

Eczacıbaşı - Lincoln Electric

**KOBATEK®**  
Products



*Coated Electrodes  
for Maintenance  
and Repair Welding*

*Flux-Cored and GMA  
Welding Wires for  
Hardfacing*



**Kobatek®**  
PROTECTIVE MAINTENANCE TECHNOLOGY

مركز البراغي والعدد  
**BTCO**  
BOLTS & TOOLS CENTER



# Index

## KOBATEK Coated Electrodes, Flux-Cored Welding Wires and GMA Welding Wires

Coated Electrodes		Page	Flux-Cored Welding Wires		Page
<b>Surface Preparation, Cutting and Gouging</b>			<b>Hardfacing Applications</b>		
Kobatek 111		7	Kobatek T-365		36
<b>Cast Irons</b>			Kobetek T-558		37
Kobatek 46		8	Kobatek T-570		38
Kobatek 418		9	Kobatek T-580		39
Kobatek 458		10	<b>GMA (MIG/MAG) Welding Wires</b>		<b>Page</b>
<b>High Alloyed Special Steels Difficult to Weld</b>			<b>Hardfacing Applications</b>		
Kobatek 301		11	Kobatek MIG T-350/S		40
Kobatek 315		12	Kobatek MIG T-600/S		41
Kobatek 326		13	Kobatek MIG T-650/S		42
Kobatek 326-N		14			
Kobatek 345		15			
Kobatek 350		16			
Kobatek 352		17			
Kobatek 358		18			
Kobatek 381		19			
Kobatek 382		20			
<b>Aluminium and Its Alloys</b>					
Kobatek 213		21			
Kobatek 250		22			
<b>Copper and Its Alloys</b>					
Kobatek 725		23			
<b>Corrosion Resistant Stainless Steels</b>					
Kobatek 818		24			
<b>Hardfacing Applications</b>					
Kobatek 512		25			
Kobatek 520		26			
Kobatek 540		27			
Kobatek 541		28			
Kobatek 543		29			
Kobatek 545		30			
Kobatek 550		32			
Kobatek 562		33			
Kobatek 578		34			

# Kobatek®

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# KOBATEK Helps to Cut Spares and Repair Costs

## Spares and Repair Costs - Wear Factors

Because wear exists wherever there is motion, nearly every industry encounters wear problems. Excessive wear causes billions of dollars to be lost annually through: unplanned downtime, repetitive replacement of costly parts, inordinate maintenance costs, lowered production efficiency and losses of sales due to poor product reliability.

KOBATEK repair and maintenance welding electrodes have been instrumental in reducing losses and increasing cost savings for companies in a number of diverse industries and applications. Companies use KOBATEK products to:

**Reduce cost :** Fewer man-hours for repair and maintenance jobs; minimized downtime and rejects; reduction in purchases of spare parts, energy and resources.

**Prolong equipment time :** Surfacing extends life 30-300%, depending upon application, as compared to that of a nonsurfaced part.

**Reduce down-time :** Save dismantling time and downtime due to replacement delays; minimizes re-fitting time, etc..

**Reduce inventory of spare parts :** There is no need to keep numerous spare parts when worn parts can be rebuilt.

There are basically two main areas where KOBATEK electrodes are used :

1 - The rebuilding of worn metal parts to their original dimensions. This is accomplished with build-up or with build-up and overlay welding.

2 - The protection of new metal parts against the loss of metal. Hardsurfacing overlay is used on both new and/or original parts where the parts are most susceptible to wear. The higher alloy overlay offers much better resistance than that of the original base material. This usually increases the work life of the component up to two or more times that of a part which is not surfaced.

With over 30 years experience in the field of repair and maintenance welding, KOBATEK can recommend and supply the most cost-effective solution to any repair-maintenance and welding problems. KOBATEK offers you a complete range of welding electrodes for every repair and preventative maintenance need. KOBATEK research teams are constantly seeking better methods of combating wear and welding problems; creating new products for new preventative maintenance and welding problems, and improving existing products for old problems. New products to match operating requirements in your plants can also be developed.

This part briefly outlines the KOBATEK product line which includes electrodes for: surface preparation, cast irons, steels, stainless steels, hardfacing, copper and aluminium alloys.

Wear is a general term used to describe a progressive deterioration of a surface with loss of shape, often accompanied by loss of weight due to the creation of debris. We have to understand the wear factors involved before making a hard surfacing product selection.

There are seven major types of wear which are caused by mechanical and chemical actions.

Mechanical causes of wear:

(1) abrasion, (2) impact, (3) erosion, (4) cavitation, (5) friction

Chemical causes of wear :

(6) corrosion and heat

### ABRASION :

Abrasion is the most common form of wear. It is caused by foreign materials (non-metallic materials such as sand, oxides or grit) moving over a metal part. The worn surface can be recognized by its polished appearance or by very fine scratches in the direction of particle movement. It can be broken down into three main categories :

- 1 - Low-stress scratching abrasion: typical components subjected to this kind of abrasion include: agricultural implements, classifiers, screens, slurry pump nozzles, sand slingers and chutes, etc..
- 2 - High-stress grinding abrasion: typical components subjected to this kind of abrasion include: augers, scraper blades, pulverizers, ball and rod mills, muller tires, brake drums, roll crushers, rollers sprockets and mixing paddles etc..
- 3 - Gouging abrasion: typical components subjected to gouging abrasion include: dragline buckets, power shovel buckets, clam shell buckets, gyratory rock crushers, roll crushers and jaw crushers, etc..



### IMPACT :

Wear by impact is the result of a succession of local shock loads on the material surface. When the stress exceeds the elastic limits of the metal, the metal deforms both beneath the point and laterally across the surface away from the impact point. Some of the effects of impact are: fatigue, cracking, flaking, compression and deformation. Typical components subjected to impact include: coupling boxes, crusher rolls, impact hammers, impactor bars, railroad frogs and crossings.

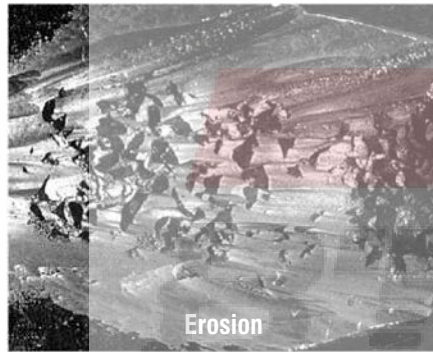
# Wear Factors

## Abrasion - Impact - Erosion - Cavitation - Corrosion - High Temperature - Friction

### EROSION :

It occurs in liquid or gaseous media, when extraneous, fine and hard particles strike a surface at an angle of incidence. Erosion can be considered a combined form of impact and abrasion. Grit-blasting is a technological application of this phenomenon. Erosion wear involves two typical mechanisms:

- 1 - In cases of vertical impact we are dealing with local phenomena, which can lead to both elastic and plastic deformation, with grooves on the worn surface.
- 2 - In cases of oblique or glancing impact by solid particles, the mechanism of surface damage involves the formation of chips.



is to analyze the exact manner in which the mechanisms are interacting. This brief description of the main types of wear shows that a detailed theoretical evaluation of any given wear problem is highly complex. But you can easily find a solution with the appropriate special KOBATEK alloys.



### HIGH TEMPERATURE:

Heat affects the metal's microstructure and generally reduces its durability. A major cause of metal failure from high temperature service is the thermal fatigue (fire cracking) that results from repetitive intense heating followed by cooling. The repeated expansion and contraction caused by this thermal cycling eventually exceeds the ability of the metal to recover and causes deep cracking. The most common form of wear caused by heat is probably oxidation. This takes place during the build-up of an oxide layer. Wear occurs when the layer is broken away by a cycle of expansion and contraction, and the whole oxidation operation is repeated. Typical components subjected to high temperature wear include: continuous caster rolls, steel mill work rolls, hot forging dies, tongs and sinter crushing equipment.

### CAVITATION:

This wear results from the rapid formation and collapse of tiny gas bubbles in a liquid. This causes high speed localized pressure changes or explosions creating shock waves that impact on the base metal surface resulting in local deformation. The damage to the surface arises from a similar mechanism to that of erosion by impact deformation, except that in the case of cavitation the solid abrasive particles are replaced by microwaves that produce pitting fatigue, subsequent micro-crevices (fissures) and the removal of metal.

### CORROSION :

It is deterioration of a metal by a chemical or electrochemical reaction between the metal and the environment such as scaling and pitting caused by oxidation when a metal is heated, or by acids eroding the base metal. The most common type of corrosion is rust. Rust transforms the surface of a metal into oxide which eventually flakes off, thus reducing the original thickness of the metal.

In most cases, several different types of wear work together, with a combined destructive effect which is often greater than the sum of their individual effects. To propose an effective solution to complex combined wear problems, one approach

### ADHESION and FRICTION (Metal-to-Metal):

This wear results from the sliding or rolling contact of one metal surface against another. To the naked eye, metal surfaces may appear smooth and even highly polished, but under a microscope they show definite hills and valleys. As metal surfaces slide against each other, the high areas (hills) are broken and tiny fragments of metal are torn away. Typical components subjected to friction include: steel mill rolls, undercarriage components, shear blades, shafts, trunnions and non-lubricated bearing surfaces.





# Kobatek 111



## Coated Electrode for Surface Preparation, Cutting and Gouging

### General Description

Kobatek 111 is used for ferrous or non-ferrous metals where grooving is necessary without supplementary gases and special electrode holder. For preparing sections prior to welding, gouging out old or defective weld metal, removing flash and risers. All these operations can be carried out in all positions; except vertical upwards. A thick, specially developed exothermic coating produces a forceful gas jet which blows the molten metal away, to give a smooth, clean groove. A finishing operation is unnecessary.

Working Speed	██████████	██████████	██████████	██████████
Cleaning	██████████	██████████	██████████	██████████
Heat Input	██████████	██████████	██████████	██████████

### RECOMMENDED PROCEDURE :

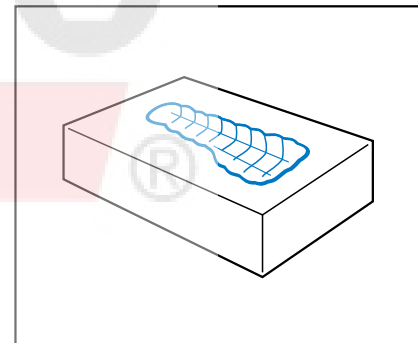
Strike the arc with the electrode normal to the workpiece and then immediately incline the electrode at an angle of 15-20° to the workpiece. Point the arc in the direction of travel, move the electrode forward to melt the metal and then pull it back to allow the gas jet to blow the molten metal away.

### Approvals

GOST, SEPRO, TSEK

### Typical Applications

- Gouging, bevelling cast iron and other metals
- Removal of old welds and rivets
- Removal of weld defects
- Piercing holes
- Back-gouging root runs



Gouging and  
Removal Weld Defects

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(-) ; AC

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.25	350	180 - 220	5
4.00	350	200 - 275	5
5.00	350	250 - 300	5

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# Kobatek 46



## Coated Electrode for Cast Irons

### General Description

An AC/DC pure nickel electrode for welding of old, contaminated, oil-soaked gray and alloyed castings with a minimum preheat. The welding should proceed step by step so that the work-piece is not heated more than necessary. It has excellent application properties on welding in position. The deposit is always soft and machinable.

Crack Resistance	████████	████████	████████	████████
Bonding	████████	████████	████████	████████
Machinability	████████	████████	████████	████████

### General Description

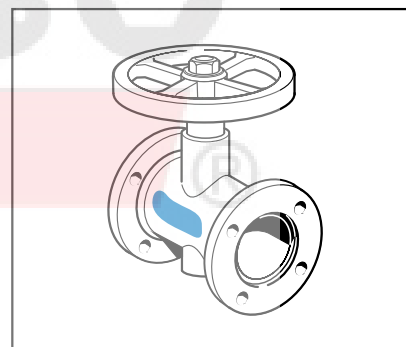
Tensile Strength : 26 - 30 kg/mm<sup>2</sup>  
Elongation (L=5d) : 8 - 10 %  
Hardness : 100 - 140 HB

### Approvals

GOST, SEPRO, TSE

### Typical Applications

- Engine blocks
- Pump housings
- Cylinder heads and blocks
- Valves
- Gear and gear boxes
- Eccentric wheels
- Work-bench sledges
- Drums
- Reclamation of faulty castings
- Joining of castings in all-cast and composite fabrications



Cast Iron  
Valve Bodies

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(-) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
2.50	300	70 - 90	50 - 60	1
3.25	300	100 - 120	80 - 90	1



# Kobatek 418



## Coated Electrode for Cast Irons

### General Description

A pure nickel, non-conductive flux coating electrode for repair and maintenance welding of cast iron components. Kobatek 418 exhibits excellent arc characteristics by producing a drop arc transfer which assists in combating surface contamination such as when joining badly oiled cast iron parts. For all types of machinable repairs on old, contaminated, oil-soaked gray and alloyed castings. Sound, dense deposits are fully machinable. It can be used for thin, as well as thick sections.

Crack Resistance	████████	████████	████████	████████	████████
Bonding	████████	████████	████████	████████	████████
Machinability	████████	████████	████████	████████	████████

### Mechanical Properties, All Weld Metal

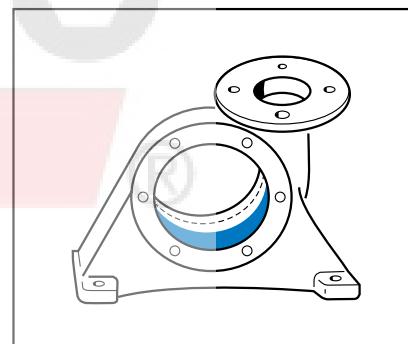
Tensile Strength : 26 - 30 kg/mm<sup>2</sup>  
Elongation (L=5d) : 8 - 10 %  
Hardness : 120 - 160 HB

### Approvals

GOST, SEPRO

### Typical Applications

- Pump housings
- Pump rotors
- Compressors
- Valves
- Gear boxes
- Engine blocks
- Cylinder heads and blocks
- Pulleys
- Eccentric wheels



Cast Iron  
Valve Seats

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(-) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
2.50	300	70 - 90	50 - 60	5
3.25	350	100 - 120	80 - 90	5
4.00	350	130 - 150	100 - 120	5

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# Kobatek 458



## Coated Electrode for Cast Irons

### General Description

Kobatek 458 has Ni-Cu alloyed deposit and it has been specially designed for welding of malleable cast iron and nodular or ductile spheroidal graphite iron where ease of welding, low heat input and high crack resistance are important. Therefore, it is very suitable for making thick joints and for filling up deep cavities. It has high crack resistant deposits which are fully machinable. It can be used on both heavy and thin sections, especially for welding in position. The special arc characteristics also allow welding even on contaminated surfaces. It is also suitable for joining cast iron to steel. The deposit is the optimum colour match with the cast iron parts.

Crack Resistance	██████████
Bonding	██████████
Machinability	██████████

### Mechanical Properties, All Weld Metal

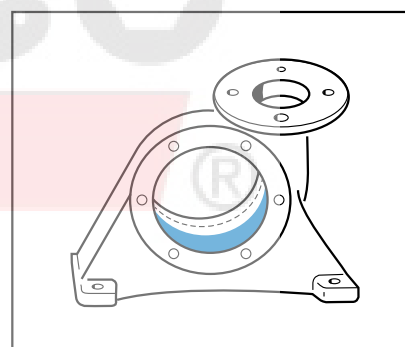
Tensile Strength : 38 - 44 kg/mm<sup>2</sup>  
Elongation (L=5d) : 15 - 20 %  
Hardness : 140 - 180 HB

### Approvals

GOST, SEPRO

### Typical Applications

- Repair of nodular and ductile iron castings and foundry defects
- Machine housings
- Pipes and flanges
- Pump impellers
- Pulleys
- Gears and gear boxes
- Turbine blades
- Engine blocks
- Transmission housings
- Joining of gray cast iron to steels and stainless steels
- Joining of steels to copper alloys



Cast Iron  
Valve Seats

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(-) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
2.50	300	80 - 90	60 - 70	5
3.25	350	110 - 120	90 - 100	5
4.00	350	140 - 150	120 - 130	5

# Kobatek 301



## Coated Electrode for High Strength Low Alloyed Steels

### General Description

Is a heavily coated basic electrode. It is suitable for joint welding applications of non-alloyed and medium carbon steels, fine grained steels such as St 70 and cast steels up to GS-70. The weld metal has a high resistance against hard and dynamic forces.

Especially it is ideal for multi pass welding connections, which has high strength and high impact properties, high creep resistance between -50 and +350°C. Also provides low spatter, easy machinable and high resistant weld seams against hot crack formation.

Pressure	████████	████████	████████	████████
Impact	████████	████████	████████	████████
Mechanical Strength	████████	████████	████████	████████
Heat	████████	████████	████████	████████
Machinability	████████	████████	████████	████████

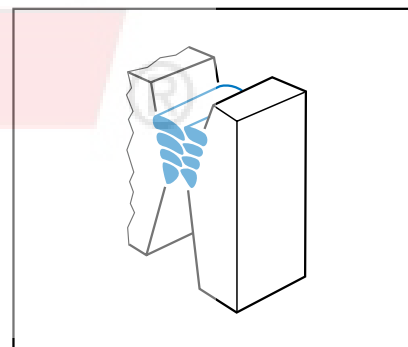
### Mechanical Properties, All Weld Metal

Tensile Strength : 8 - 62 kg/mm<sup>2</sup>  
 Yield Strength : 50 - 55 kg/mm<sup>2</sup>  
 Elongation (L=5d) : 25 - 30 %  
 Hardness : 210 - 230 HB  
 Impact (ISO-V) : 190 J (+20°C)  
                           80 J (-50°C)  
 Area Reduction : 75 - 80 %

GOST, SEPRO

### Typical Applications

- Welding of rotary kilns in cement industry
- Joint welding on parts working up to 350°C
- Joining of parts with truck chassis on earth moving equipments
- Joint welding on press constructions
- Joint welding on mills and crushers
- Filling of cast steels and worn out machine parts
- Welding applications in cold environments



Joining of Heavy Sections

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.25	350	180 - 220	5
4.00	350	200 - 275	5
5.00	350	250 - 300	5

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# Kobatek 315



## Coated Electrode for High Strength Low Alloyed Steels

### General Description

Developed for welding of N-A-XTRA, yield strength up to 85 kg/mm<sup>2</sup> and for fine grained and high strength steels such as S690. It is also suitable for steels which have a tensile strength more than 90 kg/mm<sup>2</sup>. Weld metal is low alloyed steel with Ni-Cr-Mo and is ideal for the applications, requiring both high toughness and crack resistance in cold environments down to -40°C.

The pre-heating operation is suggested before the welding of high strength steels and heat treated steels.

Kobatek 315 can also be used for multi pass welding applications. In this situation welding operation must be continuous and interpass temperature should be kept between 100-150°C.

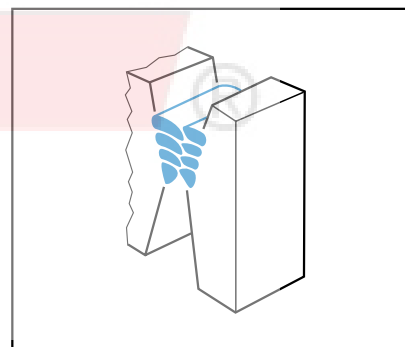
Mechanical Strength	██████████
Crack Resistance	██████████
Heat	██████████

### Mechanical Properties, All Weld Metal

Tensile Strength : 90 - 95 kg/mm<sup>2</sup>  
 Yield Strength : 85 - 90 kg/mm<sup>2</sup>  
 Elongation (L=5d) : 20 %  
 Hardness : 250 - 270 HB  
 Impact (ISO-V) : 70 J ( 0 °C)  
                           60 J ( - 20°C)  
                           50 J ( - 40°C)

### Typical Applications

- Platforms of earth moving equipments
- Welding of high strength and wear resistant steels such as Hardox and Weldox
- Repairing by welding of boom and several body cracks on earth moving equipments
- Cryogenic equipment production
- Welding of high strength and low alloyed heat treated steels
- Production of lifting cranes
- Production of machines, working under unsteady dynamic forces
- Applications of root pass welding on high strength construction steels



Joining of Heavy Sections

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC+ ) ; AC

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.25	350	100 - 150	5
4.00	350	130 - 190	5

# Kobatek 326



## Coated Electrode for High Alloyed Special Steels Difficult to Weld

### General Description

Kobatek 326 has a very crack proof weld metal. It is suitable for the joining and welding of special steels used at both sub-zero and elevated temperatures, also recommended for 5-9 % nickel steels and nickel alloys such as Inconel 600, Incoloy 800, Nimonic 75, NiCr 80/20, NiCr 60/15, NiCr15Fe and dissimilar ferrous metal combinations, including stainless steel to steel.

Kobatek 326 provides the ultimate fatigue resistance for highly stressed constructions using thick sections. The weld metal has a good impact strength down to  $-196^{\circ}\text{C}$  and a good tensile strength up to  $1000^{\circ}\text{C}$ . Also the corrosion and oxidation resistance are good.

Crack Resistance	██████████
Bonding	██████████
Machinability	██████████

### Mechanical Properties, All Weld Metal

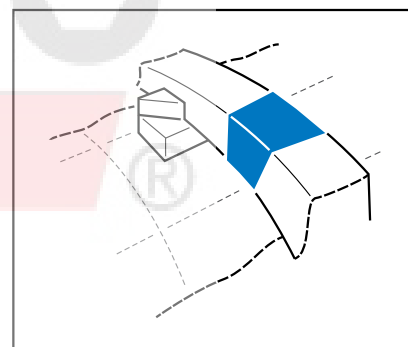
Tensile Strength : 66 - 71 kg/mm<sup>2</sup>  
Elongation (L=5d) : 40 - 44 %  
Hardness : 160 - 200 HB

### Approvals

GOST, TSEK

### Typical Applications

- Joining or repairing of heavily constrained massive sections
- Bearing rings of rotary kilns
- Walls of ball mills
- Ball mill driving gears, journals and collars
- Blast furnaces
- Flame hardening equipments
- Heat treating trays
- Pipe flanges
- Machine parts subject to thermal cycling and sub-zero temperatures such as cryogenic equipments
- Joining dissimilar combinations of steels



Bearing Rings of Rotary Kilns

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
2.50	250	80 - 90	60 - 80	2.5
3.25	300	100 - 110	70 - 100	5
4.00	350	120 - 140	100 - 110	5

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# Kobatek 326-N

## Coated Electrode for High Alloyed Special Steels Difficult to Weld

### General Description

Kobatek 326-N has a very crack proof weld metal. It is suitable for the joining and welding of special steels used at both sub-zero and elevated temperatures, also recommended for 5-9% nickel steels and nickel alloys such as Inconel 600, Incoloy 800, Nimonic 75, NiCr 80/20, NiCr 60/15, NiCr15Fe and dissimilar ferrous metal combinations, including stainless steel to steel.

Kobatek 326-N provides the ultimate fatigue resistance for highly stressed constructions using thick sections. The weld metal has a good impact strength down to  $-196^{\circ}\text{C}$  and a good tensile strength up to  $1000^{\circ}\text{C}$ . Also the corrosion and oxidation resistance are good

Mechanical Strength	
Crack Resistance	
Heat	

### Mechanical Properties, All Weld Metal

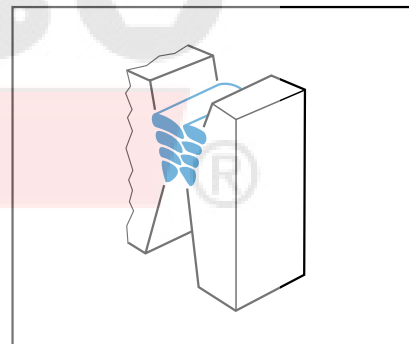
Tensile Strength : 60 - 65 kg/mm<sup>2</sup>  
Yield Strength : 38 - 42 kg/mm<sup>2</sup>  
Elongation (L=5d) : 35 - 40 %  
Hardness : 140 - 180 HB

### Approvals

GOST, TSEK

### Typical Applications

- Joining or repairing of heavily constrained massive sections
- Walls of ball mills
- Bearing rings of rotary kilns
- Boom welding of earth moving equipments
- Machine parts subject to thermal cycling and sub-zero temperatures such as cryogenic equipments
- Heat treating trays
- Ball mill driving gears, journals and collars
- Blast furnaces
- Flame hardening equipments
- Pipe flanges
- Joining dissimilar combination of steels



Joining of Heavy Sections

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
3.25	300	140 - 160	90 - 110	5
4.00	350	160 - 200	120 - 150	5

# Kobatek 345



## Coated Electrode for High Alloyed Special Steels Difficult to Weld

### General Description

A special electrode for welding steels having limited weldability, such as manganese steels, hardenable steels and others. It is an AC/DC electrode giving a non-magnetic and work hardenable stainless steel deposit containing Cr-Ni-Mn-Mo. The tough weld metal is able to absorb high welding stresses which is very important for achieving crack-free welds.

Pressure	██████████
Impact	██████████
Abrasion	██████
Heat	██████
Corrosion/Cavitation	██████████

### Mechanical Properties, All Weld Metal

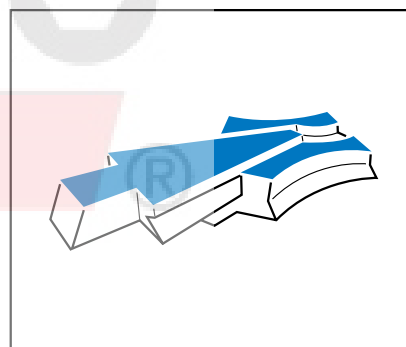
Tensile Strength : 58 - 64 kg/mm<sup>2</sup>  
 Elongation (L=5d) : 38 - 42 %  
 Hardness : 160 - 180 HB (as welded)  
 400 - 420 HB (cold worked)

### Approvals

GOST

### Typical Applications

- Site machinery
- Drilling tools
- Rails, points
- Valve seats
- Earth moving equipments
- Stone working machines
- Coal machines
- Armoured cars
- Joining between X5 CrNiMo 18 10, X10 CrNiMoNb 18 10, HI-HIII, 17 Mn 4



Railways Rails and Crossovers

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
2.50	250	85 - 110	65 - 90	2.5
3.25	300	120 - 150	90 - 120	5
4.00	350	150 - 180	110 - 140	5
5.00	350	180 - 220	160 - 190	5

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.

# Kobatek 350



## Coated Electrode for High Alloyed Special Steels Difficult to Weld

### General Description

Kobatek 350 is a basic coated electrode used for welding martensitic and martensitic-ferritic type steels. It exhibits high corrosion resistance to water, vapor and salt water. A preheating of 100-200°C should be applied for thick sectioned parts. Interpass temperature should be constant.

Weld beads are smooth and the slag is easy to remove.

Pressure	██████████
Impact	██████████
Abrasion	██
Heat	██
Corrosion/Cavitation	██████████

### Mechanical Properties, All Weld Metal

Tensile Strength : 90 - 110 kg/mm<sup>2</sup>  
 Yield Strength : 70 - 80 kg/mm<sup>2</sup>  
 Elongation (L=5d) : 10 - 15 %  
 Hardness : 38 - 40 HRC  
 Impact (ISO-V) : 24 J (+20 °C)

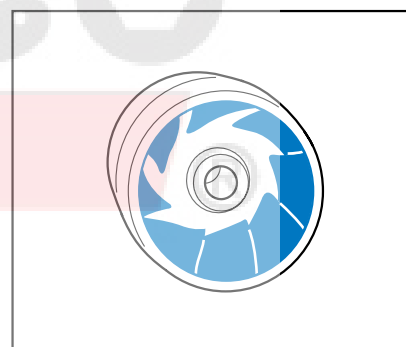
GOST

### Approvals

### Typical Applications

It is particularly used for the protection of 12-15% Cr, 4% Ni containing steels against corrosion.

- Water turbines and compressors
- Pelton, Francis turbine rotors
- Kaplan turbine blades
- Valves used in gas, vapor and water pipelines operating under service temperatures up to 450°C
- Erosive and corrosive attacks caused by sea water
- Welding of X4 CrNi 13 4 and G-X5 CrNi 13 4 (1.4343) steels.



Turbine Blades and Rotors

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.25	350	90 - 120	5
4.00	350	120 - 170	5



# Kobatek 352



## Coated Electrode for High Alloyed Special Steels Difficult to Weld

### General Description

Kobatek 352 has a manganese alloyed stainless steel deposit containing Cr-Ni-Mn-Mo which is a work hardening alloy. It is used for build-up applications and cushion layers prior to harder overlays, and for a wide range of steel, low alloy steel and 12-14% austenitic manganese steel components subjected to severe impact combined with high pressure. Steel deposit will also resist a wide range of corrosive conditions and cavitation.

Deposits exhibit a smooth even shaped bead, high metal recovery rates and ease of slag removal. The electrode can be deposited in contact with the workpiece.

Pressure	██████████	██████████	██████████	██████████	██████████
Impact	██████████	██████████	██████████	██████████	██████████
Abrasion	██████████	██████████	██████████	██████████	██████████
Heat	██████████	██████████	██████████	██████████	██████████
Corrosion/Cavitation	██████████	██████████	██████████	██████████	██████████

### Mechanical Properties, All Weld Metal

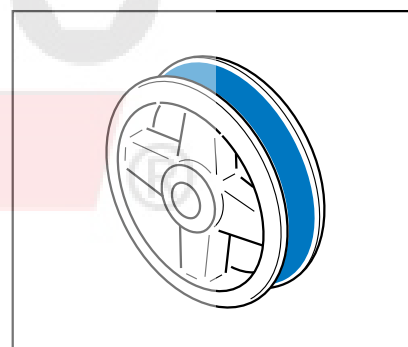
Tensile Strength : 64 - 66 kg/mm<sup>2</sup>  
 Elongation (L=5d) : 40 - 44 %  
 Hardness : 160 - 200 HB (as welded)  
 400 - 440 HB (cold worked)

### Approvals

GOST, TSEK

### Typical Applications

- Welding and repairing 12-14% manganese steels
- Crusher jaws
- Tractor sprocket tooth
- Guides and rollers on tracked vehicles
- Armour plates
- Perforated plating on ore-sorters
- Gyratory crusher cones
- Conveyor rollers
- Crusher cylinder hooks
- Dozer cutting edges
- Bucket lips and sides
- Impactors, hammers
- Joining austenitic manganese steels to carbon steels
- Stainless cladding carbon steels and low alloy steels



Conveyor  
Rollers

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
3.25	350	140 - 160	100 - 160	5
4.00	350	210 - 240	140 - 190	5

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.



# Kobatek 358

## Coated Electrode for High Strength Low Alloyed Steels

### General Description

Kobatek 358 is a high manganese austenitic type Hatfield steel structure weld metal with improved ductility and toughness and also high compression and tensile strength. Especially is suitable for buffer layers prior to harder overlays, 12-14% manganese including steels, hardenable alloyed steels and steels with limited weldability.

Kobatek 358 is resistant against high loads of impact, pressure and low forced abrasion wearing. Becomes harder working under impact with cold deformation. Weld metal can be cut with flame (oxy-fuel) processes. Not suggested to be used temperatures over 250°C. Has not anti-corrosion properties.

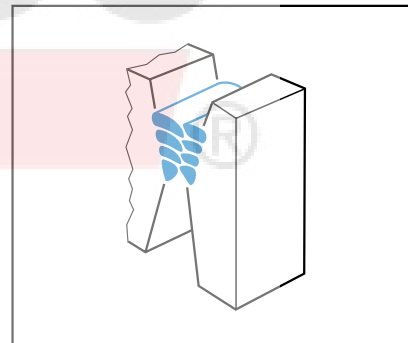
Crack Resistance	██████████
Bonding	██████████
Machinability	██████████

### Mechanical Properties, All Weld Metal

Compressive Strength :	170 kg/mm <sup>2</sup>
Tensile Strength :	80 - 85 kg/mm <sup>2</sup>
Yield Strength :	60 kg/mm <sup>2</sup>
Elongation (L=5d) :	40 - 45 %
Hardness :	160 - 170 HB (as welded) 400 - 425 HB (work hardened)
Impact (ISO-V) :	125 J (-60°C)

### Typical Applications

- Joining and welding operations of Mn-steels and joining of these steels with medium carbon steels and alloyed steels
- Armor plates
- Crushers and grinders working under impact and/or under pressure (crushers, crusher cones, crusher hammers) and including parts
- Mine, soil and earth moving equipments
- Machine parts working under impact (hammer drill)



Joining of Heavy Sections

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.25	350	80 - 135	5
4.00	350	135 - 180	5

# Kobatek 381



## Coated Electrode for High Alloyed Special Steels Difficult to Weld

### General Description

Kobatek 381 deposits a Cr-Ni-Mo based stainless steel weld metal. It is designed for welding large, high strength steel components requiring fast multi-layer deposits with crack resistance. It is ideal for repairing difficult-to-weld steels and for putting down buffer layers before filling up with hardenable deposits.

It can be used as a buffer layer on high manganese Hadfield steel and for surfacing where some resistance to impact and battering is required under corrosive conditions.

Mechanical Strength	██████████
Crack Resistance	██████████
Heat Input	██████████

### Mechanical Properties, All Weld Metal

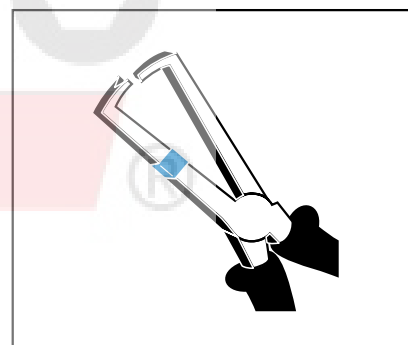
Tensile Strength : 76 - 82 kg/mm<sup>2</sup>  
Yield Strength : 58 - 62 kg/mm<sup>2</sup>  
Elongation (L=5d) : 20 - 25 %  
Hardness : 220 - 260 HB

### Approvals

GOST, TSEK

### Typical Applications

- Press cylinders in plastic and food industries
- Earth moving equipments
- Hydraulic cylinders
- Injection moulds
- Extrusion screws
- Turbine blades
- Valve seats for superheated steam
- Heat exchangers
- Coal washing screens
- Wear plates
- Bucket tooth
- Dies, gears, shafts, tools



Repair Welding of Broken Parts

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
2.50	350	90 - 120	70 - 80	5
3.25	350	130 - 150	110 - 120	5
4.00	350	180 - 210	120 - 160	5

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.

# Kobatek 382



## Coated Electrode for High Alloyed Special Steels Difficult to Weld

### General Description

It is extremely high strength and crack-resistant when joining steels of difficult weldability, such as hard manganese steels, tool steels, spring steels as well as dissimilar metal joints. A highly alloyed manual metal arc electrode with good deposition qualifies for the welding of air hardening steels, cementation steels, high carbon steels, V-Mo spring steels, stainless steels and any dissimilar combinations of these alloys.

Also ideal for the buffering of higher carbon and alloy steels prior to final hard overlays including 12-14% austenitic manganese steels. It gives workhardenable weld metal. The arc is stable and spatter-free.

Mechanical Strength	██████████
Crack Resistance	██████████
Heat Input	██████████

### Mechanical Properties, All Weld Metal

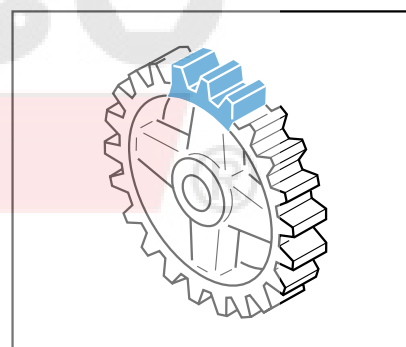
Tensile Strength : 80 - 86 kg/mm<sup>2</sup>  
Yield Strength : 64 - 66 kg/mm<sup>2</sup>  
Elongation (L=5d) : 20 - 25 %  
Hardness : 220 - 260 HB

### Approvals

GOST, TSEK

### Typical Applications

- Cutting tools
- Gears, shafts and cams
- Forging dies
- Extrusion and hydraulic cylinders
- Vibration sieves
- Forming tools
- Earth moving parts
- Chassis frames
- Cushion pass for tool steels
- Joining stainless steels to carbon steels and low alloy steels
- Joining austenitic manganese steels to carbon steels and low alloy steels



Gears, Shafts  
and Cams

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
2.50	250	60 - 80	40 - 50	2.5
3.25	350	90 - 100	60 - 80	5
4.00	350	125 - 150	90 - 120	5

# Kobatek 213



## Coated Electrode for Aluminium and its Alloys

### General Description

Kobatek 381 deposits a Cr-Ni-Mo based stainless steel weld metal. It is designed for welding large, high strength steel components requiring fast multi-layer deposits with crack resistance. It is ideal for repairing difficult-to-weld steels and for putting down buffer layers before filling up with hardenable deposits.

It can be used as a buffer layer on high manganese Hadfield steel and for surfacing where some resistance to impact and battering is required under corrosive conditions.

Mechanical Strength	████████	████	████	████
Intensity of Humidity	████████	████	████	████
Weld Metal Quality	████████	████	████	████

### Mechanical Properties, All Weld Metal

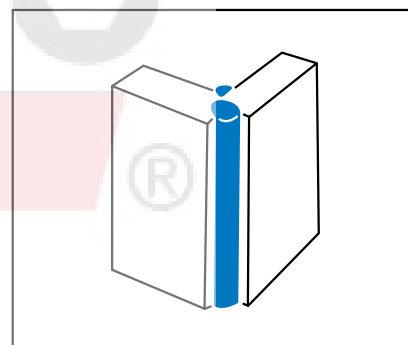
Tensile Strength : 14 - 16 kg/mm<sup>2</sup>  
 Yield Strength : 8 - 10 kg/mm<sup>2</sup>  
 Elongation (L=5d) : 15 - 18 %  
 Hardness : 50 - 60 HB

### Approvals

GOST, SEPRO

### Typical Applications

- Truck bodies and conveyers
- Rails
- Floor plates
- Engine blocks
- Machine casing
- Foundry defects
- Frames
- Rectification and fabrication of conveyers



Joining of Aluminium Plates

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
2.50	350	60 - 90	2
3.25	350	80 - 110	2
4.00	350	110 - 140	2

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.



# Kobatek 250

## Coated Electrode for Aluminium and its Alloys

### General Description

An aluminium alloyed, basic electrode recommended for production and maintenance applications including the repair of cracks, casting defects and building up sections and broken parts, also suitable for overlaying applications.

It is specially designed for welding of wrought and cast aluminium alloys, mainly of the half silumin and silumin type, containing up to 12 % silicon, like; G- $AlSi8Cu3$ , G- $AlSi10Mg$ , G- $AlSi12$ . It should not be used with aluminium magnesium alloys like;  $AlMg2$ ,  $AlMg3$ ,  $AlMg5$ . In case of necessity, it can be applied with oxy-acetylene flame.

Mechanical Strength	████████	████████	████████
Intensity of Humidity	████████	████████	████████
Weld Metal Quality	████████	████████	████████

### Mechanical Properties, All Weld Metal

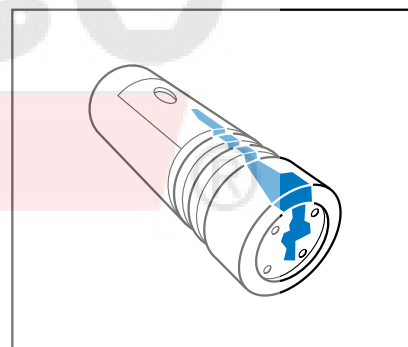
Tensile Strength : 16 - 20 kg/mm<sup>2</sup>  
Yield Strength : 6 - 8 kg/mm<sup>2</sup>  
Elongation (L=5d) : 6 - 10 %  
Hardness : 50 - 70 HB

### Approvals

GOST, SEPRO

### Typical Applications

- Engine blocks
- Truck bodies
- Housings, pumps, tanks
- Molds, pistons, fans, frames
- Casting defects
- Manufacture of petrol engines
- Window frames and stairs
- Gear boxes
- Engine pistons



Repair Welding of  
Cast Aluminium Pistons

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
2.50	350	60 - 90	2
3.25	350	80 - 110	2
4.00	350	110 - 140	2

# Kobatek 725



## Coated Electrode for Copper and its Alloys

### General Description

Kobatek 725 is a tin-bronze electrode for coating and repairing parts made of copper, bronze, red brass and for joining of these to steels, cast iron, nickel and nickel alloys. Possible to work on very large bronze parts without preheating.

Excellent resistance to metal-metal friction and good resistance to corrosion, particularly attack by acetone and dry ammoniac, industrial atmospheres and salty air, sea water and acids. It gives dense, porosity and spatter free, fully machinable deposits.

Compatibility	██████████
Corrosion	██████████
Machinability	██████████

### Mechanical Properties, All Weld Metal

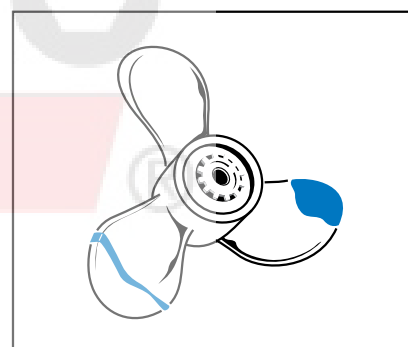
Tensile Strength : 30 - 36 kg/mm<sup>2</sup>  
Elongation (L=5d) : 15 - 25 %  
Hardness : 100 - 140 HB

### Approvals

GOST

### Typical Applications

- Electrode holders
- Bearings
- Rotors
- Screws
- Valve seats
- Pump rotors
- Spindles
- Gears
- Spirals
- Pistons
- Repairing defective castings
- Turbine blades



Screws

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
3.25	350	110 - 130	80 - 100	5
4.00	350	145 - 160	110 - 140	5

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.

# Kobatek 818



## Digital Inverter Technology - Current Range: 30-160 A

### General Description

Kobatek 818 is suited to weld Ti or Nb stabilised Cr-Ni-Mo austenitic stainless steels. It is also used for service temperatures from  $-120^{\circ}\text{C}$  up to  $+350^{\circ}\text{C}$  in petrochemical industries and for sea water applications. Excellent quality smooth weld beads are highly resistant to acids and to intergranular corrosion at operating temperatures up to  $350^{\circ}\text{C}$ . The weld metal has excellent creep strength upto  $850^{\circ}\text{C}$ .

Kobatek 818 is ideal for joining for stainless steel of similar composition and gives radiographic quality weld beats recommended for welding AISI 316, 317 and 318 type of stainless steels. Deposits exhibit a smooth even shaped bead and ease of slag removal.

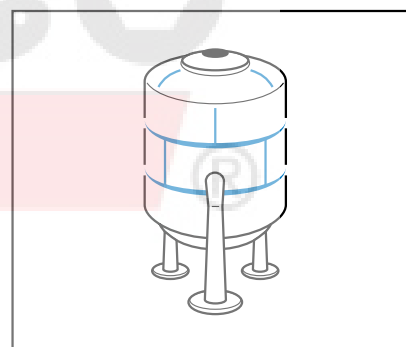
Corrosion	██████████
Heat	██████████
Welding Speed	██████████

### Mechanical Properties, All Weld Metal

Tensile Strength : 56 - 62 kg/mm<sup>2</sup>  
 Yield Strength : 42 - 46 kg/mm<sup>2</sup>  
 Elongation (L=5d) : 30 - 35 %  
 Impact (ISO-V) : 65 J (+20 °C)

### Typical Applications

- Corrosion resistant pipes
- Tanks and vessels that are made of Cr-Ni-Mo type stainless steel
- Parts that are used in chemical, food and paint industries for acid, salt, gas, vapor and water transmission
- Joining and surfacing of similar composition of stainless steels
- Fabrication of chemical plants
- Paper mill equipments
- Pickling plant
- Parts that works under sea water
- Valve seat inlays



Stainless Steel Storage Tanks

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
3.25	250	80 - 100	60 - 80	5
4.00	350	110 - 140	70 - 100	5



# Kobatek 512



## Coated Electrode for Hardfacing Applications

### General Description

An AC/DC electrode which has high alloyed Cr-Mo-V weld metal. Deposits produce high resistance to pressure and abrasion and moderate impact resistance.

It is used on steels, alloy steels and carbon manganese steel components. The weld metal is heat resistant up to about 550°C. The alloy combines with a special flux coating formulation to provide a high metal transfer across the arc.

Pressure	██████████	██████████	██████████	██████████	██████████
Impact	██████████	██████████	██████████	██████████	██████████
Abrasion	██████████	██████████	██████████	██████████	██████████
Heat	██	██	██	██	██
Corrosion/Cavitation	██	██	██	██	██

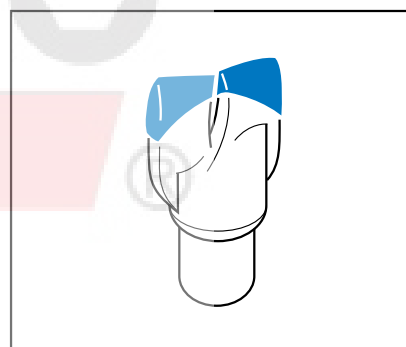
### Mechanical Properties, All Weld Metal

Hardness : 50 - 55 HRC

### Approvals

### Typical Applications

- Excavator buckets
- Dredge pump impellers
- Drill bits
- Crushers
- Breaker bars
- Gyrotory crusher cones
- Bulldozer buckets
- Chipper rotors
- Screw conveyers
- Cold pressing tools
- Shear blades
- Slideways and guide rails



Drill Bits

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(-) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
3.25	350	140 - 160	120 - 150	5
4.00	350	220 - 230	170 - 190	5

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.

# Kobatek 520



## Coated Electrode for Hardfacing Applications

### General Description

A DC electrode specially designed for low-alloy steels with a tensile strength up to 900 N/mm<sup>2</sup> and the reclamation of the parts subjected to metal-to-metal friction under high pressure.

The readily machinable deposit gives an alloy steel providing high mechanical properties and can be heat treated. It is also suitable for applications where resistance to deformation during service is required for maximum operational life.

Pressure	████████	████	████	████
Impact	████████	████	████	████
Mechanical Strength	████████	████████	████	████
Crack Resistance	████████	████	████	████
Machinability	████████	████	████	████

### Mechanical Properties, All Weld Metal

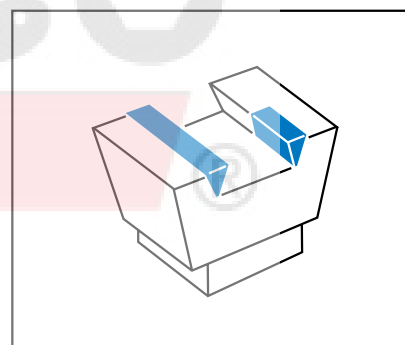
Tensile Strength : 92 - 96 kg/mm<sup>2</sup>  
Yield Strength : 76 - 80 kg/mm<sup>2</sup>  
Elongation (L=5d) : 12 - 16 %  
Hardness : 300 - 360 HB

### Approvals

GOST, TSEK

### Typical Applications

- Rollers
- Forging dies
- Forming dies
- Anvil dies
- Anvil guides of power hammer
- Hammers
- Table rollers
- Turbine blades
- Cushion layers before hardfacing



Anvil Guides  
Power Hammer Guides

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.25	350	90 - 120	5
4.00	350	110 - 150	5

# Kobatek 540



## Coated Electrode for Hardfacing Applications

### General Description

The hardest cobalt based coated electrode for hardfacing applications on components where excellent abrasion and corrosion resistance properties are necessary at elevated temperatures. It retains its hardness at temperatures in excess of 760°C. It also provides high resistance to metal-to-metal wear.

The weld deposit contains a high proportion of hard, wear resistant primary carbides making it most suitable for applications where abrasion resistance is of prime importance. It also provides high resistance to erosion and cavitation.

Compared to other cobalt based alloys, it is more crack-sensitive, and care should be taken to minimize the cooling stresses experienced during hardfacing processes. Due to its high hardness and wear resistance, it should only be finished by grinding.

Pressure	██████████
Impact	██████████
Abrasion	██████████
Heat	██████████
Corrosion/Cavitation	██████████

### Mechanical Properties, All Weld Metal

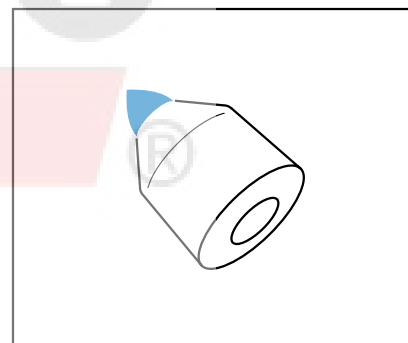
Hardness : 52 - 58 HRC (+20°C)  
42 - 46 HRC (+600°C)

### Approvals

GOST

### Typical Applications

- Shafts of pumps
- Pump and bearing sleeves
- Rotary seal rings
- Conveyor and expeller screws
- Extrusion nozzle
- Wear pads
- Handling equipments for hot steels
- Valve steam tips
- Drill collars
- Facing of rollers
- Hot cutting tools
- Rails



Anvil Guides  
Power Hammer Guides

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.20	350	90 - 120	5
4.00	350	130 - 150	5

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.



# Kobatek 541

## Coated Electrode for Hardfacing Applications

### General Description

A cobalt based coated electrode for hardfacing applications on components working at elevated temperatures where high toughness and special hardening properties are necessary combined with machinability.

The weld deposit consists of a solid solution together with complexed carbides to give excellent resistance to impact at elevated temperatures combined with excellent heat, oxidation and corrosion resistance. It also provides high edge retention for metal-to-metal wear and work hardening properties much-needed in the forging industry.

Pressure	██████████	██████████	██████████	██████████
Impact	██████████	██████████	██████████	██████████
Abrasion	████	████	████	████
Heat	██████████	██████████	██████████	██████████
Corrosion/Cavitation	██████████	██████████	██████████	██████████

### Mechanical Properties, All Weld Metal

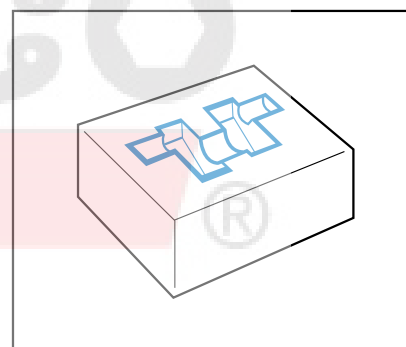
Hardness : 32 - 38 HRC (as deposited)  
45 - 50 HRC (work hardened)

### Approvals

GOST

### Typical Applications

- Forging and upset dies
- Stamping dies
- Stripper points
- Hot cutting tools and hot punches
- Plungers
- Shear blades
- Exhaust valves
- Valve seatings
- Gas turbine blades
- Furnace retorts
- Extrusion nozzles
- Draw rings
- Rams



Forging dies

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.20	350	90 - 120	5
4.00	350	130 - 150	5

# Kobatek 543



## Coated Electrode for Hardfacing Applications

### General Description

A cobalt based coated electrode for producing excellent wear resistance overlays on carbon and alloy steels. Excellent results can be obtained even when high temperature service conditions exist. It has been designed to withstand corrosion, oxidation and heat, and also has moderate resistance to pressure and abrasion.

Pressure	██████████
Impact	██████████
Abrasion	██████████
Heat	██████████
Corrosion/Cavitation	██████████

### Mechanical Properties, All Weld Metal

Hardness : 40 - 44 HRC (+20°C)  
30 - 32 HRC (+600°C)

### Approvals

GOST

### Typical Applications

- Hot shear blades
- Hot pressing tools
- Forging dies
- Steam and chemical valve seats
- Pump and bearing sleeves
- Handling equipments for hot steel
- Trimming dies and punches
- Stripper crane points
- Hot pressing dies
- Screw conveyors (for rubber)
- Valve steam tips
- Wear pads
- Drill collars
- Bearing sleeves
- Wire mill rolls
- Beaters for coke comminution



Steam and Chemical  
Valve Seats

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.20	350	90 - 120	5
4.00	350	130 - 150	5

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.



# Kobatek 545

## Coated Electrode for Hardfacing Applications

### General Description

A cobalt-base coated electrode having high hardness is characterised by a very good resistance to metal and mineral abrasion combined with corrosion and cavitation at high temperature up to 800°C, within the presence of moderate shocks.

Kobatek 545 could be considered an intermediate alloy between Kobatek 543 and Kobatek 540. It contains a higher fraction of hard, brittle carbides than Kobatek 543, and has increased resistance to lowangle erosion, abrasion, and severe sliding wear whilst retaining reasonable impact and cavitation resistance. The higher tungsten content of the weld deposit provides better high-temperature properties compared to Kobatek 543, It also provides special hardening properties combined with machinability.

Kobatek 454 is highly recommended for hardfacing of various cutting tools.

Pressure	██████████	██████████	██████████	██████████
Impact	██████████	██████████	██████████	██████████
Abrasion	██████████	██████████	██████████	██████████
Heat	██████████	██████████	██████████	██████████
Corrosion/Cavitation	██████████	██████████	██████████	██████████

### Mechanical Properties, All Weld Metal

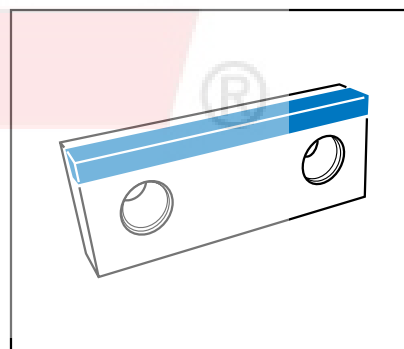
Hardness : 46 - 51 HRC (+20°C)  
36 - 40 HRC (+600°C)

### Approvals

GOST

### Typical Applications

- Hot shear blades
- Hot cutting tools
- Saw tips and teeths in the timber industry
- Tools for processing plastics
- Cutting edges of long knives and rotor blades for cutting carpets, plastics, synthetic fibres, papers and cartons
- Pinch rollers in the metal-processing industry
- Hot pressing dies and pressing tools
- Engine and pump valves
- Narrowneck glass mold plungers
- Extrusion screws
- Bearing bushes



Hot Shear Blades

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current [ A ]	Box Weight [ kg ]
3.20	350	90 - 120	5
4.00	350	130 - 150	5

# Kobatek 550



## Coated Electrode for Hardfacing Applications

### General Description

Kobatek 550 deposits a Cr-Mo alloyed, medium carbon, low-alloyed steel hardsurfacing weld metal, that is wear resistant under conditions of high pressure and impact combined with mild abrasion. It is particularly suited for surfacing cold cutting tools and for re-building manganese hard steel.

The deposit is air-hardening, non-mechinable and can resist plastic deformation without cracking. It is suitable for protective overlays on steels including plain carbon steels, carbon manganese steels, low alloy steels and also for welding of cementation steels. Deposits are usually very smooth and may require little or no finishing operation.

Pressure	██████████	██████████	██████████	██████████	██████████
Impact	██████████	██████████	██████████	██████████	██████████
Abrasion	██████████	██████████	██████████	██████████	██████████
Heat	██████████	██████████	██████████	██████████	██████████
Erosion	██████████	██████████	██████████	██████████	██████████

### Mechanical Properties, All Weld Metal

Hardness : 54 - 60 HRC

GOST

Heat Treatment (except austenitic manganese steels):

Annealing : 28 - 32 HRC (+800°C)

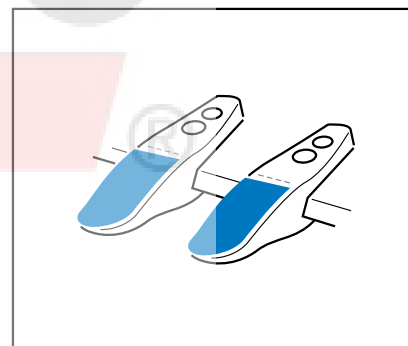
Hardening : 58 - 62 HRC (+950°C)

Tempering : 56 - 58 HRC (+190°C)

### Approvals

### Typical Applications

- Earth moving equipments
- Dragline bucket tooth
- Farming machinery
- Forestry tools
- Bulldozer blades, scraper blades
- Bucket lips
- Excavator tooth, crusher jaws and hammers
- Concrete mixers
- Plough shaves, pulping knives
- Stamping dies
- Gravel pump housing
- Conveyors
- Tractor pads, links and rollers



Excavator Teeths

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
2.50	350	80 - 90	70 - 80	5
3.25	350	110 - 130	80 - 120	5
4.00	350	135 - 160	100 - 125	5

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.

# Kobatek 562



## Coated Electrode for Hardfacing Applications

### General Description

Kobatek 562 is a W, Co and Cr enriched electrode. It gives a speed steel type weld metal that has very good resistance to softening up to 500°C. It gives high hardness and high resistance to impact and pressure. Low preheating temperatures enable the welding of hard metals. A controlled increase of hardness of the deposit can be obtained by heat treatment after welding.

Pressure	██████████	██████████	██████████	██████████
Friction	██████████	██████████	██████████	██████████
Machinability	██████████	██████████	██████████	██████████

### Mechanical Properties, All Weld Metal

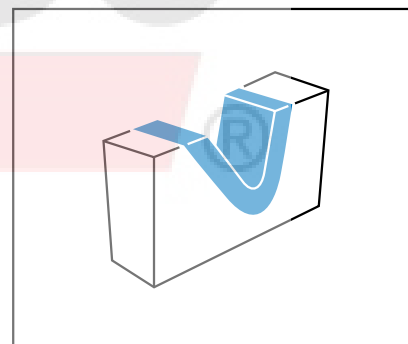
Hardness : 46 - 54 HRC  
 Heat Treatment (except austenitic manganese steels):  
 Annealing : 310 - 340 HB  
 Hardening : 50 - 53 HRC (+1150°C)  
 Tempering : 53 HRC (+550°C/1-3 hrs)

### Approvals

GOST

### Typical Applications

- Cold shear cutting edges and blades
- Profile and slab cutting edges used within the steel industry
- Hardfacing applications of injection molds
- Manufacturing of machining tools



Cold Shear Cutting Edges and Blades

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
3.25	350	110 - 140	80 - 120	5



# Kobatek 578



## Coated Electrode for Hardfacing Applications

### General Description

An AC/DC high chromium-carbide electrode. It has been designed to withstand high abrasive wear under pressure, combined with medium impacts which are specially caused by coarse sand and hard minerals. Also resistant to corrosion and oxidizing. For overlaying carbon steels, low alloy steels and 12-14% austenitic manganese steels, it produces very thick deposits and so only one pass is usually required for most applications.

Deposits are smooth, of good shape and with little or no slag residues as the electrode is almost totally consumed in producing the weld bead. Deposits may check crack to relieve stresses but this will not adversely affect weld adhesion or wear characteristics.

Pressure	██████████				
Impact	██████				
Abrasion	████████████████████				
Heat	██████				
Erosion	██████████				

### Mechanical Properties, All Weld Metal

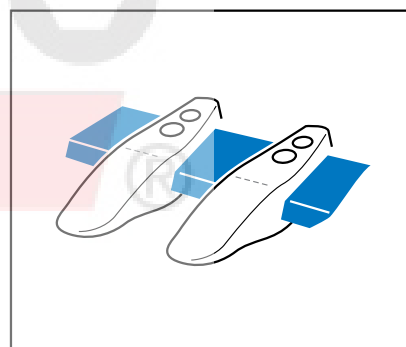
Hardness : 60 - 63 HRC (single layer)

### Approvals

GOST, TSEK

### Typical Applications

- Dragline buckets (lips, points, cutting edges, teeths)
- Scraper blades and mixers
- Conveyor chains
- Mixer blades
- Sludge pumps
- Hammers and crushers
- Crusher jaws
- Guide plates
- Dozer and bits
- Clinker chains
- Screw conveyors
- Crushing mills
- Edge runners and chutes
- Moulding screen segments
- Wearing strips



Dragline Bucket Lips Points and Blades

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(-) ; AC

Diameter [ mm ]	Length [ mm ]	Current (Method-A) [ A ]	Current (Method-B) [ A ]	Box Weight [ kg ]
3.25	350	150 - 170	100 - 120	5
4.00	350	190 - 220	140 - 160	5

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# Kobatek T-365

## Flux-Cored Welding Wire for Buffering and Hardfacing Applications

### General Description

All purpose alloy, rebuilding and joining of carbon and 12-14% manganese steels, buffer and multi-pass layers prior to hardfacing applications. Particularly designed for overlaying parts subjected to high impact and pressure conditions, in particular where rock crushing actions are present.

Kobatek T-365 generates very tough and crack-resistant weld metals. Shock impacts result in superficial work hardening. The weld metal is characterized by its good compatibility with all weldable steels.

Weld metal is not suited for flame-cutting but is machinable with cutting tools.

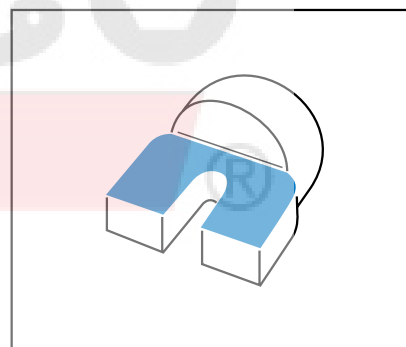
Pressure	██████████	██████████	██████████	██████████
Impact	██████████	██████████	██████████	██████████
Abrasion	██████████	██████████	██████████	██████████
Temperature	██████████	██████████	██████████	██████████
Erosion	██████████	██████████	██████████	██████████

### Mechanical Properties, All Weld Metal

Tensile Strength : 760 - 820 N/mm<sup>2</sup>  
 Elongation (L=5d) : 25 - 30 %  
 Hardness : 200 - 260 HB (as welded)  
               450 - 550 HB (after work hardening)  
 Impact ISO-V : 80 Joule (+20°C)

### Typical Applications

- Crane rollers
- Crusher cylinders
- Coupling rolling mill extensions
- Mill shaft drive ends
- Repointing of shovel teeth
- Railway rails and crossovers
- Hammers
- Beating arms



Coupling Rolling Mill Extensions

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Current [ A ]	Stick-Out [ mm ]	Spool Weight [ kg ]
1.60	180 - 250	20 - 40	15
2.80	250 - 425	35 - 50	15 / 25

# Kobatek T-558



## Flux-Cored Welding Wire for Hardfacing Applications

### General Description

Cr-Mo-M-V alloy provides excellent resistance to wear by abrasive particles such as sand, cement, gravel and rock crushing environment. It is designed to give excellent all-round resistance to combined wear by gouging abrasion, erosion, heavy impact and pressure for 12-14% Mn austenitic steels and high alloyed steels at service temperatures up to 550°C.

It is also suitable for multi-pass welding. If all requirements are ensured (such as preheating), it can give 10 mm thickness hardfacing surface with max. 3 passes. It is not necessary to use shielding gas during welding operation.

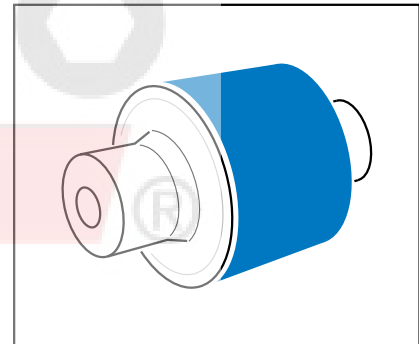
Pressure	██████████	██████████	██████████	██████████
Impact	██████████	██████████	██████████	██████████
Abrasion	██████████	██████████	██████████	██████████
Temperature	██████████	██████████	██████████	██████████
Erosion	██████████	██████████	██████████	██████████

### Mechanical Properties, All Weld Metal

Hardness : 54 - 58 HRC (3 passes)

### Typical Applications

- Crusher hammers and bars
- Excavator buckets
- Mechanical shovel bucket teeth and lips
- Scraper blades
- Augers
- Dragline lips
- Mixer parts
- Tamping tools
- Shock screens and crusher plating



Crusher Rollers

### Buffering and Intermediate Layers :

Kobatek T-365 should be used as initial or intermediate layers especially on large or heavy build-up applications and also on %12-14Mn steels.

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Current [ A ]	Stick-Out [ mm ]	Spool Weight [ kg ]
2.80	325 - 375	30 - 55	15

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.



# Kobatek T-570

## Flux-Cored Welding Wire for Hardfacing Applications

### General Description

Cr-Nb alloy designed to resist high stress grinding abrasion at service temperatures up to 450°C. It generates high wear-resistant, primary carbide-containing weld metal that is extremely resistant to abrasion due to the finely dispersed separation of very hard niobium carbides.

Perfectly suited for hardfacing of parts subjected to extreme abrasion and average shock loads.

The weld metal cannot be subjected to flame cutting, offers good resistance to scaling and cannot be machined. The deposit will readily stress relief check cracks.

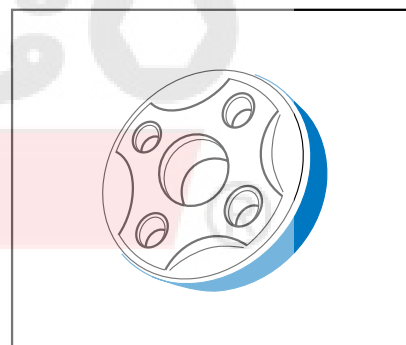
Pressure	■			
Impact	■			
Abrasion	■■■■■			
Temperature	■■■			
Corrosion	■			

### Mechanical Properties, All Weld Metal

Hardness : 60 - 64 HRC (pure weld metal)  
57 - 61 HRC (after 1st layer)

### Typical Applications

- Crusher jaws
- Mixer blades
- Pump impellers
- Mould screws
- Dredging bucket front edges
- Sand slingers
- Top coats of dredger teeth and crusher rolls
- Wear plates
- Crusher hammer discs
- Excavators



Crusher Hammer Discs

### Buffering and Intermediate Layers :

Kobatek T-365 should be used as initial or intermediate layers especially on large or heavy build-up applications and also on %12-14Mn steels.

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Current [ A ]	Stick-Out [ mm ]	Spool Weight [ kg ]
1.60	180 - 250	20 - 40	15
2.80	270 - 420	30 - 55	15 / 25

# Kobatek T-580



## Flux-Cored Welding Wire for Hardfacing Applications

### General Description

Kobatek T-580 generates high wear-resistant, primary-carbide containing weld metal. Perfectly suited for hardfacing of parts subjected to strong abrasion and medium shock loads. Application temperature should not exceed 350°C.

The weld metal cannot be subjected to flame cutting and cannot be machined. The deposit will readily stress relief check cracks.

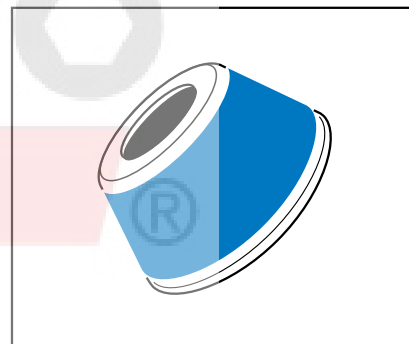
Pressure	██████████			
Impact	██████████			
Abrasion	██████████			
Temperature	██████████			
Erosion	██████████			

### Mechanical Properties, All Weld Metal

Hardness : 60 - 63 HRC (pure weld metal)  
56 - 60 HRC (1st layer)  
58 - 62 HRC (2nd layer)

### Typical Applications

- Screws
- Dredging bucket front edges
- Stirrer blades
- Sand slingers
- Top coats on dredger teeth and crushing rolls
- Refurbishment of Ni-Hard coal pulverizing rollers
- Handling sand



Conical Crushing Rolls

### Buffering and Intermediate Layers :

Kobatek T-365 should be used as initial or intermediate layers especially on large or heavy build-up applications and also on %12-14Mn steels.

### Welding Parameters / Packing and Diameter Informations

Current Type and Polarity : DC(+)

Diameter [ mm ]	Current [ A ]	Stick-Out [ mm ]	Spool Weight [ kg ]
1.60	160 - 250	20 - 40	15
2.40	230 - 350	25 - 50	15
2.80	270 - 420	30 - 55	15 / 25

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.



# Kobatek MIG T-350/S

## GMA (MIG/MAG) Welding Wire for Hardfacing Applications

### Classification

DIN 8555 : MSG 5-GZ-350  
Wr-Number : 1.7384\*

(\*) Similar

### General Description

Kobatek MIG T-350/S is a hardfacing MIG wire, providing a resistant weld metal against high loads of impact and pressure and wearing. Weld metal is Cr-Mo alloyed and can be machined mechanically. High wear resistant is achievable especially at metal against metal wearing. Weld metal is highly crack resistant and has high strength in sulfur containing environments.

### Chemical Composition (w%), Typical, Wire

C	Si	Mn	Cr	Mo	V	W
0.08	0.55	0.90	6.00	0.90	0.10	< 0.25

### Mechanical Properties, All Weld Metal

Hardness : 337 - 372 HB  
 : 36 - 40 HRC  
 Working Temperature : 500 °C  
 Preheating Temperature : 200 °C  
 Postweld Heat Treatment : 660 °C

### Shielding Gases (ISO 14175 / EN 439)

### Current Type and Polarity

MIG : M21 - Ar + 5-25% CO<sub>2</sub>  
 C1 - CO<sub>2</sub> (100%)

DC(+)

### Typical Applications

Guiding rollers and wheels, gears, moulds, excavators, crushers, threads, cutting tools, hammers, both metal surfaces rubbing on each other, guiding rails, roller bed rolls are primal fields of use.

### Packing and Diameter Informations

Diameter	0.8	1.0	1.2	1.6	2.0	2.4	3.2	Spool Weight
MIG/MAG Wire	-	-	X	-	-	-	-	15 kg

# Kobatek MIG T-600/S



## GMA (MIG/MAG) Welding Wire for Hardfacing Applications

### Classification

DIN 8555 : MSG 6-GZ-C-60G  
Wr-Number : 1.4718  
EN : X45CrSi9-3  
EN DIN 14700 : Fe8

### General Description

Kobatek T-600/S is a hardfacing MIG wire, providing a martensitic structured weld metal, resistant against abrasion wearing under impact. Weld metal has a structure of Cr-Si and if it is not tempered, can only be machined by grinding. Perfect resistance can be achieved metal against metal wearing.

### Chemical Composition (w%), Typical, Wire

C	Si	Mn	Cr
0.45	3.00	0.40	9.30

### Mechanical Properties, All Weld Metal

Hardness : 550 - 620 HB  
                  : 55 - 60 HRC  
Working Temperature : 550 °C  
Preheating Temperature : 250 °C      Softening Heat Treatment : 780 - 820 °C  
Postweld Heat Treatment : 700 °C      Hardening Heat Treatment : 1000 - 1050 °C

### Shielding Gases (ISO 14175 / EN 439)

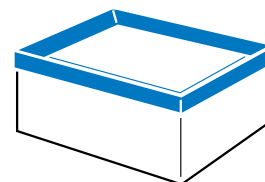
MIG : M21 - Ar + 5-25% CO<sub>2</sub>  
          C1 - CO<sub>2</sub> (100%)

### Current Type and Polarity

DC(+)

### Typical Applications

Ceramic moulds, hammers of cylindrical crushers, pneumatic hammers, shear blades, mixers, cold cutting, drilling, forging tools are primal fields of use.



Ceramic Cutting Mould Edges

### Packing and Diameter Informations

Diameter	0.8	1.0	1.2	1.6	2.0	2.4	3.2	Spool Weight
MIG/MAG Wire	-	-	X	-	-	-	-	15 kg

**Liability** : All information in this data sheet is based on the best available knowledge, is subject to change without notice and can only be considered as suitable for general guidance. **Fumes** : Consult information on Welding Safety Sheet, available upon request.

# Kobatek MIG T-650/S



## GMA (MIG/MAG) Welding Wire for Hardfacing Applications

### Classification

DIN 8555 : MSG 3-GZ-60T  
Wr-Number : 1.2606  
EN : X35CrWMoV5

### General Description

Kobatek T-650/S is a hardfacing MIG wire, providing a martensitic structured filling metal, resistant against consistent abrasion wearing under impact. Weld metal has a structure of Cr-Mo-W-V and can only be processed by grinding.

### Chemical Composition (w%), Typical, Wire

C	Si	Mn	Cr	Mo	V	W
0.35	1.10	0.40	5.20	1.40	0.40	1.30

### Mechanical Properties, All Weld Metal

Hardness : 558 - 620 HB  
                  : 57 - 60 HRC  
Working Temperature : 550 °C  
Preheating Temperature : 300 °C  
Postweld Heat Treatment : 680 °C

### Shielding Gases (ISO 14175 / EN 439)

MIG : M21 - Ar + 5-25% CO<sub>2</sub>  
C1 - CO<sub>2</sub> (100%)

### Current Type and Polarity

DC(+)

### Typical Applications

Hammers of cylindrical crushers, threads, conveying spires, pneumatic hammers, peeling knives, mixers, hot and cold cutting, drilling, forging tools are primal fields of use.

### Packing and Diameter Informations

Diameter	0.8	1.0	1.2	1.6	2.0	2.4	3.2	Spool Weight
MIG/MAG Wire	-	-	X	-	-	-	-	15 kg



# GENERAL INFORMATIONS

GENERAL INFORMATIONS	Page
Conversion Tables	44
- Electrode/Wire Diameters and Lengths	44
- Wire Feeding Rates	44
- Deposition Rates	44
- Hardness Values	45
- Stress Values	47
DIN 8555 Classification	49
Calculation of Preheating Temperature	50
Preheating Temperatures for Steels	51
Welding Positions	52

# Conversion Tables

## Electrode & Wire Diameter and Length - Deposition Rates - Wire Feeding Rates

### Electrode and Wire Diameter - Electrode Length - Deposition Rates - Wire Feeding Rates

Electrode Diameter		Electrode Length		Wire Feeding Rates		Deposition Rates	
inch	mm	inch	mm	inch/min	m/min	lb/hour	kg/hour
0.024	0.6	10	250	25	0.6	1	0.45
0.030	0.8	12	300	50	1.3	2	0.90
0.035	0.9	13	330	75	1.9	3	1.36
0.039	1.0	14	350	100	2.5	4	1.81
3/64	1.2	18	450	125	3.1	5	2.26
1/16	1.6			150	3.8	6	2.72
5/64	2.0			175	4.4	7	3.17
3/32	2.4			200	5.1	8	3.68
7/64	2.8			225	5.7	9	4.08
1/8	3.2			250	6.3	10	4.53
5/32	4.0			275	6.9	11	4.98
3/16	5.0			300	7.6	12	5.44
1/4	6.0			325	8.2	13	5.89
				350	8.9	14	6.35
				375	9.5	15	6.80
				400	10.2	16	7.25
				425	10.8	17	7.71
				450	11.4	18	8.16
				475	12.0	19	8.61
				500	12.7	20	9.07
				525	13.3	21	9.52
				550	14.0	22	9.97
				575	14.6	23	10.43
				600	15.2	24	10.88
				625	15.8	25	11.33
				650	16.5		
				675	17.1		
				700	17.8		

# Conversion Tables

## Hardness Values

### Hardness Values - 1

Brinell HB (P=30D <sup>2</sup> )	Rockwell		Vickers HV (P=30 kgf)	Tensile Strength N/mm <sup>2</sup>	Tensile Strength kgf/mm <sup>2</sup>
	HRB	HRC			
80	36.4		80	270	28
85	42.4		85	290	30
90	47.4		90	310	32
95	52.0		95	320	33
100	56.4		100	340	35
105	60.0		105	360	37
110	63.4		110	380	39
115	66.4		115	390	40
120	69.4		120	410	42
125	72.0		125	420	43
130	74.4		130	440	45
135	76.4		135	460	47
140	78.4		140	470	48
145	80.4		145	490	50
150	82.2		150	500	51
155	83.8		155	520	53
160	85.4		160	540	55
165	86.8		165	550	56
170	88.2		170	570	58
175	89.6		175	590	60
180	90.8		180	610	62
185	91.8		185	620	63
190	93.0		190	640	65
195	94.0		195	660	67
200	95.0		200	670	68
205	95.8		205	690	70
210	96.6		210	710	72
215	97.6		215	720	73
220	98.2		220	740	75
225	99.0		225	760	77
230		19.2	230	760	78
235		20.2	235	780	80
240		21.2	240	800	82
245		22.1	245	820	84
250		23.0	250	830	85
255		23.8	255	850	87
260		24.6	260	870	89
265		25.4	265	880	90
270		26.2	270	900	92
275		26.9	275	920	94
280		27.6	280	940	96
285		28.3	285	950	97
290		29.0	290	970	99
295		29.6	295	990	101
300		30.3	300	1010	103
310		31.5	310	1040	106
320		32.7	320	1080	110
330		33.8	330	1110	113

# MMA Welding Machine

Digital Inverter Technology - Current Range: 30-160 A

## Hardness Values - 1

Brinell HB (P=30D <sup>2</sup> )	Rockwell		Vickers HV (P=30 kgf)	Tensile Strength N/mm <sup>2</sup>	Tensile Strength kgf/mm <sup>2</sup>
	HRB	HRC			
340		34.9	340	1150	109760
350		36.0	350	1180	112000
359		37.0	360	1210	114240
368		38.0	370	1240	116480
376		38.9	380	1270	118720
385		39.8	390	1290	120960
392		40.7	400	1320	123200
400		41.5	410	1350	125440
408		42.4	420	1380	127680
415		43.2	430	1410	129920
423		44.0	440	1430	132160
430		44.8	450	1460	134400
		45.5	460		136640
		46.3	470		138880
		47.0	480		141120
		47.7	490		143360
		48.3	500		145600
		49.0	510		147840
		49.7	520		150080
		50.3	530		152320
		50.9	540		154560
		51.5	550		156800
		52.1	560		159040
		52.8	570		161280
		53.3	580		163520
		53.8	590		165760
		54.4	600		168000
		54.9	610		170240
		55.4	620		172480
		55.9	630		174720
		56.4	640		176960
		56.9	650		179200
		57.4	660		181440
		57.9	670		183680
		58.5	680		185920
		58.9	690		188160
		59.3	700		190400
		60.2	720		192640
		61.1	740		194880
		61.9	760		197120
		62.8	780		199360
		63.5	800		201600
		64.3	820		203840
		65.0	840		206080
		65.7	860		208320
		66.3	880		210560
		66.9	900		212800
		67.5	920		215040

# Conversion Tables

## Stress Values

### Stress Values - 1

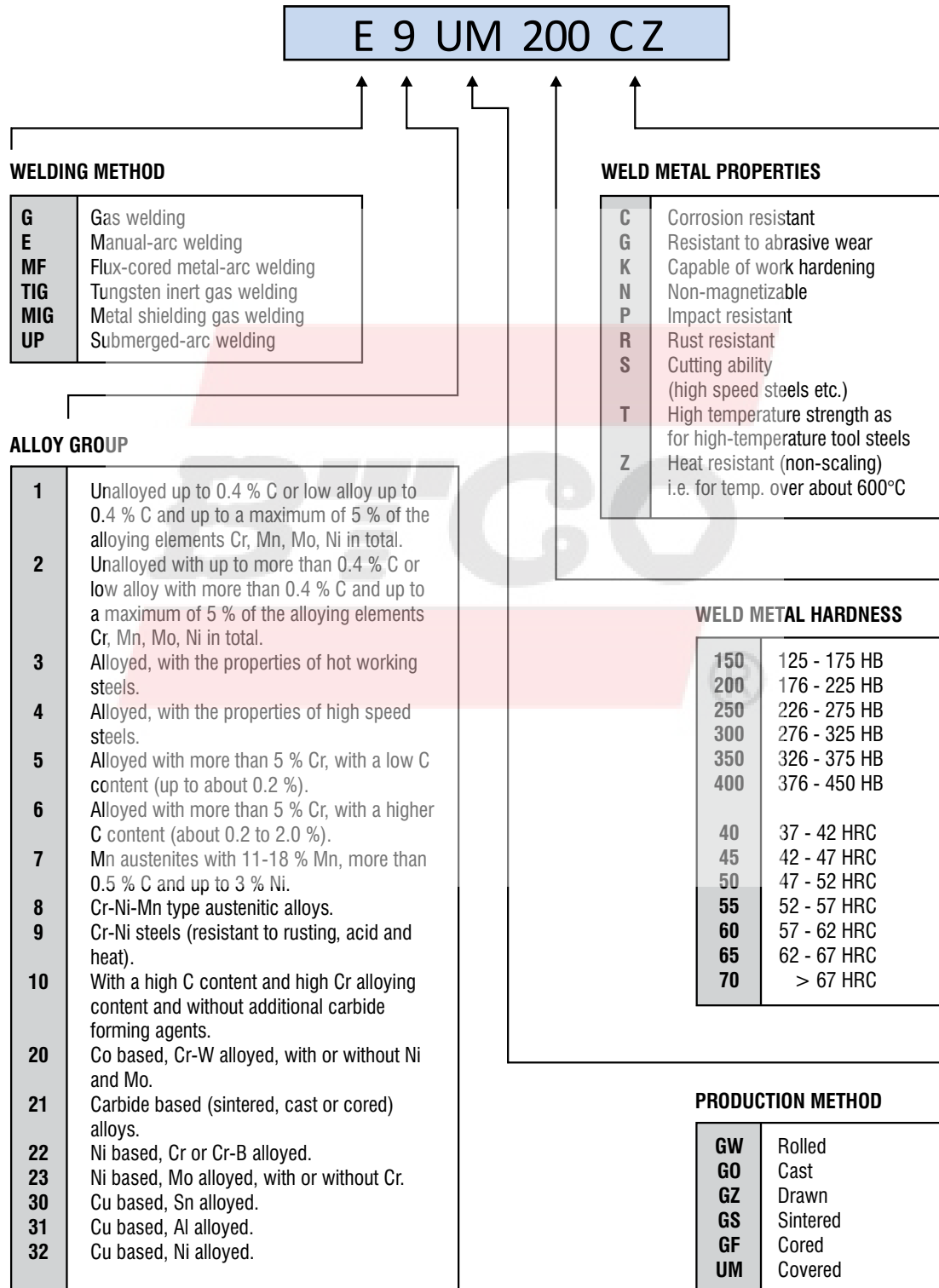
N/mm <sup>2</sup>	kgf/mm <sup>2</sup>	Psi	N/mm <sup>2</sup>	kgf/mm <sup>2</sup>	Psi
15.4	1.6	2240	756.8	77.2	109760
30.9	3.2	4480	772.2	78.7	112000
46.3	4.7	6720	787.7	80.3	114240
61.8	6.3	8960	803.1	81.9	116480
77.2	7.9	11200	818.5	83.5	118720
92.7	9.5	13440	834.0	85.0	120960
108.1	11.0	15680	849.4	86.6	123200
123.6	12.6	17920	864.9	88.2	125440
139.0	14.2	20160	880.3	89.8	127680
154.4	15.7	22400	895.7	91.3	129920
169.9	17.3	24640	911.2	92.9	132160
185.3	18.9	26880	926.7	94.5	134400
200.8	20.5	29120	942.1	96.1	136640
216.2	22.0	31360	957.5	97.6	138880
231.7	23.6	33600	973.0	99.2	141120
247.1	25.2	35840	988.4	100.8	143360
262.6	26.8	38080	1004	102.4	145600
278.0	28.3	40320	1019	103.9	147840
293.4	29.9	42560	1034	105.5	150080
308.9	31.5	44800	1050	107.1	152320
324.3	33.1	47040	1066	108.7	154560
339.8	34.6	49280	1081	110.2	156800
355.2	36.2	51520	1097	111.8	159040
370.7	37.8	53760	1112	113.4	161280
386.1	39.4	56000	1127	115.0	163520
401.6	40.9	58240	1143	116.5	165760
417.0	42.5	60480	1158	118.1	168000
432.4	44.1	62720	1174	119.7	170240
447.9	45.7	64960	1189	121.3	172480
463.3	47.2	67200	1205	122.8	174720
478.8	48.8	69440	1220	124.4	176960
494.2	50.4	71680	1236	126.0	179200
509.7	52.0	73920	1251	127.6	181440
525.1	53.5	76160	1266	129.1	183680
540.5	55.1	78400	1282	130.7	185920
556.0	56.7	80640	1297	132.3	188160
571.4	58.3	82880	1313	133.9	190400
586.9	59.8	85120	1328	135.4	192640
602.3	61.4	87360	1344	137.0	194880
617.8	63.0	89600	1359	138.6	197120
633.2	64.6	91840	1375	140.2	199360
648.7	66.1	94080	1390	141.7	201600
664.1	67.7	96320	1405	143.3	203840
679.5	69.3	98560	1421	144.9	206080
695.0	70.9	100800	1436	146.5	208320
710.4	72.4	103040	1452	148.0	210560
725.9	74.0	105280	1467	149.6	212800
741.3	75.6	107520	1483	151.2	215040



# DIN 8555 Classification

## Classification of Covered Electrodes for MMA Welding of Hardfacing Applications

### Classification of Covered Electrodes According to DIN 8555



# Calculation of Preheating Temperature

## How to Calculate the Preheating Temperature?

### Calculation of Pre-heating Temperature

$$T_{\text{pre-heat}} (\text{°C}) = 350 \sqrt{[C_{\text{eq}}] - 0.25}$$

$$[C_{\text{eq}}] = [C_c] (1 + 0.005 \times E)$$

$$[C_c] = C + \frac{\text{Mn}}{6} + \frac{\text{Cr} + \text{Mo} + \text{V}}{5} + \frac{\text{Ni} + \text{Cu}}{15}$$

$[C_{\text{eq}}]$  = Chromium equivalent (%)

$[C_c]$  = Carbon equivalent (%)

E = Workpiece thickness (mm)

$T_{\text{pre-heat}}$  = Pre-heating temperature (°C)

#### Example:

Preheating temperature required for 25 CrMo 4 steel of 12 mm thickness.

$$[C_c] = C + \frac{\text{Mn}}{6} + \frac{\text{Cr} + \text{Mo} + \text{V}}{5} + \frac{\text{Ni} + \text{Cu}}{15}$$

$$[C_c] = 0.25 + \frac{0.8}{6} + \frac{1 + 0.25 + 0}{5} + \frac{0 + 0}{15}$$

$$= 0.63$$

$$[C_{\text{eq}}] = [C_c] (1 + 0.005 \times E)$$

$$[C_{\text{eq}}] = [0.63] (1 + 0.005 \times 12)$$

$$= 0.67$$

$$T_{\text{pre-heat}} (\text{°C}) = 350 \sqrt{[C_{\text{eq}}] - 0.25}$$

$$T_{\text{pre-heat}} (\text{°C}) = 350 \sqrt{[0.67] - 0.25}$$

$$= 220 - 230 \text{ °C}$$



# Preheating Temperatures for Steels

## Preheating Temperatures for Steels Most Commonly Used

### Pre-heating Temperatures for Steels Most Commonly Used

Material Group	Material (Wr.) Number	C <sub>eq</sub>	Pre-heating Temperature (°C)
Carbon Steels	1.1141 Ck 15	0.28	no pre-heating
	1.0402 C 22	0.33	no pre-heating
	1.1172 Cq 35	0.48	150 - 200
	1.1186 Ck 40	0.58	200 - 250
	1.1248 Ck 75	0.95	300 - 350
Carbon Steels	1.1165 30 Mn 5	0.63	200 - 250
	1.1167 36 Mn 5	0.69	200 - 250
	1.0912 46 Mn 7	0.78	250 - 300
	1.3401 X 120 Mn 12	-	no pre-heating
Molybdenum Steels	1.5415 15 Mo 3	0.50	200 - 250
	1.5419 22 Mo 4	0.50	200 - 250
Chromium-Molybdenum Steels	1.7218 25 CrMo 4	0.70	250 - 300
	1.7220 34 CrMo 4	0.80	300 - 350
	1.7225 42 CrMo 4	0.90	325 - 350
	1.7360 31 CrMo 12 5	1.25	400 - 450
	1.7362 12 CrMo 19 5	1.45	400 - 450
Nickel-Chromium-Molybdenum Steels	1.6523	0.60	200 - 250
	1.6565	1.00	300 - 350
	1.6577	0.75	250 - 300
	1.6747		350 - 400
Chromium Steels	1.7015 15 Cr 3	0.42	100 - 150
	1.7006 46 Cr 2	0.62	250 - 300
	1.7035 41 Cr 4	0.84	300 - 350
	1.7176 55 Cr3	0.92	350 - 400
	1.3505 100 Cr 6	1.47	500
Nickel-Chromium Steels	1.5713 13 NiCr 6	0.52	200 - 250
	1.5736 36 NiCr 10	0.90	300 - 350
Stainless Steels	1.4301 X6 CrNi 19 10	-	no pre-heating
	1.4571 X6 CrNiMoTi 17 12 2	-	
	1.4845 X6 CrNi 25 20	-	

**Attention !** The preheating temperatures for the steel types mentioned in this table are determined mathematically and are listed to give the user a basic idea. These values might change with respect to the welding process and the dimensions of the welded component.

# Welding Positions

## Welding Positions According to ASME and ISO 6947

### Welding Positions



1G/PA

Butt and fillet welding  
in flat/downwards position



4G/PE

Butt and fillet welding  
in overhead position



2F/PB

Fillet welding in  
horizontal/vertical position



3G/PF

Butt and fillet welding  
in vertical upwards position



2G/PC

Butt welding  
in horizontal position



3G/PG

Butt and fillet welding in  
vertical downwards position







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