O | 8555 | MF 7-GF-200-KP | 200 | | 1,12 | 14,1 | 0,2 | 3,3 |
| SK 624-O | 8555 | MF 7-GF-250-GKP | 240 | | 1,00 | 17,2 | 0,3 | 8,2 |
| SK AP-O | 8555 | MF 7-GF-200-KP | 205 | | 0,37 | 16,0 | 0,3 | 12,8 |
| SK AP-OSP | 8555 | MF 7-GF-200-KP | 205 | | 0,39 | 16,3 | 0,4 | 12,9 |

Solution examples



Rail

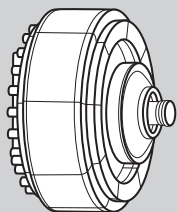
Crushing hammer

SK 218-O

SK 624-O

applications

| | Ni | Mo | Nb | Ti | W | Fe | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--|-----|----|-----|------|---|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | 0,5 | | | | | Bal. | | | | ■ | | | | | 284 |
| | 0,4 | | | | | Bal. | | | | ■ | | | | | 285 |
| | 3,5 | | | | | Bal. | | | | ■ | | | | | 286 |
| | | | 2,5 | 0,12 | | Bal. | ■ | | | ■ | | | | | 287 |
| | | | | | | Bal. | | | | ■ | ■ | | | | 288 |
| | | | | | | Bal. | | | | ■ | ■ | | | | 289 |



Grinding roller

SK AP-0

Classifications

open arc flux cored wire

DIN 8555

MF 7-GF-200/450-KP

Characteristics

Self shielded flux cored wire depositing an austenitic alloy designed for rebuilding 14 % Manganese steel parts.

| | |
|------------------------|--------------------------------|
| Microstructure: | Austenite |
| Machinability: | Good with carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | As required |

Field of use

Railway rails and crossovers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|-----|------|-----|-----|-----|---------|
| 0,9 | 14,0 | 0,5 | 0,5 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 195 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

ASME IIC SFA 5.21

MF 7-GF-200-KP

ERC FeMn-G

Characteristics

Self shielded flux cored wire depositing an austenitic alloy designed for rebuilding of 14 % Manganese steel parts.

Microstructure: Austenite

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: As required

Field of use

Crusher cylinders, crusher hammers, impactor bars.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|-----|------|-----|-----|-----|---------|
| 0,9 | 14,0 | 0,5 | 3,5 | 0,4 | balance |

Typical mechanical properties

Hardness as welded: 200 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 180 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 7-GF-200-KP

Characteristics

Self shielded flux cored wire depositing an austenitic alloy designed for rebuilding of 14% Manganese steel parts.

Microstructure: Austenite

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut.

Deposit thickness: As required

Field of use

Crusher cylinders, crusher hammers, impactor bars.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|------|------|-----|-----|-----|---------|
| 1,12 | 14,1 | 0,2 | 3,3 | 3,5 | balance |

Typical mechanical properties

Hardness as welded: 200 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 7-GF-250-GKP

Characteristics

High Chromium – Manganese alloy enriched with Niobium, designed to resist abrasion and solid erosion wear combined with heavy impact. High Manganese alloy resulting in a workhardenable deposit.

| | |
|--------------------------|---|
| Microstructure: | Dispersed Niobium and Chromium carbides in an austenitic matrix |
| Machinability: | Good with metallic carbides or cubic Boron Nitride tipped tools |
| Oxy – acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |

Field of use

Crusher hammers, gyratory crusher mantles, crusher cylinders, automobile shredder hammers.

Typical analysis in %

| C | Mn | Si | Cr | Nb | Ti | Fe |
|-----|------|-----|-----|-----|------|---------|
| 1,0 | 17,2 | 0,3 | 8,2 | 2,5 | 0,12 | balance |

Typical mechanical properties

Hardness as welded: 240 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

ASME IIC SFA 5.21

MF 7-GF-200-KP

FeMn-Cr

Characteristics

Multi-purpose cored wire, mainly used for rebuilding and joining of Carbon and 14 % Manganese steels. Can also be used as buffer layer prior to hard overlay. Work-hardenable alloy.

Microstructure: Austenite

Machinability: Good with metallic carbides tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: As required

Field of use

Railway rails and crossovers, mill shaft drive ends, gyratory crusher mantles, repointing of shovel teeth, buffer layer for inter-particles crushers.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|------|-----|------|---------|
| 0,37 | 16,0 | 0,3 | 12,8 | balance |

Typical mechanical properties

Hardness as welded: 205 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 150 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

ASME IIC SFA 5.21

MF 7-GF-200-KP

FeMn-Cr

Characteristics

Multi-purpose cored wire, mainly used for rebuilding and joining of Carbon and 14% Manganese steels. Can also be used as buffer layer prior to hard overlay. Work-hardenable alloy. Enhanced feedability and weldability.

Microstructure: Austenite

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut.

Deposit thickness: As required

Field of use

Railway rails and crossovers, mill shaft drive ends, gyratory crusher mantles, repointing of shovel teeth, buffer layer for inter-particles crushers.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|------|-----|------|---------|
| 0,39 | 16,3 | 0,4 | 12,9 | balance |

Typical mechanical properties

Hardness as welded: 205 HB

Form of delivery and recommended welding parameters

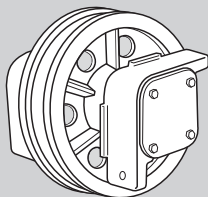
| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |

Open arc cored wires for repair, anti-wear and anti-corrosion

2. Unalloyed, fine grained and low alloyed steels

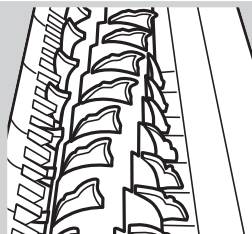
| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|-------------------|------|----------------|-----|-----|------|-----|-----|-----|
| SK 232-0 | 8555 | MF 1-GF-150-P | 170 | | 0,04 | 0,7 | 0,4 | |
| SK 242-0 | 8555 | MF 1-GF-40-P | | 40 | 0,11 | 0,6 | 0,6 | 2,4 |
| SK 252-0 | 8555 | MF 1-GF-45-G | | 44 | 0,17 | 1,4 | 0,7 | 2,8 |
| SK 258-0 | 8555 | MF 6-GF-55-GT | | 55 | 0,47 | 1,5 | 0,8 | 5,7 |
| SK 258L-0 | 8555 | MF 6-GF-45-GT | | 46 | 0,25 | 1,4 | 0,7 | 5,3 |
| SK 258 TIC-0 | 8555 | MF 6-GF-60-GP | | 58 | 1,8 | 0,9 | 0,2 | 6,1 |
| Sk 300-0 | 8555 | MF 1-GF-300-P | 285 | | 0,1 | 1,1 | 0,7 | 0,5 |
| SK 400-0 | 8555 | MF 1-GF-40-P | | 40 | 0,13 | 0,7 | 0,6 | 2,4 |
| SK 795-0 | 8555 | MF 6-GF-40-G | | 40 | 1,9 | 1,5 | 1,8 | 9 |
| SK A12-0 | 8555 | MF 6-GF-55-G | | 55 | 0,35 | 0,8 | 3 | 9,6 |
| SK BU-C1 | 8555 | MF 1-GF-250-P | 250 | | 0,04 | 0,8 | 0,1 | |
| SK BU-0 | 8555 | MF 1-GF-300-P | 280 | | 0,1 | 0,9 | 0,6 | 0,5 |
| SK CrMo21Ni-0 | 8555 | MF 1-GF-350-GP | | 40 | 0,08 | 0,9 | 0,7 | 2,3 |
| SK SOUDOCORE-S8-0 | | | 190 | | 0,28 | 0,4 | 0,1 | |

Solution examples



Crane wheel

SK 252-0

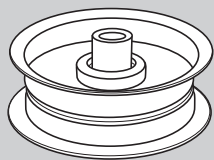


Crusher bucket

SK 258 TIC-0

applications

| Ni | Mo | Nb | Ti | W | Fe | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|-------------------|-----|----|-----|-----|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | | | 2,8 | | Bal. | | | | | | | | | 292 |
| | | | 0,9 | | Bal. | | | | ■ | | | ■ | | 293 |
| | | | | | Bal. | ■ | | | ■ | | | | | 294 |
| | 1,4 | | | 1,5 | Bal. | ■ | | | ■ | | | | | 295 |
| | 1,3 | | | 1,2 | Bal. | ■ | | | ■ | | | ■ | ■ | 296 |
| | 1,4 | | 5,5 | | Bal. | | ■ | | ■ | | | | | 297 |
| | 0,3 | | | | Bal. | | | | ■ | | | | | 298 |
| | | | | | Bal. | | | | ■ | | | ■ | | 299 |
| | 1,4 | | | | Bal. | ■ | | | | | | ■ | | 300 |
| | | | 0,5 | | Bal. | ■ | | | ■ | | | | | 301 |
| | | | | | Bal. | | | | ■ | | | | | 302 |
| | 0,3 | | | | Bal. | | | | ■ | | | | | 303 |
| 2 | 1 | | | | Bal. | | | | ■ | | | | | 304 |
| Others: Al = 1,50 | | | | | Bal. | | | | ■ | | | | | 305 |



Tractor idler

SK 400-0

SK 232-0

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

DIN 8555

MF 1-GF-150-P

Characteristics

Rebuilding alloy for Carbon steel parts.

Microstructure: Bainite

Machinability: Good

Oxy-acetylene cutting: Possible

Deposit thickness: No restriction

Field of use

Gears, axles, wheels...

Typical analysis in %

| C | Mn | Si | Ti | Fe |
|------|-----|-----|-----|---------|
| 0,04 | 0,7 | 0,4 | 2,8 | balance |

Typical mechanical properties

Hardness as welded: 170 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 1-GF-40-P

Characteristics

Open-arc wire designed for rebuilding and hard surfacing of Carbon steel parts subjected to adhesive wear with impacts.

Microstructure: Bainite + Martensite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Field of use

Crawler tractor rollers and idlers, shafts, cylinders, mine car wheels, crane wheels.

Typical analysis in %

| C | Mn | Si | Cr | Ti | Fe |
|------|-----|-----|-----|-----|---------|
| 0,11 | 0,6 | 0,6 | 2,4 | 0,9 | balance |

Typical mechanical properties

Hardness as welded: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 150 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK 252-0

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

DIN 8555

MF 1-GF-45-G

Characteristics

Open-arc wire designed to deposit an alloy resistant to adhesive wear with impacts.

Microstructure: Martensite

Machinability: Good with metallic carbides or Boron Nitride tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Field of use

Crawler tractor rollers and idlers, crane wheels, shovel bucket rollers, shafts.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|-----|-----|-----|---------|
| 0,17 | 1,4 | 0,7 | 2,8 | balance |

Typical mechanical properties

Hardness as welded: 44 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 6-GF-55-GT

Characteristics

Martensitic alloy designed to give an outstanding resistance to low stress abrasion with heavy impact and high compressive stresses. The deposit is heat treatable and forgeable.

Microstructure: Martensite

Machinability: Grinding only

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Field of use

Cable sheaves, bed knives, steel mill rollers, crane wheels, forging dies.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,47 | 1,5 | 0,8 | 5,7 | 1,4 | 1,5 | balance |

Typical mechanical properties

Hardness as welded: 55 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 125 – 180 | 26 – 30 | 35 – 40 |
| 1,6 | 200 – 300 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 300 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK 258L-0

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

DIN 8555

MF 6-GF-45-GT

Characteristics

Martensitic alloy giving a very good resistance to metal-to-metal and low stress abrasive wear at high temperature. The deposit is crack-free, heat treatable and forgeable.

Microstructure: Martensite

Machinability: Good with Tungsten carbides or cubic Boron Nitride tipped tools

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Field of use

Steel mill rollers, blast furnace bells (seat area), dredger-buckets cylinders.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,25 | 1,4 | 0,7 | 5,3 | 1,3 | 1,2 | balance |

Typical mechanical properties

Hardness as welded: 46 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK 258 TIC-0

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

DIN 8555

MF 6-GF-60-GP

Characteristics

Martensitic Chromium-Titanium alloy designed to resist high stress abrasion with heavy impact. Deposits usually do not relieve cracks.

Microstructure: Finely dispersed Titanium carbides in a hard Chromium martensitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 15 to 18 mm in 5 to 6 layers

Field of use

Crusher rollers, crusher hammers, asphalt mixer blades, agricultural tools, shovel bucket teeth and lips, bulldozer blades, cane knives and shredders, bed knives in the wood pulp industry.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Ti | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 1,8 | 0,9 | 0,2 | 6,1 | 1,4 | 5,5 | balance |

Typical mechanical properties

Hardness as welded: 58 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 150 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 280 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK 300-O

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

DIN 8555

MF 1-GF-300-P

Characteristics

Self shielded flux-cored wire to be used for rebuilding of Carbon steel parts.

Microstructure: Bainite

Machinability: Good

Oxy-acetylene cutting: Possible

Deposit thickness: Depends upon application and procedure used

Field of use

Crawler tractor links, crane wheels, shafts, buffer layer for continuous casting rollers, mine car wheels.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,1 | 1,1 | 0,7 | 0,5 | 0,3 | balance |

Typical mechanical properties

Hardness as welded: 285 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |

SK 400-0

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

DIN 8555

MF 1-GF-40-P

Characteristics

Open-arc wire designed for rebuilding and hardfacing of Carbon steel parts subjected to adhesive wear with impacts.

Microstructure: Bainite + Martensite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Field of use

Crawler tractor rollers and idlers, shafts, cylinders, mine car wheels, crane wheels.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|-----|-----|-----|---------|
| 0,13 | 0,7 | 0,6 | 2,4 | balance |

Typical mechanical properties

Hardness as welded: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 6-GF-40-G

Characteristics

Medium carbide alloy designed primarily for heavy build – up using automatic processes. The deposits will readily stress relief crack.

Microstructure: Interdendritic eutectic carbides of the type, perlite, austenite partially transformed in bainite, few martensite

Machinability: Grinding only

Oxy – acetylene cutting: Cannot be flame cut

Deposit thickness: 15 to 20 mm

Field of use

Dredge pump shells, gyratory crusher mantles and bowls.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 1,9 | 1,5 | 1,8 | 9,0 | 1,4 | balance |

Typical mechanical properties

Hardness as welded: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick – Out |
|--------------------|-----------|---------|-------------|
| 1,6 | 150 – 250 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 300 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |

SK A12-0

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

DIN 8555

MF 6-GF-55-G

Characteristics

Martensitic steel alloy designed to resist low stress abrasive wear combined with heavy impact.

| | |
|------------------------|---------------------|
| Microstructure: | Martensite |
| Machinability: | Grinding only |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Up to 4 layers |

Field of use

Bucket teeth and lips, gravel pumps, screw conveyors, sliding metal parts, gear teeth, crusher hammers, rock drills, etc.

Typical analysis in %

| C | Mn | Si | Cr | Ti | Fe |
|------|-----|-----|-----|-----|---------|
| 0,35 | 0,8 | 3,0 | 9,6 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 55 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 150 – 200 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK BU-C1

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

DIN 8555

MF 1-GF-250-P

Characteristics

Open-arc wire for joining and rebuilding of mild and low alloy steels.

Microstructure: Ferrite

Machinability: Good

Oxy-acetylene cutting: Possible

Deposit thickness: As required

Field of use

Profiles, reels, roll construction and reparation, crane wheel.

Typical analysis in %

| C | Mn | Si | Fe |
|------|-----|-----|---------|
| 0,04 | 0,8 | 0,1 | balance |

Typical mechanical properties

Hardness as welded: 250 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 150 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,8 | 250 – 300 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 1-GF-300-P

Characteristics

Rebuilding alloy for Carbon steel parts. Can also be used as buffer layer prior to hard overlay.

Microstructure: Bainite

Machinability: Good

Oxy-acetylene cutting: Possible

Deposit thickness: Depends upon application and procedure used

Field of use

Crawler tractor links, crane wheels, shafts, buffer layer for continuous casting rollers, mine car wheels.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,1 | 0,9 | 0,6 | 0,5 | 0,3 | balance |

Typical mechanical properties

Hardness as welded: 280 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 150 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK CrMo21Ni-0

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

DIN 8555

MF 1-GF-350-GP

Characteristics

Open-arc cored wire designed for rebuilding and hardfacing for Carbon steel parts.

Microstructure: Bainite

Machinability: Good

Oxy-acetylene cutting: Difficult

Deposit thickness: No restriction

Field of use

Crawler tractor links, crane wheels, shafts, buffer layer for continuous casting rollers, mine car wheels.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,08 | 0,9 | 0,7 | 2,3 | 2,0 | 1,0 | balance |

Typical mechanical properties

Hardness as welded: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |

SK SOUDOCORE S8-0

unalloyed, fine grained and low alloyed steels

Classifications

open arc flux cored wire

EN 758

ASME IIC SFA 5.20-01

T 42 Z W N 4

E 70 T-4

Characteristics

Open-arc flux cored wire designed for joining and rebuilding of mild and low alloy steels. High deposition rate for applications in flat positions. Highly crack resistant and easy slag removal properties.

| | |
|------------------------|----------------|
| Microstructure: | Ferrite |
| Machinability: | Good |
| Oxy-acetylene cutting: | Possible |
| Deposit thickness: | No restriction |
| Shielding gas: | Not applicable |

Field of use

Joining and build-up of carbon steels. Maintenance of slag ladles in steelmaking processes.

Typical analysis in %

| C | Mn | Si | Al | Fe |
|------|-----|-----|------|---------|
| 0,28 | 0,4 | 0,1 | 1,50 | balance |

Typical mechanical properties

Hardness as welded: 190 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,0 | 200 – 550 | 26 – 35 | 25 – 50 |

Open arc cored wires for repair, anti-wear and anti-corrosion

3. High alloyed steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr | |
|--------------|------|----------------|----|-----|-----|-----|-----|------|--|
| SK 162-O | 8555 | MF 10-GF-65-G | | 63 | 5,4 | 0,2 | 1,3 | 27 | |
| SK 162 WP-O | 8555 | MF 10-GF-65-G | | 63 | 5,4 | 0,2 | 1,3 | 27 | |
| SK 240-O | 8555 | MF 10-GF-55-G | | 56 | 3,5 | 1,3 | 1,7 | 16,5 | |
| SK 255 Mo-O | 8555 | MF 10-GF-60-G | | 60 | 5 | 0,2 | 0,5 | 28 | |
| SK 255-O | 8555 | MF 10-GF-60-G | | 60 | 5 | 0,6 | 1 | 27 | |
| SK 256 Mn-O | 8555 | MF 10-GF-65-G | | 63 | 6,2 | 2,5 | 1,4 | 25 | |
| SK 256-O | 8555 | MF 10-GF-65-G | | 63 | 5,5 | 1,1 | 1,2 | 25,7 | |
| SK 258 NbC-O | 8555 | MF 6-GF-60-G | | 57 | 1,4 | 0,7 | 1,2 | 5,3 | |
| SK 260 NbC-O | 8555 | MF 6-GF-60 | | 60 | 1,2 | 0,6 | 1,4 | 5,3 | |
| SK 299-O | 8555 | MF 10-GF-65-GZ | | 64 | 4,9 | 0,2 | 1 | 11,3 | |
| SK 460-O | 8555 | MF 10-GF-60-G | | 57 | 3,7 | 0,3 | 1,1 | 32 | |
| SK 820-O | 8555 | MF 10-GF-60-G | | 59 | 4 | 0,1 | 0,1 | 20 | |
| SK 866-O | 8555 | MF 10-GF-60-G | | 60 | 4,5 | 0,7 | 0,8 | 27 | |
| SK 867-O | 8555 | MF 10-GF-60-G | | 62 | 5 | 0,2 | 1,9 | 29 | |

applications

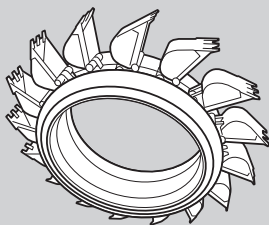
| Mo | Nb | W | V | B | Fe | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|-----|-----|-----|-----|------|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | | | | | Bal. | | ■ | ■ | | | | | | 310 |
| | | | | | Bal. | | ■ | ■ | | | | | | 311 |
| | | | | | Bal. | | ■ | | | | | | | 312 |
| 1,3 | | | | | Bal. | | ■ | ■ | | | | | | 313 |
| | | | | 0,5 | Bal. | | ■ | ■ | | | | | | 314 |
| | | | | | Bal. | | ■ | ■ | | | | | | 315 |
| | | | | | Bal. | | ■ | ■ | | | | | | 316 |
| | 8,5 | 1,5 | | | Bal. | | ■ | | ■ | | | | | 317 |
| | 8,3 | 1,2 | | 2 | Bal. | | ■ | | ■ | | | | | 318 |
| | 6,8 | | 5,7 | 0,55 | Bal. | | ■ | ■ | | | | | ■ | 319 |
| 0,5 | | | | 0,2 | Bal. | | ■ | | | | | | | 320 |
| | | | | 0,45 | Bal. | | ■ | ■ | | | | | | 321 |
| | | | | 0,5 | Bal. | | ■ | ■ | | | | | | 322 |
| | | | | 0,5 | 0,5 | | ■ | ■ | | | | | | 323 |

Open arc cored wires for repair, anti-wear and anti-corrosion

3. High alloyed steels

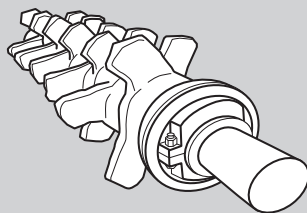
| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|-----------------|------|----------------|----|-----|-----|-----|-----|------|
| SK 867WP-O | 8555 | MF 10-GF-60-G | | 62 | 5 | 0,2 | 1,4 | 29 |
| SK 900-O | 8555 | MF 21-GF-65-G | | 63 | 2,9 | 0,4 | 0,4 | 5,8 |
| SK A39-O | 8555 | MF 10-GF-60-G | | 58 | 4 | 0,3 | 0,7 | 18,5 |
| SK A43-O | 8555 | MF 10-GF-65-G | | 64 | 5,6 | 0,2 | 1,3 | 20,2 |
| SK A43-OB | 8555 | MF 10-GF-65-G | | 65 | 5,2 | 0,2 | 1 | 20,3 |
| SK A43WP-O | 8555 | MF 10-GF-65-G | | 64 | 5,6 | 0,2 | 1,3 | 20,2 |
| SK A44-O | 8555 | MF 10-GF-60-G | | 62 | 5,2 | 0,9 | 0,5 | 19 |
| SK A45-O | 8555 | MF 10-GF-65-GT | | 63 | 5,3 | 0,2 | 0,7 | 21,2 |
| SK A45W-O | 8555 | MF 10-GF-65-GT | | 63 | 5,3 | 0,2 | 0,5 | 21,2 |
| SK A46-O | 8555 | MF 10-GF-60-GZ | | 61 | 4,7 | 0,2 | 1 | 20,7 |
| SK A64-O | 8555 | MF 10-GF-65-GT | | 61 | 4,8 | 0,6 | 1,2 | 20,5 |
| SK ABRA-MAX-O/G | 8555 | MF 6-GF-70-GT | | 70 | + | + | + | + |

Solution examples



Bucket wheel

SK A43-O

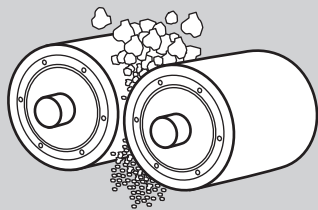


Sinter spike crusher

SK A45-O

applications

| Mo | Nb | W | V | B | Fe | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|-----|----------|-----|-----|------|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | | | | 0,5 | Bal. | | ■ | ■ | | | | | | 324 |
| | | 42 | | | Bal. | | ■ | ■ | | | | | | 325 |
| | 3 | | | 0,25 | Bal. | | ■ | ■ | | | | | | 326 |
| | 6,7 | | | | Bal. | | ■ | ■ | | | | | ■ | 327 |
| | 6,7 | | | 1 | Bal. | | ■ | ■ | | | | | ■ | 328 |
| | 6,7 | | | | Bal. | | ■ | ■ | | | | | ■ | 329 |
| 1,2 | 5,1 | 1 | 1 | | Bal. | | ■ | ■ | | | | | | 330 |
| 6,3 | 6,1 | 1,9 | 1 | | Bal. | | ■ | ■ | | | | | ■ | 331 |
| 6,2 | 6,1 | 1,8 | 1 | | Bal. | | ■ | ■ | | | | | ■ | 332 |
| 5 | Co = 8,8 | | | | Bal. | | ■ | ■ | | | | | ■ | 333 |
| | | | 9,9 | | Bal. | | ■ | ■ | | | | | | 334 |
| + | + | + | + | + | Bal. | | ■ | ■ | | | | | ■ | 335 |



Silicate crusher

SK ABRA-MAX O/G

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-G

Characteristics

High Chromium alloy designed to resist high stress grinding abrasion with low impact. The deposit will show readily stress relief cracks.

Microstructure: Primary carbides and M7C3 eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 10 to 15 mm maximum in 3 layers

Field of use

Gyratory crushers cones and mantles, vertical roller mills, coal pulverizer rolls, wear plates, etc.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|-----|-----|-----|------|---------|
| 5,4 | 0,2 | 1,3 | 27,0 | balance |

Typical mechanical properties

Hardness as welded: 63 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 500 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-G

Characteristics

High Chromium alloy designed to resist high stress grinding abrasion with low impact. The deposit will show readily stress relief cracks. Optimized welding behavior for wear plates manufacturing.

Microstructure: Primary carbides and M7C3 eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 10 to 15 mm maximum in 3 layers

Field of use

Wear plates.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|-----|-----|-----|------|---------|
| 5,4 | 0,2 | 1,3 | 27,0 | balance |

Typical mechanical properties

Hardness as welded: 63 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 500 | 26 – 30 | 35 – 40 |

SK 240-0

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-55-G

Characteristics

Open-arc wire depositing a medium Chromium carbide alloy designed to resist grinding abrasive wear with medium impact.

Microstructure: Interdendritic eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 10 to 12 mm in 2 to 3 layers

Field of use

Final overlay on gyratory crusher mantles, augers, crusher hammers and crusher rollers, palm kernels expeller screws.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|-----|-----|-----|------|---------|
| 3,5 | 1,3 | 1,7 | 16,5 | balance |

Typical mechanical properties

Hardness as welded: 56 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 150 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |

SK 255 Mo-0

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

ASME IIC SFA 5.21

MF 10-GF-60-G

FeCr-A9

Characteristics

Open-arc metal cored wire designed to deposit a metal resistant to high stress grinding abrasion with low impact. The deposits will readily show stress relief cracks.

Microstructure: Primary carbides and eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 10 mm maximum in 2 to 3 layers

Field of use

Concrete pumps, mixer parts, conveyer screws, etc.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|-----|-----|-----|------|-----|---------|
| 5,0 | 0,2 | 0,5 | 28,0 | 1,3 | balance |

Typical mechanical properties

Hardness as welded: 60 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,0 | 200 – 300 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

ASME IIC SFA 5.21

MF 10-GF-60-G

FeCr-A9

Characteristics

Self shielded cored wire designed to deposit an alloy resistant to high stress grinding abrasion with low impact. The deposits will readily show stress relief cracks.

Microstructure: Primary carbides and eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 10 mm maximum in 2 to 3 layers

Field of use

Palm oil expeller screws, groundnut oil expeller screws, cement conveyors screws, catalytic pipes, dredge pump impellers, dredge cutters, shovel bucket teeth.

Typical analysis in %

| C | Mn | Si | Cr | B | Fe |
|-----|-----|-----|------|-----|---------|
| 5,0 | 0,6 | 1,0 | 27,0 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 60 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 125 – 180 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |

SK 256 Mn-0

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-G

Characteristics

Open-arc cored wire depositing an alloy designed to resist high stress grinding abrasion with low impact. The deposits will readily show stress relief cracks.

Microstructure: Primary Chromium carbides (70 %) in an eutectic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 10 to 12 mm maximum in 2 to 3 layers

Field of use

Wear plates, mining and earthmoving equipment, sand dredge parts, drag line components, etc.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|-----|-----|-----|------|---------|
| 6,2 | 2,5 | 1,4 | 25,0 | balance |

Typical mechanical properties

Hardness as welded: 63 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,8 | 300 – 550 | 26 – 34 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-G

Characteristics

High Chromium carbide alloy designed to resist high stress grinding abrasion with low impact. The deposits will readily show stress relief cracks.

Microstructure: Primary Chromium carbides (70 %) and eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 10 to 12 mm maximum in 2 to 3 layers

Field of use

Coal pulverizing rollers, mining and earthmoving equipment, sand dredge parts, drag line components, etc.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|-----|-----|-----|------|---------|
| 5,5 | 1,1 | 1,2 | 25,7 | balance |

Typical mechanical properties

Hardness as welded: 63 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK 258 NbC-O

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

MF 6-GF-60-G

Characteristics

Open-arc flux-cored wire designed to deposit a crack-free martensitic alloy.

Microstructure: Martensite, little residual austenite and dispersed NbC carbides

Precautions: Preheating temperature 250 °C

Interpass temperature: 300 °C

Stress-relieving: 500 °C for 6 to 8 hours

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut.

Deposit thickness: Up to 4 layers

Field of use

Inter-particles crusher rollers.

Typical analysis in %

| C | Mn | Si | Cr | Nb | W | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 1,4 | 0,7 | 1,2 | 5,3 | 8,5 | 1,5 | balance |

Typical mechanical properties

Hardness as welded: 57 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |
| 3,2 | 350 – 400 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 6-GF-60

Characteristics

Special crack-free martensitic alloy enhanced with Boron designed to resist high stress abrasive wear.

Microstructure: Martensite and primary niobium carbides

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Up to 4 layers

Field of use

Hardbanding of drilling pipes.

Typical analysis in %

| C | Mn | Si | Cr | Nb | W | B | Fe |
|-----|-----|-----|-----|-----|-----|-----|---------|
| 1,2 | 0,6 | 1,4 | 5,3 | 8,3 | 1,2 | 2,0 | balance |

Typical mechanical properties

Hardness as welded: 60 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |
| 3,2 | 350 – 400 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-GZ

Characteristics

Hardfacing cored wire for open arc welding designed to surface parts subject to high stress grinding abrasion without impact up to high temperatures (up to 650 °C).

Microstructure: Austenitic matrix with complex carbides

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 10 mm in 2 to 3 layers

Field of use

Grizzly bars, chutes, conveyor screws, mixers, mining and earth moving equipment wear parts, clinker crushers, etc.

Typical analysis in %

| C | Mn | Si | Cr | Nb | V | B | Fe |
|-----|-----|-----|------|-----|-----|------|---------|
| 4,9 | 0,2 | 1,0 | 11,3 | 6,8 | 5,7 | 0,55 | balance |

Typical mechanical properties

Hardness as welded: 64 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-60-G

Characteristics

High Chromium alloy designed to resist severe abrasive wear with moderate impacts. The deposits will readily show stress relief cracks.

Microstructure: Primary carbides in an eutectic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 10 to 12 mm in 2 to 3 layers

Field of use

Auger flights, guides, pump housings.

Typical analysis in %

| C | Mn | Si | Cr | Mo | B | Fe |
|-----|-----|-----|------|-----|-----|---------|
| 3,7 | 0,3 | 1,1 | 32,0 | 0,5 | 0,2 | balance |

Typical mechanical properties

Hardness as welded: 57 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-60-G

Characteristics

Hardfacing Chromium carbide alloy recommended for applications combining moderate stress abrasion with moderate impact. The deposit will readily show stress relief cracks.

Microstructure: Primary carbides and eutectic carbides, austenite
 Machinability: Grinding only
 Oxy-acetylene cutting: Cannot be flame cut
 Deposit thickness: 2 to 3 layers maximum

Field of use

Wear plates, screw conveyors, shovel bucket teeth and lips, etc.

Typical analysis in %

| C | Mn | Si | Cr | B | Fe |
|-----|-----|-----|------|------|---------|
| 4,0 | 0,1 | 0,1 | 20,0 | 0,45 | balance |

Typical mechanical properties

Hardness as welded: 59 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 150 | 26 – 30 | 35 – 40 |
| 1,6 | 150 – 250 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-60-G

Characteristics

Alloy designed to resist high stress grinding abrasion with low impact. The deposits will readily show stress relief cracks.

Microstructure: Primary carbides and eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 10 mm maximum in 2 to 3 layers

Field of use

Palm oil expeller screws, groundnut oil expeller screws, cement conveyors screws, catalytic pipes, dredge pump impellers, dredge cutters, shovel bucket teeth, wear plates.

Typical analysis in %

| C | Mn | Si | Cr | B | Fe |
|-----|-----|-----|------|-----|---------|
| 4,5 | 0,7 | 0,8 | 27,0 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 60 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-60-G

Characteristics

Alloy designed to resist high stress grinding abrasion with low impact. The deposits will readily show stress relief cracks.

Microstructure: Primary and eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 10 mm in 2 to 3 layers

Field of use

Cement conveyors screws, catalytic pipes, dredge pump impellers, dredge cutters, shovel bucket teeth, wear plates.

Typical analysis in %

| C | Mn | Si | Cr | B | Fe |
|-----|-----|-----|------|-----|---------|
| 5,0 | 0,2 | 1,9 | 29,0 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 62 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 500 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-60-G

Characteristics

High Chromium alloy designed to resist high stress grinding abrasion with low impact. The deposit will show readily stress relief cracks. Welding properties optimized for wear plates manufacturing.

Microstructure: Primary and eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 10 mm in 2 to 3 layers

Field of use

Wear plates.

Typical analysis in %

| C | Mn | Si | Cr | B | Fe |
|-----|-----|-----|------|-----|---------|
| 5,0 | 0,2 | 1,4 | 29,0 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 62 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 500 | 26 – 30 | 35 – 40 |

SK 900-0

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

MF 21-GF-65-G

Characteristics

Cored wire containing about 60 % Tungsten carbide particles. The composition and particle size have been optimized to provide the best combination of toughness and wear resistance. The deposit will readily show stress relief cracks.

Microstructure: 65 % Tungsten carbides
 35 % austenite + martensite

Machinability: Grinding only

Deposit thickness: 1 to 2 layers maximum

Field of use

Wheel excavator bucket teeth, concrete mixer blades, brick and clay mill augers, crusher rollers, wood chipper spouts and bed knives, dredging wear parts, etc.

Typical analysis in %

| C | Mn | Si | Cr | W | Fe |
|-----|-----|-----|-----|------|---------|
| 2,9 | 0,4 | 0,4 | 5,8 | 42,0 | balance |

Typical mechanical properties

Hardness as welded: 63 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 125 – 200 | 19 – 24 | 35 – 40 |
| 2,0 | 140 – 250 | 19 – 24 | 35 – 40 |
| 2,4 | 150 – 300 | 19 – 24 | 35 – 40 |

SK A39-0

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-60-G

Characteristics

CrNb alloy with addition of Boron designed to resist high stress grinding and gouging abrasion. The deposit will readily show stress relief cracks.

Microstructure: Eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 10 mm maximum in 2 to 3 layers

Field of use

Bucket teeth and lips on bucket-wheel excavators in coal and phosphate mines, brick and clay mill augers, bucket teeth and lips on shovel buckets and bulldozer blades working in sand, crushing equipment, wear plates, screens in the coal industry, etc.

Typical analysis in %

| C | Mn | Si | Cr | Nb | B |
|-----|-----|-----|------|-----|------|
| 4,0 | 0,3 | 0,7 | 18,5 | 3,0 | 0,25 |

Typical mechanical properties

Hardness: 58 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-G

Characteristics

CrNb alloy designed to resist high stress grinding abrasion at service temperature not exceeding 450 °C. The deposit will readily show stress relief cracks.

Microstructure: Austenitic matrix with primary & eutectic carbides and nodular Nb carbides

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 10 to 12 mm in 2 to 3 layers

Field of use

Shovel, excavator, dredge and dragline bucket lips and teeth, hammers, rippers, crushing equipment, wear plates, expeller screws, giratory crushers, etc.

Typical analysis in %

| C | Mn | Si | Cr | Nb | Fe |
|-----|-----|-----|------|-----|---------|
| 5,6 | 0,2 | 1,3 | 20,2 | 6,7 | balance |

Typical mechanical properties

Hardness as welded: 64 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK A43-OB

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-G

Characteristics

CrNb alloy with addition of Boron designed to resist high stress grinding and gouging abrasion. The deposit will readily show stress relief cracks.

Microstructure: Complex carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 2 layers maximum

Field of use

Shovel, excavator, dredge and dragline bucket lips and teeth, hammers, ripper teeth, crushing equipment, expeller screws, giratory crushers, wear plates, screens in the coal industry, etc.

Typical analysis in %

| C | Mn | Si | Cr | Nb | B | Fe |
|-----|-----|-----|------|-----|-----|---------|
| 5,2 | 0,2 | 1,0 | 20,3 | 6.7 | 1,0 | balance |

Typical mechanical properties

Hardness as welded: 65 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 30 – 35 |
| 2,4 | 250 – 300 | 26 – 30 | 30 – 35 |
| 2,8 | 325 – 450 | 26 – 30 | 30 – 35 |

SK A43WP-0

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-G

Characteristics

CrNb alloy designed to resist high stress grinding abrasion at service temperature not exceeding 450 °C. The deposit will readily show stress relief cracks. Welding properties optimized for wear plates manufacturing.

Microstructure: Austenitic matrix with primary & eutectic carbides and nodular Nb carbides

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 10 to 12 mm in 2 to 3 layers

Field of use

Wear plates.

Typical analysis in %

| C | Mn | Si | Cr | Nb | Fe |
|-----|-----|-----|------|-----|---------|
| 5,6 | 0,2 | 1,3 | 20,2 | 6,7 | balance |

Typical mechanical properties

Hardness as welded: 64 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-60-G

Characteristics

CrNb alloy with addition of Molybdenum, Tungsten and Vanadium designed to resist high stress and gouging abrasion with moderate impact.

Microstructure: Austenitic matrix with primary & eutectic carbides and nodular Nb carbides

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 2 to 3 layers maximum

Field of use

Wear plates, blast furnace burden area, chutes.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Nb | W | V | Fe |
|-----|-----|-----|------|-----|-----|-----|-----|---------|
| 5,2 | 0,9 | 0,5 | 19,0 | 1,2 | 5,1 | 1,0 | 1,0 | balance |

Typical mechanical properties

Hardness as welded: 62 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 27 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-GT

Characteristics

Chromium-Niobium-Molybdenum alloy with addition of Tungsten and Vanadium designed to resist high stress grinding abrasion with low impact and solid erosion at service temperatures up to 650 °C. The deposits will readily show stress relief cracks.

Microstructure: Austenitic matrix with hexagonal primary and eutectic carbides and nodular Nb carbides with complex combined carbides

Oxy-acetylene cutting Cannot be flame cut

Machinability Grinding only

Deposit thickness 8 to 12 mm in 2 or 3 layers

Field of use

Wear plates, sinter finger crushers, exhaust fan blades in pellet plants, perlite crushers, bucket teeth and lips on bucketwheel excavators, boiler fan blades, burden area in blast furnace bells, etc.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Nb | W | V | Fe |
|-----|-----|-----|------|-----|-----|-----|-----|---------|
| 5,3 | 0,2 | 0,7 | 21,2 | 6,3 | 6,1 | 1,9 | 1,0 | balance |

Typical mechanical properties

Hardness as welded: 63 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

SK A 45W-0

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-GT

Characteristics

Chromium-Niobium-Molybdenum alloy with addition of Tungsten and Vanadium designed to resist high stress grinding abrasion with low impact and solid erosion at service temperatures up to 650 °C. The deposits will readily show stress relief cracks.

Microstructure: Austenitic matrix with complex carbides of different types
Chromium rich hexagonal primary carbides,
M7C3 eutectic carbides and nodular Niobium carbides.

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut.

Deposit thickness: 8 to 10 mm in 2 to 3 layers

Field of use

Wear plates, Sinter finger crushers, exhaust fan blades in pellet plants, perlite crushers, bucket teeth and lips on bucket-wheel excavators in phosphate mines, Boiler fan blades in the sugar cane industry, burden area in blast furnace bells, wear plates in blast furnace bell-less top charging systems .

Typical analysis in %

| C | Mn | Si | Cr | Mo | Nb | W | V | Fe |
|-----|-----|-----|------|-----|-----|-----|-----|---------|
| 5,5 | 0,2 | 0,5 | 21,2 | 6,2 | 6,1 | 1,8 | 1,0 | balance |

Typical mechanical properties

Hardness as welded: 63 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,8* | 300 – 350 | 26 – 30 | 35 – 40 |

*available on request

SK A46-0

high alloyed steels

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-60-GZ

Characteristics

Chromium-Molybdenum-Cobalt alloy designed to resist high stress grinding abrasive wear at service temperature up to 650 °C. The deposit will readily show stress relief cracks. The deposits can be heat treated at 900 °C and then quenched in water to give a hardness of 67 HRC.

Microstructure: Complex carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 10 to 12 mm in 2 to 3 layers

Field of use

Ore crushers, fan blades, pump casing, sinter plant parts, back-up plates in steel grit blasting equipment.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Co | Fe |
|-----|-----|-----|------|-----|-----|---------|
| 4,7 | 0,2 | 1,0 | 20,7 | 5,0 | 8,8 | balance |

Typical mechanical properties

Hardness as welded: 61 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 10-GF-65-GT

Characteristics

Special Chromium-Vanadium alloy specially developed to resist high stress grinding abrasive wear. The deposit will readily show stress relief cracks.

Microstructure: Austenitic matrix with primary and eutectic carbides enhanced with Vanadium carbides.

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Maximum 3 layers

Field of use

Mixer blades, armour plates of crushers.

Typical analysis in %

| C | Mn | Si | Cr | V | Fe |
|-----|-----|-----|------|-----|---------|
| 4,8 | 0,6 | 1,2 | 20,5 | 9,9 | balance |

Typical mechanical properties

Hardness as welded: 61 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |

Classifications

open arc metal cored wire

DIN 8555

MF 6-GF-70-GT

Characteristics

Special hardfacing cored wire designed to give an extreme resistance against high stress grinding abrasion and erosion without impact. The typical mechanical properties can be achieved in the first layer. The deposit will readily show stress relief cracks.

Microstructure: Complex carbo-borides and borides homogeneously dispersed in the matrix

Oxy-acetylene cutting: Cannot be flame cut

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Machinability: Grinding only

Deposit Thickness: ca. 8 mm in maximum 2 layers

Shielding gas: Argon + 2 % Oxygen (if not used as open arc)

Field of use

Conveyors screws, crusher plates and rolls, shredder teeth, fan blades, bucket teeth and lips, agricultural machinery, wear plates, etc.

Typical analysis

All Weld : C + Cr + Mo + Nb + W + V + B (Bal Fe)

Typical mechanical properties

Hardness as welded: 70 HRC

Form of delivery and recommended welding parameters

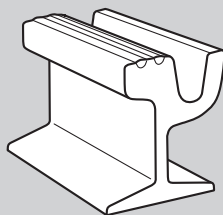
| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 230 | 26 – 30 | 20 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 20 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 20 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Open arc cored wires for repair, anti-wear and anti-corrosion

4. Stainless steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|--------------|------|---------------------|-----|-----|------|-----|-----|------|
| SK 308L-0 | 8555 | MF 9-GF-150-C | 170 | | 0,02 | 0,8 | 0,9 | 20 |
| SK 309L-0 | 8555 | MF 9-GF-150 | 170 | | 0,03 | 0,8 | 0,9 | 23 |
| SK 370-0 | 8555 | MF 5-GF-400-C | | 42 | 0,03 | 0,5 | 0,6 | 15,5 |
| SK 402-0 | 8555 | MF 8-GF-150/400-KPZ | 160 | | 0,09 | 6 | 0,9 | 18 |
| SK 415-0 | 8555 | MF 5-GF-50-C | | 48 | 0,19 | 0,8 | 0,7 | 13 |
| SK 420-0 | 8555 | MF 6-GF-55-C | | 54 | 0,4 | 0,7 | 0,2 | 13,5 |
| SK 430-0 | 8555 | MF 5-GF-250-C | 260 | | 0,04 | 0,9 | 0,2 | 17 |
| SK 714 N-0 | 8555 | MF 5-GF-45 | | 44 | 0,03 | 1 | 0,6 | 13 |
| SK 741-0 | 8555 | MF 5-GF-45-C | | 43 | 0,02 | 0,6 | 0,6 | 12,6 |

Solution examples

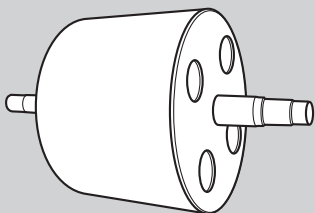


Rail

SK 402-0

applications

| | Ni | Mo | Nb | Ti | V | Fe | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--|-----|-----|----------------|------|------|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | 9,5 | | | | | Bal. | | | | | ■ | | | | 338 |
| | 12 | | | | | Bal. | | | | | ■ | | | | 339 |
| | 5,2 | 0,5 | | | | Bal. | | | | | ■ | | ■ | ■ | 340 |
| | 7,8 | | | | | Bal. | | | ■ | | ■ | | | | 341 |
| | 2,2 | 1 | | 0,25 | 0,35 | Bal. | | | | | ■ | | ■ | ■ | 342 |
| | | 0,2 | | | | Bal. | | | | | ■ | | ■ | | 343 |
| | | | | | | Bal. | | | | | ■ | | | | 344 |
| | 4,2 | 0,5 | Other: N = 0,1 | | | Bal. | | | | | ■ | | ■ | | 345 |
| | 5,2 | 0,8 | | | | Bal. | | | | | ■ | | ■ | ■ | 346 |



Casting roller

SK 714 N-0

Classifications

open arc flux cored wire

DIN 8555

ASME IIC SFA 5.22

MF 9-GF-150-C

E 308L-T3

Characteristics

Self shielded flux cored wire depositing a 19 % Chromium, 9 % Nickel, low Carbon stainless steel alloy.

Microstructure: Austenite +/- 10 % ferrite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: No restriction

Field of use

Cladding stainless steels containing 16 – 21 % Cr and 8 – 13 % Ni on un- or low alloyed carbon steels.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|------|-----|-----|------|-----|---------|
| 0,02 | 0,8 | 0,9 | 20,0 | 9,5 | balance |

Typical mechanical properties

Hardness as welded: 170 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 150 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 220 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 9-GF-150

Characteristics

Open-arc wire with slag depositing a 23 % Chromium 12 % Nickel low carbon composition suitable for joining dissimilar metals and as buffer layer prior to hard overlays.

| | |
|------------------------|---------------------|
| Microstructure: | Austenite + ferrite |
| Machinability: | Good |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | No restriction |

Field of use

Stainless steel cladding on carbon steels, buffer layers on difficult to weld steels, Corrosion resistant overlays on rail heads submitted to corrosive action.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|------|-----|-----|------|------|---------|
| 0,03 | 0,8 | 0,9 | 23,0 | 12,0 | balance |

Typical mechanical properties

Hardness as welded: 170 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 220 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 5-GF-400-C

Characteristics

Self shielded cored wire depositing a ferritic-martensitic steel designed to resist metal-to-metal wear, corrosion and thermal fatigue fire cracking.

Microstructure: Martensite + 10 % Ferrite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Up to 4 layers

Field of use

Hardfacing of continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Fe |
|------|-----|-----|------|-----|-----|---------|
| 0,03 | 0,5 | 0,6 | 15,5 | 5,2 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 42 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Travel Speed |
|--------------------|-----------|---------|-----------|--------------|
| 1,6 | 180 – 220 | 26 – 30 | 30 – 35 | 30 – 35 |
| 2,0 | 200 – 300 | 26 – 30 | 30 – 35 | 30 – 35 |
| 2,4 | 250 – 360 | 26 – 30 | 30 – 35 | 30 – 35 |

Classifications

open arc flux cored wire

DIN 8555

MF 8-GF-150/400-KPZ

Characteristics

Austenitic alloy type 18Cr8Ni7Mn recommended for build up and buffer layer prior to hardfacing. It can also be used for joining of dissimilar metals.

| | |
|------------------------|---|
| Microstructure: | Austenite |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | As required |

Field of use

Joining of wear plates on shovel buckets, railways and tramway lines, press rams, joining stainless steels to carbon manganese steels, building up and buttering before hardfacing, welding of 14 % Mn steels, armour and hard to weld steels.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|------|-----|-----|------|-----|---------|
| 0,09 | 6,0 | 0,9 | 18,0 | 7,8 | balance |

Typical mechanical properties

Hardness as welded: 160 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,2 | 120 – 150 | 26 – 30 | 35 – 40 |
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 5-GF-50-C

Characteristics

Alloy depositing a ferritic-martensitic steel designed to resist metal-to-metal wear, corrosion and thermal fatigue.

Microstructure: Martensite, little ferrite (10 %)

Machinability: Good with metallic carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Field of use

Continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | V | Ti | Fe |
|------|-----|-----|------|-----|-----|------|------|---------|
| 0,19 | 0,8 | 0,7 | 13,0 | 2,2 | 1,0 | 0,35 | 0,25 | balance |

Typical mechanical properties

Hardness as welded: 48 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,0 | 200 – 250 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 6-GF-55-C

Characteristics

Alloy depositing a martensitic steel containing 13 % Chromium giving a good resistance to metal-to-metal wear and corrosion.

Microstructure: Martensite

Machinability: Good with cubic Boron Nitride tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Field of use

Dredging pump casings, continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|-----|-----|-----|------|-----|---------|
| 0,4 | 0,7 | 0,2 | 13,5 | 0,2 | balance |

Typical mechanical properties

Hardness as welded: 54 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 30 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 30 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 30 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 5-GF-250-C

Characteristics

Alloy depositing a ferritic steel containing 17 % Chromium designed to resist corrosion at high temperatures, particularly in presence of sulphurous gas.

Microstructure: Ferrite and few martensite

Machinability: Very good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Field of use

Continuous casting rollers situated at the top of the line, valves, steam and gas turbine parts, valve seats.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|-----|-----|------|---------|
| 0,04 | 0,9 | 0,2 | 17,0 | balance |

Typical mechanical properties

Hardness as welded: 260 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 29 | 35 – 40 |
| 2,0 | 200 – 300 | 26 – 29 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 29 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 5-GF-45

Characteristics

Alloy depositing a ferritic-martensitic steel with addition of nitrogen designed to resist metal-to-metal wear, corrosion and thermal fatigue.

| | |
|------------------------|---|
| Microstructure: | Martensite + ferrite |
| Machinability: | Good with carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |

Field of use

Continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | N | Fe |
|------|-----|-----|------|-----|-----|-----|---------|
| 0,03 | 1,0 | 0,6 | 13,0 | 4,2 | 0,5 | 0,1 | balance |

Typical mechanical properties

Hardness as welded: 44 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,4 | 250 – 300 | 25 – 26 | 35 – 40 |

Classifications

open arc flux cored wire

DIN 8555

MF 5-GF-45-C

Characteristics

Alloy depositing a ferritic-martensitic steel containing 13 % Chromium, 5 % Nickel and 1 % Molybdenum designed to resist metal-to-metal wear, corrosion and thermal fatigue fire cracking.

Microstructure: Martensite + 10 % Ferrite

Machinability: Good with carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Field of use

Continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Fe |
|------|-----|-----|------|-----|-----|---------|
| 0,02 | 0,6 | 0,6 | 12,6 | 5,2 | 0,8 | balance |

Typical mechanical properties

Hardness as welded: 43 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 1,6 | 180 – 200 | 26 – 29 | 35 – 40 |
| 2,4 | 250 – 300 | 26 – 29 | 35 – 40 |
| 2,8 | 300 – 350 | 26 – 29 | 35 – 40 |



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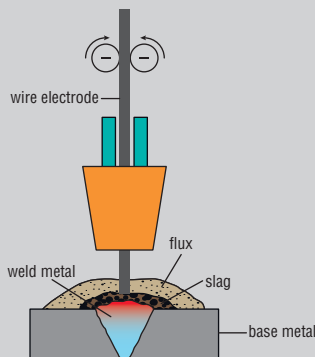
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Description of the SAW process

SAW = Submerged Arc Welding

Submerged arc welding is an arc welding process in which the arc burns between an electrode (wire or strip) and the workpiece. The special feature of this method is that the arc burns out of sight in a cavity, filled with gases and vapours, under a layer of coarse-grained, mineral welding flux.



The welding flux melts in the arc, forming a liquid slag that floats on the molten pool, so protecting it from the effects of the atmosphere (like the shielding gas in gas shielded arc welding). The welding electrode, whether wire or strip, is supplied by an automatic feed system, while the welding flux is supplied from a reservoir or through a compressed air feed system. The welding current flows via a contact tube to the electrode immediately above the welding area. This has several advantages, including high current carrying capacity, high deposition rate, and a wide range of possible variations of the welding parameters. The flux coating, moreover, results in high thermal efficiency, and submerged arc welding is therefore known as a high-efficiency process. Turning to detail, there is a distinction in submerged arc welding between single-wire welding, double-wire welding, tandem welding and strip welding.

The composition of the weld metal can be influenced through the right selection of the electrode and flux combination, since chemical reactions between the melt and the slag can control the burn-off and pick-up of alloying elements. The method generates very few emissions, and creates spatter-free seams of high quality.

It is a fully automated welding procedure carried out, for instance, using welding gantries, booms, motorised axis systems or carriages, most often for welding long seams in an industrial context. The method is often employed in shipbuilding, container manufacture, bridge building and steel construction. The method can be applied for joint welding and for build-up welding, for instance for wear or corrosion protection layers.

SAW wires and fluxes for anti-wear applications

1. SAW wires

| Product name | EN | | Mat.-No. | Page |
|----------------|----------|------------|---------------|------|
| UTP UP 73 G 2 | 14700 | SZ Fe8 | Special Alloy | 351 |
| UTP UP 73 G 3 | 14700 | S Fe 3 | Special Alloy | 352 |
| UTP UP 73 G 4 | 14700 | SZ Fe3 | Special Alloy | 353 |
| UTP UP DUR 250 | 14700 | SZ Fe1 | 1.8401 | 354 |
| UTP UP DUR 350 | DIN 8555 | UP2-GZ-400 | 1.8405 | 355 |

Classifications

SAW solid wire

| | | |
|----------|--------------|---------------|
| EN 14700 | DIN 8555 | Material-No. |
| SZ Fe8 | UP 3-GZ-50-T | Special Alloy |

Characteristics and field of use

The SAW wire UTP UP 73 G 2 is used for high wear resistant buildups on construction parts and tools subject to high abrasion and pressure in combination with medium impact loads at elevated performance temperatures, e.g. forging tools, roll mandrills, mangle rolls, thrust rolls as well as for the production of high-grade work surfaces made of non- or low alloyed base materials.

Machinable by grinding or hard metal alloys.

Hardness of the pure weld deposit:

untreated: 48 – 52 HRC
tempered 550 °C: approx. 55 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ti | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,35 | 0,3 | 1,2 | 7,0 | 2,0 | 0,3 | balance |

Welding instruction

Clean welding area to metallic bright. Preheat massive construction parts and tool steels to 250 – 400 °C, if necessary stress relief annealing at 550 °C. Slow cooling.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------------------|
| 3,0* | 400 – 500 | 28 – 30 | 30 – 50 |

*available on request

Classifications

SAW solid wire

EN 14700

DIN 8555

Material-No.

S Fe 3

UP 3-GZ-40-T

Special Alloy

Characteristics and field of use

Due to the excellent hot wear resistance and toughness, the wire UTP UP 73 G 3 is used for highly stressed surfacings on hot working tools which are simultaneously subject to high mechanical, thermal and abrasive loads, such as forge saddles, rolls, rotors, hot-shear blades.

Machining with hard metal alloys.

Hardness of the pure weld metal:

untreated: 38 – 42 HRC
tempered at 550 °C: approx. 45 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ti | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,25 | 0,5 | 0,7 | 5,0 | 4,0 | 0,6 | balance |

Welding instruction

Clean welding area to metallic bright. Preheat massive construction parts and tool steels to 250 – 400 °C, if necessary stress relief annealing at 550 °C. Slow cooling.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------------------|
| 2,4* | 300 – 350 | 28 – 30 | 30 – 50 |

*available on request

Classifications

SAW solid wire

| | | |
|----------|---------------|---------------|
| EN 14700 | DIN 8555 | Material-No. |
| SZ Fe3 | UP 3-GZ-350-T | Special Alloy |

Characteristics and field of use

Due to the good hot wear resistance and toughness, the wire UTP UP 73 G 4 is used for surfacings on hot working tools and construction parts, which are subject to impact, pressure and abrasion at elevated temperatures, such as rolls, running wheels, guidings, recipients, drums. Hot wear resistant claddings can be made on non- and low alloyed base materials.

The weld deposit is machinable.

Hardness of the pure weld deposit : 32 – 35 HRC

Typical analysis in %

| C | Si | Mn | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,1 | 0,4 | 0,6 | 6,5 | 3,3 | balance |

Welding instruction

Clean welding area to metallic bright, cracks in the tool have to be gouged out completely. Preheating temperature of 400 °C on tools should be maintained, stress relief, if necessary, at 550 °C. Preheating to 150 °C generally on non-and low alloyed materials.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------------------|
| 2,4* | 300 – 350 | 28 – 30 | 30 – 50 |
| 3,0* | 320 – 450 | 28 – 30 | 30 – 50 |
| 4,0* | 400 – 500 | 28 – 30 | 30 – 50 |

*available on request

Classifications

SAW solid wire

EN 14700

DIN 8555

Material-No.

SZ Fe1

UP 1-GZ-250

1.8401

Characteristics and field of use

The SAW wire UTP UP DUR 250 is used for submerged arc welding on construction parts, where resistance against rolling wear and a good machinability is required, such as surfacings on rail crossings, couplings, wobbler drives, crane wheels, shafts and gear parts.

Hardness of the pure weld deposit : approx. 250 HB

Typical analysis in %

| C | Si | Mn | Cr | Ti | Al | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 0,3 | 0,4 | 1,0 | 1,0 | 0,2 | 0,1 | balance |

Welding instruction

Clean welding area to metallic bright.
Preheat massive parts to 150 °C, cooling down slowly.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Travel Speed(cm/min) |
|--------------------|-----------|---------|----------------------|
| 3,0* | 400 – 500 | 28 – 30 | 30 – 50 |
| 4,0* | 500 – 600 | 28 – 30 | 30 – 50 |

*available on request

Classifications

SAW solid wire

DIN 8555

Material-No.

UP2-GZ-400

1.8405

Characteristics and field of use

UTP UP DUR 350 is used for submerged arc welding on construction parts where resistance against rolling wear and a good machinability is required, such as surfacings on rail crossings, stamps, striking tools, crane wheels, shafts and gear parts.

Hardness of the pure weld deposit : approx. 400 HB

Typical analysis in %

| C | Si | Mn | Cr | Al | Ti | Fe |
|-----|------|-----|-----|-----|-----|---------|
| 0,7 | 0,45 | 2,0 | 1,0 | 0,1 | 0,2 | balance |

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------------------|
| 3,0* | 400 – 500 | 28 – 30 | 35 – 45 |
| 4,0* | 500 – 600 | 28 – 30 | 35 – 45 |

*available on request

SAW wires and fluxes for anti-wear applications

2. SAW fluxes

| Product name | EN ISO | | AWS | | Page |
|---------------|--------|------------------|-----|--|------|
| UTP UP FX 602 | 14174 | SA FB 1 65 DC H5 | | | 357 |
| UTP UP FX 680 | 14174 | SF CS 2 DC | | | 358 |

Classifications

SAW flux

EN ISO 14174

SA FB 1 65 DC H5

Characteristics and field of use

UTP UP FX 602 is an agglomerated fluoride-basic welding flux for hardfacing on un- and lowalloyed steels. Due to its neutral metallurgical behaviour it can be used with a wide range of different un- and low-alloyed submerged arc wire electrodes.

UTP UP FX 602 can be used for single and multiple-wire-welding, it provides a good slag detachability even at high working temperatures.

Chemical composition of the flux (guiding values) in %

| CaF ₂ | CaO + MgO | Al ₂ O ₃ + MnO | SiO ₂ + TiO ₂ |
|------------------|-----------|--------------------------------------|-------------------------------------|
| 24 | 38 | 18 | 18 |

Properties

- Basicity grade (according to Boniszewski) 3,3 (Mol %)
- Grain size 3 – 20 (0,3 – 2,0 mm)
- Flux consumption ~ 1 (kg flux/kg wire)
- If stored properly / for first use, the flux can be used without redrying directly out of the bag. Flux that has become moist should be redried for about 2 hours at 350 – 400 °C prior to use.

Form of delivery

25 kg (plastic bag)

UTP UP FX 680

anti-wear

Classifications

SAW flux

EN ISO 14174

SF CS 2 DC

Characteristics and field of use

UTP UP FX 680 is a neutral, fused sub-arc welding flux of the calcium-silicate-type for joining and hardfacing of low-alloyed heat-resistant steels.

It is a light basic type, has neutral metallurgical behaviour and provides excellent slag detachability. It is designed for use under direct current.

Chemical composition of the flux (guiding values) in %

| CaF ₂ | CaO + MgO | Al ₂ O ₃ | SiO ₂ |
|------------------|-----------|--------------------------------|------------------|
| 20 | 35 | 5 | 30 |

Properties

- Basicity grade (according to Boniszewski) 1,3
- Grain size 0,1 – 1,6 mm (Tyler: 10 x 150)
- Flux consumption ~ 1 (kg flux / kg wire)
- If stored properly / for first use, the flux can be used without redrying directly from the bag. Flux that has become moist should be redried for about 2 hours at 300 – 350 °C prior to use.

Form of delivery

15 kg (bags)

SAW wires and fluxes for anti-corrosion applications

1. SAW wires

| Product name | EN ISO | AWS | Mat.-No. | Page |
|----------------|--------|--------------------------------|-------------------|------------|
| UTP UP 068 HH | 18274 | S Ni 6082 (NiCr20Mn3Nb) | A5.14 ER NiCr-3 | 2.4806 360 |
| UTP UP 776 | 18274 | S Ni 6276 (NiCr15Mo16Fe6W4) | A5.14 ER NiCrMo-4 | 2.4886 361 |
| UTP UP 6222 Mo | 18274 | S Ni 6625 (NiCr22Mo9Nb) | A5.14 ER NiCrMo-3 | 2.4831 362 |

UTP UP 068 HH

anti-corrosion

Classifications

SAW solid wire

| | | |
|-------------------------|-----------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6082 (NiCr20Mn3Nb) | ER NiCr-3 | 2.4806 |

Characteristics and field of use

UTP UP 068 HH is used for claddings in the reactor construction and for joining of similar base metals and low-alloyed steels with stainless steels:

| | | |
|---------|--------------------|------------|
| Mat-No. | DIN | UNS-No. |
| 2.4816 | NiCr15Fe | UNS N06600 |
| 2.4817 | LC-NiCr15Fe | UNS N10665 |
| 1.4876 | X 10NiCrAlTi 32 20 | UNS N08800 |

Typical analysis in %

| | | | | | | |
|--------|-------|-----|------|---------|-----|-----|
| C | Si | Mn | Cr | Ni | Nb | Fe |
| < 0,02 | < 0,2 | 3,0 | 20,0 | balance | 2,7 | 0,8 |

Mechanical properties of the weld metal according to EN ISO 15792-1 (min. values at RT)

| | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_V |
| MPa | MPa | % | J (RT) |
| > 350 | > 600 | > 35 | > 100 |

Form of delivery and recommended welding parameters

| | | | |
|---------------------------|-----------------|----------------|------------------------------|
| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Travel Speed (cm/min)</i> |
| 1,6 | 200 – 250 | 28 – 30 | 30 – 50 |
| 2,0 | 250 – 350 | 28 – 30 | 30 – 50 |
| 2,4 | 350 – 450 | 28 – 30 | 30 – 50 |

Classifications

SAW solid wire

| | | |
|-----------------------------|-------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6276 (NiCr15Mo16Fe6W4) | ER NiCrMo-4 | 2.4886 |

Characteristics and field of use

UTP UP 776 is suitable for joining and surfacing on matching and similar alloys such as 2.4819 NiMo16Cr15W UNS N10276 and surface weldings on low-alloyed steels.

UTP UP 776 is employed primarily for welding components in plants for chemical processes with high corrosion resistance in reducing and, above all, in oxidizing environments.

UTP UP 776 is also used for cryogenic applications such as joining 9 % Ni steels.

Typical analysis in %

| C | Si | Mn | P | S | Cr | Mo | Ni | W | Fe |
|------|------|-----|-------|-------|------|------|---------|-----|-----|
| 0,02 | 0,25 | 1,0 | 0,008 | 0,006 | 16,0 | 15,5 | balance | 3,5 | 6,5 |

Mechanical properties of the weld metal according to EN ISO 15792-1 (min. values at RT)

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J (RT) |
| ≥ 450 | ≥ 690 | ≥ 35 | > 70 |

Welding instruction

The welding area has to be free of impurities (oil, paint, grease, markings and so on). Welding must be performed with low heat input. The maximum interpass temperature should be kept below 150 °C. Using dried welding flux is mandatory.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------------------|
| 1,6 | 200 – 250 | 26 – 30 | 40 – 50 |
| 2,4 | 280 – 350 | 26 – 30 | 40 – 50 |

UTP UP 6222 Mo

anti-corrosion

Classifications

SAW solid wire

| | | |
|-------------------------|-------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6625 (NiCr22Mo9Nb) | ER NiCrMo-3 | 2.4831 |

Characteristics and field of use

UTP UP 6222 Mo is applied for joint welding of base materials with the same or with a similar composition, e.g. Alloy 625 (UNS N06625) or NiCr22Mo9Nb, Material-No. 2.4856 or mixed combinations with stainless steels and carbon steels.

Furthermore the wire is used for cold-tough Ni-steels, e.g. X8Ni9 for LNG projects. UTP UP 6222 Mo is also applied on alloyed or unalloyed steels for cladding of corrosion resistant plants.

Typical analysis in %

| | | | | | | |
|--------|-------|------|-----|---------|-----|-----|
| C | Si | Cr | Mo | Ni | Nb | Fe |
| < 0,02 | < 0,2 | 21,0 | 9,0 | balance | 3,3 | 2,0 |

Mechanical properties of the weld metal according to EN ISO 15792-1 (min. values at RT)

| | | | | |
|----------------------------------|-------------------------------|-----------------------|------------------------------|---------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v | |
| MPa | MPa | % | J (RT) | -196 °C |
| 460 | 725 | 40 | > 80 | 65 |

Welding instruction

The welding area has to be free from impurities (oil, paint, markings etc.). Welding must be performed with a low heat input. The maximum interpass temperature is at 150 °C. Stick out: approx. 25 mm

Form of delivery and recommended welding parameters

| | | | |
|---------------------------|-----------------|----------------|------------------------------|
| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Travel Speed (cm/min)</i> |
| 1,6 | 200 – 250 | 28 – 30 | 30 – 50 |
| 2,0 | 250 – 350 | 28 – 30 | 30 – 50 |
| 2,4 | 350 – 450 | 28 – 30 | 30 – 50 |
| 3,2 | 400 – 450 | 28 – 30 | 30 – 50 |

SAW wires and fluxes for anti-corrosion applications

2. SAW fluxes

| Product name | EN ISO | | AWS | | Page |
|---------------|--------|------------|-----|--|------|
| UTP UP FX 104 | 14174 | SA FB 2 AC | | | 364 |
| UTP UP FX 504 | 14174 | SA AB 2 AC | | | 365 |

Classifications

SAW flux

EN ISO 14174

SA FB 2 AC

Characteristics and field of use

UTP UP FX 104 is an agglomerated welding flux of the fluoride-basic type for joining and cladding of stainless and heat resistant steel and nickel based alloys.

It has neutral metallurgical behaviour and no additional Chrome support. It can be used for welding with direct or alternating current set up.

Chemical composition of the flux (guiding values) in %

| SiO ₂ + TiO ₂ | CaO + MgO | Al ₂ O ₃ + MnO | CaF ₂ |
|-------------------------------------|-----------|--------------------------------------|------------------|
| 15 | 36 | 20 | 25 |

Properties

- Basicity grade (according to Boniszewski) 2,7
- Grain size 0,2 – 2,0 mm (Tyler: 10 x 48)

If stored properly the flux can be used without redrying directly from the drum. Flux that has become moist should be redried for approximately 2 hours at 300 – 350 °C prior to use.

Form of delivery

30 kg (steel drum)

Classifications

SAW flux

EN ISO 14174

SA AB 2 AC

Characteristics and field of use

UTP UP FX 504 is an agglomerated welding flux of the aluminate basic type designed for joining and surfacing applications on unalloyed steels, stainless and heat resistant steels and Ni-base alloys.

It has neutral metallurgical behaviour and provides excellent slag detachability in all applications under direct or alternating current.

Chemical composition of the flux (guiding values) in %

| SiO ₂ + TiO ₂ | CaO + MgO | Al ₂ O ₃ + MnO | CaF ₂ |
|-------------------------------------|-----------|--------------------------------------|------------------|
| 8 | 13 | 55 | 22 |

Properties

- Basicity grade (according to Boniszewski) Mol. %: 1,5
- Grain size 0,3 – 1,6 mm (Tyler: 10 x 48)

If stored properly the flux can be used without redrying directly from the drum. Flux that has become moist should be redried for around 2 hours at 300 – 350 °C prior to use.

Form of delivery

30 kg (steel drum)

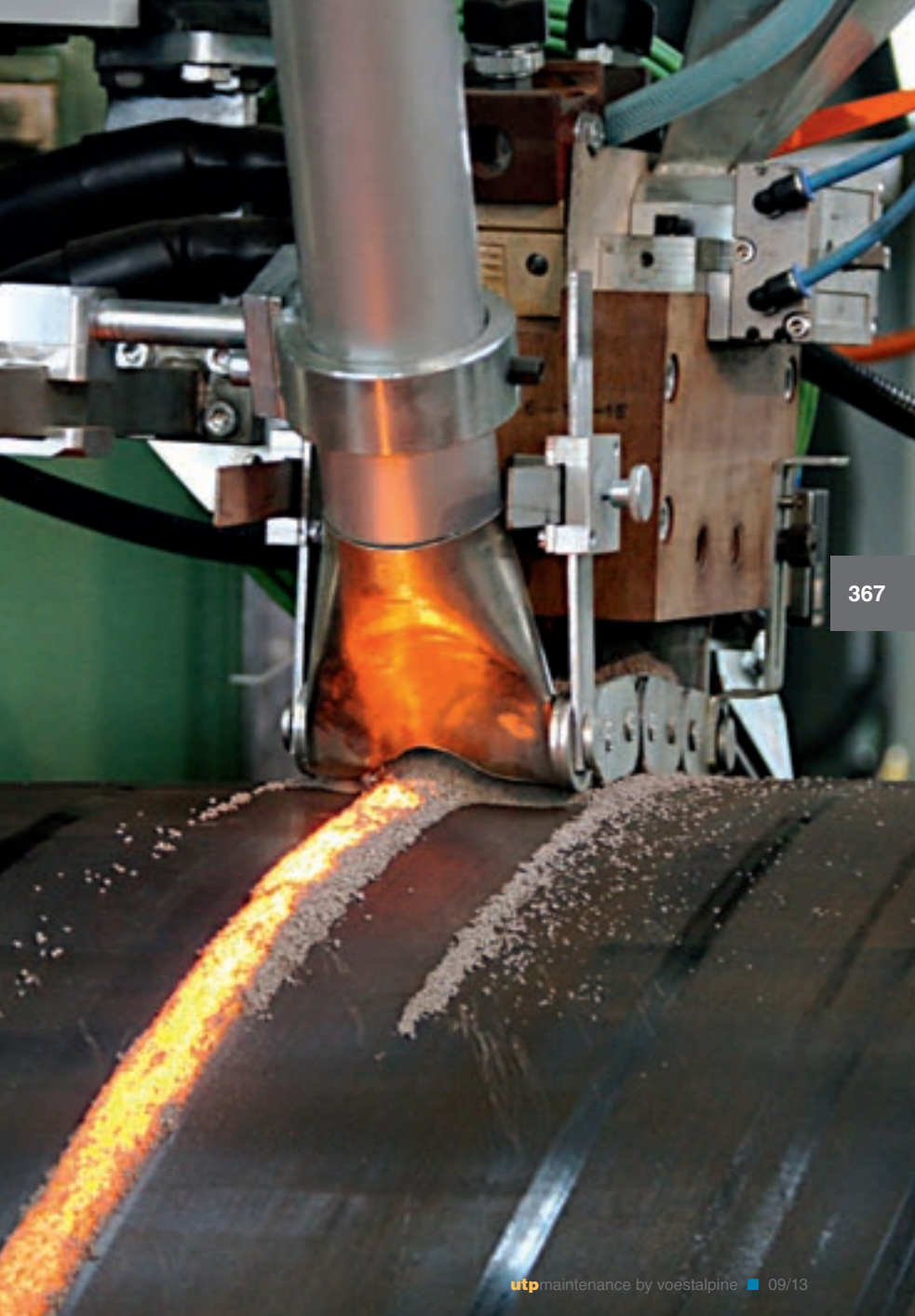
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SAW – cored wires and fluxes

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Submerged arc cored wires for anti-wear and anti-corrosion

1. Manganese steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr | |
|--------------|------|--------------------|-----|-----|------|------|-----|------|--|
| SK 219-S | 8555 | UP 7-GF-200/450-KP | 205 | | 0,95 | 18,0 | 1,0 | 4,6 | |
| SK AP-S | 8555 | UP 7-GF-200-KP | 200 | | 0,45 | 16,0 | 0,5 | 13,0 | |

applications

| Mo | Nb | W | V | Fe | Co | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|----|----|---|---|------|----|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | | | | Bal. | | | | | ■ | | | ■ | | 370 |
| | | | | Bal. | | | | | ■ | | | ■ | | 371 |

SK 219-S

manganese steels

Classifications

SAW cored wire

DIN 8555

UP 7-GF-200/450-KP

Characteristics

Designed to deposit by submerged arc welding a fully austenitic alloy in a single layer on Carbon steel parts.

Microstructure: Austenite

Machinability: Good with carbides tipped tools

Oxy-acetylene cutting: Not possible

Deposit thickness: As required

Welding flux: Record SA

Field of use

Tramway and railway rails, crossovers, crossing frogs and curves.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|------|-----|-----|---------|
| 0,95 | 18,0 | 1,0 | 4,6 | balance |

Typical mechanical properties

Hardness as welded: 205 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,8 | 300 – 400 | 28 – 30 | 30 – 35 | 1,1 | 35 – 40 |
| 3,2 | 325 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |

Classifications

SAW cored wire

DIN 8555

ASME IIC SFA 5.21

UP 7-GF-200-KP

FeMn-Cr

Characteristics

Multi-purpose cored wire, mainly used for rebuilding and joining of Carbon and 14 % Manganese steels. Can also be used as buffer layer prior to hard overlay. Work-hardenable alloy.

| | |
|------------------------|--|
| Microstructure: | Austenite |
| Machinability: | Good with metallic carbides tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | As required |
| Welding flux: | Record SA, Record SR |

Field of use

Railway rails and crossovers, mill shaft drive ends, gyratory crusher mantles, re-pointing of shovel teeth, buffer layer for inter-particles crushers.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|------|-----|------|---------|
| 0,45 | 16,0 | 0,5 | 13,0 | balance |

Typical mechanical properties

Hardness as welded: 200 HB

Form of delivery and recommended welding parameters

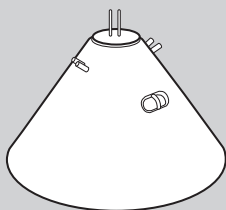
| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

Submerged arc cored wires for anti-wear and anti-corrosion

2. Unalloyed, fine grained and low alloyed steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|-------------------|------|----------------|-----|-----|------|-----|-----|-----|
| SK 20 CrMo-SA | 8555 | UP 1-GF-200 | 250 | | 0,13 | 1,0 | 0,4 | 0,6 |
| SK 242-S | 8555 | UP 1-GF-40-P | | 40 | 0,14 | 1,6 | 0,7 | 2,0 |
| SK 258-SA | 8555 | UP 6-GF-55-GT | | 57 | 0,5 | 1,5 | 0,6 | 6,2 |
| SK 258L-SA | 8555 | UP 6-GF-45-GT | | 44 | 0,18 | 1,5 | 0,4 | 5,6 |
| SK 258 NbC-SA | 8555 | UP 6-GF-60-G | | 57 | 1,2 | 0,8 | 0,8 | 6,0 |
| SK 263-SA | 8555 | UP 6-GF-50-GP | | 50 | 0,23 | 1,2 | 0,7 | 6,0 |
| SK 350-S | 8555 | UP 1-350 | 320 | | 0,07 | 1,4 | 0,3 | 4,0 |
| SK BU-S | 8555 | UP 1-GF-300-P | 280 | | 0,1 | 0,9 | 0,6 | 0,5 |
| SK CrMo15-SA | 8555 | UP 1-GF-250 | 230 | | 0,02 | 0,8 | 0,6 | 1,1 |
| SK SOUDOCORE D-SA | 8555 | UP 1-GF-200-GP | 190 | | 0,09 | 1,5 | 0,5 | |

Solution examples



Blast furnace bell (seat area)

SK 258L-SA

applications

| Mo | Nb | W | V | Fe | Co | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|-----|-----|-----|-----|------|----|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| 0,3 | | | | Bal. | | | | | ■ | | | | | 374 |
| 0,7 | | | 0,4 | Bal. | | | | | ■ | | | ■ | | 375 |
| 1,7 | | 1,7 | | Bal. | | | ■ | | ■ | | | ■ | | 376 |
| 1,7 | | 1,5 | | Bal. | | | | | ■ | | | ■ | | 377 |
| | 8,0 | 1,4 | | Bal. | | ■ | | | ■ | | | ■ | | 378 |
| 2,7 | | | | Bal. | | ■ | | | ■ | | | ■ | | 379 |
| 0,5 | 0,1 | | | Bal. | | | | | ■ | | | | | 380 |
| 0,3 | | | | Bal. | | | | | ■ | | | | | 381 |
| 0,4 | | | | Bal. | | | | | ■ | | | | | 382 |
| | | | | Bal. | | | | | ■ | | | | | 383 |



Tramway rail

SK BU-S

SK 20 CrMo-SA

unalloyed, fine grained and low alloyed steels

Classifications

SAW cored wire

| | | |
|-------------|-------------------|-------------------|
| DIN 8555 | ASME IIC SFA 5.23 | ASME IIC SFA 5.23 |
| UP 1-GF-200 | F9P2-ECB1-B1 | F10A0-ECB1-B1 |

Characteristics

Cored wire designed to deposit a 0,2%C-0,5%Cr-0,2%Mo alloy for submerged arc welding of unalloyed and low alloyed steels.

| | |
|------------------------|---|
| Microstructure: | Ferritic |
| Machinability: | Good |
| Oxy-acetylene cutting: | Possible |
| Deposit thickness: | Depends upon application and procedure used |
| Welding flux: | Record SA |

Field of use

Heat resistant steel, steel casting, buffer layers.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|------|-----|-----|-----|-----|---------|
| 0,13 | 1,0 | 0,4 | 0,6 | 0,3 | balance |

Typical mechanical properties

Hardness as welded: 250 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 450 | 30 – 32 | 30 – 35 | 1,1 | 35 – 45 |

SK 242-S

unalloyed, fine grained and low alloyed steels

Classifications

SAW cored wire

DIN 8555

UP 1-GF-40-P

Characteristics

Submerged arc surfacing wire for rebuilding and hard surfacing alloy of Carbon steel parts subjected to adhesive wear with impacts.

Microstructure: Bainite + Martensite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Welding flux: Record SA

Field of use

Crawler tractor rollers and idlers, shafts, cylinders, mine car wheels, crane wheels.

Typical analysis in %

| C | Mn | Si | Cr | Mo | V | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,14 | 1,6 | 0,7 | 2,0 | 0,7 | 0,4 | balance |

Typical mechanical properties

Hardness as welded: 40 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 3,2 | 325 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |

SK 258-SA

unalloyed, fine grained and low alloyed steels

Classifications

SAW cored wire

DIN 8555

UP 6-GF-55-GT

Characteristics

Martensitic alloy designed to give an outstanding resistance to low stress abrasion with heavy impact and high compressive stresses. The deposit is heat treatable and forgeable.

Microstructure: Martensite

Machinability: Grinding only

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Welding flux: Record SA, Record SR

Field of use

Cable sheaves, bed knives, steel mill rollers, crane wheels, forging dies.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 0,5 | 1,5 | 0,6 | 6,2 | 1,7 | 1,7 | balance |

Typical mechanical properties

Hardness as welded: 57 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |
| 4,0 | 380 – 550 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 258L-SA

unalloyed, fine grained and low alloyed steels

Classifications

SAW cored wire

DIN 8555

UP 6-GF-45-GT

Characteristics

Martensitic alloy giving a very good resistance to metal-to-metal and low stress abrasive wear at high temperature. The deposit is crack-free, heat treatable and forgeable.

Microstructure: Martensite

Machinability: Good with Tungsten carbides or cubic Boron Nitride tipped tools

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Welding flux: Record SA, Record SR

Field of use

Steel mill rollers, blast furnace bells (seat area), dredger-buckets cylinders.

Typical analysis in %

| C | Mn | Si | Cr | Mo | W | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,18 | 1,5 | 0,4 | 5,6 | 1,7 | 1,5 | balance |

Typical mechanical properties

Hardness as welded: 44 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 2,8 | 300 – 400 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 258 NbC-SA

unalloyed, fine grained and low alloyed steels

Classifications

SAW cored wire

DIN 8555

UP 6-GF-60-G

Characteristics

Sub-arc flux-cored wire designed to deposit a crack-free martensitic alloy.

Microstructure: Martensite, little residual austenite and dispersed NbC carbides

Precautions: Preheating temperature 250 °C / Interpass temperature 300 °C

Stress-relieving: 500 °C for 6 to 8 hours

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Up to 4 layers

Welding flux: Record SA

Field of use

Inter-particles crusher rollers.

Typical analysis in %

| C | Mn | Si | Cr | Nb | W | Fe |
|-----|-----|-----|-----|-----|-----|---------|
| 1,2 | 0,8 | 0,8 | 6,0 | 8,0 | 1,4 | balance |

Typical mechanical properties

Hardness as welded: 57 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|-----------------------|-----------|---------|-----------|-----------|--------------------------|
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 263-SA

unalloyed, fine grained and low alloyed steels

Classifications

SAW cored wire

DIN 8555

UP 6-GF-50-GP

Characteristics

Martensitic alloy giving a very good resistance against metal-to-metal and low stress abrasive wear at high temperature. The deposit is crack-free, heat treatable and forgeable.

Microstructure: Martensite

Machinability: Good with Tungsten carbides or cubic Boron Nitride tipped tools

Oxy-acetylene cutting: Flame cut is difficult

Deposit thickness: Depends upon application and procedure used

Welding flux: Record SA, Record SR

Field of use

Steel mill rollers, blast furnace bells (seat area), dredger-buckets cylinders.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|------|-----|-----|-----|-----|---------|
| 0,23 | 1,2 | 0,7 | 6,0 | 2,7 | balance |

Typical mechanical properties

Hardness as welded: 50 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 350-S

unalloyed, fine grained and low alloyed steels

Classifications

SAW cored wire

DIN 8555

UP 1-350

Characteristics

Rebuilding and hardfacing alloy for Carbon steel parts.

Microstructure: Bainite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: As required

Field of use

Sliding metal parts, gear teeth, undercarriage links, rollers and idlers, shafts, bushing.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Nb | Fe |
|------|-----|-----|-----|-----|-----|---------|
| 0,07 | 1,4 | 0,3 | 4,0 | 0,5 | 0,1 | balance |

Typical mechanical properties

Hardness as welded: 320 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|-----------------------|-----------|---------|-----------|-----------|--------------------------|
| 3,2 | 325 – 450 | 26 – 30 | 35 – 40 | 1,1 | 40 – 50 |

Classifications

SAW cored wire

DIN 8555

UP 1-GF-300-P

Characteristics

Rebuilding alloy for Carbon steel parts. Can also be used as buffer layer prior to hard overlay.

Microstructure: Bainite

Machinability: Good

Oxy-acetylene cutting: Possible

Deposit thickness: Depends upon application and procedure used

Welding flux: Record SA

Field of use

Crawler tractor links, crane wheels, shafts, buffer layer for continuous casting rollers, mine car wheels.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|-----|-----|-----|-----|-----|---------|
| 0,1 | 0,9 | 0,6 | 0,5 | 0,3 | balance |

Typical mechanical properties

Hardness as welded: 280 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 280 – 350 | 26 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |

SK CrMo15-SA

unalloyed, fine grained and low alloyed steels

Classifications

SAW cored wire

| | | |
|-------------|-------------------|-------------------|
| DIN 8555 | ASME IIC SFA 5.23 | ASME IIC SFA 5.23 |
| UP 1-GF-250 | F9P2-ECB2-B2 | F10A10-ECB2-B2 |

Characteristics

Cored wire for joining and rebuilding of mild and low alloy steels. Can also be used as buffer layer prior to hardfacing.

| | |
|------------------------|---|
| Microstructure: | Ferritic |
| Machinability: | Good with conventional tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Welding flux: | Record SA |

Field of use

Joining and rebuilding of heat resistant steel and steel casting parts. Buffer layers.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|------|-----|-----|-----|-----|---------|
| 0,02 | 0,8 | 0,6 | 1,1 | 0,4 | balance |

Typical mechanical properties

Hardness as welded: 230 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,0 | 250 – 400 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 500 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |

SK SOUDOCORE D-SA

unalloyed, fine grained and low alloyed steels

Classifications

SAW cored wire

DIN 8555

ASME IIC SFA 5.17

UP 1-GF-200-GP

F7A8-EC1

Characteristics

Flux cored wire for submerged arc welding designed for rebuilding and buffering prior to hardfacing. High deposition rate. Excellent mechanical properties.

| | |
|------------------------|------------------|
| Microstructure: | Ferrite |
| Machinability: | Excellent |
| Oxy-acetylene cutting: | Can be flame cut |
| Deposit thickness: | No restriction |
| Welding flux: | Record SA |

Field of use

Cushion layer on inter-particles crusher cylinder (Polysius; Fuller).

Typical analysis in %

| C | Mn | Si | Fe |
|------|-----|-----|---------|
| 0,09 | 1,5 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 190 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 4,0 | 380 – 700 | 28 – 33 | 30 | 1,1 | 40 – 60 |

Submerged arc cored wires for anti-wear and anti-corrosion

3. High alloyed steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|--------------|------|----------------|----|-----|-----|-----|-----|------|
| SK 255-S | 8555 | UP 10-GF-60-G | | 58 | 4,6 | 0,9 | 0,5 | 27,0 |
| SK A45-S | 8555 | UP 10-GF-65-GT | | 64 | 5,1 | 0,2 | 0,6 | 21,5 |

applications

| Mo | Nb | W | V | Fe | Co | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|-----|-----|-----|------|------|----|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | | | | Bal. | | | ■ | | | | | | | 386 |
| 5,4 | 5,7 | 1,9 | 0,95 | Bal. | | | ■ | ■ | | | | | ■ | 387 |

SK 255-S

high alloyed steels

Classifications

SAW cored wire

DIN 8555

ASME IIC SFA 5.21

UP 10-GF-60-G

FeCr-A9

Characteristics

Cored wire for sub-arc welding designed to resist high stress grinding abrasion with low impact. The deposits will readily show stress relief cracks.

Microstructure: Primary carbides and eutectic carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 10 mm maximum in 2 to 3 layers

Welding flux: Record SA

Field of use

Palm oil expeller screws, groundnut oil expeller screws, cement conveyors screws, catalytic pipes, dredge pump impellers, dredge cutters, shovel bucket teeth.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|-----|-----|-----|------|---------|
| 4,6 | 0,9 | 0,5 | 27,0 | balance |

Typical mechanical properties

Hardness as welded: 58 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 3,2 | 325 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |

SK A45-S

high alloyed steels

Classifications

SAW cored wire

DIN 8555

UP 10-GF-65-GT

Characteristics

Chromium-Niobium-Molybdenum alloy with addition of Tungsten and Vanadium designed to resist high stress grinding abrasion with low impact and solid erosion at service temperatures up to 650 °C. The deposits will readily show stress relief cracks.

Microstructure: Complex carbides and Nb nodular carbides in an austenitic matrix

Machinability: Grinding only

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: 8 to 12 mm in 2 or 3 layers

Welding flux: Record SA, Record SR

Field of use

Wear plates, sinter finger crushers, exhaust fan blades in pellet plants, perlite crushers, bucket teeth and lips on bucketwheel excavators, Boiler fan blades, burden area in blast furnace bells, etc.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Nb | W | V | Fe |
|-----|-----|-----|------|-----|-----|-----|------|---------|
| 5,1 | 0,2 | 0,6 | 21,5 | 5,4 | 5,7 | 1,9 | 0,95 | balance |

Typical mechanical properties

Hardness as welded: 64 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 3,2 | 325 – 380 | 26 – 32 | 30 – 35 | 1,1 | 35 – 45 |

Submerged arc cored wires for anti-wear and anti-corrosion

4. Tool steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|--------------|------|---------------|----|-----|------|-----|-----|------|
| SK D35-S | 8555 | UP 5-GF-50-CT | | 47 | 0,12 | 0,2 | 0,5 | 15,0 |

applications

| Mo | Nb | W | V | Fe | Co | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|-----|----|---|---|------|------|---------------------|----------------------|---------|--------|---|---|---|---|------|
| 2,3 | | | | Bal. | 13,5 | | | | |  |  |  |  | 390 |

SK D35-S

tool steels

Classifications

SAW cored wire

DIN 8555

UP 5-GF-50-CT

Characteristics

Special Iron-Chromium-Cobalt-Molybdenum alloy designed to resist metal-to-metal wear, fatigue, oxidation, cavitation and corrosion at high temperature. The typical hardness can be achieved in the first layer.

| | |
|------------------------|---|
| Microstructure: | Martensite + 15 % ferrite (in first layer) |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Welding flux: | Record SA, Record SR |

Field of use

Continuous casting driving rollers, dies, mandrels, blanking punches, forming and punching tools, forging dies, swaging dies, pump elements.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Co | Fe |
|------|-----|-----|------|-----|------|---------|
| 0,12 | 0,2 | 0,5 | 15,0 | 2,3 | 13,5 | balance |

Typical mechanical properties

Hardness as welded: 47 HRC

Form of delivery and recommended welding parameters

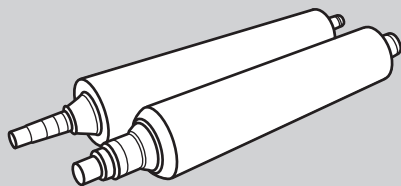
| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |

Submerged arc cored wires for anti-wear and anti-corrosion

5. Stainless steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|----------------|------|---------------------|-----|-----|------|-----|-----|------|
| SK 385-SA | 8555 | UP 6-GF-55-CG | | 54 | | 1,3 | 0,4 | 16,0 |
| SK 402-S | 8555 | UP 8-GF-150/400-KPZ | 150 | | 0,07 | 6,6 | 1,0 | 17,0 |
| SK 410 NiMo-SA | 8555 | UP 5-GF-40-C | | 39 | 0,05 | 1,0 | 0,3 | 12,5 |
| SK 415-SA | 8555 | UP 5-GF-45-C | | 42 | 0,08 | 0,9 | 0,4 | 13,5 |
| SK 420-SA | 8555 | UP 6-GF-55-C | | 53 | 0,27 | 1,3 | 0,3 | 13,5 |
| SK 430C-SA | 8555 | UP 5-GF-200-C | 175 | | 0,04 | 0,9 | 0,5 | 19,5 |
| SK 430 Mo-SA | 8555 | UP 6-GF-300-C | 260 | | 0,25 | 1,0 | 0,6 | 17,9 |
| SK 461C-SA | 8555 | UP 6-GF-50-C | | 54 | 0,26 | 0,9 | 0,5 | 12,2 |
| SK 461-SA | 8555 | UP 6-GF-45-C | | 43 | 0,22 | 0,9 | 0,5 | 13,5 |
| SK 740 L-SA | 8555 | UP 5-GF-45 | | 33 | 0,05 | 1,0 | 0,7 | 16,5 |
| SK 742 N-SK | 8555 | UP 5-GF-45-C | | 44 | 0,04 | 1,2 | 0,4 | 13,5 |

Solution example



Continuous casting roller

SK 742 N-SK

applications

| | Ni | Mo | Nb | W | V | Fe | Co | N | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--|-----|-----|-----|-----|------|------|-----|------|---------|--------|-----------|------------|---------------------|------|------|
| | | 0,5 | | | | Bal. | | | | | ■ | | ■ | | 394 |
| | 8,0 | | | | | Bal. | | | | ■ | ■ | | | | 395 |
| | 5,0 | 0,9 | | | | Bal. | | | | | ■ | | ■ | | 396 |
| | 2,1 | 1,1 | 0,2 | | 0,3 | Bal. | | | | | ■ | | ■ | | 397 |
| | | | | | | Bal. | | | | | ■ | | ■ | | 398 |
| | | | | | | Bal. | | | | | ■ | | ■ | | 399 |
| | | 1,0 | | | | Bal. | | | | | ■ | | ■ | | 400 |
| | 0,4 | 1,4 | | 0,9 | 1,0 | Bal. | 1,8 | | | | ■ | | ■ | | 401 |
| | | 2,0 | | 0,9 | 2,0 | Bal. | 1,8 | | | | ■ | | ■ | | 402 |
| | 3,7 | 1,7 | 0,2 | | 0,2 | Bal. | | | | | ■ | | ■ | | 403 |
| | 3,3 | 1,3 | 0,1 | | 0,15 | Bal. | | 0,06 | | | ■ | | ■ | | 404 |

SK 385-SA

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 6-GF-55-CG

Characteristics

Martensitic alloy designed to resist metal-to-metal wear, corrosion and thermal fatigue.

Microstructure: Chromium carbides in a martensitic matrix with residual austenite

Machinability: Fair with carbide tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Welding flux: Record SA

Field of use

Pinch rollers, bending rollers, deflector rollers, looper rollers.

Typical analysis in %

| Mn | Si | Cr | Mo | Fe |
|-----|-----|------|-----|---------|
| 1,3 | 0,4 | 16,0 | 0,5 | balance |

Typical mechanical properties

Hardness as welded: 54 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 402-S

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 8-GF-150/400-KPZ

Characteristics

Austenitic alloy type 18Cr8Ni7Mn recommended for build up and buffer layer prior to hardfacing. It can also be used for joining of dissimilar metals.

| | |
|------------------------|---|
| Microstructure: | Austenite |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | As required |
| Welding flux: | Record SA |

Field of use

Joining of wear plates on shovel buckets, rebuilding of rails, press rams, tramways rail bends.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|------|-----|-----|------|-----|---------|
| 0,07 | 6,6 | 1,0 | 17,0 | 8,0 | balance |

Typical mechanical properties

Hardness as welded: 150 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 3,2 | 325 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |

SK 410 NiMo-SA

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 5-GF-40-C

Characteristics

Alloy depositing a ferritic-martensitic steel containing 13 % Chromium, 5 % Nickel and 1 % Molybdenum designed to resist metal-to-metal wear, corrosion and thermal fatigue fire cracking.

| | |
|------------------------|---|
| Microstructure: | Martensite + 10 % Ferrite |
| Machinability: | Good with carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Welding flux: | Record SA |

Field of use

Continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Fe |
|------|-----|-----|------|-----|-----|---------|
| 0,05 | 1,0 | 0,3 | 12,5 | 5,0 | 0,9 | balance |

Typical mechanical properties

Hardness as welded: 39 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 415-SA

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 5-GF-45-C

Characteristics

Alloy depositing a ferritic-martensitic steel designed to resist metal-to-metal wear, corrosion and thermal fatigue.

| | |
|------------------------|---|
| Microstructure: | Martensite + 10 % Ferrite |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Welding flux: | Record SA, Record SK |

Field of use

Continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Nb | V | Fe |
|------|-----|-----|------|-----|-----|-----|-----|---------|
| 0,08 | 0,9 | 0,4 | 13,5 | 2,1 | 1,1 | 0,2 | 0,3 | balance |

Typical mechanical properties

Hardness as welded: 42 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 420-SA

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 6-GF-55-C

Characteristics

Alloy depositing a martensitic steel containing 13 % Chromium giving a good resistance to metal-to-metal wear and corrosion.

Microstructure: Martensite

Machinability: Good with cubic Boron Nitride tipped tools

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Welding flux: Record SA

Field of use

Dredging pump casings, continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|-----|-----|------|---------|
| 0,27 | 1,3 | 0,3 | 13,5 | balance |

Typical mechanical properties

Hardness as welded: 53 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 430C-SA

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 5-GF-200-C

Characteristics

Alloy depositing a ferritic steel containing 17 % Chromium designed to resist corrosion at high temperatures, particularly in presence of sulphurous gas.

Microstructure: Ferrite and few martensite

Machinability: Very good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Welding flux: Record SA, Record SK

Field of use

Continuous casting rollers situated at the top of the line, valves, steam and gas turbine parts, valve seats.

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|------|-----|-----|------|---------|
| 0,04 | 0,9 | 0,5 | 19,5 | balance |

Typical mechanical properties

Hardness as welded: 175 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 250 – 350 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 2,8 | 300 – 400 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 430 Mo-SA

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 6-GF-300-C

Characteristics

Alloy depositing a ferritic steel containing 17 % Chromium enhanced with Molybdenum addition designed to resist corrosion at high temperatures, particularly in presence of sulphurous gas.

Microstructure: Ferrite and few martensite

Machinability: Good

Oxy-acetylene cutting: Cannot be flame cut

Deposit thickness: Depends upon application and procedure used

Welding flux: Record SA, Record SK

Field of use

Continuous casting rollers, valves, steam and gas turbine parts, valve seats.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Fe |
|------|-----|-----|------|-----|---------|
| 0,25 | 1,0 | 0,6 | 17,9 | 1,0 | balance |

Typical mechanical properties

Hardness as welded: 260 HB

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 461C-SA

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 6-GF-50-C

Characteristics

Alloy depositing a ferritic-martensitic steel designed to resist metal-to-metal wear, corrosion and thermal fatigue fire cracking.

| | |
|------------------------|---|
| Microstructure: | Martensite + max 20 % ferrite |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Welding flux: | Record SA, Record SK |

Field of use

Continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Co | W | V | Fe |
|------|-----|-----|------|-----|-----|-----|-----|-----|---------|
| 0,26 | 0,9 | 0,5 | 12,2 | 0,4 | 1,4 | 1,8 | 0,9 | 1,0 | balance |

Typical mechanical properties

Hardness as welded: 54 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 250 – 350 | 28 – 30 | 30 – 35 | 1,1 | 35 – 50 |
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 461-SA

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 6-GF-45-C

Characteristics

Alloy depositing a ferritic-martensitic steel designed to resist metal-to-metal wear, corrosion and thermal fatigue fire cracking.

| | |
|------------------------|---|
| Microstructure: | Martensite + 20 % ferrite (second layer) |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Welding flux: | Record SA, Record SR |

Field of use

Continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Mo | Co | W | V | Fe |
|------|-----|-----|------|-----|-----|-----|-----|---------|
| 0,22 | 0,9 | 0,5 | 13,5 | 2,0 | 1,8 | 0,9 | 2,0 | balance |

Typical mechanical properties

Hardness as welded: 43 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |

SK 740 L-SA

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 5-GF-45

Characteristics

Alloy depositing a ferritic-martensitic steel in two layers on a CrMo steel containing 0,4 % C. It has been designed to resist metal-to-metal wear, corrosion and thermal fatigue fire cracking.

| | |
|------------------------|---|
| Microstructure: | Martensite + ferrite |
| Machinability: | Good with carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Welding flux: | Record SA |

Field of use

Continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Nb | V | Fe |
|------|-----|-----|------|-----|-----|-----|-----|---------|
| 0,05 | 1,0 | 0,7 | 16,5 | 3,7 | 1,7 | 0,2 | 0,2 | balance |

Typical mechanical properties

Hardness as welded: 33 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 450 | 28 – 30 | 25 – 35 | 1,1 | 30 – 50 |

SK 742 N-SK

stainless steels

Classifications

SAW cored wire

DIN 8555

UP 5-GF-45-C

Characteristics

Alloy depositing a ferritic-martensitic steel with addition of Nitrogen designed to enhance the resistance to thermal fatigue and intragranular corrosion by reducing the formation of carbides at grain boundaries.

| | |
|------------------------|---|
| Microstructure: | Martensite + 10 % Ferrite |
| Machinability: | Good with metallic carbide tipped tools |
| Oxy-acetylene cutting: | Cannot be flame cut |
| Deposit thickness: | Depends upon application and procedure used |
| Welding flux: | Record SK |

Field of use

Continuous casting rollers.

Typical analysis in %

| C | Mn | Si | Cr | Ni | Mo | Nb | V | N | Fe |
|------|-----|-----|------|-----|-----|-----|------|------|---------|
| 0,04 | 1,2 | 0,4 | 13,5 | 3,3 | 1,3 | 0,1 | 0,15 | 0,06 | balance |

Typical mechanical properties

Hardness as welded: 44 HRC

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out | Flux-Rate | Travel Speed (cm/min) |
|--------------------|-----------|---------|-----------|-----------|-----------------------|
| 2,4 | 275 – 450 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 2,8 | 300 – 400 | 28 – 30 | 30 – 35 | 1,1 | 35 – 45 |
| 3,2 | 325 – 500 | 28 – 32 | 30 – 35 | 1,1 | 40 – 50 |



405

SAW product selection table

| Cored wire | Flux | | |
|-------------------|-----------|-----------|-----------|
| | RECORD SA | RECORD SK | RECORD SR |
| SK 219-S | ■ | | |
| SK AP-Sw | ■ | | |
| SK 20CrMo-SA | ■ | | |
| SK 242-S | ■ | | |
| SK 258 NbC-SA | ■ | | ■ |
| SK 258L-SA | ■ | | ■ |
| SK 258-SA | ■ | | ■ |
| SK 263-SA | ■ | | ■ |
| SK 350-S | ■ | | |
| SK BU-S | ■ | | ■ |
| SK CrMo15-SA | ■ | | |
| SK SOUDOCORE-D-SA | ■ | | |
| SK 255-S | ■ | | |
| SK A45-S | ■ | | |
| SK 385-SA | ■ | | |
| SK 402-S | ■ | | |
| SK 410 NiMo-SA | ■ | | |
| SK 415-SA | ■ | | |
| SK 420-SA | ■ | | |
| SK 430 Mo-SA | ■ | ■ | |
| SK 430C-SA | ■ | ■ | |
| SK 461-CSA | ■ | ■ | |
| SK 461-SA | ■ | ■ | |
| SK 740L-SA | ■ | ■ | |
| SK 742 N-SK | | ■ | |
| SK D35-S | ■ | | ■ |
| Page | 407 | 408 | 409 |

RECORD SA

Classifications

SAW flux

EN 760

SA FB 3

Description

Highly basic agglomerated flux designed for hardfacing with cored wires or solid wires.

Very good slag removal even at high welding intensity levels.

Suitable with DC or AC.

General characteristics

| | |
|-------------------|---|
| Current: | DC (+ and -) and AC – 1000 A max. |
| Basicity index: | 3,4 (according to Bonizewski; calculated in mole %) |
| Grain size: | 0,4 – 1,4 mm (14 x 40 N° ASTM) |
| Apparent density: | 0,85 |
| Consumption: | 0,65 (kg fused flux / kg wire) |
| Redrying: | 1 to 2 hours at 350 +/- 50 °C |

Packing

25 kg (pail)

25 kg (bag)

RECORD SK**Classifications**

SAW flux

EN 760

SA FB 3

Description

Special agglomerated flux for hardfacing with high Nitrogen containing flux cored wire as SK 742N-SK.

Very good slag removal and weld bead appearance make this flux particularly suitable for the hardfacing of continuous casting rolls.

General characteristics

| | |
|-------------------|---|
| Current: | DC (+) – 1000 A max. |
| Basicity index: | 3,3 (according to Bonizewski; calculated in mole %) |
| Grain size: | 0,4 – 1,4 mm (14 x 40 N° ASTM) |
| Apparent density: | 0,8 |
| Consumption: | 0,7 (kg fused flux / kg wire) |
| Redrying: | 1 to 2 hours at 350 +/- 50 °C |

Packing

25 kg (bag)

RECORD SR

Classifications

SAW flux

EN 760

SA FB 3

Description

Highly basic agglomerated flux for hardfacing with solid and cored wires.

Suitable with DC and AC welding currents.

Easy slag removability and deposits free from porosities.

Very low hydrogen level and low hygroscopicity.

General characteristics

| | |
|-------------------|---|
| Current: | DC (+ and -) and AC – 1000 A max. |
| Basicity index: | 2,0 (according to Bonizewski; calculated in mole %) |
| Grain size: | 0,4 – 1 mm (14 x 60 N° ASTM) |
| Apparent density: | 1,0 |
| Consumption: | 0,7 (kg fused flux / kg wire) |
| Redrying: | 1 to 2 hours at 350 +/- 50 °C |

Packing

25 kg (bag)

List of contents

Cladding

Cladding

| | |
|-----------------------|-----|
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| 3. Solid wires | 421 |

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|---------------------|-----|
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|---------------------|-----|

Open arc cored wires

| | |
|---------------------|-----|
| 1. Stainless steels | 428 |
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SAW cored wires for anti-wear and anti-corrosion applications

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|---------------------|-----|

| | |
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| | |
|---|------------|
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|---|------------|

Strip cladding

| | |
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| 3. Cobalt alloys | 442 |

Strip cladding equipment

| | |
|-----------------------------|-----|
| 1. Strip cladding nozzles | 444 |
| 2. Magnetic steering device | 445 |

Cladding

1. Covered electrodes

| Product name | EN ISO | | AWS | | Mat.-No. | Page |
|--------------|--------|--------------------------------|-------|-------------|----------|------|
| UTP 759 Kb | 14172 | E Ni 6059 (NiCr23Mo16) | A5.11 | E NiCrMo-13 | 2.4609 | 412 |
| UTP 776 Kb | 14172 | E Ni 6276 (NiCr15Mo15Fe6W4) | A5.11 | E NiCrMo-4 | 2.4887 | 413 |
| UTP 4225 | 14172 | E Ni 8165 (NiCr25Fe30Mo) | | | 2.4652 | 414 |
| UTP 6222 Mo | 14172 | E Ni 6625 (NiCr22Mo9Nb) | A5.11 | E NiCrMo-3 | 2.4621 | 415 |

UTP 759 Kb

Classifications

covered electrode

| | | |
|------------------------|-------------|--------------|
| EN ISO 14172 | AWS A5.11 | Material-No. |
| E Ni 6059 (NiCr23Mo16) | E NiCrMo-13 | 2.4609 |

Characteristics and field of use

UTP 759 Kb is employed primarily for welding components in environmental plants and plants for chemical processes with highly corrosive media. Joint welding of matching base materials as Material-No. 2.4605 or similar matching materials as material No 2.4602 NiCr-21Mo14W. Joint welding of these materials with low-alloyed steels. Cladding on low-alloyed steels.

In addition to its good resistance to contaminated oxidating mineral acids, acetic acids and acetic anhydrides, hot contaminated sulphuric - and phosphoric acid, UTP 759 Kb has an excellent resistance against pitting and crevice corrosion. The special composition of the coating extensively prevents the precipitation of intermetallic phases.

UTP 759 Kb can be welded in all positions except vertical down. Stable arc, easy slag removal.

Typical analysis in %

| | | | | | | |
|--------|-------|-----|------|------|---------|-----|
| C | Si | Mn | Cr | Mo | Ni | Fe |
| < 0,02 | < 0,2 | 0,5 | 22,5 | 15,5 | balance | 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 450 | > 720 | > 30 | > 60 |

Welding instruction

Opening angle of the prepared seam approx. 70 °C, root gap approx. 2 mm. Weld stick electrode with slight tilt and with a short arc. String beads are welded. The interpass temperature of 150 °C and a max. weaving width 2,5 x diameter of the stick electrode core wire should not be exceeded. Re-dry the stick electrodes 2 – 3 hours at 250 – 300 °C before use and weld them out of a warm stick electrode carrier.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 06687)

Form of delivery and recommended welding parameters

| | | | |
|---------------------------------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 250 | 3,2 x 300 | 4,0 x 350 |
| Amperage | 50 – 70 | 70 – 100 | 90 – 130 |

UTP 776 Kb

Classifications

covered electrode

| | | |
|-----------------------------|------------|--------------|
| EN ISO 14172 | AWS A5.11 | Material-No. |
| E Ni 6276 (NiCr15Mo15Fe6W4) | E NiCrMo-4 | 2.4887 |

Characteristics and field of use

Joint welding of matching base materials, as Material-No. 2.4819 (NiMo16Cr15W) and surfacing on low-alloyed steels. It is employed primarily for welding components in plants for chemical processes with highly corrosive media, but also for surfacing press tools, punches etc. which operate at high temperatures.

In addition to its exceptional resistance to contaminated mineral acids, chlorine-contaminated media, and chloride containing media, it resists strong oxidisers such as ferric and cupric chlorides and is one of the few materials which will resist wet chlorine gas.

The stick electrode can be welded in all positions except vertical-down. Stable arc, easy slag removal.

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | W | Fe |
|--------|-------|-----|------|------|---------|-----|-----|
| < 0,02 | < 0,2 | 0,6 | 16,5 | 16,5 | balance | 4,0 | 5,0 |

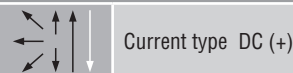
Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 450 | > 720 | > 30 | > 70 |

Welding instruction

For avoidance of intermetallic precipitation the stick electrode should be welded with lowest possible heat input and minimum interpass temperature. Beam width of the prepared seam approx. 70°, root gap approx. 2 mm. Weld stick electrode with slight tilt and with a short arc. String beads are welded. The interpass temperature of 150 °C and a max. weaving width 2,5 x diameter of the stick electrode core wire should not be exceeded. Re-dry the stick electrodes 2 – 3 hours at 250 – 300 °C before use and weld them out of a warm stick electrode carrier.

Welding positions



Approvals

TÜV (No. 05257)

Form of delivery and recommended welding parameters

| | | | |
|---------------------------------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 250 | 3,2 x 300 | 4,0 x 350 |
| Amperage | 50 – 70 | 70 – 100 | 90 – 130 |

UTP 4225

Classifications

covered electrode

EN ISO 14172

Material-No.

E Ni 8165 (NiCr25Fe30Mo)

2.4652

Characteristics and field of use

UTP 4225 is suitable for joining and surfacing of alloys of similar nature, such as e.g. NiCr21Mo, furthermore for welding of CrNiMoCu-alloyed austenitic steels used for high quality tank and apparatus construction in the chemical industry, corrosion resistance in media of sulphuric- and phosphoric acid.

The stick electrode can be welded in all positions except vertical-down. Stable arc, easy slag removal. The seam is finely rippled and notch-free. The weld metal UTP 4225 is resistant against pitting and stress corrosion cracking in media containing chloride ions. High resistance against reducing acids due to the combination of nickel, molybdenum and copper. Resistant in oxidising acids. UTP 4225 results in a fully austenitic weld metal.

Typical analysis in %

| C | Si | Mn | Cr | Mo | Ni | Cu | Fe |
|--------|-----|-----|------|-----|------|-----|---------|
| < 0,03 | 0,4 | 2,5 | 26,0 | 6,0 | 40,0 | 1,8 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J |
| > 350 | > 550 | > 30 | > 80 |

Welding instruction

The welding zone must be free from residues. Opening angle of the prepared seam 70 – 80°, root gap approx. 2 mm. Weld stick electrode with a slight tilt and with short arc. String beads are welded, if necessary, with little weaving, max. weaving width 2,5 x diameter of the stick electrode core wire. Weldable with very low current adjustment. The end crater should be filled thoroughly and the arc must be drawn away to the side. Re-dry the stick electrodes for 2 – 3 hours at 250 – 300 °C before use and weld them out of a warm electrode carrier.

Welding positions



Current type DC (+)

Approvals

TÜV (No. 06680)

Form of delivery and recommended welding parameters

| | | |
|-------------------------------|-----------|-----------|
| Electrodes \emptyset mm x L | 3,2 x 350 | 4,0 x 350 |
| Amperage | 70 – 100 | 90 – 120 |

UTP 6222 Mo

Classifications

covered electrode

| | | |
|-------------------------|------------|--------------|
| EN ISO 14172 | AWS A5.11 | Material-No. |
| E Ni 6625 (NiCr22Mo9Nb) | E NiCrMo-3 | 2.4621 |

Characteristics and field of use

UTP 6222 Mo is particularly suited for joining and surfacing on nickel alloys, austenitic steels, low temperature nickel steels, austenitic-ferritic-joints and claddings of the same or similar nature, like 2.4856 (NiCr22Mo 9 Nb), 1.4876 (X30 NiCrAlTi 32 20), 1.4529 (X2 NiCrMoCu 25 20 5).

The weld metal is heat resistant and suitable for operating temperatures up to 1000 °C. It must be noted that a slight decrease in ductility will occur if prolonged heat treatment is given within the temperature range 600 – 800 °C. Scale-resisting in low-sulphur atmosphere up to 1100 °C. High creep strength.

Typical analysis in %

| | | | | | | | |
|------|-----|-----|------|-----|---------|-----|-----|
| C | Si | Mn | Cr | Mo | Ni | Nb | Fe |
| 0,03 | 0,4 | 0,6 | 22,0 | 9,0 | balance | 3,3 | < 1 |

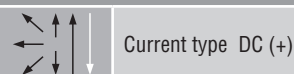
Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V | |
|---------------------------|------------------------|----------------|-----------------------|---------|
| MPa | MPa | % | J | -196 °C |
| > 450 | > 760 | > 30 | > 75 | 45 |

Welding instruction

Opening angle of the prepared seam approx. 70°, root gap approx. 2 mm. Weld stick electrode with slight tilt and short arc. String beads are welded. The interpass temperature of 150 °C and a max. weaving with 2,5 x diameter of the stick electrode core wire should not be exceeded. Re-dry the stick electrodes 2 – 3 hours at 250 – 300 °C before use and weld them out of a warm electrode carrier.

Welding positions



Approvals

TÜV (No. 03610), DNV, ABS, GL, BV

Form of delivery and recommended welding parameters

| | | | | |
|---------------------------------|-----------|-----------|-----------|-----------|
| Electrodes \varnothing mm x L | 2,5 x 250 | 3,2 x 300 | 4,0 x 350 | 5,0 x 400 |
| Amperage | 50 – 70 | 70 – 95 | 90 – 120 | 120 – 160 |

Cladding

2. TIG rods

| Product name | EN ISO | | AWS | | Mat.-No. | Page |
|---------------|--------|--------------------------------|-------|-----------------------------|----------|------|
| UTP A 759 | 18274 | S Ni 6059 (NiCr23Mo16) | A5.14 | ER NiCrMo-13 | 2.4607 | 417 |
| UTP A 776 | 18274 | S Ni 6276 (NiCr15Mo16Fe6W4) | A5.14 | ER NiCrMo-4 | 2.4886 | 418 |
| UTP A 4221 | 18274 | S Ni 8065 (NiFe30Cr21Mo3) | A5.14 | ER NiFeCr-1 (UNS N08065) | | 419 |
| UTP A 6222 Mo | 18274 | S Ni 6625 (NiCr22Mo9Nb) | A5.14 | ER NiCrMo-3 | 2.4831 | 420 |

UTP A 759

Classifications

TIG rod

| | | |
|------------------------|--------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6059 (NiCr23Mo16) | ER NiCrMo-13 | 2.4607 |

Characteristics and field of use

UTP A 759 is suitable for welding components in plants for chemical processes with highly corrosive media.

For joining materials of the same or similar natures, e.g.

| | | |
|--------|--------------|------------|
| 2.4602 | NiCr21Mo14W | UNS N06022 |
| 2.4605 | NiCr23Mo16Al | UNS N06059 |
| 2.4610 | NiMo16Cr16Ti | UNS N06455 |
| 2.4819 | NiMo16Cr15W | UNS N10276 |

and these materials with low alloyed steels such as for surfacing on low alloyed steels.

Good corrosion resistance against acetic acid and acetic hydride, hot contaminated sulphuric and phosphoric acids and other contaminated oxidising mineral acids. Intermetallic precipitation will be largely avoided.

Typical analysis in %

| | | | | | |
|--------|-----|------|------|---------|-------|
| C | Si | Cr | Mo | Ni | Fe |
| < 0,01 | 0,1 | 22,5 | 15,5 | balance | < 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| > 450 | > 720 | > 35 | > 100 |

Welding instruction

The welding area has to be free from impurities (oil, paint, grease and dust). Minimize heat input. The interpass temperature should not exceed 150° C. Heat input < 12 kJ/cm

Approvals

TÜV (No. 06068), GL

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | R 1 |
| 2,0 x 1000 | DC (-) | R 1 |
| 2,4 x 1000 | DC (-) | R 1 |
| 3,2 x 1000* | DC (-) | R 1 |

*available on request

UTP A 776

Classifications

TIG rod

EN ISO 18274

AWS A5.14

Material-No.

S Ni 6276 (NiCr15Mo16Fe6W4)

ER NiCrMo-4

2.4886

Characteristics and field of use

UTP A 776 is suitable for joint welding of matching base materials, as 2.4819 NiMo16Cr15W UNS N10276 and surface weldings on low-alloyed steels.

UTP A 776 is employed primarily for welding components in plants for chemical processes with highly corrosive media, but also for surfacing press tools, punches, etc. which operate at high temperature.

Excellent resistance against sulphuric acids at high chloride concentrations.

Typical analysis in %

| C | Si | Cr | Mo | Ni | V | W | Fe |
|--------|------|------|------|---------|-----|-----|-----|
| < 0,01 | 0,07 | 16,0 | 16,0 | balance | 0,2 | 3,5 | 6,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| > 450 | > 750 | > 30 | > 90 |

Welding instruction

To avoid intermetallic precipitations, the rod should be welded with lowest possible heat input and interpass temperature.

Approvals

TÜV (No. 05587)

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | R 1 |
| 2,0 x 1000 | DC (-) | R 1 |
| 2,4 x 1000 | DC (-) | R 1 |
| 3,2 x 1000 | DC (-) | R 1 |

UTP A 4221

Classifications

TIG rod

EN ISO 18274

AWS A5.14

S Ni 8065 (NiFe30Cr21Mo3)

ER NiFeCr-1 (UNS N08065)

Characteristics and field of use

UTP A 4221 is suitable for joining and surfacing of alloys of similar nature, furthermore for welding of CrNi-MoCu-alloyed austenitic steels used for high quality tank and apparatus construction in the chemical industry, corrosion resistance in media of sulphuric and phosphoric acid.

UTP A 4221 is specially designed for welding alloy 825 (2.4858, UNS N08825).

Fully austenitic weld metal with high resistance against stress corrosion cracking and pitting in media containing chloride ions. Good corrosion resistance against reducing acids due to the combination of Ni, Mo and Cu. Sufficient resistance against oxidizing acids. The weld metal is corrosion resistant in sea water.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Mo | Cu | Fe |
|------|------|-----|------|------|-----|-----|---------|
| 0,01 | 0,25 | 0,8 | 20,5 | 41,0 | 3,1 | 1,8 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 360 | > 550 | > 30 | > 100 |

Welding instruction

The welding area has to be free from impurities (oil, paint, markings). Minimize heat input. The interpass temperature should not exceed 120 °C.

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 2,4 x 1000 | DC (-) | I 1 |

UTP A 6222 Mo

Classifications

TIG rod

EN ISO 18274

AWS A5.14

Material-No.

S Ni 6625 (NiCr22Mo9Nb)

ER NiCrMo-3

2.4831

Characteristics and field of use

UTP A 6222 Mo has a high nickel content and is suitable for welding high-strength and high-corrosion resistant nickel-base alloys, e. g.

X1 NiCrMoCuN25206

1.4529

UNS N08926

X1 NiCrMoCuN25205

1.4539

UNS N08904

NiCr21Mo

2.4858

UNS N08825

NiCr22Mo9Nb

2.4856

UNS N06625

It can be used for joining ferritic steel to austenitic steel as well as for surfacing on steel. It is also possible to weld 9 % nickel steels using this wire due to its high yield strength. Its wide range of uses is of particular significance in aviation, in chemical industry and in applications involving seawater.

The special features of the weld metal of UTP A 6222 Mo include a good creep rupture strength, corrosion resistance, resistance to stress and hot cracking. It is highly resistant and tough even at working temperatures up to 1100° C. It has an extremely good fatigue resistance due to the alloying elements Mo and Nb in the NiCr-matrix. The weld metal is highly resistant to oxidation and is almost immune to stress corrosion cracking. It resists intergranular penetration without having been heat-treated.

Typical analysis in %

| C | Si | Cr | Mo | Ni | Nb | Fe |
|--------|-------|------|-----|---------|-----|-----|
| < 0,02 | < 0,2 | 22,0 | 9,0 | balance | 3,5 | 1,0 |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] -196° C |
| > 460 | > 740 | > 30 | > 100 > 85 |

Welding instruction

The welding area has to be free from impurities (oil, paint, grease). Minimize heat input. The interpass temperature should not exceed 150° C. Heat input < 12 kJ/cm

Approvals

TÜV (No. 03461), GL, DNV, ABS

Form of delivery and recommended welding parameters

| Rod diameter x length (mm) | Current type | Shielding gas (EN ISO 14175) |
|----------------------------|--------------|------------------------------|
| 1,6 x 1000 | DC (-) | R 1 |
| 2,0 x 1000 | DC (-) | R 1 |
| 2,4 x 1000 | DC (-) | R 1 |
| 3,2 x 1000* | DC (-) | R 1 |

*available on request

Cladding

3. Solid wires

| Product name | EN ISO | AWS | Mat.-No. | Page |
|-----------------|--------|------------------------------|-----------------------------------|------------|
| UTP A 786 | 18274 | S Ni 6686 (NiCr21Mo16W4) | A5.14 ER NiCrMo-14 | 422 |
| UTP A 4221 | 18274 | S Ni 8065 (NiFe30Cr21Mo3) | A5.14 ER NiFeCr-1 (UNS N08065) | 423 |
| UTP A 6222 Mo | 18274 | S Ni 6625 (NiCr22Mo9Nb) | A5.14 ER NiCrMo-3 | 2.4831 424 |
| UTP A 6222 Mo-3 | 18274 | S Ni 6625 (NiCr22Mo9Nb) | A5.14 ER NiCrMo-3 | 2.4831 425 |

UTP A 786

Classifications

solid wire

EN ISO 18274

AWS A5.14

S Ni 6686 (NiCr21Mo16W4)

ER NiCrMo-14

Characteristics and field of use

UTP A 786 is suitable for joining and surfacing of high corrosion resistant NiCrMo alloys for chemical processes in highly corrosive reducing and oxidizing environments.

UTP A 786 is particularly designed for claddings of desulphurization and waste incineration components such as pipes and finned tubes made of heat resistant steels.

Joining of similar or dissimilar base materials:

Nickel base alloys

2.4602 NiCr21Mo14W

2.4605 NiCr23Mo16Al

2.4606 NiCr21Mo16W

2.4610 NiMo16Cr16Ti

2.4819 NiMo16Cr15W

Low alloyed steels

16Mo3, ASTM A 312 Gr. T11/T12

Typical analysis in %

| C | Si | Mn | Cr | Mo | W | Al | Fe | Ni |
|------|------|-------|------|------|-----|-----|-------|---------|
| 0,01 | 0,08 | < 0,5 | 22,8 | 16,0 | 3,8 | 0,3 | < 1,0 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_V |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| > 450 | > 760 | > 30 | > 50 |

Welding instruction

Clean the welding area thoroughly. Preheating of large parts at approx. 80°C, interpass temperature max. 150°C. Use MIG pulse welding process with a low heat input (< 10 kJ/cm).

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,0 | DC (+) | Z-ArHeH2Co2-30/2/0,05 |
| 1,2 | DC (+) | Z-ArHeH2Co2-30/2/0,05 |

UTP A 4221

Classifications

solid wire

EN ISO 18274

AWS A5.14

S Ni 8065 (NiFe30Cr21Mo3)

ER NiFeCr-1 (UNS N08065)

Characteristics and field of use

UTP A 4221 is suitable for joining and surfacing of alloys of similar nature, furthermore for welding of CrNi-MoCu-alloyed austenitic steels used for high quality tank and apparatus construction in the chemical industry, corrosion resistance in media of sulphuric and phosphoric acid.

UTP A 4221 is specially designed for welding alloy 825 (2.4858, UNS N08825).

Fully austenitic weld metal with high resistance against stress corrosion cracking and pitting in media containing chloride ions. Good corrosion resistance against reducing acids due to the combination of Ni, Mo and Cu. Sufficient resistance against oxidizing acids. The weld metal is corrosion resistant in sea water.

Typical analysis in %

| C | Si | Mn | Cr | Ni | Mo | Cu | Fe |
|------|------|-----|------|------|-----|-----|---------|
| 0,01 | 0,25 | 0,8 | 20,5 | 41,0 | 3,1 | 1,8 | balance |

Mechanical properties of the weld metal

| Yield strength $R_{p0,2}$ | Tensile strength R_m | Elongation A | Impact strength K_v |
|---------------------------|------------------------|----------------|-----------------------|
| MPa | MPa | % | J [RT] |
| 360 | > 550 | > 30 | > 100 |

Welding instruction

The welding area has to be free from impurities (oil, paint, markings). Minimize heat input. The interpass temperature should not exceed 120 °C.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | Shielding gas (EN ISO 14175) |
|--------------------|--------------|------------------------------|
| 1,2 | DC (+) | I 1 |

UTP A 6222 Mo

Classifications

solid wire

| | | |
|-------------------------|-------------|--------------|
| EN ISO 18274 | AWS A5.14 | Material-No. |
| S Ni 6625 (NiCr22Mo9Nb) | ER NiCrMo-3 | 2.4831 |

Characteristics and field of use

UTP A 6222 Mo has a high nickel content and is suitable for welding high-strength and high-corrosion resistant nickel-base alloys, e. g.

| | | |
|-------------------|--------|------------|
| X1 NiCrMoCuN25206 | 1.4529 | UNS N08926 |
| X1 NiCrMoCuN25205 | 1.4539 | UNS N08904 |
| NiCr21Mo | 2.4858 | UNS N08825 |
| NiCr22Mo9Nb | 2.4856 | UNS N06625 |

It can be used for joining ferritic steel to austenitic steel as well as for surfacing on steel. It is also possible to weld 9 % nickel steels using this wire due to its high yield strength. Its wide range of uses is of particular significance in aviation, in chemical industry and in applications involving seawater.

The special features of the weld metal of UTP A 6222 Mo include a good creep rupture strength, corrosion resistance, resistance to stress and hot cracking. It is highly resistant and tough even at working temperatures up to 1100 °C. It has an extremely good fatigue resistance due to the alloying elements Mo and Nb in the NiCr-matrix. The weld metal is highly resistant to oxidation and is almost immune to stress corrosion cracking. It resists intergranular penetration without having been heat-treated.

Typical analysis in %

| | | | | | | |
|--------|-------|------|-----|---------|-----|-----|
| C | Si | Cr | Mo | Ni | Nb | Fe |
| < 0,02 | < 0,2 | 22,0 | 9,0 | balance | 3,5 | 1,0 |

Mechanical properties of the weld metal

| | | | | |
|----------------------------------|-------------------------------|---------------------|------------------------------|---------|
| <i>Yield strength</i> $R_{p0,2}$ | <i>Tensile strength</i> R_m | <i>Elongation</i> A | <i>Impact strength</i> K_v | |
| MPa | MPa | % | J (RT) | -196 °C |
| > 460 | > 740 | > 30 | > 100 | > 85 |

Welding instruction

The welding area has to be free from impurities (oil, paint, grease and dust). Minimize heat input. The interpass temperature should not exceed 150 °C. Heat input < 12 kJ/cm.

Approvals

TÜV (No. 03460), GL, DNV, ABS

Form of delivery and recommended welding parameters

| | | | |
|---------------------------|---------------------|-------------------------------------|--------------------|
| <i>Wire diameter (mm)</i> | <i>Current type</i> | <i>Shielding gas (EN ISO 14175)</i> | |
| 0,8* | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |
| 1,0 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |
| 1,2 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |
| 1,6 | DC (+) | I 1 | Z-ArHeHC-30/2/0,05 |

*available on request

UTP A 6222 Mo-3

Classifications

solid wire

EN ISO 18274

AWS A5.14

Material-No.

S Ni 6625 (NiCr22Mo9Nb)

ER NiCrMo-3

2.4831

Characteristics and field of use

UTP A 6222 Mo-3 has been developed for applications in the oil & gas industry, and is mainly used for cladding and joining of unalloyed and high strength low alloyed steel (HSLA) components. Typical applications are internal cladding of tubes & pipes, risers, and subsea components such as manifolds, BOPs, Christmas trees, well heads, flanges, valve bodies, blocks etc. to improve corrosion resistance to surfaces exposed to hydrocarbon and hydrogen sulphide.

Typical base metals for these applications are SAE 4130, SAE 8630, F 22, F 65. UTP A 6222 Mo-3 has excellent dissimilar materials welding characteristics and can be used for joining components produced from a variety of clad and base metal alloys such as austenitic, super austenitic, martensitic, Duplex and Super Duplex stainless steels.

UTP A 6222 Mo-3 is manufactured to optimise wire-feed and weld pool delivery characteristics, via consistent metallurgical quality raw material and physical control of wire processing, pre-requisites for successful cold and hot wire GTAW/TIG applications where the highest quality standards have to be fulfilled. The wire can also be successfully applied using the GMAW/MIG process.

UTP A 6222 Mo-3 can be welded with either cold- or hot wire automated TIG (GTAW) or MIG (GMAW) processes.

Typical analysis in %

| C | Si | Cr | Mo | Nb | Fe | Ni |
|--------|-------|------|-----|-----|------|---------|
| ≤ 0,02 | ≤ 0,2 | 22,0 | 9,0 | 3,5 | <1,0 | balance |

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Current type | | Shielding gas (EN ISO 14175) | |
|--------------------|--------------|--------|------------------------------|-------------------|
| | TIG | MIG | | |
| 0,9 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |
| 1,0 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |
| 1,14 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |
| 1,2 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |
| 1,6 | DC (-) | DC (+) | I 1 | Z-ArHeHC-30/2/0,5 |

Gas shielded cored wires

1. Stainless steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr |
|--------------------|------|----------------|-----|-----|------|-----|-----|------|
| SK 307-G | 8555 | MF 8-GF-150-KP | 155 | | 0,1 | 7,1 | 0,8 | 17,9 |
| SK 356-G | 8555 | MF 4-GF-50-ST | | 47 | 0,7 | 1,2 | 0,9 | 12,0 |
| SK 402-G | 8555 | MF 8-GF-150-KP | 170 | | 0,1 | 6,6 | 0,6 | 17,1 |
| SK 410C-G | 8555 | MF 5-GF-40-C | | 40 | 0,08 | 0,7 | 0,4 | 13,0 |
| SK 420 Mo-G | 8555 | MF 6-GF-55-C | | 54 | 0,24 | 1,0 | 0,4 | 12,0 |
| SK 430-G | 8555 | MF 5-GF-200-C | 190 | | 0,06 | 0,8 | 0,6 | 17,8 |
| SK 430 Mo-G | | | 260 | | 0,25 | 1,0 | 0,6 | 19,0 |
| SK 519-G | 8555 | MF 8-GF-C | | | 0,02 | 2,8 | 0,5 | 20,5 |
| SK 741-G | 8555 | MF 5-GF-40-C | | 41 | 0,06 | 0,5 | 0,6 | 13,0 |
| SK 768-G | 8555 | MF 5-GF-350-C | | 34 | 0,02 | 0,3 | 0,3 | 14,5 |
| SK ANTINIT DUR 290 | 8555 | MF 9-GF-250-CT | 250 | | 0,06 | 1,9 | 5,6 | 17,0 |
| SK ANTINIT DUR 500 | 8555 | MF 9-GF-45-CT | | 43 | 0,07 | 4,3 | 4,5 | 17,5 |

Product data sheets: Chapter FCAW-G – gas shielded cored wires

| | Ni | Mo | Nb | Ti | W | V | Fe | Cu | Low stress abrasion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--|------|-----|-----------------|-----|-----|-----|------|-----|---------------------|--------|-----------|------------|---------------------|------|------|
| | 8,5 | | | | | | Bal. | 0,2 | | | ■ | | ■ | | 268 |
| | 0,7 | 3,8 | | | 0,9 | 2,0 | Bal. | | ■ | ■ | | | ■ | | 269 |
| | 7,8 | | | | | | Bal. | | | ■ | | | | | 270 |
| | | | | | | | Bal. | | | | ■ | | ■ | | 271 |
| | | 0,7 | | | | | Bal. | | | | ■ | | ■ | | 272 |
| | | | | 0,2 | | | Bal. | | | | ■ | | | | 273 |
| | | 0,9 | | | | | Bal. | | | | ■ | | | | 274 |
| | 24,2 | 5,0 | Other: N = 0,12 | | | | Bal. | 1,1 | | ■ | ■ | | | | 275 |
| | 5,5 | 0,8 | | | | | Bal. | | | | ■ | | ■ | | 276 |
| | 6,3 | 2,5 | | | | | Bal. | | | | ■ | | ■ | | 277 |
| | 8,3 | | | | | | Bal. | | | | ■ | ■ | ■ | ■ | 278 |
| | 8,0 | 5,4 | 1,0 | | | | Bal. | | | | ■ | ■ | ■ | ■ | 279 |

Open arc cored wires

1. Stainless steels

| Product name | DIN | | HB | HRC | C | Mn | Si | Cr | |
|--------------|------|---------------------|-----|-----|------|-----|-----|------|--|
| SK 308L-O | 8555 | MF 9-GF-150-C | 170 | | 0,02 | 0,8 | 0,9 | 20 | |
| SK 309L-O | 8555 | MF 9-GF-150 | 170 | | 0,03 | 0,8 | 0,9 | 23 | |
| SK 370-O | 8555 | MF 5-GF-400-C | | 42 | 0,03 | 0,5 | 0,6 | 15,5 | |
| SK 402-O | 8555 | MF 8-GF-150/400-KPZ | 160 | | 0,09 | 6 | 0,9 | 18 | |
| SK 415-O | 8555 | MF 5-GF-50-C | | 48 | 0,19 | 0,8 | 0,7 | 13 | |
| SK 420-O | 8555 | MF 6-GF-55-C | | 54 | 0,4 | 0,7 | 0,2 | 13,5 | |
| SK 430-O | 8555 | MF 5-GF-250-C | 260 | | 0,04 | 0,9 | 0,2 | 17 | |
| SK 714 N-O | 8555 | MF 5-GF-45 | | 44 | 0,03 | 1 | 0,6 | 13 | |
| SK 741-O | 8555 | MF 5-GF-45-C | | 43 | 0,02 | 0,6 | 0,6 | 12,6 | |

Product data sheets: Chapter FCAW-O – open arc cored wires

| | Ni | Mo | Nb | Ti | V | Fe | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--|-----|-----|-----------------|------|------|------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| | 9,5 | | | | | Bal. | | | | | ■ | | | | 338 |
| | 12 | | | | | Bal. | | | | | ■ | | | | 339 |
| | 5,2 | 0,5 | | | | Bal. | | | | | ■ | | ■ | ■ | 340 |
| | 7,8 | | | | | Bal. | | ■ | | | ■ | | | | 341 |
| | 2,2 | 1 | | 0,25 | 0,35 | Bal. | | | | | ■ | | ■ | ■ | 342 |
| | | 0,2 | | | | Bal. | | | | | ■ | | ■ | | 343 |
| | | | | | | Bal. | | | | | ■ | | | | 344 |
| | 4,2 | 0,5 | Other: N = 0,10 | | | Bal. | | | | | ■ | | ■ | | 345 |
| | 5,2 | 0,8 | | | | Bal. | | | | | ■ | | ■ | ■ | 346 |

SAW cored wires for anti-wear and anti-corrosion applications

1. Stainless steels

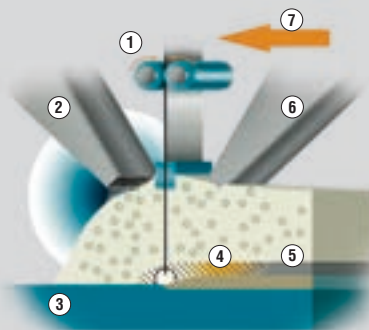
| Product name | DIN | | HB | HRC | C | Mn | Si | Cr | |
|----------------|------|---------------------|-----|-----|------|-----|-----|------|--|
| SK 385-SA | 8555 | UP 6-GF-55-CG | | 54 | 0,3 | 1,3 | 0,4 | 16 | |
| SK 402-S | 8555 | UP 8-GF-150/400-KPZ | 150 | | 0,07 | 6,6 | 1 | 17 | |
| SK 410 NiMo-SA | 8555 | UP 5-GF-40-C | | 39 | 0,05 | 1 | 0,3 | 12,5 | |
| SK 415-SA | 8555 | UP 5-GF-45-C | | 42 | 0,08 | 0,9 | 0,4 | 13,5 | |
| SK 420-SA | 8555 | UP 6-GF-55-C | | 53 | 0,27 | 1,3 | 0,3 | 13,5 | |
| SK 430C-SA | 8555 | UP 5-GF-200-C | 260 | | 0,25 | 1 | 0,6 | 17,9 | |
| SK 430 Mo-SA | 8555 | UP 6-GF-300-C | 175 | | 0,04 | 0,9 | 0,5 | 19,5 | |
| SK 461C-SA | 8555 | UP 6-GF-50-C | | 54 | 0,26 | 0,9 | 0,5 | 12,2 | |
| SK 461-SA | 8555 | UP 6-GF-45-C | | 43 | 0,22 | 0,9 | 0,5 | 13,5 | |
| SK 740 L-SA | 8555 | UP 5-GF-45-C | | 33 | 0,05 | 1 | 0,7 | 16,5 | |
| SK 742 N-SK | 8555 | UP 5-GF-45-C | | 44 | 0,04 | 1,2 | 0,4 | 13,5 | |

Product data sheets: Chapter SAW – cored wires and fluxes

| | Ni | Mo | Nb | W | V | Fe | Co | N | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--|-----|-----|-----|-----|------|------|-----|------|---------|--------|-----------|------------|---------------------|------|------|
| | | 0,5 | | | | Bal. | | | | | ■ | | ■ | | 394 |
| | 8 | | | | | Bal. | | | | ■ | ■ | | | | 395 |
| | 5 | 0,9 | | | | Bal. | | | | | ■ | | ■ | | 396 |
| | 2,1 | 1,1 | 0,2 | | 0,3 | Bal. | | | | | ■ | | ■ | | 397 |
| | | | | | | Bal. | | | | | ■ | | ■ | | 398 |
| | | 1 | | | | Bal. | | | | | ■ | | ■ | | 399 |
| | | | | | | Bal. | | | | | ■ | | ■ | | 400 |
| | 0,4 | 1,4 | | 0,9 | 1 | Bal. | 1,8 | | | | ■ | | ■ | | 401 |
| | | 2 | | 0,9 | 2 | Bal. | 1,8 | | | | ■ | | ■ | | 402 |
| | 3,7 | 1,7 | 0,2 | | 0,2 | Bal. | | | | | ■ | | ■ | | 403 |
| | 3,3 | 1,3 | 0,1 | | 0,15 | Bal. | | 0,06 | | | ■ | | ■ | | 404 |

Description of (SAW) submerged arc strip cladding

- ① Strip feed & regulation
- ② Flux feed hopper
- ③ Base metal
- ④ Solidified slag
- ⑤ Liquid slag
- ⑥ Flux feed hopper
- ⑦ Direction of the welding

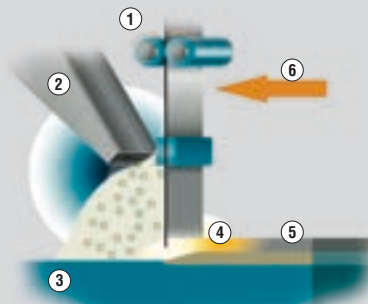


Submerged arc (SAW) strip cladding can easily be compared to submerged arc welding with wire. You “only” have to replace the wire by a strip. The strip is fed through two driving rolls. The current is transferred to the strip by two contact shoes, which have approximately the same width of the strip and are especially designed for optimal current transfer to the strip. The flux is fed from two sides by two flux hoppers. The bottom of the strip is therefore totally submerged by flux. The energy needed to melt the strip is provided by an electric arc. The flux is also melted and a liquid slag forms on the top of the liquid metal. As the process progresses, the slag solidifies and detaches automatically.

- High deposition rate
- High quality weld metal
- Easy slag removal

Description of (ESW) electro slag strip cladding

- ① Strip feed & regulation
- ② Flux feed hopper
- ③ Base metal
- ④ Solidified slag
- ⑤ Liquid slag
- ⑥ Direction of the welding



The electroslag welding process (ESW) slightly differs from the SAW strip cladding process in the fact that the flux is fed only from one side and that there is no electric arc. The liquid slag is electroconductive and conducts the energy required to melt the strip and flux by Joule-effect. When the strip arrives in the welding pool, it melts. As the slag solidifies, it forms a protective layer on the hot metal and then detaches automatically.

- Lower penetration
- Lower dilution (down to 7%)
- High current density resulting to higher deposition rate (up to 50 kg/h)
- Open weld pool
- Special high speed fluxes (up to 45 cm/min)
- High deposition rate (up to 1,2m²/h)
- Perfect overlap and very flat bead surface with magnetic steering
- Low flux consumption

Strip cladding

1. Unalloyed, fine grained and low alloyed steels

| Type of deposited alloy | Welding process | Layer | Type of strip (60 x 0,5 mm) | Type of flux | Chemical analyses | | |
|-------------------------|-----------------|-------------------|--------------------------------|--------------|-------------------|-----|--|
| | | | Soudotape | + Record | C | Mn | |
| Unalloyed steel | SAW | 1.+2. L: strip | A | | 0,025 | 0,2 | |
| | | 2. L: deposit | A | S 46 T | 0,055 | 1,0 | |
| | | 1.+2. L: strip | A | | 0,025 | 0,2 | |
| | | 2. L: deposit | A | RT 146 | 0,055 | 1,0 | |
| 0,5 Mo | SAW | 1.+2. L: strip | A | | 0,025 | 0,2 | |
| | | 2. L: deposit | A | SMoTW | 0,042 | 1,0 | |
| 1 Ni - 0,5 Mo | SAW | 1.+2. L: strip | A | | 0,025 | 0,2 | |
| | | 2. L: deposit | A | NiMo15T | 0,116 | 0,7 | |
| 1,5 Cr - 0,5 Mo | SAW | 1.+2.+3. L: strip | A | | 0,025 | 0,2 | |
| | | 2. L: deposit | A | CrMo15TW | 0,060 | 0,4 | |
| | | 3. L: deposit | A | CrMo15TW | 0,036 | 0,5 | |
| 2 Cr - 0,5 Mo | SAW | 1.+2.+3. L: strip | A | | 0,025 | 0,2 | |
| | | 1. L: deposit | A | CrMo25TW | 0,140 | 0,6 | |
| | | 2. L: deposit | A | CrMo25TW | 0,110 | 0,7 | |
| | | 3. L: deposit | A | CrMo25TW | 0,080 | 0,6 | |
| 3 Cr - 0,5 Mo | SAW | 1.+2.+3. L: strip | A | | 0,025 | 0,2 | |
| | | 3. L: deposit | A | RT 250 | 0,080 | 0,7 | |
| 5 Cr - 0,9 Mo | SAW | 1.+2.+3. L: strip | A | | 0,025 | 0,2 | |
| | | 2. L: deposit | A | RT 350 | 0,070 | 0,3 | |
| | | 3. L: deposit | A | RT 350 | 0,080 | 0,3 | |

| on a 0,2% C plate (typical) (weight - %) | | | | | | | | | Welding parameters (60 x 0,5 mm) | | | Layer thickness | Deposition rate | |
|--|------|-----|-----|-----|----|------|--------|----------|----------------------------------|----|----------|-----------------|-----------------|-------------------|
| | Si | Cr | Ni | Mo | Nb | Fe | Others | Hardness | A | V | cm / min | mm | kg/h | m ² /h |
| | 0,01 | | | | | bal. | | | | | | | | |
| | 0,5 | | | | | bal. | | 150 HB | 1150 | 28 | 15 | 4,4 | 22 | 0,63 |
| | 0,01 | | | | | bal. | | | | | | | | |
| | 0,5 | | | | | bal. | | 150 HB | 1150 | 28 | 15 | 4,4 | 22 | 0,63 |
| | 0,01 | | | | | bal. | | | | | | | | |
| | 0,6 | | | 0,6 | | bal. | | | 900 | 26 | 18 | 3,0 | 17 | 0,72 |
| | 0,01 | | | | | bal. | | | | | | | | |
| | 0,5 | | 0,9 | 0,5 | | bal. | | 210 HB | 1100 | 25 | 13 | 4,2 | 21 | 0,63 |
| | 0,01 | | | | | bal. | | | | | | | | |
| | 0,3 | 1,3 | | 0,6 | | bal. | | 240 HB | 800 | 24 | 17 | 3,5 | 15 | 0,55 |
| | 0,3 | 1,3 | | 0,6 | | bal. | | 235 HB | 800 | 24 | 17 | 3,5 | 15 | 0,55 |
| | 0,01 | | | | | bal. | | | | | | | | |
| | 0,4 | 1,4 | | 0,5 | | bal. | | 240 HB | 650 | 28 | 13 | 4 | 12 | 0,39 |
| | 0,5 | 1,7 | | 0,6 | | bal. | | 240 HB | 650 | 28 | 13 | 4 | 12 | 0,39 |
| | 0,5 | 1,9 | | 0,6 | | bal. | | 240 HB | 650 | 28 | 13 | 4 | 12 | 0,39 |
| | 0,01 | | | | | bal. | | | | | | | | |
| | 0,7 | 3,0 | | 0,4 | | bal. | | 290 HB | 1275 | 24 | 15 | 4,4 | 24 | 0,69 |
| | 0,01 | | | | | bal. | | | | | | | | |
| | 0,3 | 4,6 | | 0,8 | | bal. | | 325 HB | 900 | 28 | 13 | 3,8 | 17 | 0,57 |
| | 0,3 | 5,0 | | 0,9 | | bal. | | 325 HB | 900 | 28 | 13 | 3,8 | 17 | 0,57 |

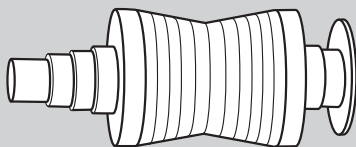
1 inch = 25,4 mm / 1 lbs = 0,4536 kg

Strip cladding

1. Unalloyed, fine grained and low alloyed steels

| Type of deposited alloy | Welding process | Layer | Type of strip (60x0,5 mm) | Type of flux | Chemical analyses | | |
|---------------------------|-----------------|-------------------|------------------------------|--------------|-------------------|-----|--|
| | | | Soudotape | + Record | C | Mn | |
| 0,4C - 6Cr - 0,7Mo | SAW | 1.+2.+3. L: strip | A | | 0,025 | 0,2 | |
| | | 1. L: deposit | A | RT 600 | 0,290 | 0,6 | |
| | | 2. L: deposit | A | RT 600 | 0,330 | 0,4 | |
| | | 3. L: deposit | A | RT 600 | 0,340 | 0,3 | |
| 0,2C - 6Cr - 1,5Mo - 1,5W | SAW | 1.+2.+3. L: strip | 258 | | 0,330 | 1,1 | |
| | | 2. L: deposit | 258 | RT 159 | 0,250 | 1,0 | |
| | | 3. L: deposit | 258 | RT 159 | 0,250 | 1,0 | |
| | ESW | 1.+2. L: strip | 258 | | 0,330 | 1,1 | |
| | | 1. L: deposit | 258 | EST 122 | 0,250 | 1,0 | |
| | | 2. L: deposit | 258 | EST 122 | 0,250 | 1,0 | |

Solution examples

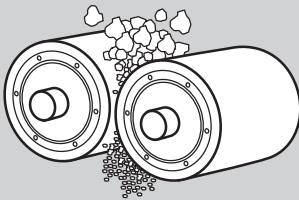


Pinch roller

Soudotape 258 + Record RT 159

| on a 0,2% C plate (typical) (weight -%) | | | | | | | | | Welding parameters (60 x 0,5 mm) | | | Layer thickness | Deposition rate | |
|---|------|-----|-----|-----|----|------|--------|----------|----------------------------------|----|----------|-----------------|-----------------|-------------------|
| | Si | Cr | Ni | Mo | Nb | Fe | Others | Hardness | A | V | cm / min | mm | kg/h | m ² /h |
| | 0,01 | | | | | bal. | | | | | | | | |
| | 0,7 | 3,4 | | 0,5 | | bal. | | 45 HRC | 950 | 27 | 17 | 4 | 18 | 0,57 |
| | 0,8 | 4,6 | | 0,6 | | bal. | | 50 HRC | 950 | 27 | 17 | 4 | 18 | 0,57 |
| | 0,9 | 5,3 | | 0,7 | | bal. | | 55 HRC | 950 | 27 | 17 | 4 | 18 | 0,57 |
| | 0,4 | 6,8 | 0,4 | 1,7 | | bal. | W 1,7 | | | | | | | |
| | 0,5 | 6,4 | 0,3 | 1,3 | | bal. | W 1,55 | 45 HRC | 750 | 28 | 12 | 3,2 | 14 | 0,56 |
| | 0,5 | 6,6 | 0,3 | 1,6 | | bal. | W 1,6 | 50 HRC | 750 | 28 | 12 | 3,2 | 14 | 0,56 |
| | 0,4 | 6,8 | 0,4 | 1,7 | | bal. | W 1,7 | | | | | | | |
| | 0,5 | 5,4 | 0,2 | 1,3 | | bal. | W 1,35 | 45 HRC | 1250 | 24 | 16 | 5 | 24 | 0,60 |
| | 0,6 | 6,4 | 0,3 | 1,5 | | bal. | W 1,55 | 45 HRC | 1250 | 24 | 16 | 4,8 | 24 | 0,62 |

1 inch = 25,4 mm / 1 lbs = 0,4536 kg



Carbon crusher

Soudotape A + Record SMOtW

Strip cladding

2. Stainless steels hardfacing and buffering

| Type of deposited alloy | Welding process | Layer | Type of strip (60 x 0,5 mm) | Type of flux | Chemical analyses | | |
|-------------------------|-----------------|-------------------|--------------------------------|--------------|-------------------|-----|--|
| | | | Soudotape | + Record | C | Mn | |
| 410 | ESW * | 1. L: strip | 430 | | 0,045 | 0,4 | |
| | | 1. L: deposit | 430 | EST 122 | 0,055 | 0,4 | |
| 420 | SAW | 1.+2.+3. L: strip | 420 | | 0,330 | 0,4 | |
| | | 1. L: deposit | 420 | RT 159 | 0,190 | 0,2 | |
| | | 2. L: deposit | 420 | RT 159 | 0,200 | 0,2 | |
| | | 3. L: deposit | 420 | RT 159 | 0,200 | 0,2 | |
| | ESW | 1.+2. L: strip | 420 | | 0,330 | 0,4 | |
| | | 1. L: deposit | 420 | EST 426 | 0,290 | 0,4 | |
| | | 2. L: deposit | 420 | EST 426 | 0,310 | 0,3 | |
| 420 Mo | ESW | 1.+2.+3. L: strip | 420 | | 0,330 | 0,4 | |
| | | 1. L: deposit | 420 | EST 423 | 0,270 | 0,4 | |
| | | 2. L: deposit | 420 | EST 423 | 0,280 | 0,2 | |
| | | 3. L: deposit | 420 | EST 423 | 0,290 | 0,3 | |
| 14Cr2Ni1Mo | SAW | 1.+2. L: strip | 430 | | 0,045 | 0,4 | |
| | | 2. L: deposit | 430 | RT 179 | 0,071 | 0,1 | |
| 410 NiMo | SAW | 1.+2.+3. L: strip | 430 | | 0,045 | 0,4 | |
| | | 1. L: deposit | 430 | RT 152 | 0,068 | 0,6 | |
| | | 2. L: deposit | 430 | RT 152 | 0,037 | 0,5 | |
| | | 3. L: deposit | 430 | RT 152 | 0,033 | 0,5 | |
| | ESW | 1.+2.+3. L: strip | 430 | | 0,045 | 0,4 | |
| | | 1. L: deposit | 430 | EST 452 | 0,062 | 0,5 | |
| 2. L: deposit | | 430 | EST 452 | 0,052 | 0,3 | | |
| | | 3. L: deposit | 430 | EST 452 | 0,045 | 0,3 | |
| 13Cr4Ni1Mo | SAW | 1.+2. L: strip | 430 | | 0,045 | 0,4 | |
| | | 1. L: deposit | 430 | RT 162 | 0,054 | 0,6 | |
| | | 2. L: deposit | 430 | RT 162 | 0,039 | 0,5 | |
| 410 NiMoNbV | SAW | 1.+2.+3. L: strip | 430 | | 0,045 | 0,4 | |
| | | 1. L: deposit | 430 | RT 742 | 0,085 | 0,4 | |
| | | 2. L: deposit | 430 | RT 742 | 0,090 | 0,3 | |
| | | 3. L: deposit | 430 | RT 742 | 0,090 | 0,3 | |

*single layer

| on a 0,2% C plate (typical) (weight-%) | | | | | | | | | Welding parameters (60x0,5 mm) | | | Layer thickness | Deposition rate | |
|--|-----|------|-----|------|-----|------|--------|----------|-----------------------------------|----|--------|-----------------|-----------------|-------------------|
| | Si | Cr | Ni | Mo | Nb | Fe | Others | Hardness | A | V | cm/min | mm | kg/h | m ² /h |
| | 0,3 | 16,2 | 0,1 | | | bal. | | | | | | | | |
| | 0,5 | 12,9 | | | | bal. | | 280 HB | 1250 | 24 | 20 | 4,5 | 24 | 0,67 |
| | 0,4 | 13,6 | | | | bal. | | | | | | | | |
| | 0,7 | 9,2 | | | | bal. | | 45 HRC | 750 | 28 | 12 | 3,8 | 14 | 0,47 |
| | 0,8 | 11,6 | | | | bal. | | 45 HRC | 750 | 28 | 12 | 3,6 | 14 | 0,50 |
| | 0,8 | 12,2 | | | | bal. | | 50 HRC | 750 | 28 | 12 | 3,5 | 14 | 0,51 |
| | 0,4 | 13,6 | | | | bal. | | | | | | | | |
| | 0,4 | 10,6 | | | | bal. | | 50 HRC | 1400 | 24 | 24 | 4,4 | 27 | 0,76 |
| | 0,2 | 12,6 | | | | bal. | | 50 HRC | 1400 | 24 | 24 | 4,2 | 27 | 0,80 |
| | 0,4 | 13,6 | | | | bal. | | | | | | | | |
| | 0,2 | 10,5 | | 1,4 | | bal. | | 50 HRC | 1250 | 24 | 17 | 4,3 | 24 | 0,70 |
| | 0,1 | 12,8 | | 1,8 | | bal. | | 50 HRC | 1250 | 24 | 17 | 4,2 | 24 | 0,71 |
| | 0,1 | 12,9 | | 1,8 | | bal. | | 50 HRC | 1250 | 24 | 17 | 4,2 | 24 | 0,71 |
| | 0,3 | 16,2 | 0,1 | 0,02 | | bal. | | | | | | | 0 | |
| | 1,2 | 17,3 | 0,1 | | | bal. | | | 900 | 24 | 15 | 4,0 | 17 | 0,54 |
| | 0,3 | 16,2 | 0,1 | 0,02 | | bal. | | | | | | | | |
| | 0,6 | 12,2 | 2,9 | 0,7 | | bal. | | 405 HB | 650 | 27 | 13 | 3,5 | 12 | 0,44 |
| | 0,9 | 13,9 | 3,8 | 0,9 | | bal. | | 390 HB | 650 | 27 | 13 | 3,5 | 12 | 0,44 |
| | 0,9 | 14,0 | 3,8 | 0,9 | | bal. | | 385 HB | 650 | 27 | 13 | 3,5 | 12 | 0,44 |
| | 0,3 | 16,2 | 0,1 | 0,02 | | bal. | | | | | | | | |
| | 0,4 | 11,7 | 3,0 | 0,4 | | bal. | | 40 HRC | 1100 | 24 | 16 | 4 | 21 | 0,66 |
| | 0,4 | 14,1 | 3,3 | 0,4 | | bal. | | 40 HRC | 1100 | 24 | 16 | 3,5 | 21 | 0,75 |
| | 0,4 | 14,8 | 3,6 | 0,5 | | bal. | | 40 HRC | 1100 | 24 | 16 | 3,5 | 21 | 0,75 |
| | 0,3 | 16,2 | 0,1 | 0,02 | | bal. | | | | | | | | |
| | 1,0 | 13,1 | 4,0 | 0,7 | | bal. | | 40 HRC | 650 | 27 | 13 | 3 | 12 | 0,52 |
| | 1,1 | 16,2 | 5,3 | 0,9 | | bal. | | 35 HRC | 650 | 27 | 13 | 3 | 12 | 0,52 |
| | 0,3 | 16,2 | 0,1 | 0,02 | | bal. | | | | | | | | |
| | 0,8 | 12,0 | 2,0 | 0,9 | 0,1 | bal. | V 0,10 | 40 HRC | 800 | 27 | 13 | 3 | 15 | 0,64 |
| | 0,9 | 13,0 | 2,3 | 1,0 | 0,1 | bal. | V 0,13 | 40 HRC | 800 | 27 | 13 | 3 | 15 | 0,64 |
| | 0,9 | 13,5 | 2,4 | 1,0 | 0,2 | bal. | V 0,15 | 40 HRC | 800 | 27 | 13 | 3 | 15 | 0,64 |

1 inch = 25,4 mm / 1 lbs = 0,4536 kg

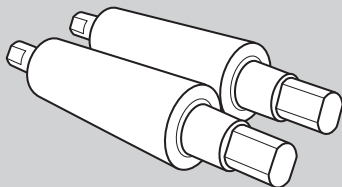
Strip cladding

2. Stainless steels hardfacing and buffering

| Type of deposited alloy | Welding process | Layer | Type of strip (60x0,5 mm) | Type of flux | Chemical analyses | | |
|-------------------------|-----------------|-------------------|------------------------------|--------------|-------------------|-----|-----|
| | | | Soudotape | + Record | C | Mn | |
| 12Cr6Ni2Mo | SAW | 1.+2.+3. L: strip | 430L | | 0,015 | 0,4 | |
| | | 1. L: deposit | 430L | RT 168 | 0,075 | 0,4 | |
| | | 2. L: deposit | 430L | RT 168 | 0,027 | 0,3 | |
| | | 3. L: deposit | 430L | RT 168 | 0,017 | 0,2 | |
| 17Cr | SAW | 1.+2. L: strip | 430 | | 0,045 | 0,4 | |
| | | 1. L: deposit | 430 | RT 179 | 0,060 | 0,4 | |
| | | 2. L: deposit | 430 | RT 179 | 0,071 | 0,5 | |
| | ESW | 1.+2. L: strip | 430 | | 0,045 | 0,4 | |
| | | 1. L: deposit | 430 | EST 127 | 0,055 | 0,4 | |
| | | 2. L: deposit | 430 | EST 127 | 0,050 | 0,4 | |
| 18Cr 8Ni 6Mn | ESW | 1.+2. L: strip | 308L | | 0,013 | 1,7 | |
| | | 1. L: deposit | 308L | EST 307 | 0,079 | 4,9 | |
| | | 2. L: deposit | 308L | EST 307 | 0,071 | 5,3 | |
| 18Cr 10Ni 4,5Mn | ESW* | 1. L: strip | 309L | | 0,012 | 1,8 | 0,4 |
| | | 1. L: deposit | 309L | EST 307 | 0,088 | 4,3 | 0,4 |

*single layer

Solution examples

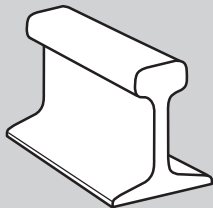


Continuous casting roller

Soudotape 430 + Record RT 162

| on a 0,2% C plate (typical) (weight-%) | | | | | | | | Welding parameters (60x0,5 mm) | | | Layer thickness | Deposition rate | | |
|--|------|------|------|------|----|------|--------|--------------------------------|------|----|-----------------|-----------------|------|-------------------|
| | Si | Cr | Ni | Mo | Nb | Fe | Others | Hardness | A | V | cm/min | mm | kg/h | m ² /h |
| | 0,3 | 16,4 | 0,1 | 0,02 | | bal. | | | | | | | | |
| | 0,6 | 9,5 | 3,9 | 2,0 | | bal. | | | 800 | 26 | 16 | 2,8 | 15 | 0,68 |
| | 0,7 | 12,1 | 4,7 | 2,5 | | bal. | | | 800 | 26 | 16 | 2,8 | 15 | 0,68 |
| | 0,8 | 12,9 | 5,2 | 2,6 | | bal. | | 35 HRC | 800 | 26 | 16 | 2,8 | 15 | 0,68 |
| | 0,3 | 16,2 | 0,1 | | | bal. | | | | | | | | |
| | 1,0 | 15,0 | | | | bal. | | | 900 | 24 | 15 | 4,1 | 17 | 0,53 |
| | 1,1 | 17,3 | | | | bal. | | | 900 | 24 | 15 | 4,1 | 17 | 0,53 |
| | 0,3 | 16,2 | 0,1 | | | bal. | | | | | | | | |
| | 0,5 | 14,5 | | | | bal. | | | 1250 | 24 | 20 | 4,5 | 24 | 0,67 |
| | 0,6 | 17,2 | | | | bal. | | | 1250 | 24 | 20 | 4,5 | 24 | 0,67 |
| | 0,4 | 20,3 | 10,4 | | | bal. | | | . | | | | | |
| | 0,5 | 17,7 | 8,8 | | | bal. | | | 1250 | 24 | 17 | 4,5 | 24 | 0,67 |
| | 0,6 | 18,6 | 9,2 | | | bal. | | | 1250 | 24 | 17 | 4,5 | 24 | 0,67 |
| | 23,7 | 13,3 | | | | bal. | | | . | | | | | |
| | 19,3 | 10,7 | | | | bal. | | | 1250 | 24 | 17 | 4,5 | 24 | 0,67 |

1 inch = 25,4 mm / 1 lbs = 0,4536 kg



Rail

Soudotape 309L + Record EST 307

Strip cladding

3. Cobalt alloys

| Type of deposited alloy | Welding process | Layer | Type of strip (60 x 0,5 mm) | Type of flux | Chemical analyses | | |
|-------------------------|-----------------|----------------|--------------------------------|--------------|-------------------|-----|--|
| | | | Soudotape | + Record | C | Mn | |
| Cobalt alloy 6 | ESW | 1.+2. L: strip | SCoCr 6 | | 1,100 | 0,6 | |
| | | 1. L: deposit | SCoCr 6 | EST 126 | 1,000 | 0,4 | |
| | | 2. L: deposit | SCoCr 6 | EST 126 | 1,050 | 0,5 | |
| Cobalt alloy 21 | ESW | 1.+2. L: strip | SCoCr 21 | | 0,250 | 0,4 | |
| | | 1. L: deposit | SCoCr 21 | EST 126 | 0,300 | 0,2 | |
| | | 2. L: deposit | SCoCr 21 | EST 126 | 0,250 | 0,4 | |

| on a 0,2% C plate (typical) (weight -%) | | | | | | | | Welding parameters (60 x 0,5 mm) | | | Layer thickness | Deposition rate | | |
|---|-----|------|-----|-----|------|------|--------|-------------------------------------|------|----|-----------------|-----------------|------|-------------------|
| | Si | Cr | Ni | Mo | Co | Fe | Others | Hardness | A | V | cm/min | mm | kg/h | m ² /h |
| | 0,1 | 31,5 | 2,1 | 0,8 | bal. | | W 5 | | | | | | | |
| | 0,3 | 28,5 | 0,0 | 0,0 | bal. | 6,0 | W 4,8 | 40 HRC | 1000 | 26 | 10 | 5 | 19,2 | 0,48 |
| | 0,3 | 29,0 | 0,0 | 0,0 | bal. | 3,0 | W 4,5 | 42 HRC | 1000 | 26 | 10 | 4,5 | 19,2 | 0,53 |
| | 0,5 | 27,2 | 3,3 | 5,5 | bal. | | | | | | | | | |
| | 0,4 | 24,5 | 1,5 | 5,3 | bal. | 10,0 | | 30 HRC | 1000 | 26 | 10 | 5 | 19,2 | 0,48 |
| | 0,5 | 25,7 | 3,0 | 5,3 | bal. | 3,0 | | 31 HRC | 1000 | 26 | 10 | 4,5 | 19,2 | 0,53 |

1 inch = 25,4 mm / 1 lbs = 0,4536 kg

Strip cladding equipment

1. Strip cladding nozzles

| Type | SK 30-ES2-75 | SK 60 ES3-207 | SK 125 ES1-300 | SK 180 ES1-315* |
|-----------------------------|--------------|---------------|--------------------|-----------------|
| Allowed strip width (mm) | 15 - 20 - 30 | 30 - 60 | 30 - 60 - 90 - 120 | 120 - 150 - 180 |
| Min. interval diameter (mm) | | | | |
| Longitudinal ** | 220 | 380 | 550 | 700 |
| Circular** | 350 | 550 | 700 | 900 |
| Dimensions (mm) | 125x165x280 | 265x280x270 | 300x450x270 | 500x370x350 |
| Weight (kg) | 4 | 10 | 18 | 36 |

* Only available on request

inch = 25,4 mm / 1 lbs = 0,4536 kg

** May vary according drive motor and positioning equipment

Strip cladding head designed for both submerged arc and electroslag strip cladding.



SK 30-ES2-75

This nozzle is designed for electroslag and submerged arc strip cladding with strip sizes smaller than 30 mm. The small size of this nozzle makes it possible to weld on the inside of tubes with an internal diameter of 350 mm when welding circular and even 220 mm when welding longitudinally.



SK 60 ES3-207

This nozzle is designed for electroslag and submerged arc strip cladding with strip sizes of 30 mm and 60 mm. The minimal internal diameter necessary for welding with this nozzle is 550 mm when welding circular and 380 mm when welding longitudinally.



SK 125-ESI-300

This nozzle is designed for electroslag and submerged arc strip cladding with strip sizes of 30 mm, 60 mm, 90 mm and 120 mm. The minimal internal diameter necessary for welding with this nozzle is 700 mm when welding circular and 550 mm when welding longitudinally.

Strip cladding equipment

2. Magnetic steering device

| Type | SK CED 1 1370 C22 | SK CED 1 1370 C11 |
|---------------|----------------------|----------------------|
| Input voltage | 230 V | 110 V |
| Frequency | 50 Hz | 60 Hz |



SK CED 1 1370 C22 • SK CED 1 1370 C11

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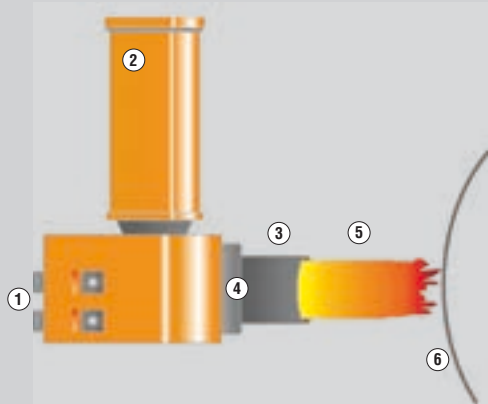
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Powders

1. PLASweld™ – Powders for hard facing 467

Description of the thermal spraying process

- ① Acetylene / Oxygen
- ② Powder container
- ③ Burner nozzle
- ④ Conveying gas / Powder
- ⑤ Acetylene / Oxygen –
Flame and spray particles
- ⑥ Workpiece



In powder flame spraying, the spray material, in powder form, is melted with an oxy-fuel gas flame, accelerated towards a component by the combustion gases and sprayed on to the surface of the component. Metallic, oxide ceramic, carbide and plastic powders can be processed using spray guns specifically designed for those materials. Spray guns that frequently take the form of manual torches, preferably using acetylene as a fuel gas because of its high flame temperature, are chosen for metallic alloys based on nickel, iron or cobalt. The powder particles, which are partially melted by the flame, deform on impact with the surface of the component and are deposited there to form a spray coating with a lamellar structure. The main areas of application for thermal coatings are corrosion protection and wear protection.

Powders

1. SIMmelt™ – Powders for simultaneous meltdown

SIMmelt™ - Powder description

Powders for flame spraying with simultaneous melting

Self fluxing alloys

Powder types based on NiBSi + C + Cr + Co + Cu + tungsten carbide

SIMmelt™ - Powder characterization

Alloyed metal powder (some with hard additives),

Round grains (matrix)

Smooth surface

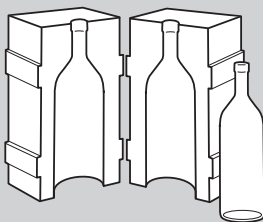
Gas atomized (except hard material additives)

Typical grain size: –106 +20 micron, adjusted to the torch

Spraying layer hardness ~ 150 HV up to >60 HRC

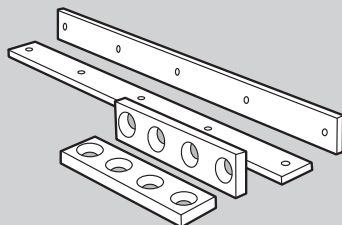
| Product name | Grain size | Chem. composition | Hardness |
|-------------------|-------------|-------------------|---------------|
| SIMmelt™ Cobalt45 | –106 +20 µm | CoCrNiWFeSiB | 400 – 460 HV |
| SIMmelt™ NiBas30 | –106 +20 µm | NiBSi | 260 – 310 HV |
| SIMmelt™ NiBas25 | –106 +20 µm | NiBSi | 205 – 260 HV |
| SIMmelt™ NiBas40 | –106 +20 µm | NiCrBSiFe | 40 HRC |
| SIMmelt™ NiBas50 | –106 +20 µm | NiCrBSiFe | 50 HRC |
| SIMmelt™ NiBas22 | –106 +20 µm | NiCuBSi | 170 – 240 HV |
| SIMmelt™ NiBas25F | –53 +20 µm | NiBSi | 190 – 260 HV |
| SIMmelt™ NiBas60 | –106 +20 µm | NiCrBSiFe | 60 HRC |
| SIMmelt™ NiBasW35 | –106 +20 µm | NiCrBSiFe+WSC | Matrix 60 HRC |
| SIMmelt™ NiBasW55 | –106 +20 µm | NiCrCoBSiFe+WSC | Matrix 60 HRC |
| SIMmelt™ NiBasW60 | –106 +20 µm | NiCrBSiFe+WSC | Matrix 60 HRC |

Solution examples



Bottle mold

SIMmelt™ NiBas30



Shear blade

SIMmelt™ NiBas50

Powders

2. SUBmelt™ – Powders for subsequent melting

SUBmelt™ - Powder description

Powders for flame spraying and subsequent melting

Self fluxing alloys

Powders types based NiCrBSi and tungsten carbide

SUBmelt™ - Powder characterization

Alloyed metal powders (some with hard additives)

Round grains (matrix)

Smooth surface

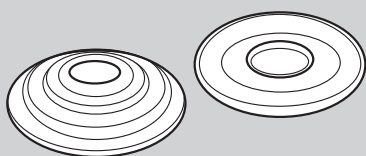
Gas atomized (except hard material additives)

Typical grain size: –125+45 microns

Spray coating hardness ~200 HV to > 60 HRC

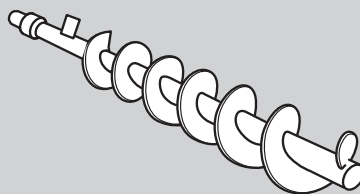
| Product name | Grain size | Chem. composition | Hardness |
|-------------------|--------------|-------------------|---------------|
| SUBmelt™ NiBas40 | –125 + 36 µm | NiCrBSiFe | 40 HRC |
| SUBmelt™ NiBas50 | –125 + 45 µm | NiCrBSiFe | 50 HRC |
| SUBmelt™ NiBas56 | –125 + 45 µm | NiCrBSiFeCuMo | 56 HRC |
| SUBmelt™ NiBas60 | –125 + 45 µm | NiCrBSiFe | 60 HRC |
| SUBmelt™ NiBasW35 | –125 + 45 µm | NiCrBSiFe+WSC | Matrix 60 HRC |
| SUBmelt™ NiBasW50 | –125 + 45 µm | NiCrBSiFe+WSC | Matrix 60 HRC |
| SUBmelt™ NiBasW60 | –125 + 45 µm | NiCrBSiFe+WSC | Matrix 60 HRC |

Solution examples



Valve disk

SUBmelt™ NiBas40



Screw conveyor

SUBmelt™ NiBas60

Powders

3. COLDMelt™ – Powders without melting (cold process)

COLDMelt™ - Powder description

Powder for thermal spraying without melting (cold process)

Metal alloys, hard alloys, hard material additives (usually with bond layer)

COLDMelt™ - Powder characterization

Metal or metal alloyed (some with hard additives)

Round grains (gas atomized)

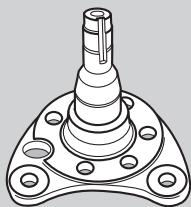
Smooth surface

Spattered grain, uniform grain structure, water atomized (except for hard material additives)

Typical grain size: – 125 + 36 microns

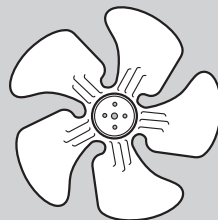
| Product name | Grain size | Chem. composition | Hardness |
|------------------------|---------------|-------------------|---------------|
| COLDMelt™ Base 17 | – 106 + 36 µm | NiAl | 150 – 190 HV |
| COLDMelt™ Base 20 | – 106 + 45 µm | NiAlMo | 170 – 240 HV |
| COLDMelt™ Zn | – 125 µm | Zn | 23 HB |
| COLDMelt™ Ni37 | – 106 + 36 µm | NiCrBSiFeAl | 350 – 380 HV |
| COLDMelt™ CuAl | – 120 + 36 µm | CuAl | 130 HV |
| COLDMelt™ NiW15 | – 125 + 20 µm | NiCrBSiFeAl+WSC | Matrix 400 HV |
| COLDMelt™ stainless 18 | – 106 + 36 µm | FeCrNiMo | 180 HV |
| COLDMelt™ Fe31 | – 125 + 45 µm | FeCrNi | 260 – 350 HV |
| COLDMelt™ OneStep 16 | – 106 + 45 µm | NiCrAlMoFe | 170 HV |

Solution examples



Axle journal

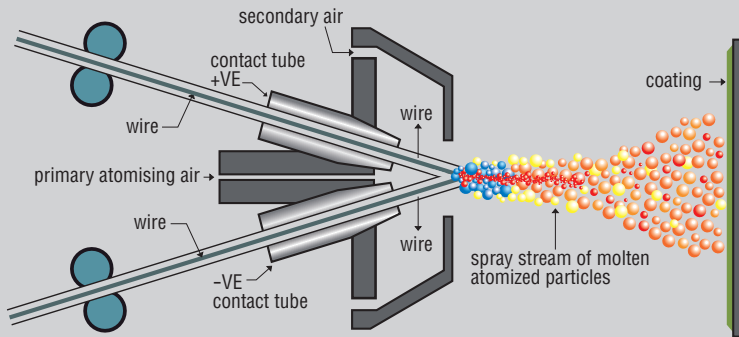
COLDMelt™ CuAl



Fan vane

COLDMelt™ NiW15

Description of the arc spraying with flux-cored wires process



Arc Spraying is the highest productivity thermal spraying process. A DC electric arc is struck between two continuous consumable wire electrodes that form the spray material. Compressed gas [usually air] atomizes the molten spray material into fine droplets and propels them towards the substrate. The process is simple to operate and can be used either manually or in an automated manner.

Cored wires

1. High alloyed steels

| Product name | Alloy type | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--------------|---------------------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| SK 235-M | High alloyed steels | | ■ | | | ■ | | | | 453 |
| SK 255-M | High alloyed steels | | ■ | | | | | | | 454 |
| SK 420-M | High alloyed steels | | | | | ■ | | | | 455 |
| SK 848-M | High alloyed steels | | | | | ■ | | | ■ | 456 |

SK 235-M

high alloyed steels

Classifications

cored wire for arc spraying

Characteristics and field of use

SK 235-M is a cored wire developed for arc spraying. This material produces a hard, abrasive and corrosion resistant coating up to service temperature of about 900 °C.

SK 235-M is used primarily as a hard corrosion resistant interface. We recommend to apply thickness not exceeding 12 mm.

Hardness as deposited: NA

Typical analysis in %

| C | Mn | Si | Cr | B | Fe |
|------|-----|-----|------|-----|---------|
| 0,06 | 1,8 | 1,7 | 29,0 | 3,4 | balance |

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised.

For general spray practices, see AWS C2.1-73.

Thermal spraying is a completely safe process when performed in accordance with proper safety measures.

Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Psi | Spray Dist |
|--------------------|-----------|---------|---------|------------|
| 1,6 | 150 – 350 | 29 – 31 | 60 – 80 | 100 – 200 |

SK 255-M

high alloyed steels

Classifications

cored wire for arc spraying

Characteristics and field of use

Flux cored wire for the arc spraying process.

Hard coating with good oxydation resistance.

Hardness as deposited: NA

Typical analysis in %

| C | Mn | Si | Cr | Fe | B |
|-----|-----|-----|------|---------|-----|
| 4,5 | 0,7 | 1,3 | 26,0 | balance | 0,3 |

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised.

For general spray practices, see AWS C2.1-73.

Thermal spraying is a completely safe process when performed in accordance with proper safety measures.

Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Psi</i> | <i>Spray Dist</i> |
|---------------------------|-----------------|----------------|------------|-------------------|
| 1,6 | 150 – 350 | 29 – 31 | 60 – 80 | 100 – 200 |

SK 420-M

high alloyed steels

Classifications

cored wire for arc spraying

Characteristics and field of use

SK 420-M is a chrome steel cored wire made exclusively for arc spraying to ensure a good corrosion and oxidation resistance.

Hard coatings with good oxidation and corrosion resistances.

Hardness as deposited: NA

Typical analysis in %

| C | Mn | Si | Cr | Fe |
|-----|-----|-----|------|---------|
| 0,4 | 0,5 | 0,4 | 14,0 | balance |

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised.

For general spray practices, see AWS C2.1-73.

Thermal spraying is a completely safe process when performed in accordance with proper safety measures.

Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Psi | Spray Dist |
|--------------------|-----------|---------|---------|------------|
| 1,6 | 150 – 350 | 29 – 31 | 60 – 80 | 100 – 125 |

SK 848-M

high alloyed steels

Classifications

cored wire for arc spraying

Characteristics and field of use

Arc-spraying cored wire designed to produce a hard abrasive and corrosion resistant coating up service temperature of about 900 °C.

SK 848-M is used primarily as a hard corrosion resistant interface. We recommended to apply thickness not exceeding 12 mm.

Hardness as deposited: NA

Typical analysis in %

| C | Mn | Si | Cr | Ni | Fe |
|------|-----|-----|-----|-----|---------|
| 0,06 | 0,7 | 0,2 | 0,2 | 3,9 | balance |

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised.

For general spray practices, see AWS C2.1-73.

Thermal spraying is a completely safe process when performed in accordance with proper safety measures.

Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

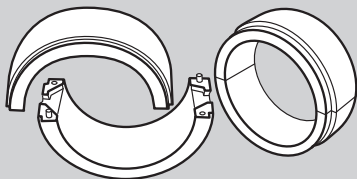
| Wire diameter (mm) | Amperage | Voltage | Psi | Spray Dist |
|--------------------|-----------|---------|---------|------------|
| 1,6 | 150 – 350 | 29 – 31 | 60 – 80 | 100 – 200 |

Cored wires

2. Nickel alloys

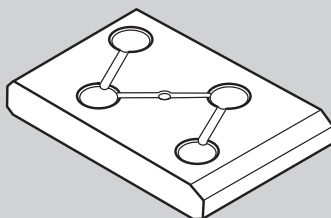
| Product name | Alloy type | Low stress abrasion | High stress abrasion | Erosion | Impact | Corrosion | Cavitation | Metal to metal wear | Heat | Page |
|--------------|---------------|---------------------|----------------------|---------|--------|-----------|------------|---------------------|------|------|
| SK 825-M | Nickel alloys | | | | | ■ | | | ■ | 458 |
| SK 830-MF | Nickel alloys | ■ | | | | ■ | | | ■ | 459 |
| SK 840-MF | Nickel alloys | | | | | ■ | | | | 460 |
| SK 850-MF | Nickel alloys | ■ | | | | ■ | | | ■ | 461 |
| SK 858-M | Nickel alloys | | | | | ■ | | | ■ | 462 |
| SK 860-MF | Nickel alloys | | ■ | | | ■ | | | ■ | 463 |
| SK 868-M | Nickel alloys | | | | | ■ | | | ■ | 464 |
| SK 900-MF | Nickel alloys | | ■ | | | ■ | | | ■ | 465 |

Solution examples



Bearings journal

SK 830-MF



Wear plate

SK 900-MF

Classifications

cored wire for arc spraying

Characteristics and field of use

Arc-spraying Ni-base cored wire with addition of Molybdenum and Aluminium designed to produce a high quality, high tensile bondcoat. The alloy gives a tough and dense coating, resistant to high temperature oxidation, thermal shock and abrasion.

Bondcoats and coatings.

Hardness as deposited: NA

Typical analysis in %

| | | |
|---------|-----|-----|
| Ni | Mo | Al |
| balance | 5,0 | 6,5 |

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised.

For general spray practices, see AWS C2.1-73.

Thermal spraying is a completely safe process when performed in accordance with proper safety measures.

Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Psi</i> | <i>Spray Dist</i> |
|---------------------------|-----------------|----------------|------------|-------------------|
| 1,6 | 100 – 300 | 29 – 31 | 60 – 80 | 100 – 200 |

Classifications

cored wire for arc spraying

Characteristics and field of use

SK 830-MF is a cored wire made exclusively for Arc Spraying, especially developed for spraying with subsequent fusion. It is a Ni-base alloy with addition of Boron and Silicon.

Application needing high oxidation, heat and corrosion resistance.

Hardness as deposited: NA

Typical analysis

Ni, B, Si

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised.

For general spray practices, see AWS C2.1-73.

Thermal spraying is a completely safe process when performed in accordance with proper safety measures.

Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Psi</i> | <i>Spray Dist</i> |
|---------------------------|-----------------|----------------|------------|-------------------|
| 1,6 | 100 – 300 | 29 – 31 | 40 – 60 | 100 – 200 |

SK 840-MF

nickel alloys

Classifications

cored wire for arc spraying

Characteristics and field of use

Cored wire made exclusively for Arc Spraying, especially developed for spraying with subsequent fusion. It is a Ni-base alloy with addition of Boron and Silicon.

Application needing high oxidation, heat and corrosion resistance.

Hardness as deposited: NA

Typical analysis

Ni, Cr, B, Si

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised. For general spray practices, see AWS C2.1-73. Thermal spraying is a completely safe process when performed in accordance with proper safety measures. Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Psi</i> | <i>Spray Dist</i> |
|---------------------------|-----------------|----------------|------------|-------------------|
| 1,6 | 100 – 300 | 29 – 31 | 40 – 60 | 100 – 200 |

Classifications

cored wire for arc spraying

Characteristics and field of use

Cored wire made exclusively for Arc Spraying, especially developed for spraying with subsequent fusion. It is a Ni-base alloy with addition of Boron and Silicon.

Application needing a resistance to abrasive wear combined with corrosion.

Hardness as deposited: NA

Typical analysis

Ni, Cr, B, Si

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised. For general spray practices, see AWS C2.1-73. Thermal spraying is a completely safe process when performed in accordance with proper safety measures. Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Psi</i> | <i>Spray Dist</i> |
|---------------------------|-----------------|----------------|------------|-------------------|
| 1,6 | 100 – 300 | 29 – 31 | 40 – 60 | 100 – 200 |

Classifications

cored wire for arc spraying

Characteristics and field of use

SK 858-M is a unique Nickel and Aluminium wire produced specifically for the production of a high quality, high tensile bondcoat for use exclusively with the arc spray process.

Bondcoat.

Hardness as deposited: NA

Typical analysis in %

| | Ni | Al |
|----------------------|---------|-----|
| Pure deposited metal | balance | 5,0 |

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised. For general spray practices, see AWS C2.1-73. Thermal spraying is a completely safe process when performed in accordance with proper safety measures. Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Psi</i> | <i>Spray Dist</i> |
|---------------------------|-----------------|----------------|------------|-------------------|
| 1,6* | 100 – 300 | 29 – 31 | 60 – 80 | 100 – 200 |

*available on request

Classifications

cored wire for arc spraying

Characteristics and field of use

SK 860-MF is a cored wire made exclusively for Arc Spraying, especially developed for spraying with subsequent fusion. It is a Ni-base alloy with addition of Boron and Silicon.

Application needing a high resistance to abrasive wear combined with corrosion.

Hardness as deposited: NA

Typical analysis

Ni, Cr, B, Si

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised. For general spray practices, see AWS C2.1-73. Thermal spraying is a completely safe process when performed in accordance with proper safety measures. Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Psi</i> | <i>Spray Dist</i> |
|---------------------------|-----------------|----------------|------------|-------------------|
| 1,6 | 100 – 300 | 29 – 31 | 40 – 60 | 100 – 200 |

*available on request

SK 868-M

nickel alloys

Classifications

cored wire for arc spraying

Characteristics and field of use

SK 868-M is a cored wire made exclusively for arc spraying which when applied will provide a coating with an extreme resistance to corrosion caused by gases and ashes containing sulphur and Vanadium compounds resulting from high temperature combustion.

Boiler pipes.

Hardness as deposited: NA

Typical analysis in %

| Cr | Ni | Ti |
|------|---------|-----|
| 45,0 | balance | 4,0 |

Welding instruction

Observe normal spraying practices, respiratory protection and proper air flow pattern advised. For general spray practices, see AWS C2.1-73. Thermal spraying is a completely safe process when performed in accordance with proper safety measures. Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Psi | Spray Dist |
|--------------------|-----------|---------|---------|------------|
| 1,6 | 100 – 300 | 29 – 31 | 60 – 80 | 100 – 200 |

*available on request

Classifications

cored wire for arc spraying

Characteristics and field of use

Arc-spraying Ni-base cored wire with addition of Boron, Silicon and Tungsten carbides (30 %) especially developed for spraying with subsequent fusion.

Suitable for thick-coating on parts subject to both high abrasion and corrosion: feeding screw in the wood industry, hammers, dredging wear parts, etc.

Hardness as deposited: NA

Typical analysis

Ni, Cr, B, Si, W

Welding instruction

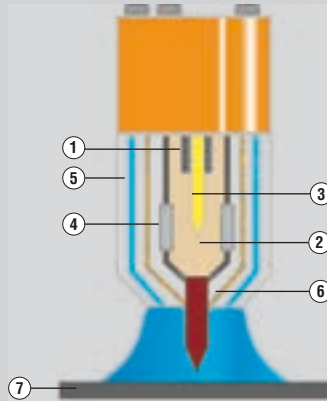
Observe normal spraying practices, respiratory protection and proper air flow pattern advised. For general spray practices, see AWS C2.1-73. Thermal spraying is a completely safe process when performed in accordance with proper safety measures. Become familiar with local safety regulations before starting spray operations.

Form of delivery and recommended welding parameters

| <i>Wire diameter (mm)</i> | <i>Amperage</i> | <i>Voltage</i> | <i>Psi</i> | <i>Spray Dist</i> |
|---------------------------|-----------------|----------------|------------|-------------------|
| 1,6 x 1000 | 100 – 300 | 29 – 31 | 40 – 60 | 100 – 200 |

Description of the plasma transferred arc process

- ① Cathode holding device
- ② Plasma gas
- ③ Cathode
- ④ Water cooling
- ⑤ Shielding gas
- ⑥ Feeding gas and powder
- ⑦ Workpiece



Plasma powder surfacing (PPS), also known as the plasma transferred arc (PTA) process, is a thermal coating process. In contrast to the spraying processes, this method is a welding process and so involves metallurgical bonding of the applied material to the base material. However, if the parameters are set optimally, the degree to which it blends with the base material can be reduced to a minimum. The PTA process is employed primarily for surfacing of wear resistant and corrosion resistant coatings on to a base material.

The process is characterised by the use of two separately controllable electric arcs. One of these is the (non-transferred) pilot arc; this arc is formed between the non-melting (tungsten) electrode and the plasma nozzle. It accelerates the plasma gas and enables ignition of the (transferred) main arc. This arc burns with a high energy density between the electrode and the workpiece. With the aid of the electric arc, both the base material and the metal powder that serves as the welding consumable are fused together, which then gives rise to the deposited protective coating. Ar, H₂, He, or mixtures of gas are employed as a processing gas. This serves, firstly, as a plasma gas and, secondly, as a shielding gas and as a carrier gas for the powder.

In smaller grain sizes (typical 45 – 125 µm) also suitable for Laser Welding.

Powders

1. PLASweld™ – Powders for hard facing

PLASweld™ - Powder description

Alloyed metal powder (some with hard additives)

Round grain, smooth surface, gas atomized (except hard material additives)

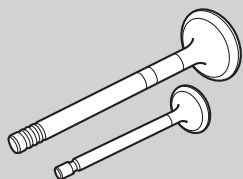
Typical particle size: –150+50 microns or –200+63 microns

Surface hardening of about 180 HV (buffer layers) up to 60 HRC

| Product name | Grain size* | Chem. composition | Hardness |
|------------------------|-------------|-------------------|---------------|
| PLASweld™ Celsit 706 | –150+50 µm | CoCrWC | 41 HRC |
| PLASweld™ Celsit 706HC | –150+50 µm | CoCrWC | 43 HRC |
| PLASweld™ Celsit 708 | –150+50 µm | CoCrNiWC | 45 HRC |
| PLASweld™ Celsit 712 | –150+50 µm | CoCrWC | 48 HRC |
| PLASweld™ Celsit 712HC | –150+50 µm | CoCrWC | 49 HRC |
| PLASweld™ Celsit 721 | –150+50 µm | CoCrMoNiC | 32 HRC |
| PLASweld™ Ledurit 60 | –150+50 µm | FeCrC | 57 HRC |
| PLASweld™ Ledurit 68 | –150+50 µm | FeCrCBV | 62 HRC |
| PLASweld™ Ferro55 | –150+50 µm | FeCrMo | 55 HRC |
| PLASweld™ Ferro39 | –150+50 µm | FeCrMo | 39 HRC |
| PLASweld™ NiBas W60 | –150+50 µm | NiBSi+WSC | Matrix 60 HRC |
| PLASweld™ NiBas 776 | –150+50 µm | NiCrMoW | 170 HB |
| PLASweld™ NiBas 068HH | –150+50 µm | NiCrFeNb | 170 HB |
| PLASweld™ NiBas 6222Mo | –150+50 µm | NiCrMoNb | 200 HB |
| PLASweld™ Ferro45 | –150+50 µm | FeCrMo | 45 HRC |
| PLASweld™ FerroV10 | –150+50 µm | FeCrV | 60 HRC |
| PLASweld™ FerroV12 | –150+50 µm | FeCrV | 61 HRC |
| PLASweld™ FerroV15 | –150+50 µm | FeCrV | 61 HRC |

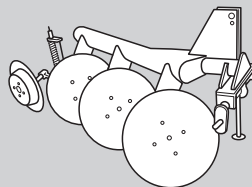
* Also available in grain size –200+63 µm or according to customers requirements.

Solution examples



Intake and exhaust valve

PLASweld™ Celsit 706



Plow disc (Harrow)

PLASweld™ Celsit 712

List of contents

Special products

Covered electrodes

- | | |
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| 1. Chamfering and gouging covered electrodes | 469 |
| 2. Underwater repair electrode | 469 |
| 3. Underwater cutting electrode | 469 |
| 4. Gas rods | 469 |

Cored Wires

- | | |
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| 1. Cutting cored wire | 477 |
|-----------------------|-----|

Covered electrodes

1. Chamfering and gouging covered electrodes

| Product name | Description | Page |
|--------------|--|------|
| UTP 82 AS | Chamfering stick electrode for metallic materials. | 470 |
| UTP 82 Ko | Carbon stick electrode for arc-air gouging of all industrial metals. | 471 |

2. Underwater repair electrode

| Product name | Description | Page |
|----------------|---|------|
| UTP Nautica 20 | Covered electrode for manual metal arc welding under hyperbaric wet conditions. | 472 |

3. Underwater cutting electrode

| Product name | Description | Page |
|-----------------|---|------|
| UTP Nautica Cut | Especially designed for cutting, boring and chamfering materials in wet environments. | 473 |

4. Gas rods

| Product name | Description | Page |
|--------------|---|------|
| UTP 7502 | Gas welding cast rod with low melting matrix and coarse hard metal grain for deep drilling technique. | 474 |
| UTP A 7550 | Heavy coated, flexible tungsten-carbide welding rod against extreme mineral friction wear, corrosion resistant. | 475 |
| UTP A 7560 | Tungsten-carbide tube rod against extreme mineral abrasion. | 476 |

UTP 82 AS

Classifications

covered electrode

Characteristics and field of use

The strongly coated chamfering stick electrode UTP 82 AS can be used on all steel grades with ferritic and austenitic structure, as well as cast iron, cast steel and all non-ferrous metals. It enables workpieces to be grooved out in a very simple way. UTP 82 AS is also suitable for removing corroded metal layers and for fusion-cutting metallic materials.

UTP 82 AS strikes easily and generates a high gas pressure, enabling a clean and smooth cut to be achieved.

Welding instruction

When grooving it is advisable to tilt the plate in the direction of working, so that the molten parent metal can run off better. The stick electrode should be inclined to the parent metal as horizontally as possible (approx. 15°) and kept constantly in contact with it. The working speed is increased by slight pushing movements in the direction of working. Parent metal left on the edge of the groove is easily removed with the slag hammer. Machining the groove down to the bare metal may be advisable, depending on the circumstances.

Current type

DC (-) / AC

Form of delivery and recommended welding parameters

| | | | | |
|----------------------------|-----------|-----------|-----------|-----------|
| <i>Electrodes</i> Ø mm x L | 2,5 x 250 | 3,2 x 350 | 4,0 x 350 | 5,0 x 350 |
| <i>Amperage</i> | 150 – 250 | 200 – 300 | 250 – 400 | 350 – 500 |

UTP 82 Ko

Classifications

covered electrode

Characteristics and field of use

UTP 82 Ko is suited for pointing and cutting of all metals melting in the arc, such as all steels and cast steels, cast iron materials, aluminium-, nickel- and copper alloys.

High pointing rate, universally applicable, high economic efficiency.

Welding instruction

High tensile steels susceptible to a hardness increase should be preheated to 150 – 400 °C, just as copper.

Compressed air approx. 4,5 bar

Current type

DC (+)

Form of delivery and recommended welding parameters

| | | | |
|----------------------------|-----------|------------|------------|
| <i>Electrodes Ø mm x L</i> | 4,0 x 305 | 8,0 x 305* | 9,5 x 305* |
| <i>Amperage</i> | 180 – 220 | 350 – 500 | 500 – 650 |

*available on request

UTP Nautica 20

Classifications

underwater electrode

DIN 2302

E 42 0 Z RA 2 UW 10 fr

Characteristics and field of use

Covered electrode for manual metal arc welding under hyperbaric wet conditions down to 20 msw. Very good weldability in vertical down position.

Base materials

S235JRG2 – unalloyed and fine grained structural steels. Higher strength structural steels should not be welded with this type of electrodes as these materials are susceptible to “Hydrogen Induced Cold Cracking (HICC)” when welded in wet environment. The carbon content of the parent metal should not exceed 0,15%.

Typical analysis in %

| C | Si | Mn | Mo |
|------|------|------|------|
| 0.08 | 0.30 | 0.55 | 0.50 |

Mechanical properties of the weld metal

| Heat treatment | 0.2%-Yield strength | Tensile strength | Impact values CVN |
|----------------|---------------------|------------------|----------------------|
| | MPa | MPa | J |
| AW | 420 | 500 | 38 |

Welding positions



Current type DC (+) / DC (-)

Approvals

GL

Form of delivery and recommended welding parameters

| Electrodes \varnothing mm x L | Amperage |
|---------------------------------|-----------|
| 3.2 x 350 | 150 – 200 |

UTP Nautica Cut

Classifications underwater cutting-electrode

Characteristics and field of use

Phoenix Nautica Cut especially designed for cutting, boring and chamfering metallic materials in wet environments. Perfect tool for maintenance and repair work under water. The coating respectively the arc, develops a strong gas jet, which blows away the molten material.

Neither compressed air nor additional fuel gas and no special electrode holder are necessary, so that the standard underwater welding equipment can be used. The arc ignition behaviour is excellent. Because of the high current carrying capacity Phoenix Nautica Cut is suitable for greater wall thicknesses up to 12 mm. The clean cut surfaces permits the use for welding directly without further preparation.

Base materials

Applicable for steel, cast iron and all metals except pure copper.

Current type

= -

Welding instruction

Strike the arc by holding the electrode perpendicular to the workpiece, thereafter the electrode should be pointed in the appropriate direction and pushed forward. Keep the electrode in contact with the workpiece and move it like a handsaw. If a deeper cut is required, repeat the procedure until the desired depth is reached.

To pierce holes, simply hold the electrode vertical, strike the arc and push through the base metal, removing the electrode immediately once the hole is made. The size of the hole may be increased by moving the electrode in a circular motion.

Form of delivery and recommended welding parameters

| <i>Electrodes Ø mm x L</i> | <i>Amperage</i> |
|----------------------------|-----------------|
| 3,2 x 450 | 200 – 300 |

UTP 7502

Classifications

gas rod

DIN 8555

Special alloy

Characteristics and field of use

UTP 7502 is suitable for high wear resistant cladding in the deep drilling technique, e.g. drill bits for core removing holes, stabilizer, face cutters such as in mining and foundries. The oxy-acetylene rod is made of a special CuZnNi-matrix with inlayed tungsten-carbides. Their regular distribution enables high quality claddings.

The weld deposit of UTP 7502 consists of very hard tungsten carbides, imbedded in a corrosion resistant matrix.

| | |
|---------------------|-----------------|
| Hardness Carbide | approx. 2500 HV |
| Working temperature | approx. 900 °C |

Typical analysis in %

| | |
|------------------|---------------|
| W ₂ C | CuZnNi-Matrix |
| 60,0 | 40,0 |

Welding instruction

The cladding surface has to be cleaned to metallic bright and has to be free of impurities. Spread flux UTP Flux HLS-B on the surface, apply a thin layer of the brazing alloy UTP 2. The use of this flux is also recommended when applying UTP 7502. Avoid overheating.

Flame adjustment: neutral (neither gas – nor oxygen-excess)

Form of delivery

| <i>Length of rod (mm)</i> | <i>Weights of rod (g)</i> | <i>Grain size (mm)</i> |
|---------------------------|---------------------------|------------------------|
| approx. 450 | approx. 500 | 1,6 – 3,2' |
| approx. 450 | approx. 500 | 3,2 – 4,8' |

*available on request

UTP A 7550

Classifications

gas rod

DIN 8555

EN 14700

WSG 21-UM-55-CG

C Ni 20

Characteristics and field of use

UTP A 7550 can be welded by oxy-acetylene or TIG process. The rod is based on a Ni-Cr-B-Si matrix enveloping tungsten carbides. These carbides have two different grain sizes and build a compact shielding layer on the rod. The matrix melts at 1050° C, i.e. under the melting range of steels.

UTP A 7550 is particularly suitable for claddings on machine parts subject to extreme friction wear by hard, abrasive materials. This alloy is used in brickyards, industries of argillaceous earth, cement factories, mining, offshore such as for producing the machines and systems of the mentioned industries.

Only suitable for slight to medium impact stress. The weld deposit is corrosion resistant.

Hardness

Carbide: approx. 2500 HV

Matrix: approx. 55 HRC

Typical analysis in %

W₂C

NiCrBSi-Matrix

60,0

40,0

Welding instruction

The weld area must be metallic clean, preheating to 300 – 500 °C depending the size. Keep welding torch flat to the work piece and melt surface slightly. Avoid overheating.

Form of delivery and recommended welding parameters

| <i>Rod diameter x length (mm)</i> | <i>Current type</i> | <i>Shielding gas EN ISO 14175</i> |
|-----------------------------------|---------------------|---------------------------------------|
| 6,0 x 450 | DC (-) | I 1 |

UTP A 7560

Classifications

gas rod

DIN 8555

EN 14700

G 21-GF-60 G

T Fe 20

Characteristics and field of use

The filled gas welding rod UTP A 7560 is suitable for claddings on tools and machine parts subject to highest mineral wear, such as drill bits, roller bits, sets of drill-rods, excavator buckets, mixer blades. It is also suitable for highly stressed machine parts, which are used for the reprocessing of sand, cement, lime, clay, coal, slags.

UTP A 7560 is suited for extreme mineralic abrasion with medium impact strain.

Hardness

Carbide: approx. 2500 HV

Matrix: approx. 60 HRC

Typical analysis in %

W₂C

FeC

60,0

40,0

Welding instruction

Clean welding area to metallic bright. Preheating temperature 300 – 500° C, depending on the size of the workpiece. Hold torch as flat as possible to the workpiece. Melt surface slightly. Avoid overheating.

Form of delivery and recommended welding parameters

| <i>Rod diameter x length (mm)</i> | <i>Current type</i> | <i>Shielding gas EN ISO 14175</i> |
|-----------------------------------|---------------------|---------------------------------------|
| 3,5 x 700* | DC (-) | I 1 |
| 4,0 x 700* | DC (-) | I 1 |
| 5,0 x 700* | DC (-) | I 1 |

*available on request

Cored Wires

1. Cutting cored wire

| Product name | Description | Page |
|--------------|---|------|
| SK CUTARC | Special flux-cored wire specially developed for gouging applications. | 477 |

SK CUTARC

Classifications

cored wire

Characteristics and field of use

Special cored wire developed for gouging applications in vertical down position. High penetration. Can also be used for cutting applications.

Gouging of old overlays on rolls before re-hardfacing, cutting of steel scrap parts.

Hardness as welded: NA

Gouging rate at 350 A / 40 V 6 – 7 (kg / h)

Gouging rate at 450 A / 40 V 10 – 11 (kg / h)

Gouging rate at 400 A / 35 V 7 – 8 (kg / h)

Gouging rate at 400 A / 40 V 8 – 9 (kg / h)

Form of delivery and recommended welding parameters

| Wire diameter (mm) | Amperage | Voltage | Stick-Out |
|--------------------|-----------|---------|-----------|
| 2,4 | 400 – 600 | 32 – 45 | 35 – 40 |

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| Guidelines for the storage and transport of cored welding wires for general applications | 490 |
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| Guidelines for the storage and transport of solid welding wire and rods for general applications | 491 |
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Packaging information

1. SMAW – covered electrodes

Boxes for stick electrodes

| <i>Length</i> | <i>Quantity</i> | <i>Dimension LxHxW (mm)</i> | <i>Material</i> |
|---------------|-----------------|---------------------------------|---------------------------------|
| 250 mm | 1 Box | 255 x 75 x 57 | Folded carton in shrink foil |
| | 4 Boxes | 260 x 80 x 246 | Corrugated cardboard |
| 300 mm | 1 Box | 305 x 75 x 57 | Folded carton in shrink foil |
| | 4 Boxes | 310 x 80 x 246 | Corrugated cardboard |
| 350 mm | 1 Box | 355 x 75 x 57 | Folded carton in shrink foil |
| | 4 Boxes | 360 x 80 x 246 | Corrugated cardboard |
| 450 mm | 1 Box | 455 x 75 x 57 | Folded carton in shrink foil |
| | 4 Boxes | 460 x 80 x 246 | Corrugated cardboard |



Cans for stick electrodes

| <i>Length</i> | <i>Quantity</i> | <i>Dimension LxHxW (mm)</i> | <i>Material</i> |
|---------------|-----------------|---------------------------------|-----------------------|
| 250/350 mm | 1 Can | Ø 75 x 362 | Tinplate can, painted |
| | 3 Cans | 88 x 240 x 375 | Corrugated cardboard |
| 450 mm | 1 Can | Ø 75 x 462 | Tinplate can, painted |
| | 3 Cans | 88 x 240 x 475 | Corrugated cardboard |



Number and weight units of stick electrodes depends on each type of electrodes and can not be advised yet. Please ask for further information.

Packaging information

1. SMAW – covered electrodes

Vakuum packing “ExtraDry”

| <i>Length</i> | <i>Quantity</i> | <i>Dimension L x H x W (mm)</i> | <i>Material</i> |
|---------------|-----------------|-------------------------------------|--|
| 350 mm | 1 Bowl | 365 x 27 x 75 | Plastic bowl, wrapped in aluminum laminated foil |
| | 9 Bowls | 390 x 105 x 255 | Corrugated cardboard |
| 450 mm | 1 Bowl | 465 x 27 x 75 | Plastic bowl, wrapped in aluminum laminated foil |
| | 9 Bowls | 490 x 105 x 255 | Corrugated cardboard |



Packaging information

2. GTAW – TIG rods

Cardboard tube packing

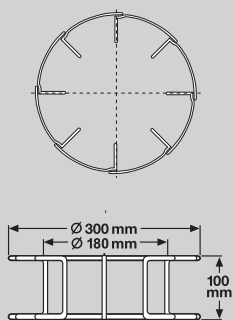
| <i>Length</i> | <i>Weight</i> | <i>Quantity</i> | <i>Dimension L x H x W (mm)</i> | <i>Material</i> |
|---------------|---------------|-----------------|-------------------------------------|---|
| 1000 mm | 5 kg | 1 Tube | L 1015 x Ø 45 | Cardboard tube with integrated VCI foil |
| | 20 kg | 4 Tubes | 1025 x 54 x 190 | Corrugated cardboard |



Packaging information

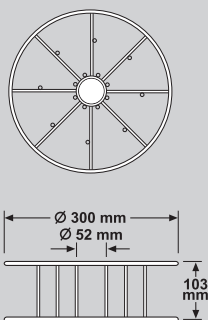
3. GMAW – MIG wires

Spools according to EN ISO 544



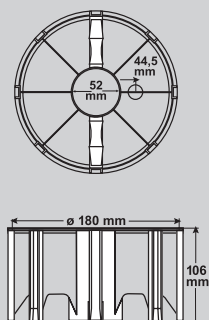
B 300

| | |
|----------------------|-------------------------|
| Wire weight: (kg) | 12,5/15/18 |
| Material: | Steel wire, coppered |
| Use: | Disposable |



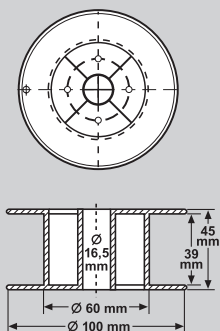
BS 300

| | |
|----------------------|-----------------------|
| Wire weight: (kg) | 12,5/15/18 |
| Material: | Steel wire, coated |
| Use: | Disposable |



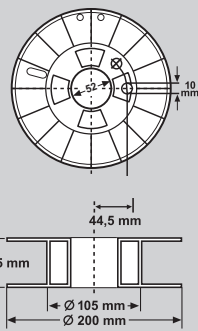
Adapter for B 300

| | |
|-----------|------------|
| Material: | Plastic |
| Use: | Returnable |



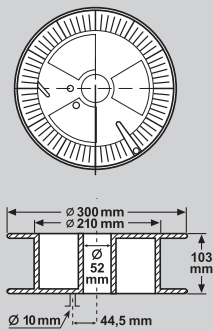
B 300

| | |
|----------------------|-------------------------|
| Wire weight: (kg) | 12,5/15/18 |
| Material: | Steel wire, coppered |
| Use: | Disposable |



BS 300

| | |
|----------------------|-----------------------|
| Wire weight: (kg) | 12,5/15/18 |
| Material: | Steel wire, coated |
| Use: | Disposable |



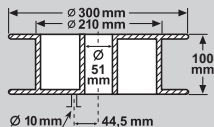
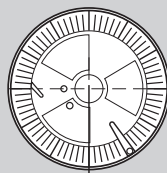
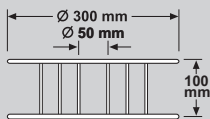
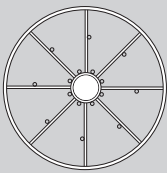
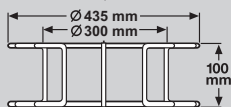
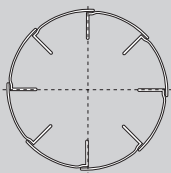
Adapter for B 300

| | |
|-----------|------------|
| Material: | Plastic |
| Use: | Returnable |

Packaging information

4. GMAW – flux cored wires

Spools according to EN ISO 544



K 435 (B 450)

| | |
|-------------------|----------------------|
| Wire weight: (kg) | 25 |
| Material: | Steel wire, coppered |
| Use: | Disposable |

B 300

| | |
|-------------------|--------------------|
| Wire weight: (kg) | 15 |
| Material: | Steel wire, coated |
| Use: | Disposable |

S 300

| | |
|-------------------|------------|
| Wire weight: (kg) | 10 |
| Material: | Plastic |
| Use: | Returnable |

Autopack

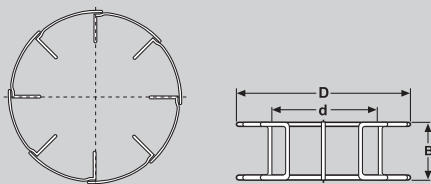
| | | |
|-----------------|-------------|-------------|
| Weight (kg): | 150 | 250 |
| Dimension (mm): | Ø 585 x 470 | Ø 560 x 845 |



Packaging information

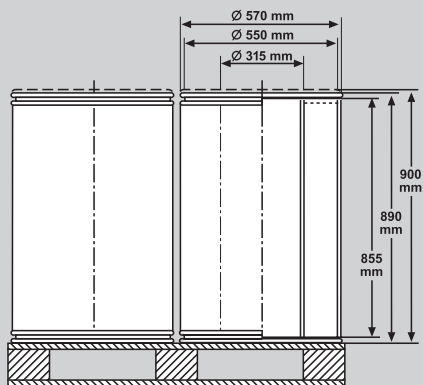
5. SAW – flux and wires

One way spools



| Spool designation | Type EN ISO 544 | Dimension D / d / B (mm) | Weight (kg) | Material | for wire diameter (mm) |
|-------------------|----------------------------|-----------------------------|----------------|------------|---------------------------|
| K 415-100 | Basket ring spool B 450 | 415 / 300 / 103 | 25 | steel wire | 2,0 – 4,0 |
| K 300 | Basket ring spool B 300 | 300 / 180 / 103 | 15 / 18 | steel wire | 1,2 – 2,0 |

Drum packings

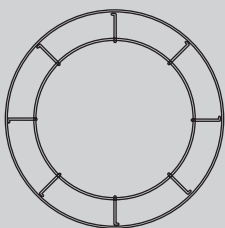


| | |
|-----------------|--|
| Wire electrode: | Ø 2,0 – 5,0 mm |
| Wire weight: | 150 / 250 / 350 kg |
| Pallets: | 2 Drums / Euro pallet (1200 x 800 mm) |
| Material: | Fiber drum (Cardboard) with metal ring |
| Use: | One way |

Packaging information

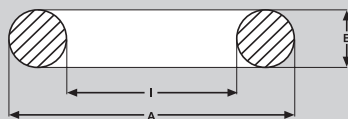
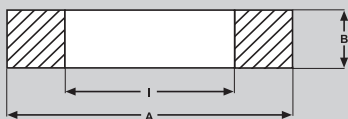
5. SAW – flux and wires



Returnable spool



| Spool designation | Type EN ISO 544 | Dimension D / d / B (mm) | Weight (kg) | Material |
|-------------------|--------------------|-----------------------------|----------------|------------|
| K 800 | – | 825 / 600 / 115 | 100 | steel wire |

Coil dimensions



| Coil designation | Dimension D / d / B (mm) | Weight (kg) |
|--|-----------------------------|----------------|
|  AA* | 770 / 570 / 100 | 100 |
|  C | 320 / 220 / 50 | 10 |

*on request

Packaging information

5. SAW – flux and wires

Bag and drums

| | | |
|---------------------|-------|-----|
| <i>Weight (kg):</i> | 25 kg | 250 |
|---------------------|-------|-----|



Large packing: Big Bag

| | |
|----------------|---------------|
| <i>Weight:</i> | 500 / 1000 kg |
|----------------|---------------|

| | |
|-------------------|--|
| <i>Dimension:</i> | Gaps between hanging up latches: approx. 800 x 800 mm |
|-------------------|--|

Dimension of Big Bag on pallet:

500 kg:
1000 x 1000 x 550 mm

1000 kg:
1000 x 1000 x 1050 mm

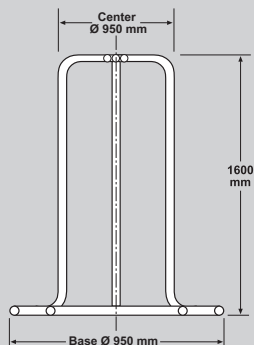
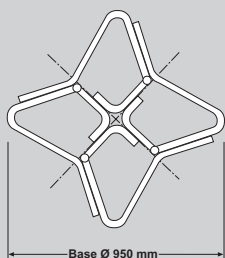
Dimensions are reference values,
because of more or less bulge of
Big Bags.



Packaging information

5. SAW – flux and wires

Heavy duty steel dispenser, large



Weight: ca. 750 kg

Material: Steel sheet



Packaging information

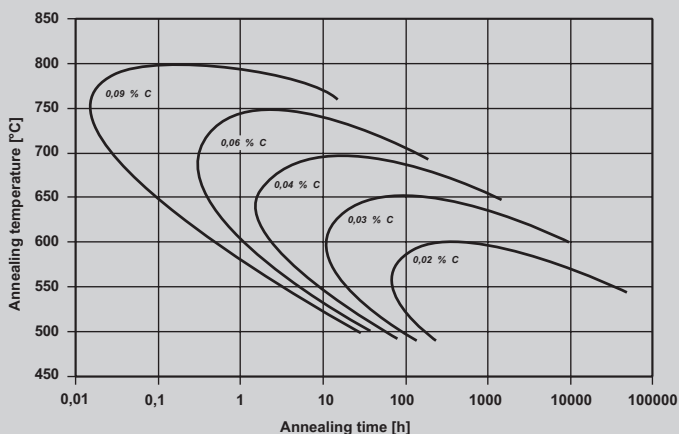
6. SAW – strips



| <i>Width & Thickness</i> | <i>Width & Coil</i> |
|------------------------------|-------------------------|
| 15 x 0,5 mm | 15 – 20 kg |
| 20 x 0,5 mm | 20 – 25 kg |
| 30 x 0,5 mm | 25 – 30 kg |
| 60 x 0,5 mm | 55 – 60 kg |
| 90 x 0,5 mm | 75 – 90 kg |

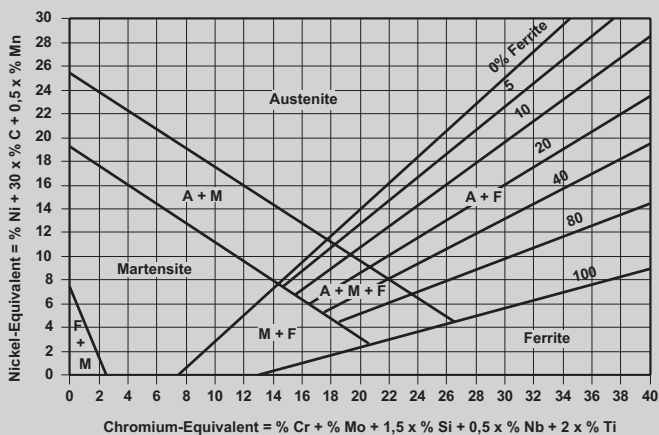
Diagrams

1. Rocha intergranular corrosion diagram



Range of intergranular corrosion for 18/8 chromium-nickel steels in relation to the free carbon content (acc. to H.J. Rocha)

2. Schaeffler diagram

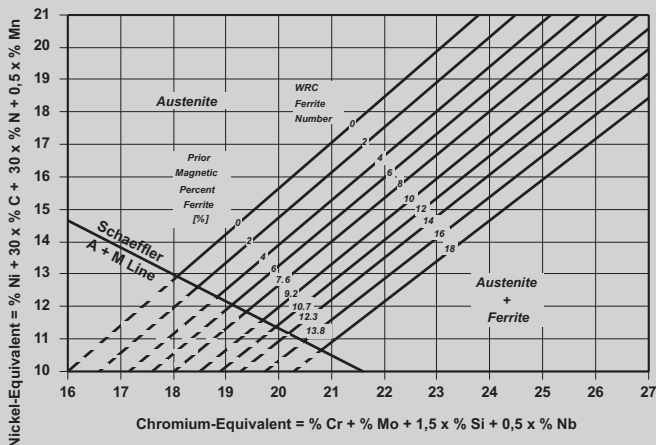


Schaeffler - Diagram

(acc. to A. L. Schaeffler, Metal Progress Nov. 1949, page 680 up to 680-B)

Diagrams

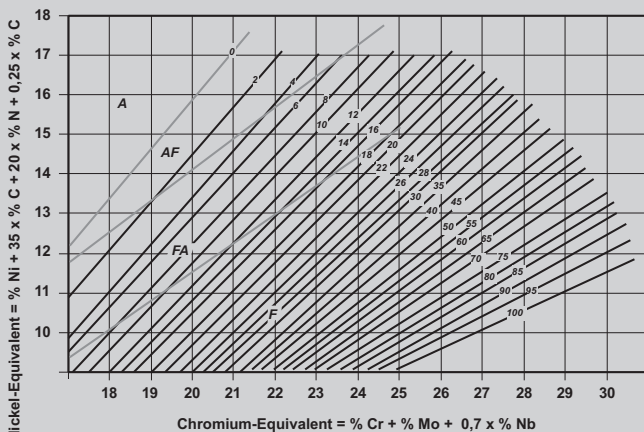
3. DeLong diagram



DeLong - Diagram

(acc. to W. T. DeLong, Welding Journal, July 1974, page 273-s up to 286-s)

4. WRC 92 diagram



WRC - 92 - Diagram

(acc. to D. J. Kotecki and T. A. Siewert, Welding Journal; May 1992, page 171-s up to 178-s)

Guidelines for the storage and transport of cored welding wires for general applications

1. General conditions

- 1.1 These guidelines are valid for general application for storage and transport of cored welding wire. This does not however release the user from his duty and responsibility in convincing himself of the faultless condition of the welding consumables in question.

2. Storage and Transport

- 2.1 Whenever welding consumables are transported, care must be taken that the material itself or the packaging is not damaged. The stacked height of cartons and packages should not exceed 6 units.

Precautions should be taken that older deliveries are used before newer ones (first in, first out).

Precautions should be taken to avoid storage in damp areas while in original packaging condition. To protect welding consumables against moisture pick up during long term storage, store preferably in a room with max. 60 % relative atmospheric humidity and a temperature of 18 – 23 °C. Temperature fluctuations should be avoided in order to prevent condensation.

Storage in direct contact with the floor or walls should be avoided.

- 2.2 Seamed and seamless cored wires in undamaged packages can be stored under mentioned conditions for a term of two years without reapplied usability testing. Start of storage term is the date when the purchaser's reception control certifies the correct status of the delivery directly after its incoming.
- 2.3 Improper storage and handling of cored wire can cause visible damage to the welding consumables. They may show defects such as kinks, bends and rust.

3. Redrying of flux cored wires

Even though the storage conditions as in section 2 are maintained it is probably necessary to redry seamed cored wires before they are welded because of safety cases.

Therefore the cored wires have to be unpacked and placed in the drying oven. A redrying temperature of 150 °C is recommended and should be maintained for a duration of 3 hours. In general the redrying procedure is limited to 24 hours.

Seamless cored wires do not require a redrying process.

Attention: Cored wires delivered on plastic spools can not be redried!

Guidelines for the storage and transport of solid welding wire and rods for general applications

1. General conditions

- 1.1 These guidelines are valid for general application for the storage and transport of solid welding wires and rods for arc welding. This does not however release the user from his duty and responsibility in convincing himself of the faultless condition of the welding consumables in question.

2. Storage and Transport

- 2.1 Whenever welding consumables are transported, care must be taken that the material itself or the packaging is not damaged. The stacked height of the cartons and packages or sacks should not exceed 6 units.

Precautions shall be taken that older deliveries are used before newer ones (first in, first out).

Precautions should be taken to avoid storage in damp areas while in original packaging condition. To protect welding consumables against moisture pick up during long term storage, store preferably in a room with a maximum of 60 % relative atmospheric humidity and a temperature of 18 – 23 °C. Temperature fluctuations shall be avoided in order to prevent condensation.

Storage in direct contact with the floor or walls shall be avoided.

- 2.2 All welding consumables that have been removed from their original packaging and not used for an extended period of time shall be stored in a clean and dry room, which is free of dust and sufficiently ventilated. Welding consumables showing evidence of deterioration following extended periods of exposure shall not be used.
- 2.3 Improper storage and handling of solid welding wire and rods can cause visible damage to the welding consumables. They may show defects such as kinks, bends and rust.

3. Guarantee

Provided that the guarantee conditions have not been otherwise agreed upon in individual contracts, a guarantee period of 12 months is guaranteed. Substitution claims will be regulated according to our general conditions of delivery and payment, in the event that claims, regardless of type, should be derived from the above recommendations.

Guidelines for the storage and rebaking of welding consumables for nuclear power plants and general applications

1. General conditions

- 1.1 These guidelines are valid for the storage and rebaking of all kinds of welding consumables which are determined for the application in the nuclear sector. This does not however release the user from his duty and responsibility in convincing himself of the faultless condition of the welding consumables in question.
- 1.2 We also recommend the use of these guidelines for all consumables determined for general application.

2. Storage

- 2.1 Whenever welding consumables are transported, extreme care must be taken that the material itself or the packaging is not damaged. The stacked height of the cartons and packages or sacks should not exceed 6 units.

Precautions should be taken that older production lots are used before newer ones.

- 2.2 All filler metals have to be stored in a clean and dry room which is free of dust and sufficiently ventilated. To protect the electrodes/fluxes against moisture pick up during storage, they should be stored preferably in a room with max. 60 % relative atmospheric humidity and a temperature of 18 – 23 °C. Temperature fluctuations have to be avoided in order to prevent condensation.

Improper storage and handling of bare solid welding wire and rods can cause visible damage to the filler metals. They may show defects such as links, bends and rust.

The storage in direct contact with the floor or walls should be avoided.

- 2.3 Under the above mentioned conditions and in undamaged packaging, coated electrodes and fluxes can be stored for a maximum of 2 years, without further testing (KTA 1408.3) before usage. The storage period begins at the point when the customer acknowledges the proper conditions of the merchandise, immediately on receipt of the delivery.

3. Rebaking of coated electrodes and flux

- 3.1 Even when the storage conditions mentioned in paragraph 2 have been observed, it is advisable, as a safeguard, to rebake the electrodes/fluxes before welding. Before starting the rebaking process, the electrodes should be removed from the packages with the appropriate care and laid in the baking oven. Under no circumstances the stacked height of the electrodes/fluxes in the oven should exceed 40 – 50 mm.

For rebaking, the filler metals should be held at the rebaking temperature of at least 2 hours.

The electrodes can be rebaked several times, although the total rebaking time must not exceed 10 hours.

Guidelines for the storage and rebaking of welding consumables for nuclear power plants and general applications

Recommendation for the redrying of electrodes and fluxes

| Coated electrodes Application | Type of coating acc. EN ... | Redrying | Redrying temperature (°C) | max. time for total redrying (h) |
|---|--------------------------------|----------|---------------------------------|--|
| Mild steel and low- alloyed qualities | A, AR, C, RC, R, RR, RB | No | – | – |
| | B | Yes | 250 – 350 | 10 |
| Fine grained structural steel qualities with YS ≥ 350/mm ² | B | Yes | 300 – 350 | 10 |
| Creep- and high temperature resistant qualities | R | No | – | – |
| | RB | Yes | 180 – 200 | 10 |
| | B | Yes | 300 – 350 | 10 |
| Stainless steels and ni-base qualities | R, B | Yes | 250 – 300 | 10 |
| Duplex-qualities | B, R | Yes | 250 – 300 | 10 |
| (soft) Martensitic and heat resistant ferritic qualities | B, R | Yes | 300 – 350 | 10 |

If the H₂-content in the weld deposit is limited to max. 5 ml/100 g, redrying is necessary at 300 up to 350 °C/2 h.

| Fluxes | Type of flux acc. EN ... | Redrying | Redrying temperature (°C) | max. time for total redrying (h) |
|----------------------------------|-----------------------------|----------|---------------------------------|--|
| All fluxes; UV ... and UA ... | AR, AB, FB | Yes | 300 – 350 | 10 |
| Marathon 104, 431, 444 | FB | Yes | 300 – 350 | 10 |
| Marathon 213 | CS | Yes | 250 – 300 | 10 |

Flux out of sealed drums must not be redried.

4. Intermediate storage of coated electrodes

- 4.1 Intermediate storage in the warming cupboard at:
120 – 180 °C, for a maximum of 3 weeks.
- 4.2 Intermediate storage in the holding carrier at:
100 °C – 150 °C, for a maximum of 8 hours.
- 4.3 Intermediate storage of fluxes

Rebaked fluxes which are not bound for direct use, can be stored at a storing temperature of about 150 °C at ± 20 °C for max. 2 weeks. Alternatively this flux can also be stored in sealed steel barrels.

Guidelines for the storage and rebaking of welding consumables for nuclear power plants and general applications

5. Cellulose-electrodes

Cellulosic coated electrodes are produced with a well defined moisture content in the coating. These electrodes are packed in tin cans. Cellulosic electrodes may never be redried.

6. Vacuum-package “Extra-Dry”

On special customer's desire electrodes can be packed in a vacuum package. These electrodes can be used without rebaking in a period up to 9 hours after opening the undamaged package. Thereby you will achieve H₂-contents less than 5 ml/100 g weld deposit.

Electrodes which are not used out of the vacuum package (within 9 hours) can be regenerated by rebaking at 300 – 350 °C for 2 h.

7. Return of the electrodes from the working area

After bringing back the coated electrodes/fluxes from the working area, rebaking as mentioned in paragraph 3 is always necessary.

The return of open packages to stock is not permissible.

8. Guarantee

Provided that the guarantee conditions have not been otherwise agreed upon in individual contracts, a guarantee period of 12 months is guaranteed. Substitution claims will be regulated according to our general conditions of delivery and payment, in the event that claims, regardless of type, should be derived from the above recommendations.

Material test certificates according to EN 10 204

Increasingly, certificates attesting the characteristics and property values of the welding filler metals are required by customers or inspection authorities within the framework of the acceptance testing of weldments.

A few explanatory notes are given below with the request that they be kept in mind when making inquiries or ordering.

The EN standard 10 204 is taken as a basis to determine the schedule of such certificates in the case of inquiries and orders. EN 10 204 defines who is responsible for testing and authorized to sign, and whether the certificates must contain details concerning general typical values or specific test results relating to the particular delivery in question.

We would like to emphasize strongly that the EN standard 10 204 does not contain the following details and that these must be specified by the customer when ordering:

| | |
|---------------------|--|
| Scope of testing: | e.g. type and number of tests, individual elements in case of chemical analyses |
| Consumables: | e.g. type of shielding gas, etc. |
| Test parameters: | e.g. postweld heat treatment of the test piece, test temperature |
| Requirements: | e.g. minimum values for yield strength, tensile strength, elongation, impact values, chemical composition tolerances |
| Inspection society: | e.g. TÜV, Germanischer Lloyd, DB |

3.1 and 3.2 certificates according EN 10 204 are fee-based.

Standard certificates issued for filler metals (in excerpts)

| Type of certificate | Confirmation of certificate by | Content of the certificate |
|-------------------------------|---|---|
| Test report 2.2 | Manufacturer | Non specific values, based on continuous production records |
| Inspection certificate 3.1 | The manufacturer's authorized representative independent of the manufacturing department | Specific test results determined from the consignment or representative lot of this consignment |
| Inspection certificate 3.2 | The manufacturer's authorized representative independent of the manufacturing department and the purchaser's authorized representative or inspector designated by the official regulations. | Specific test results determined from the consignment or representative lot of this consignment |

Hardness conversion table

R_m = Tensile strength (MPa)

HB = Brinell hardness

HV = Vickers hardness

HRC = Rockwell hardness

| R _m | HV | HB | HRC | R _m | HV | HB | HRC | R _m | HV | HB | HRC |
|----------------|-----|-----|-----|----------------|-----|-----|-----|----------------|-----|-----|-----|
| 200 | 63 | 60 | – | 545 | 170 | 162 | – | 890 | 278 | 264 | |
| 210 | 65 | 62 | – | 550 | 172 | 163 | – | 900 | 280 | 266 | 27 |
| 220 | 69 | 66 | – | 560 | 175 | 166 | – | 910 | 283 | 269 | |
| 225 | 70 | 67 | – | 570 | 178 | 169 | – | 915 | 285 | 271 | |
| 230 | 72 | 68 | – | 575 | 180 | 171 | – | 920 | 287 | 273 | 28 |
| 240 | 75 | 71 | – | 580 | 181 | 172 | – | 930 | 290 | 276 | |
| 250 | 79 | 75 | – | 590 | 184 | 175 | – | 940 | 293 | 278 | 29 |
| 255 | 80 | 76 | – | 595 | 185 | 176 | – | 950 | 295 | 280 | |
| 260 | 82 | 78 | – | 600 | 187 | 178 | – | 960 | 299 | 284 | |
| 270 | 85 | 81 | – | 610 | 190 | 181 | – | 965 | 300 | 285 | |
| 280 | 88 | 84 | – | 620 | 193 | 184 | – | 970 | 302 | 287 | 30 |
| 285 | 90 | 86 | – | 625 | 195 | 185 | – | 980 | 305 | 290 | |
| 290 | 91 | 87 | – | 630 | 197 | 187 | – | 990 | 308 | 293 | |
| 300 | 94 | 89 | – | 640 | 200 | 190 | – | 995 | 310 | 295 | 31 |
| 305 | 95 | 90 | – | 650 | 203 | 193 | – | 1000 | 311 | 296 | |
| 310 | 97 | 92 | – | 660 | 205 | 195 | – | 1010 | 314 | 299 | |
| 320 | 100 | 95 | – | 670 | 208 | 198 | – | 1020 | 317 | 301 | 32 |
| 330 | 103 | 98 | – | 675 | 210 | 199 | – | 1030 | 320 | 304 | |
| 335 | 105 | 100 | – | 680 | 212 | 201 | – | 1040 | 323 | 307 | |
| 340 | 107 | 102 | – | 690 | 215 | 204 | – | 1050 | 327 | 311 | 33 |
| 350 | 110 | 105 | – | 700 | 219 | 208 | – | 1060 | 330 | 314 | |
| 360 | 113 | 107 | – | 705 | 220 | 209 | – | 1070 | 333 | 316 | |
| 370 | 115 | 109 | – | 710 | 222 | 211 | – | 1080 | 336 | 319 | 34 |
| 380 | 119 | 113 | – | 720 | 225 | 214 | – | 1090 | 339 | 322 | |
| 385 | 120 | 114 | – | 730 | 228 | 216 | – | 1095 | 340 | 323 | |
| 390 | 122 | 116 | – | 740 | 230 | 219 | – | 1100 | 342 | 325 | |
| 400 | 125 | 119 | – | 750 | 233 | 221 | – | 1110 | 345 | 328 | 35 |
| 410 | 128 | 122 | – | 755 | 235 | 223 | – | 1120 | 349 | 332 | |
| 415 | 130 | 124 | – | 760 | 237 | 225 | – | 1125 | 350 | 333 | |
| 420 | 132 | 125 | – | 770 | 240 | 228 | – | 1130 | 352 | 334 | |
| 430 | 135 | 128 | – | 780 | 243 | 231 | 21 | 1140 | 355 | 337 | 36 |
| 440 | 138 | 131 | – | 785 | 245 | 233 | | 1150 | 358 | 340 | |
| 450 | 140 | 133 | – | 790 | 247 | 235 | | 1155 | 360 | 342 | |
| 460 | 143 | 136 | – | 800 | 250 | 238 | 22 | 1160 | 361 | 343 | |
| 465 | 145 | 138 | – | 810 | 253 | 240 | | 1170 | 364 | 346 | 37 |
| 470 | 147 | 140 | – | 820 | 255 | 242 | 23 | 1180 | 367 | 349 | |
| 480 | 150 | 143 | – | 830 | 258 | 245 | | 1190 | 370 | 352 | |
| 490 | 153 | 145 | – | 835 | 260 | 247 | 24 | 1200 | 373 | 354 | 38 |
| 495 | 155 | 147 | – | 840 | 262 | 249 | | 1210 | 376 | 357 | |
| 500 | 157 | 149 | – | 850 | 265 | 252 | | 1220 | 380 | 361 | |

| R _m | HV | HB | HRC |
|----------------|-----|-----|-----|
| 510 | 160 | 152 | – |
| 520 | 163 | 155 | – |
| 530 | 165 | 157 | – |
| 540 | 168 | 160 | – |
| 1260 | 392 | 372 | 40 |
| 1270 | 394 | 374 | |
| 1280 | 397 | 377 | |
| 1290 | 400 | 380 | |
| 1300 | 403 | 383 | 41 |
| 1310 | 407 | 387 | |
| 1320 | 410 | 390 | |
| 1330 | 413 | 393 | 42 |
| 1340 | 417 | 396 | |
| 1350 | 420 | 399 | |
| 1360 | 423 | 402 | 43 |
| 1370 | 426 | 405 | |
| 1380 | 430 | 409 | |
| 1390 | 431 | 410 | |
| 1400 | 434 | 413 | 44 |
| 1410 | 437 | 415 | |
| 1420 | 440 | 418 | |
| 1430 | 443 | 421 | 45 |
| 1440 | 446 | 424 | |
| 1450 | 449 | 427 | |
| 1455 | 450 | 428 | |
| 1460 | 452 | 429 | |
| 1470 | 455 | 432 | |
| 1480 | 458 | 435 | 46 |
| 1485 | 460 | 437 | |
| 1490 | 461 | 438 | |
| 1500 | 464 | 441 | |
| 1510 | 467 | 444 | |
| 1520 | 470 | 447 | |
| 1530 | 473 | 449 | 47 |
| 1540 | 476 | 452 | |
| 1550 | 479 | 455 | |
| 1555 | 480 | 456 | |
| 1560 | 481 | | |
| 1570 | 484 | | 48 |
| 1580 | 486 | | |
| 1590 | 489 | | |
| 1595 | 490 | | |
| 1600 | 491 | | |
| 1610 | 494 | | |

| R _m | HV | HB | HRC |
|----------------|-----|-----|-----|
| 860 | 268 | 255 | 25 |
| 865 | 270 | 257 | |
| 870 | 272 | 258 | 26 |
| 880 | 275 | 261 | |
| 1620 | 497 | | 49 |
| 1630 | 500 | | |
| 1640 | 503 | | |
| 1650 | 506 | | |
| 1660 | 509 | | |
| 1665 | 510 | | |
| 1670 | 511 | | |
| 1680 | 514 | | 50 |
| 1690 | 517 | | |
| 1700 | 520 | | |
| 1710 | 522 | | |
| 1720 | 525 | | |
| 1730 | 527 | | 51 |
| 1740 | 530 | | |
| 1750 | 533 | | |
| 1760 | 536 | | |
| 1770 | 539 | | |
| 1775 | 540 | | |
| 1780 | 541 | | |
| 1790 | 544 | | 52 |
| 1800 | 547 | | |
| 1810 | 550 | | |
| 1820 | 553 | | |
| 1830 | 556 | | |
| 1840 | 559 | | |
| 1845 | 560 | | 53 |
| 1850 | 561 | | |
| 1860 | 564 | | |
| 1870 | 567 | | |
| 1880 | 570 | | |
| 1890 | 572 | | |
| 1900 | 575 | | |
| 1910 | 578 | | 54 |
| 1920 | 580 | | |
| 1930 | 583 | | |
| 1940 | 586 | | |
| 1950 | 589 | | |
| 1955 | 590 | | |
| 1960 | 591 | | |
| 1970 | 594 | | |

| R _m | HV | HB | HRC |
|----------------|-----|-----|-----|
| 1230 | 382 | 363 | 39 |
| 1240 | 385 | 366 | |
| 1250 | 388 | 369 | |
| 1255 | 390 | 371 | |
| 1980 | 596 | | 55 |
| 1990 | 599 | | |
| 1995 | 600 | | |
| 2000 | 602 | | |
| 2010 | 605 | | |
| 2020 | 607 | | |
| 2030 | 610 | | |
| 2040 | 613 | | |
| 2050 | 615 | | 56 |
| 2060 | 618 | | |
| 2070 | 620 | | |
| 2080 | 623 | | |
| 2090 | 626 | | |
| 2100 | 629 | | |
| 2105 | 630 | | |
| 2110 | 631 | | |
| 2120 | 634 | | |
| 2130 | 636 | | |
| 2140 | 639 | | 57 |
| 2145 | 640 | | |
| 2150 | 641 | | |
| 2160 | 644 | | |
| 2170 | 647 | | |
| 2180 | 650 | | |
| 2190 | 653 | | |
| 2200 | 655 | | 58 |
| | 675 | | 59 |
| | 698 | | 60 |
| | 720 | | 61 |
| | 745 | | 62 |
| | 773 | | 63 |
| | 800 | | 64 |
| | 829 | | 65 |
| | 864 | | 66 |
| | 900 | | 67 |
| | 940 | | 68 |

Caution: Because of their approximate nature, conversion tables must be regarded as only an estimate of comparative values. It is recommended that hardness conversions be applied primarily to values such as specification limits, which are established by agreement or mandate, and that the conversion of test data be avoided whenever possible.

Metallography structures

1. Austenitic

Field of use & properties comments

An alloy that after solidification and cooling down to room temperature according to such microstructure is generally qualified as an austenitic one. Alloying elements stabilizing the austenite structure are most of the time Carbon, Manganese and Nickel but Chromium and Niobium might be used in combination in order to modify work hardenability and/or abrasion resistance. Austenitic alloys appreciated for building-up tasks, buffering prior overlaying with carbide containing alloys. Austenitic alloys with up to 0,7 % C and 20 – 30 (Mn + Cr) % with or without Ni, providing very stable austenite are appreciated for overlay on carbon and low alloyed steels no matter the dilution could be as well for joints on “hard to weld” steels or dissimilar joints between carbon or low alloy steels and 14 % Mn Hadfield steels. Carbon level has a relative low influence on the final hardness at room temperature. High Manganese steels should not be exposed over long time intervals to temperatures exceeding 350 °C in order to avoid any embrittlement by carbide precipitation.

Main characteristics

Usual Austenitic & Martensitic single microstructures used in overlay welding.

- Work hardenable
- Not magnetic in as cast state
- Strongly resistant to impacts
- Not prone to crack propagation
- Moderately resistant to abrasion most over in the work hardened state
- Fairly resistant to rusting
- Not hardenable by heat treatment
- Cannot be flame cut

Metallography structures

2. Martensitic

Field of use & properties comments

3 subfamilies of martensitic alloys are existing: unalloyed (mainly alloyed with C & Cr), medium alloyed (alloyed with C, Cr < 11 %, Mo, W, V, Nb) & stainless grades (alloyed with min. 12 % Cr). The martensite is a microstructure out of equilibrium, obtained by rapid cooling, the faster the cooling rate, the harder the microstructure. Low carbon, unalloyed martensitic alloys are primarily used for building-up to original dimensions or for buffering prior to hardfacing with harder materials. Overlay welding with martensitic alloys (as substrate or consumable) generally require preheating ($\geq 150 - 350$ °C depending on chemistry and thickness concerned) in order to avoid cold cracking due inappropriate cooling rate. Medium alloyed martensitics thanks to their good tempering resistance may be used to repair welding on cold & hot working tool steels up to 500 – 550 °C.

Stainless martensitic alloys are fairly resisting to thermal shock, to wet corrosion and show a good behaviour face to adhesion and hot oxidation that makes them appreciated for overlays on caster and steel mill hot rollers and for Sulphur bearing fumes exhaust systems. These alloys don't suit for joining purposes nor used for overlaying austenitic grades.

Main characteristics (2. Martensitic)

Usual Austenitic & Martensitic single microstructures used in overlay welding

- Generally good resistance against impacts up to 0,5 % C
- Quite high resistance against compressive stresses
- High response to heat treating
- Particular good behaviour to adhesion wear (metal to metal sliding wear)
- Prone to crack propagation
- Low resistant to rusting with exception for martensitic stainless grades
- Resistant to hot oxidation up to 800 °C and to hot corrosion for stainless grades

Metallography structures

3. Complex carbide microstructure with austenitic or martensitic iron matrix

Field of use & properties comments

Alloys of this family perform very well when abrasion is concerned thanks to their variable proportions of widely dispersed carbides. Therefore most of these alloys contain as main alloying elements both carbon and chromium. Low carbon (1,5 – 3 %) favours small carbides quantities related to the matrix so they exhibit good abrasion resistance combined with a good toughness properties making them capable to make a good compromise when both shocks and abrasion are present.

Increased level of carbon (up to 6 – 7 %), allow to boost the carbide number and sizes while the matrix progressively loses its toughness. As consequence of this, relief check cracks appear more frequently and are closer from each other's. With a few exceptions requiring specific procedures, it is generally preferred to use these alloys on substrates buffered with austenitic layers avoiding check cracks to move to the base material. The risk of spalling associated with check cracks and high hardness imposes to minimise the number of layers to 3 or 4. Combination of large and small carbides sizes allow to extend the abrasion wear resistance to fine abrasive particles.

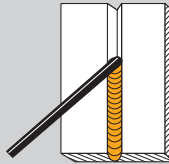
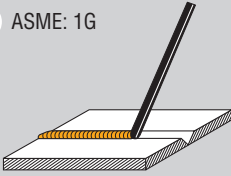
Main characteristics

- Highly resistant to abrasion under low & high compressive stresses.
- Moderate to low resistance to impacts
- Fairly resistant to corrosion
- Good resistance to heat
- Only machinable by grinding
- May develop relief check cracks
- Cannot be flame cut

Welding positions according to EN ISO 6947 und ASME code, section IX

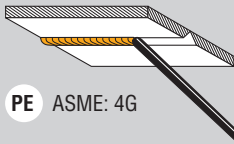
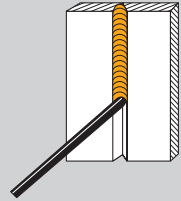
Butt welds

PA ASME: 1G



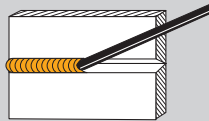
PF ASME: 3Gu

PG ASME: 3Gd

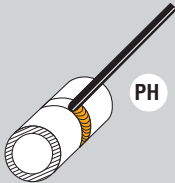
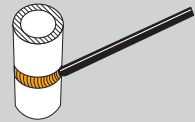


PE ASME: 4G

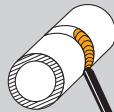
PC ASME: 2G



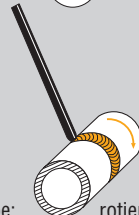
PC Pipe: fixed vertical
Pipe axis: ASME: 2G



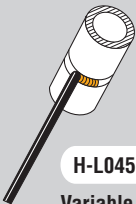
PH Pipe: fixed horizontal
Pipe axis: ASME: 5Gu



PJ Pipe: fixed horizontal
Pipe axis: ASME: 5Gd



PA Pipe: rotierend horizontal
Pipe axis: ASME: 1G



H-L045

Variable axis

Pipe: fixed
Pipe axis: inclined (e.g. 45°)
ASME: 6Gu



J-L045

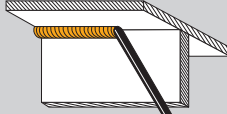
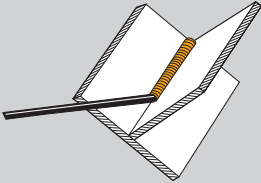
Variable axis

Pipe: fixed
Pipe axis: inclined (e.g. 45°)
ASME: 6Gd

Welding positions according to EN ISO 6947 und ASME code, section IX

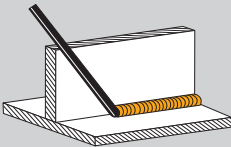
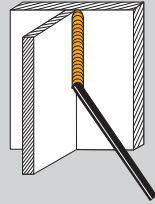
Fillets welds

PA ASME: 1F

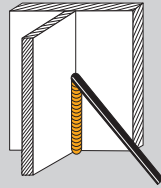


PD ASME: 4F

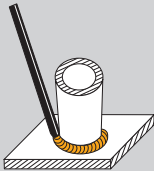
PG ASME: 3Fd



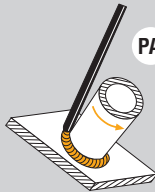
PF ASME: 3Fu



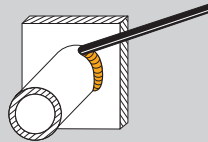
PB ASME: 2F



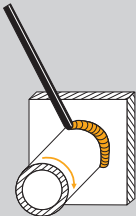
Pipe: fixed vertical
Pipe axis: ASME: 2F



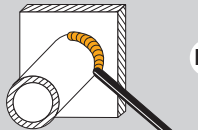
PA Pipe: rotated inclined
Pipe axis: ASME: 1FR



PH Pipe: fixed horizontal
Pipe axis: ASME: 5Fu

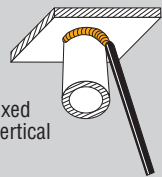


PB Pipe: rotated horizontal
Pipe axis: ASME: 2FR



PJ Pipe: fixed horizontal
Pipe axis: ASME: 4Fd

PD Pipe: fixed vertical
Pipe axis: ASME: 4F



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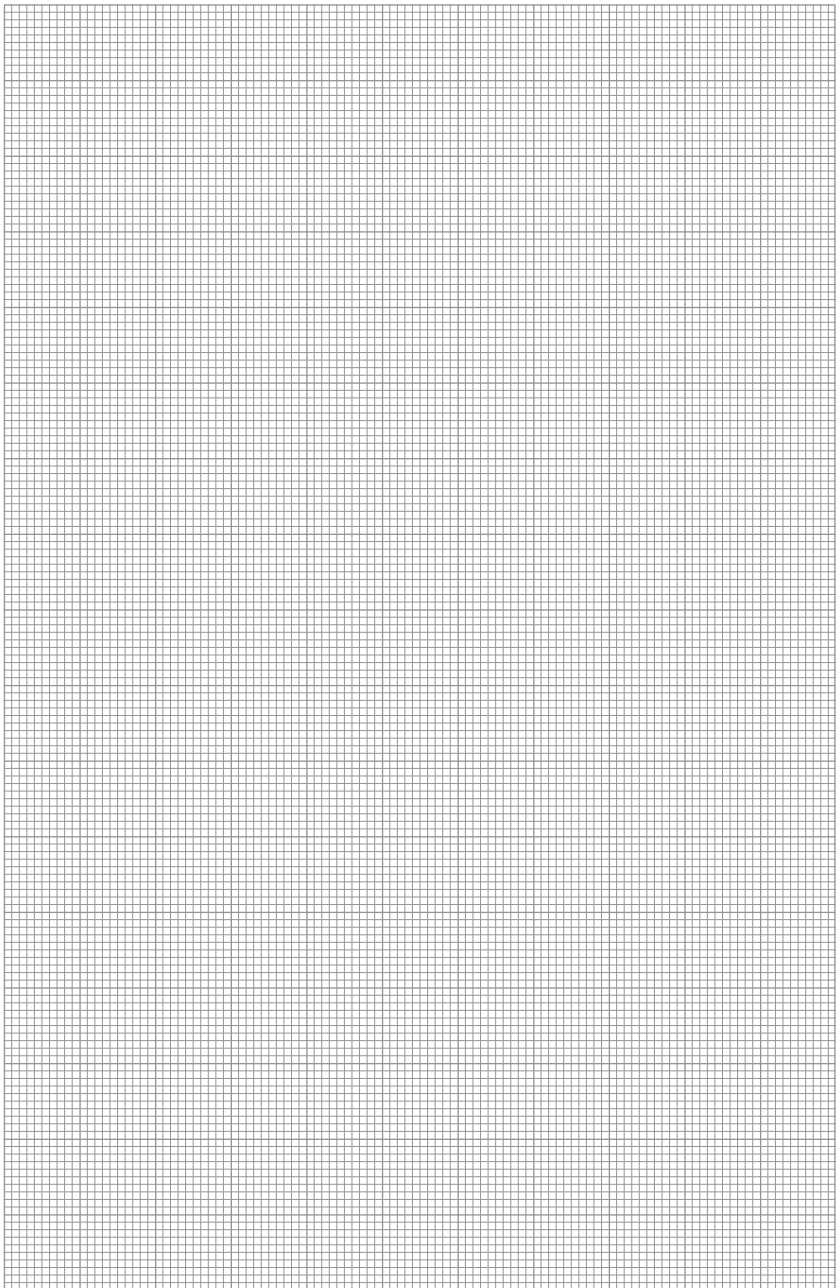
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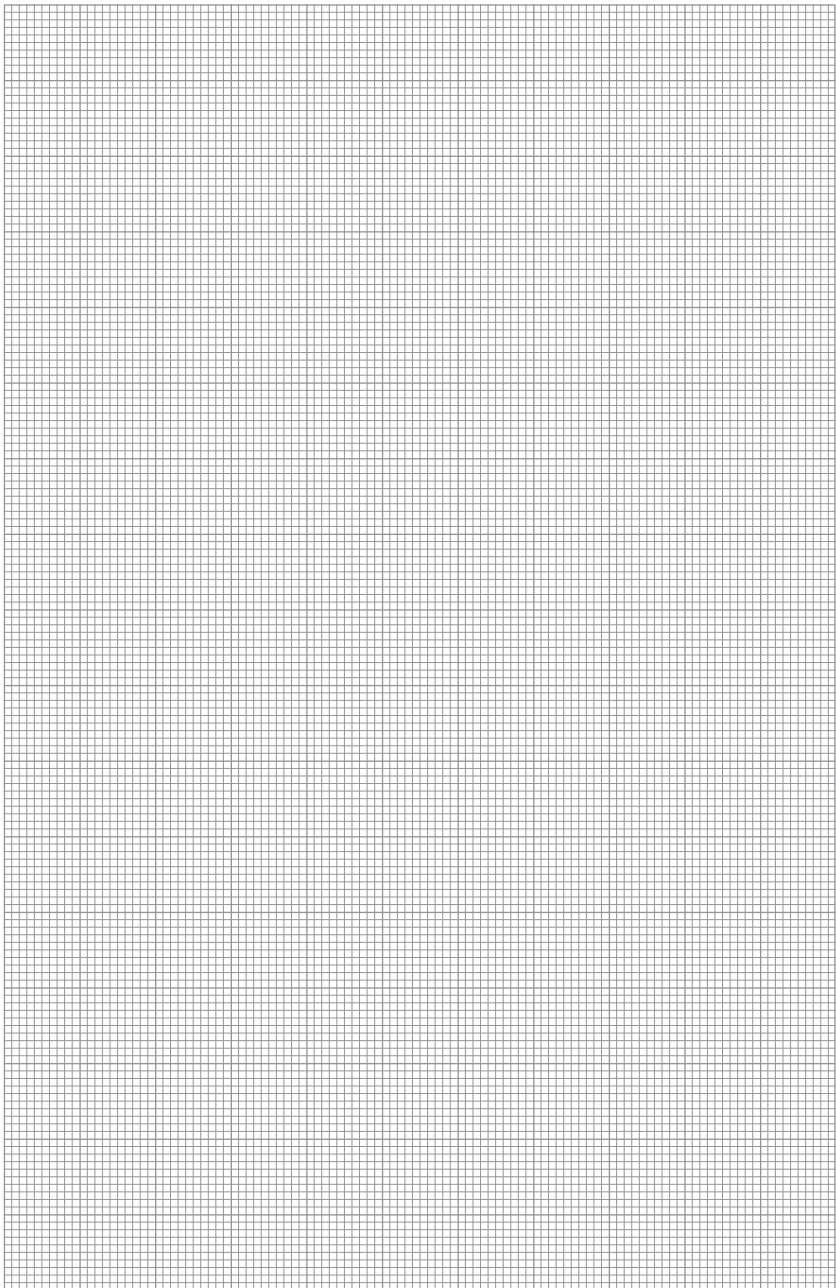
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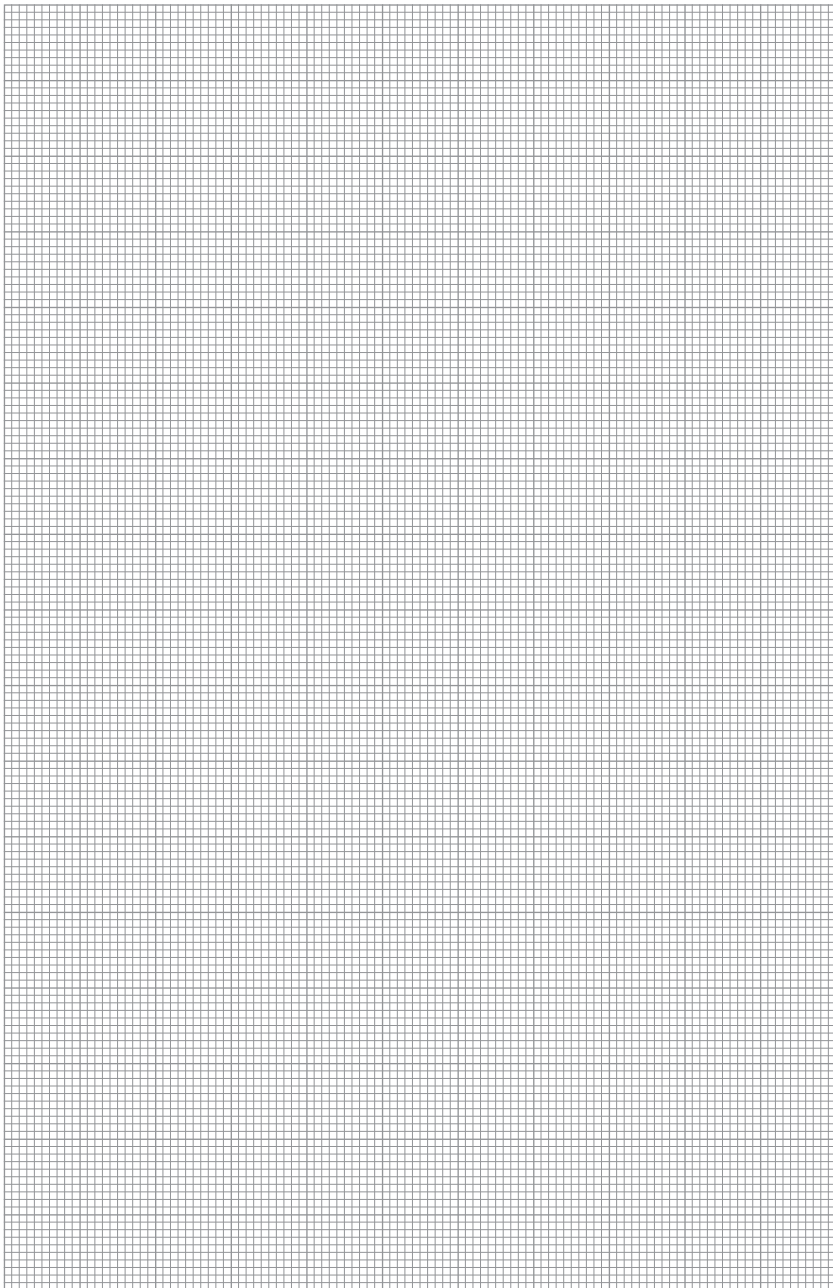
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All data on our products contained in this welding guide are based upon careful investigation and intensive research. However, we do not assume any liability for their correctness.

We recommend the user to test – on his own responsibility – our products with regard to their special application.

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voestalpine Böhler Welding Germany GmbH
Elsässer Straße 10
79189 Bad Krozingen
Germany
T. +49 7633 409-01
F. +49 7633 409-222

voestalpine Böhler Welding Belgium S.A.
Rue de l'Yser 2
7180 Seneffe
Belgium
T. +32 64 5102-25
F. +32 64 5102-30



UTP Maintenance
Global Brand Management
T. + 49 7633 409-01
utp.maintenance@voestalpine.com

voestalpine
ONE STEP AHEAD.