English

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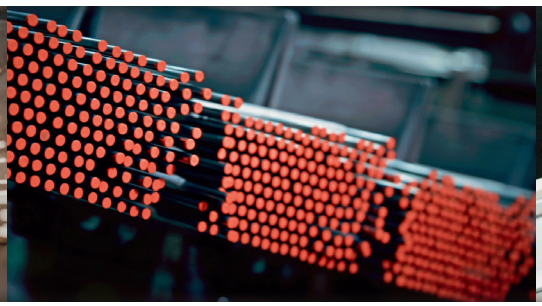
Welding Consumables & Abrasives



Contents

Handbook HILCO Welding Consumables & Abrasives

Hilarius Haarlem Holland BV (HILCO), the Netherlands, offers a complete range of welding consumables and abrasives. Our greatest strength is the diversity of our line of products, which ranges from unalloyed to high-alloyed steel and aluminium alloys. Our welding consumables are tested, certified, and considered reliable by both our customers and internationally recognized classification institutes including Lloyds Register of Shipping, ABS, DNV-GL, and TüV. Our HILCO HILDISCs are manufactured according to ISO 9001 and EN12413 standards and meet the requirements of the Organisation of Abrasives (oSa).

We are your ideal partners for your construction and manufacturing projects as well as for repair and maintenance. The highly specialized nature of these tasks requires distinctive approaches, which we cover with our extensive knowledge and expertise, experience, and complete range of products.

Our understanding of the specific demands of your operation will result in the optimum solution for any application, so you will never be without customized assistance. Our experienced, highly motivated, and service-minded team will gladly answer all your technical questions and will propose economical solutions. In other words we will offer you a bespoke solution - anywhere in the world.

On 28 September 1915, Mr Watze Hilarius started manufacturing wire nails and roof slates. Hilarius has since built a strong tradition of serving its customers, who are now located in approximately 100 countries across the world. This has resulted in strong partnerships with welders, welding engineers, purchasing managers, field technicians, and construction and production managers. This has been achieved either by direct contact or through our extensive global network of trained distributors. You can find the registered brand name HILCO, in combination with the powerful green colour, anywhere, even in places where you would least expect it.

At Hilarius we consider welding to be people's business. We are committed to enhancing relationships with our business partners, which effectively optimizes our mutual success in business. We take things further to become closer, and are committed to making strong connections.

We are the smile behind the welder!

Our products	Applications for our products
Coated electrodes	Shipyards
Solid MIG/MAG wires	Offshore
Welding rods for TIG and gas welding	Pressure vessel & boiler industry
Wires and fluxes for submerged arc welding	Construction works
Rutile, basic and metal cored wires	Chemical & petrochemical industry
Cored wires for hardfacing, overlaying	Heat exchanger industry
High strength and creep resistant alloys	Transport & lifting industry
Brazing filler metals	Gas & oil industry
Nickel-, copper-, cobalt-, aluminium alloys	Road & bridge construction industry
Hardfacing alloys	Paper industry
Consumables for Repair & Maintenance	Sugar industry
Brazing filler metals	Steel industry
HILDISC: cutting, grinding (both Steel-Inox)	Mining
and Flapdisc (Steel-Inox-Alu)	Cement industry
Accessories such as inverters (HM160MV)	Marine equipment
Welding Helmets, Gloves etc.	Repair & Maintenance

The product data sheets of the individual HILCO Welding Consumables contain a detailed description of each respective product. The data sheets are subdivided as follows:

Product identification
Brand name: mentioning the typical name of the respective product
Product ID: in sequence process - steel grade - typical application (optional)
Standard designation: classification according to AWS/ASME (Section II part C), EN and EN Werkstoffnr.

Typical characteristics of the product
Gives information about the specific product, the product properties and our recommendations for welding current, polarity, welding positions, approvals and arc voltage which is the voltage at which you can strike the arc of the stick electrodes. The different welding positions which according to AWS and EN are indicated by code digits are symbolized in the product data sheet as follows:

AWS: 1G, 2G, 3G, 4G, 5G, 6G
EN: PA, PB, PC, PD, PE, PF, PG
"All positions"

AWS: 1G, 2G, 3G, 4G, 5Gu
EN: PA, PB, PC, PD, PE, PF
"All positions, except vertical down"

AWS: 1G, 1F, 2G, 2F
EN: PA, PB, PC
"Flat butt and fillet welds only"

Application / properties
A description of the typical characteristics of the specific product, the most important base materials to be welded and its typical applications. In case the base material or application requested is not included in the data-sheet, or if you have any questions on the subject, your local HILCO distributor or our office in the Netherlands will be pleased to help you. You can call us at the number of HILCO in the Netherlands +31 - (0) 23 - 531 91 00.
Fax +31 - (0) 23 - 532 59 06
Email: info@hilco-welding.com

Chemical composition
The weld metal analysis indicates the chemical composition of the deposit weld metal in weight % per element. The values indicated in the product data sheets were determined by routine testing by our quality assurance department.

Mechanical properties
The specified mechanical properties are typical values and refer to all-weld metal. It must be taken into account that the mechanical properties of welded joints, depending on the base materials, dimensions of the component, welding position, welding parameters, preheating, interpass temperatures, post-weld-heat-treatment (PWHT), may deviate from those of the all-weld metal. The mechanical properties indicated in the product data-sheets are to be considered as general guidelines and they may vary according to the variations of product batches.

Disclaimer
The products and information in this handbook are based on today's knowledge about welding, welding techniques and product development. All technical data mentioned is not binding and alterations are possible at any time. If necessary, please contact us for the latest developments.

Product name

Process - steel grade - typical application (optional)

Standard designation as per:	AWS	American Welding Society
	EN	European standard (issued by CEN)
	Werkstoffnr.	EN identification for materials

Coating type, wire type or flux type (depending on the process):
Identifies the characteristics of the product concerned by means of either the chemical composition of the covering or core. In case of wire type the specific welding process concerned.

Current:
Identifies the current and polarity recommended. For DC current the sequence identifies our recommendations

AC current
= AC

DC current / electrode connected to positive pole
= DCEP

DC current / electrode connected to negative pole
= DCEN

DC current / negative pole with a remark
= DCEN

Welding positions:
Identifies the welding position we recommend the consumable to be used in

All positions

All positions, except vertical downwards

All positions, specifically in vertical down position

Flat butt and fillet welds only

Flat butt and fillet welds, limited vertical upwards

Approvals: consumable is tested annually and approved by international institutes

ABS	American Bureau of Shipping
BV	Bureau Veritas
DB	Deutsche Bundesbahn (German Railways)
DNV-GL	Det Norske Veritas/ Germanischer Lloyds
LR	Lloyds Register of Shipping
TüV	Technische überwachungs Verein

Tip colour: (if applicable) colour code for identification of stick electrodes, to be found on grip end of the electrode
Printing: Brand name / EN classification / AWS specification (or parts of this sequence) printed on the electrodes' coating.

Stick electrodes
Rutile and low-hydrogen electrodes are packed in cardboard packs with polyethylene wrapping which are then packed in outer boxes made of corrugated board in units of 3 or 4.

Pipeweld electrodes for welding cross-country pipelines are packed in steel metal cans to ensure moisture levels necessary for proper operation.

Hilchrome stainless steel electrodes are packed in hermetically sealed metal cans, which are then packed in outer boxes of corrugated board in units of 3. The metal HILcan offers the following advantages:

- Guaranteed completely dry electrodes, maintained in exactly the same quality controlled condition as immediately after production;
- Problem-free storage in the original sealed packaging;
- Protection from damage, climate changes and moisture pick-up;
- A weld metal deposit without any porosity when the electrodes are used within one single shift (8 hrs.) in any climatic condition.

Hardmelt stick electrodes for depositing wear resistant layers are packed in the same way as rutile and low-hydrogen electrodes.

Hilco electrodes for welding Ni-base alloys, non-ferrous alloys, cast iron grades and stellite are packed in small handy packages of max. 2 kilo with polyethylene shrink-wrapping which are then packed in outer boxes of corrugated board in units of 7.

Hilco stick electrodes for welding Aluminium are packed in hermetically sealed aluminium cans, which are then packed in outer boxes made of corrugated board in units of 6.

TIG rods, gas welding rods
TIG rods and gas welding rods are available in 5 kilo packs.

Flux for submerged arc welding
HILCOWELD fluxes are normally supplied in polyethylene bags of 25 kilo.

MIG/MAG wires, Cored wires and wires for submerged arc welding
are spooled on various spool types, each spool is packed in a polyethylene bag and individually or combined (S100 spools, some S200 spools) packed in corrugated boxes. With the introduction of the EN standard for technical delivery conditions the name of the spool types have been amended as follows:

DIN 8559	EN-ISO 544	Type	Typical weight * (kg)	Outer diameter (mm.)	Inner diameter (mm.)	Outer width (mm.)	Bore diameter (mm.)
D 100	S 100	Plastic spool	1,0	100 +/- 2	-	45 +0/-2	16,5 +1/-0
D 200	S 200	Plastic spool	5,0	200 +/- 3	-	55 +0/-3	50,5 +2,5/-0
D 300	S 300	Plastic spool	15,0	300 +/- 5	-	103 +0/-3	50,5 +2,5/-0
K 300	B 300	Basket spool	15,0	300 +0/-5	180 +/- 2	100 +/- 3	-
"Sandvik"	BS 300	Basket spool	15,0	300 +/- 5	-	103 +0/-3	50,5 +2,5/-0
K 415	B 415	Basket spool	25,0	415 +/- 5	300 +15/-0	70 +0/-15	-
-	MP	Drums	250,0	-	-	-	-

Note: typical weight indicates the typical content of a spool.
Please consult the product data sheets of the specific product for accurate information.

EN-ISO 544	Typical application
S 100	Plastic spools for **orbital welding**
S 200	Plastic spools for usage in **confined areas**
S 300	Plastic spools for universal usage
B 300	**Steel basket spools for universal usage** - to be used with an adaptor
BS 300	**Steel basket spools with characteristics of D 300 spools - environment friendly**
B 415	Steel basket spools for Submerged arc welding wires
MP	**Drums to improve your productivity.** Each MP contains more than thirteen 15 kilo spools, reducing stop-and-go sequences to an absolute minimum. Ideal for automatic welding processes requiring high productivity.

Designation			Constituents in percent volume						Procedure	Remarks
Group	Code	Mixture (data-sheet)	Oxidizing		Inert		Reducing	Un-reactive		
			CO_2	O_2	Ar	He	H_2	N_2		
R	1	-			Bal.		>0-15		TIG, root shielding, plasma cutting	reducing
	2	-			Bal.		>15-35			
I	1	Pure Ar			100				MIG, TIG, root shielding	inert
	2	-				100				
	3	ArHe			Bal.	>0-95				
M1	1	$ArCO_2$	>0-5		Bal.		>0-5		MAG	Slightly oxidizing
	2	$ArCO_2$	>0-5		Bal.					
	3	$ArCO_2O_2$		>0-3	Bal.					
	4	$ArCO_2O_2$	>0-5	>0-3	Bal.					
M2	1	$ArCO_2$	>5-25		Bal.					
	2	ArO_2		>3-10	Bal.					
	3	$ArCO_2O_2$	>0-5	>3-10	Bal.					
	4	$ArCO_2O_2$	>5-25	>0-8	Bal.					
M3	1	$ArCO_2O_2$	>25-50	>10-15	Bal.					Strongly oxidizing
	2	Pure Ar			Bal.					
	3	$ArCO_2O_2$	>5-50	>8-15	Bal.					
C	1	CO_2	100							
	2	CO_2O_2	Bal.	>0-30						
F	1							100	Plasma cutting, root shielding	Unreactive reducing
	2						>0-50	Bal.		
Note: Argon (Ar) may be substituted by Helium (He) up to 95% - the He percentage is indicated by an extra digit.										

Handling, storage, drying stick electrodes

To ensure satisfactory weld quality, the stick must be handled and stored properly before use. Electrode coatings are carefully designed to provide the necessary operating characteristics and weld properties required for each electrode type. Generally, stick electrodes should be stored in their original packing. The storage facilities should have an infrastructure which makes the "first in - first out" principle possible. Electrodes are manufactured to be within acceptable moisture limits, consistent with the type of covering and strength of the weld metal. It is recommended that the storage room is organised in such way that the electrodes are stored dry and safe. Moisturizing units should not be stored in the same area. Open packaging should be stored in special conditioned areas.

TYPICAL STORAGE CONDITIONS FOR STICK ELECTRODES
Storage of covered electrodes in cardboard boxes requires in general humidity and temperature controlled storage areas. Recommended storage conditions include: • Temperature 18-25°C, relative humidity max. 60% • Temperature 25-35°C, relative humidity max. 50%

Re-drying of stick electrodes is recommended if the electrodes have picked up moisture or is imperiously required for low-hydrogen basic coated electrodes. We advise you to use the electrodes from a quiver after re-drying.

TYPICAL RE-DRYING GUIDELINES FOR STICK ELECTRODES				
Electrodes for	**Coating type**	**Re-drying recommended**	**Re-dry temperature ºC**	**Re-drying time / h.**
Unalloyed and low alloy structural steel	A, AR, RC, R, RR	No	--	--
	RB, B	Yes	300-350	2 - 10
Pipelines	C	Not allowed!	--	--
Fine grain steel	B	Yes	300-350	2 - 10
High temperature steel	R	No	--	--
	B	Yes	300-350	2 - 10
Stainless and heat resisting steel	R	Yes	120-200	2 - 10
	RB, B	No	--	--
Soft-martensitic steel	B	Yes	300-350	2 - 10
Duplex steel	R, RB	Yes	250-300	2 - 10
Hardfacing	R	No	--	--
	RB, B	Yes	300-350	2 - 10
Ni-base alloys	All types	If necessary	120-300	2 - 10

In certain cases it may be reasonable to re-dry electrodes even when they are not mentioned in the table above. Should the coating exhibit an excessively high water content as a result of e.g. improper storage or other adverse influences, which is reflected by the welding behaviour and by increased spattering or formation of pores, the electrodes may be re-dried at 100-120ºC for one hour. Electrodes in special packaging (f.i. HILcans) can be used without re-drying and holding in a drying oven within a period of 8 hours after opening. After that the electrodes can be re-dried in accordance with the table above.

Handling, storage, drying cored wires

Unalloyed and low-alloyed cored wires are less sensitive to moisture pick-up since a metal sheath mainly covers the internal core. Nevertheless, it is possible that the working environment affects the low hydrogen characteristics. For storage we recommend the same conditions as mentioned for stick electrodes (typical storage conditions for stick electrodes). For re-drying we suggest that you re-dry the wires at 150ºC / max. 24 h.

Stainless steel cored wires are more sensitive to moisture pick up. Therefore, the spools are vacuum packed. Storage facilities and re-dry procedures are the same as for unalloyed and low-alloyed cored wires. For stainless steel cored wires we kindly ask you to pay extra attention to removing the spools at the end of the working period and storing them in a conditioned area. In case of need you can re-dry the wires at 150ºC / max. 24 h.

Handling, storage, drying fluxes for submerged arc welding
We recommend that you store welding fluxes at a constant temperature in a conditioned area, thus avoiding moisture pick-up. The shelf life of welding fluxes can be max. three years if stored properly. Flux in damaged packaging should be used or repacked immediately. To ensure crack-free usage, fluoride-basic fluxes should be dried before use. Re-drying can be avoided in the case of usage directly from undamaged, airtight packaging.

TYPICAL REDRYING GUIDELINES SUB-ARC WELDING FLUXES			
Production method	**Re-drying recommended**	**Re-dry temperature ºC**	**Re-drying time (hours)**
Agglomerated flux	Yes	300	2 - 4
Fused	Yes	200	2 - 4

Re-dry temperatures as mentioned in the table above are considered to be guidelines only. Re-drying in multiple sequences is possible within the mentioned re-drying time. Fluxes that are not used immediately after re-drying should be stored in a heated area or in an airtight packaging such as hermetically sealable drums. Storage temperature of the heated area should be around 150ºC; max. storage period is 30 days. We recommend using a re-drying oven where special care should be taken not to overheat the flux.

SI Units for use in the welding industry To convert *to* metric, *multiply* by the factor in remarks; To convert *from* metric, *divide* by the factor				
Quantity	**Unit**	**Symbol**	**Other units/symbols**	**Remarks / factor**
Length	Meter	m	Inch (in) Foot (ft) Yard (yd)	0.0254 0.3048 0.9144
Area	Square meter	m^2	$Inch^2$ (in^2) $Foot^2$ (ft^2) $Yard^2$ (yd^2)	0.0064516 0.09290304 0.8361274
Volume	Cubic meter	m^3	$Inch^3$ (in^3) $Foot^3$ (ft^3)	0.001638706 0.02831685
Frequency	Hertz	Hz	-	-
Mass	Kilogram	kg	Pounds (lbs)	0.4535924
Density	Kilogram per cubic meter	Kg/m^3	-	-
Force	Newton	N	kgf lbf	0.980665 0.4448222
Mechanical load	Pascal, Mega Pascal	Pa MPa	Newton per square meter Newton per square millimetre (N/mm^2)	1 1
		MPa	Ton f/in^2 1 ksi = 1.000 psi	0,064749 6,89476
Impact strength	Joule	J	-	1J = 1NM 1J = 0,7377562 fl lbf 1J = 0,1011972 kgf m
Temperature	Kelvin	K	Degree Celsius (ºC) Degree Fahrenheit (ºF)	tK=tC + 273.15 tK=(tF+ 459.67)/1.8
	Celsius	C	Degree Fahrenheit (ºF)	tF=(tCx1.8)+32
	Fahrenheit	F	Degree Celsius (ºC)	tC=(tF-32)/1.8
Electric current	Ampere	A	-	-
Electric potential	Voltage	V	-	-
Current density	Ampere per meter	A/m^2	-	-

Conversion international sizes								
mm	SWG	inch	mm	SWG	inch	mm	SWG	inch
1,2	-	3/64	3,0	10	1/8	8,0	-	5/16
1,5	16	1/16	4,0	8	5/32	10,0	-	3/8
2,0	14	5/64	5,0	6	3/16	13,0	-	1/2
2,5	12	3/32	6,0	4	1/4	25,4	-	1/1

Material test certificates according to EN 10204
Certificates attesting the characteristics and property values of welding filler metals are requested by customers or the inspection authorities within the framework of the acceptance testing of welded structures.

A few explanatory notes are included in this handbook with the request that they should be kept in mind when making enquiries or placing orders.

The EN standard 10204 is taken as a basis to determine the schedule of such certificates. The standard 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.

We would like to emphasize that EN 10204 does not contain the following details so that these must be specified by the customer upon ordering:

Scope of testing: e.g. type and number of tests, individual elements in case of chemical analysis tests
Consumables: e.g. type of shielding gas etc.
Test parameters: e.g. post weld heat treatment of the test piece, test temperatures
Requirements: e.g. minimum values for yield strength, tensile strength, elongation, impact values, chemical composition tolerances
Inspection society: if required.

All certificates issued in conformity with EN 10204 must be paid for and are charged separately.

Hilco Test Reports
Typical test reports issued by Hilarius Haarlem Holland BV

Acc. to EN 10204	Issued by	Contents
2.2	HILCO QA dept.	Typical chemical analysis Typical mechanical properties Specific information about shipment
3.1	HILCO QA dept.	Actual chemical analysis Typical mechanical properties Specific information about shipment

Ships plate

All grades of shipbuilding steels are suitable for welding. Normal shipbuilding steels have a tensile strength of 400-480 MPa. These steels can be divided into 5 categories according to their quality:

Category	A	killed to semi-killed
	B	killed to semi-killed
	C	Al-killed, fine grained
	D	all deoxidizing techniques, not killed
	E	Al-killed, fine grained

The required minimum impact strength values for the materials of categories C, D and E also apply to the filler metals. The values for ISO-V notch specimens are as follows:

Category	1	47 Joule minimum at +20ºC
	2	47 Joule minimum at 0ºC
	3	47 Joule minimum at -20ºC
		61 Joule minimum at -10ºC

Those welding consumables classified as per categories 2 and 3 having a low hydrogen content are additionally marked with:

Category	H15	max. H_2O 0,5 g/100 g samples = (H_{DM} < 15 ml / 100 gr deposit weld metal)
	H10	max. H_2O 0,3 g/100 g samples = (H_{DM} < 10 ml / 100 gr deposit weld metal)
	H5	max.H_2O 0,2 g/100 g samples = (H_{DM} < 5 ml / 100 gr deposit weld metal)

Structural steel

In general, the weldability of unalloyed structural steel is easy. As in all welding processes the weld metal needs its mechanical properties to match the base materials to be welded. The welder must avoid forming defects in the weld.
Unlimited weldability for the different welding processes cannot be guaranteed for structural steels. The behaviour of a steel plate during and after welding has a close relationship to the chemical structure of the material itself as well as its dimensions and shape. Furthermore the fabrication and service conditions of the component are important.

Boiler steel

There are no restrictions to the weldability of boiler steels. Please follow the recommendations mentioned in this handbook or mentioned in the classifications of the base materials to be welded.

Fine grain steel

All fine-grained steels can be welded. Restrictions only exist for welding processes involving considerable heat accumulation. Please follow the recommendations mentioned in this handbook or mentioned in the classifications of the base materials to be welded.

Pipe steel

The weldability of pipe steels is not subject to any restrictions. Please follow the recommendations mentioned in this handbook or mentioned in the classifications of the base materials to be welded.

Cast steel

The weldability of cast steels is only subject to restrictions as per EN 10213. Please follow the recommendations mentioned in this handbook or mentioned in the classifications of the base materials to be welded.

The known DIN designations 1629, 1681, 17100, 17102, 17155 and 17172 have been replaced by EN standards. A summary of both old designations and their replacements is as follows:

	OLD DESIGNATION (DIN)		EN STANDARD (NEW)	
Base materials	**DIN**	**designation**	**EN**	**designation**
Pipe steel	DIN 1629 / 1630	St. 37.0	EN 10216-1	P235T1
		St. 37.4		P235T2
		St. 44.0		P275T1
		St. 44.4		P275T2
		St. 52.0		P355N
Cast steel	DIN 1681	GS-45	EN 10213	GP240R
		GS-52		GP240H T1/T2
Structural steel	DIN 17100	St. 33	EN 10025	S185
		St. 37-2		S235JR
		USt. 37-2		S235JRG1
		RSt. 37-2		S235JRG2
		St. 37-3U		S235J0
		St. 37-3N		S235J2G3
		St. 44-2		S275JR
		St. 44-3U		S275J0
		St. 44-3N		S275J2G3
		St. 52-3U		S355J0
		St. 52-3N		S355J2G3
		St. 50-2		E295
		St. 60-2		E335
		St. 70-2		E360
Fine grain steel	DIN 17 102	StE 285	EN 10028-3	P275N
		WStE 285		P275NH
		TStE 285		P275NL1
		EStE 285		P275NL2
		StE 355		P355N
		WStE 355		P355NH
		TStE 355		P355NL1
		EStE 355		P355NL2
		StE 460		P460N
		WStE 460		P460NH
		TStE 460		P460NL1
		EStE 460		P460NL2
		StE 285 / -	EN 10113	S275N / S275M
		TStE 285 / -		S275NL / S275ML
		StE 355 / BStE 355 TM		S355N / S355M
		TStE 355 / BTStE355 TM		S355NL / S355ML
		StE 420 / BStE 420 TM		S420N / S420M
		TStE 420 / BTStE420 TM		S420NL / S420ML
		StE 460 / BStE 460 TM		S460N / S460M
		TStE 460 / BTStE460 TM		S460 NL / S460 ML

	OLD DESIGNATION (DIN)		EN STANDARD (NEW)	
Base materials	**DIN**	**designation**	**EN**	**designation**
Boiler steel	DIN 17 155	H I	EN 10028-2	P235GH
		H II		P265GH
		17 Mn 4		P295GH
		19 Mn 6		P355GH
		15 Mo 3		16 Mo 3
		13 CrMo 4 4		13 CrMo 4-5
		10 CrMo 9 10		10 CrMo 9-10

Fine grain steel (high strength steel)	-	TStE 460 V	EN 10025	S460QL
		StE 500 V / TStE 500 V		S500Q / S500QL
		StE 550 V / TStE 550 V		S550Q / S550QL
		StE 620 V / TStE 620 V		S620Q / S620QL
		StE 690 V / TStE 690 V		S690Q / S690QL
		TStE 890 V / TStE 960 V		S890QL / S960QL

Fine grain steel (weather-resistant)		S235JRW-S355JRW	S235J2G3Cu-S355J2G3Cu

	OLD DESIGNATION (DIN)		EN STANDARD (NEW)		API 5L
Base materials	**DIN**	**designation**	**EN**	**designation**	**design.**
Pipe steel	DIN 17 172	StE290.7	EN 10208-2	L240MB	X42
		StE290.7TM		L290MB	
		StE240.7		L240NB	
		StE290.7		L290NB	
		StE320.7		L320NB	X46
		StE360.7TM		L360MB	X52
		StE360.7		L360NB	
		StE385.7		L385NB	X56
		StE415.7		L415NB	
		StE415.7TM		L415MB	X60
		StE445.7TM		L445MB	X65
		StE480.7TM		L480MB	X70
		StE550.7TM		L550MB	X80

	DESIGNATION	EN STANDARD (NEW)
Ships plate	Grade A	S235JRS2
	Grade AH32	S315G1S
	Grade AH36	S355G1S
	Grade AH40	-
	Grade B	-
	Grade D	S235J2S1.0
	Grade DH32	S315G2S
	Grade DH36	S355G2S
	Grade DH40	-
	Grade E	S235J4S
	Grade EH32	EN 17102: P315N
	Grade EH36	S355G3S
	Grade EH40	-

HILCO RED EXTRA

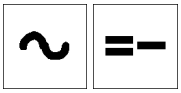
Stick electrode – unalloyed steel

AWS A5.1: E 6013

EN ISO 2560-A: E 42 0 RC 11

Coating type:
Rutile

Current:



Welding positions:

Red Extra is our universal electrode for all welding positions, including vertical-down position. This electrode is characterised by easy handling, smooth arc transfer, easy slag removal and a finely rippled bead surface. Red Extra is the ideal choice for construction work where the use of one type of electrode is permissible. Typical applications include assembly, workshop and repair welding of mild and low-alloyed structural steels. Red Extra is an all-current type (AC/DC), which also operates on transformers with low OCV, min. 42V.

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,09	0,5	0,4	0,005	0,015

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 22	0ºC ≥ 47 20ºC ≥ 47

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,0	300	10,5	40-60
2,5	350	18,2	60-100
3,2	350	28,9	90-140
4,0	350	44,2	150-190
5,0	350	70,4	180-240

HILCO RED

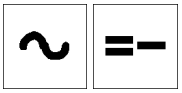
Stick electrodes – unalloyed steel

AWS A5.1: E 6013

EN ISO 2560-A: E 42 0 RC 11

Coating type:
Rutile

Current:



Welding positions:

Red is our rutile coated electrode for all welding positions, including vertical-down position. This electrode is characterised by easy handling, smooth arc transfer, easy slag removal and a finely rippled bead surface. Red is selected in a wide range of sheet metal applications. Typical applications include tack welding and welding on galvanised, primer painted and slightly rusted plates. Red is an all-current type (AC/DC) and is suitable for welding on transformers with low OCV, min. 42V.

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,11	0,5	0,3	0,012	0,017

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 22	0ºC ≥ 47 20ºC ≥ 47

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	18,2	60-90
3,2	350	28,9	90-140
4,0	350	44,2	150-190

HILCO BROWN

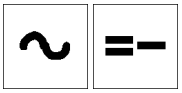
Stick electrodes – unalloyed steel

AWS A5.1: E 6013

EN ISO 2560-A: E 42 0 RC 11

Coating type:
Rutile

Current:



Welding positions:

Brown is our “fast freezing” rutile coated electrode for all welding positions, especially vertical-down position. This electrode is characterised by easy handling, a good penetrating arc and the ability to bridge wide root openings under conditions of poor fit: on rusty, scaled, primer painted and/or contaminated plate material. Brown is selected for bridging gaps, assembly, repair and workshop welding. Typical applications include repair welding in shipbuilding. Brown is an all-current type (AC/DC).

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,10	0,5	0,4	0,010	0,016

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 22	0ºC ≥ 47 20ºC ≥ 50

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	18,8	60-100
3,2	350	31,3	90-140
4,0	350	47,0	150-190

HILCO PIPEWELD 6010

Stick electrodes – unalloyed steel

AWS A5.1: E 6010

EN ISO 2560-A: E 38 3 C 21

Coating type:
Cellulose

Current:
=+ =−* * Root pass!

Welding positions:


Pipeweld 6010 is our cellulose coated electrode recommended for all welding positions, particularly in vertical down and overhead position. The electrode is characterised by a deeply penetrating, forceful, spray type arc and readily removable slag. The majority of applications are in joining carbon steel, but performance on galvanised and some low-alloy steels is proven to be excellent. Typical applications include shipbuilding, general constructions, bridges, storage tanks, piping and pressure vessel fittings.

Base materials to be welded:
- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:
- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance
- Oil & Gas Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si
0,12	0,5	0,14

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 390	≥ 470	≥ 22	-30ºC ≥ 47 20ºC ≥ 70

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	17,7	50-80
3,2	350	25,5	80-130

HILCO PIPEWELD 7010

Stick electrodes – unalloyed steel

AWS A5.5: E 7010-P1

EN ISO 2560-A : E 42 3 C 25

Coating type:
Cellulose

Current:
=+ =−* *root pass

Welding positions:

Pipeweld 7010 is our cellulose-coated electrode recommended primarily for welding high-strength pipe butt joints in the vertical down position. The electrode is characterised by a deeply penetrating, forceful, spray type arc and readily removable slag. Typical application for Pipeweld 7010 is the welding of API 5L: X52 piping assemblies.

Base materials to be welded:

- Pipe steels L240MB - L360MB, API 5L X42 - X60
- Pipe steels root passes up to API 5L X70

Applications:

- Pipe welding

Chemical Composition, wt.% weld metal – typical:

C	Mn	Si
0,14	0,7	0,14

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
AW	≥ 420	≥ 500	≥ 22	20ºC ≥ 100 -40ºC ≥ 45

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	350	25,5	80-130
4,0	350	39,2	120-180

HILCO VELORA

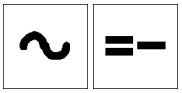
Stick electrodes – unalloyed steel

AWS A5.1: E 6013

EN ISO 2560-A: E 42 0 RR 12

Coating type:
Rutile

Current:



Welding positions:

Velora is our “slow freezing” rutile coated electrode for all welding positions, except vertical down position. The electrode is characterised by easy handling, smooth arc transfer, easy slag removal and a finely rippled bead surface. Velora is selected for fast downhand welding of thin sheet metals (< 5,0 mm. wall-thickness). Typical applications include assembly, workshop and repair welding of mild and low-alloyed structural steels. Velora is an all-current type (AC/DC), which also operates on transformers with low OCV, min. 42V.

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,10	0,5	0,3	0,006	0,018

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 22	0ºC ≥ 47 20ºC ≥ 60

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	20,5	60-100
3,2	350	34,4	100-140
4,0	450	70,0	150-190

HILCO VELVETA

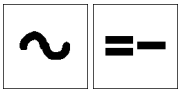
Stick electrodes – unalloyed steel

AWS A5.1: E 6013

EN ISO 2560-A: E 42 0 RR 32

Coating type:
Rutile

Current:



Welding positions:

Velveta is our rutile coated electrode for all welding positions, especially for vertical up position. This electrode is characterised by an extremely easy handling, smooth arc transfer, easy slag removal and a finely rippled bead surface. Velveta is the logic first choice for thin-walled pipe welding. Typical applications include assembly, workshop and repair welding of mild and low-alloyed structural steels. Velveta is an all-current type (AC/DC), which also operates on transformers with low OCV, min. 42V.

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance
- Oil & Gas Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,08	0,40	0,40	0,008	0,013

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 22	0ºC ≥ 47 20ºC ≥ 50

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,0	300	10,0	50-70
2,5	350	19,2	60-100
3,2	350	31,3	80-140
4,0	350	46,0	130-180
4,0	450	59,0	130-180

HILCO BASIC 55

Stick electrodes – unalloyed steel

AWS A5.1: E 7016

EN ISO 2560-A: E 38 3 B 12 H10

Coating type:
Basic-rutile

Current:
~ =+ =−*
*root pass

Welding positions:


Basic 55 is our double coated basic-rutile electrode for all welding positions, except vertical down position. This electrode is characterised by easy handling, a well controllable arc, excellent root penetration, easy slag removal and excellent metallurgical properties up to -30ºC. Typical applications include shipbuilding, general constructions, bridges, storage tanks as well as root pass and positional welding. Basic 55 is an all-current type (AC/DC).

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0- St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,06	0,90	0,70	≤ 0,025	≤ 0,025

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 400	≥ 490	≥ 22	-20ºC ≥ 90

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	19,5	55-95
3,2	350	32,8	80-150
3,2	450	42,4	95-150
4,0	450	65,0	120-190

HILCO BASIC

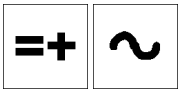
Stick electrodes – unalloyed steel

AWS A5.1: E 7018-1

EN ISO 2560-A: E 42 5 B 32 H5

Coating type:
Basic

Current:



Welding positions:

Basic is our high quality low hydrogen (H_{DM} < 5 ml. / 100 gr. deposit weld metal) electrode for all welding positions, except vertical down position. This electrode is characterised by a smooth, quiet arc, very low spatter, an easy slag removal and good mechanical properties up to -50°C. Typical applications include shipbuilding, general constructions and offshore constructions. Basic is welded on DC (+) current, has 120% recovery and is suitable to weld fine-grain steel grades.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,07	1,3	0,3	0,006	0,011

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 25	-50ºC ≥ 47 20ºC ≥ 120

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	21,0	65-110
3,2	350	39,1	100-145
4,0	450	72,5	135-200
5,0	450	103,6	180-280

HILCO BASIC SUPER

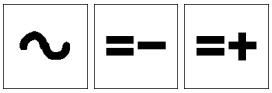
Stick electrodes – unalloyed steel

AWS A5.1: E 7018-1

EN ISO 2560-A: E 42 5 B 32 H5

Coating type:
Basic

Current:



Welding positions:

Basic Super is our universal low hydrogen (H_{DM} < 5 ml. / 100 gr. deposit weld metal) electrode for all welding positions, except vertical down position. This electrode is characterised by a smooth, quiet arc, very low spatter, easy slag removal and excellent mechanical properties even at low temperatures (down to -40ºC). Typical applications include shipbuilding, general constructions and offshore constructions. Basic Super is the ideal choice for out-of-position welding.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,07	1,3	0,6	0,005	0,014

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 25	-50ºC ≥ 47 20ºC ≥ 120

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	20,5	65-90
3,2	350	37,3	100-140
4,0	450	64,4	140-190
5,0	450	98,3	180-250

HILCO REGINA 150

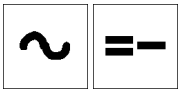
Stick electrodes – unalloyed steel – high efficiency

AWS A5.1: E 7024-1

EN ISO 2560-A: E 42 2 RA 53

Coating type:
Rutile-acid

Current:



Welding positions:

Regina 150 is our rutile-acid coated high efficiency (recovery 160%) electrode for making x-ray quality fillet welds in the flat and horizontal position. This electrode has a smooth quiet arc, very low spatter and easily removable slag (self-releasing even in narrow angles). Regina 150 can be used with high travel speeds, resulting in high deposition rates (> 3,6 kgs./hour). Typical applications include joining heavier sections of mild and low-alloyed structural steels found in shipbuilding and general constructions as well as usage on primer painted or contaminated plates.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,10	0,90	0,3	0,008	0,015

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 22	-20ºC ≥ 50 20ºC ≥ 75

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
4,0	450	96,7	170-240
5,0	450	147,5	230-340

HILCO REGINA 160

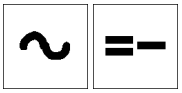
Stick electrodes – unalloyed steel – high efficiency

AWS A5.1: E 7024-1

EN ISO 2560-A: E 42 0 RR 53

Coating type:
Rutile

Current:



Welding positions:

Regina 160 is our easy-to-handle high efficiency (recovery 160%) electrode for making fillet welds in the flat and horizontal position. This electrode has a smooth quiet arc, very low spatter and easily removable slag. Regina 160 can be used with high travel speeds, resulting in high deposition rates (> 3,5 kgs./hour). Typical applications include joining mild and low-alloyed structural steels as well as usage on primer painted or contaminated plates. Regina 160 is an all-current type (AC/DC).

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,09	0,7	0,4	0,009	0,018

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 22	0ºC ≥ 47 20ºC ≥ 47

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	450	65,6	120-160
4,0	450	103,6	160-230
5,0	450	154,3	250-340

HILCO SG1A SUPERFLOW

MAG wires – unalloyed steel

EN ISO 14341-A: G 46 A M21 2Ti

AWS A5.18: ER70S-2

Wire type:
MAG solid wire

Current:

Welding positions:

Shielding gas:
M12-M33

SG1A Superflow is our solid wire for MAG welding unalloyed and low alloyed galvanized structural steels. We have added Ti, Zr and Al to the wire which makes SG 1 A Superflow ideal for welding oxidised (rusted) material and also coated plate (primed or painted).

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance
- Transport Lifting Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	S	P	Ti	Zr	Al
0,04	1,2	0,55	≤ 0,035	≤ 0,025	0,10	0,07	0,10

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 480	≥ 560	≥ 22	20°C ≥ 100

Note: properties under M21

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.	Current A	Voltage V
0,8	BS300	15	80-180	17-20
1,0	BS300	15	120-240	17-22

HILCO K60

MAG wires – unalloyed steel

AWS A5.18: ER 70S-6

EN ISO 14341-A: G 38 2 C G3 Si 1 / G 42 3 M G3 Si 1

Wire type:
MAG Solid wire

Current:

Welding positions:

Shielding gas:
C1, M1-M3

K60 is our solid wire for MAG welding unalloyed and low alloyed, incl. fine grain types, structural steels. The wire is used in a wide range of applications: general constructions, shipbuilding, bridges, tanks etc.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance
- Transport & Lifting Industry

Chemical composition of the welding wire – typical:

C	Mn	Si	S	P
0,07	1,50	0,90	≤ 0,025	≤ 0,025

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 500	≥ 22	-30°C ≥ 27

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.	Current A	Voltage V
0,6	S200 vac	5	60-140	16-20
0,8	S200 vac	5	80-180	17-20
0,8	S300 vac	15	80-180	17-20
0.9	S300 vac	15	100-200	17-20
1,0	S300 vac	15	120-240	17-22
1,2	S300 vac	15	160-260	18-26
1,6	S300 vac	15	180-300	20-29

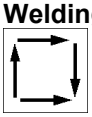
HILCO HILCORD 41

Cored wires – unalloyed steel

AWS A5.36: E71T1 – M21A4-CS1-1
E71T1 – C1A2-CS1-DH4
EN ISO 17632-A: T 46 4 P M 1 H5
T 46 2 P C 1 H5

Wire type:
Rutile cored wire

Current:
=+

Welding positions:


Shielding gas:
M21 / C1

Hilcord 41 is our seamless copper coated rutile flux cored wire for MAG welding unalloyed and low alloyed structural steels in all positions. This wire can be used in a wide range of applications and offers excellent weldability, good mechanical properties, practically no spatter and allows you to weld in spray arc mode. Hilcord 41 is a guaranteed low hydrogen content wire (H_{DM} < 5 ml/100 gr. deposit weld metal). The specific properties of seamless cored wires offer you a guaranteed problem-free usage at all times!

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	S	P
0,06	1,35	0,45	≤ 0,020	≤ 0,020

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 460	≥ 530	≥ 22	-20ºC ≥ 47

Note: properties under M21 gas shielding

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.	Current A	Voltage V
1,0	B300	16	130-270	21-30
1,2	B300	16	160-300	22-32

HILCO HILCORD 52

Cored wires – unalloyed steel

AWS A5.36: E 70T15-M21A2-CS1-H4

EN ISO 17632-A: T 46 6 M M 1 H5

Wire type:
Metal cored wire

Current:
=+

Welding positions:


Shielding gas:
M21

Hilcord 52 is our seamless copper coated metal cored wire for MAG welding unalloyed and low alloyed structural steels in all welding positions. This wire is spatter free, offers good side wall wetting, concave weld shape, radio graphical soundness and porosity free weld metal. Hilcord 52 is a guaranteed low hydrogen content wire (H_{DM} < 5 ml/100 gr. deposit weld metal). The specific properties of seamless cored wires offer you a guaranteed problem-free usage at all times!

Base materials to be welded:
- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, P355NH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EstE355, StE285TM-EstE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:
- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	S	P
0,06	1,6	0,8	≤ 0,030	≤ 0,03

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 460	≥ 550	≥ 20	-20°C ≥ 47

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.	Current A	Voltage V
1,0	B300	16	90-280	16-30
1,2	B300	16	120-350	17-32

HILCO FER SG1

TIG rods – unalloyed steel

AWS A5.18: ER70S-3

EN ISO 636-A: W 42 2 W 2 Si 1

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1

Fer SG1 is our copper coated wire for TIG welding unalloyed and low alloyed, incl. fine grain types, and structural steels. Typical applications include: general constructions, shipbuilding, bridges, tanks and is extremely suited for joining thin sheet metals. To be used in combination with tungsten electrodes type WS2 WITSTAR®.

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

C	Mn	Si
0,09	1,15	0,60

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 22	-20°C ≥ 100

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,0	1000	5

HILCO FER SG1A

TIG rods – unalloyed steel

AWS A5.18: ER70S-2

EN ISO 636-A: W 42 2 W 2 Ti

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1

Fer SG1A is our copper coated wire for TIG welding unalloyed and low alloyed galvanized structural steels. We have added Ti, Zr and Al to the wire, this makes Fer SG1A ideal for welding oxidized (rusted) material and also coated plate (primed or painted). To be used in combination with tungsten electrodes type WS2 WITSTAR®.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance
- Transport & Lifting Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Ti	Zr	Al
0,06	1,10	0,50	0,10	0,07	0,10

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 480	≥ 560	≥ 22	-20°C ≥ 47

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5

HILCO FER SG2

TIG rods – unalloyed steel

AWS A5.18: ER70S-6

EN ISO 636-A: W 46 2 W 3 Si 1

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1

Fer SG2 is our copper coated wire for TIG welding unalloyed and low alloyed, incl. fine grain types, and structural steels. Typical applications include: general constructions, shipbuilding, bridges, tanks etc. To be used in combination with tungsten electrodes type WS2 WITSTAR®.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance
- Transport & Lifting Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si
0,09	1,47	0,87

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 460	≥ 500	≥ 22	-50°C ≥ 47

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
2,4	1000	5

HILCO FER G1

Gas welding rods – unalloyed steel

EN 12536: O I
AWS A5.2: ~ R 45

Wire type:
OAW Solid wire

Shielding gas:
Oxy-acetylene

Welding positions:

Fer G1 is our copper coated rod for oxy-acetylene gas welding of unalloyed structural steels. Fer G1 is easy flowing and gives a very clean smooth weld. Operating temperature of the workpiece is maximum 350°C.

Base materials to be welded:

- Structural steel S185-255, St.33-St37.3
- Boiler steel P235GH-P265GH, HI, HII
- Pipe steel P235T1-L210, St.37.0-St.44.0

Applications:

- General fabrication & construction
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

C	Mn	Si
0,08	0,50	0,10

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 260	≥ 360	≥ 20	20°C ≥ 30

Note: properties under oxy-acetylene gas

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5 / 25
2,0	1000	5 / 25
2,4	1000	5 / 25
3,0	1000	5 / 25
4,0	1000	5 / 25

HILCO HW150

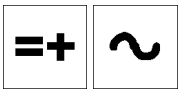
SAW fluxes – unalloyed steel

EN ISO 14174: S F MS 1 67 AC

Flux type:
Fused, Mn/Si alloying

Grain size:
EN ISO 14174: 1-16 (12x150)

Current:



Welding positions:

HW150 is our fused flux for submerged arc welding unalloyed and low alloyed structural steels in combination with solid wire H100. HW150 is suitable for single and multipass welding, for fillet welds and multi wire applications. The weld has an excellent appearance and the slag is self-releasing. The basicity index is 0,8 ca. (Boniszewski).

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Type of wire	C	Si	Mn	Weld metal classification acc. to EN ISO 14171-A AWS A 5.17 – SFA 5.17
H 100	0,05	0,2	1,3	S 38 2 MS S2 F6A2-EM12K

Mechanical properties, weld metal – typical:

Condition A = as welded		0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J	
					-20°C	-30°C
H 100	A	≥ 400	≥ 470	≥ 22	≥ 47	≥ 27

Packaging data:

Type	Weight / kg.
bag	25 kilo

HILCO HW155

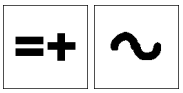
SAW fluxes – unalloyed steel

EN ISO 14174: S F MS 1 56 AC

Flux type:
Fused, Mn/Si alloying

Grain size: EN ISO 14174: 1-8 (40x150)

Current:



Welding positions:

HW155 is our fused flux for submerged arc welding unalloyed and low alloyed structural steels in combination with solid wires H60,H100. HW155 is specifically developed for high speed welding on thin sheet metals (3 to 5 mm. Thickness). Typical applications include the manufacturing of lamp and telephone poles. Flux is suitable for single and multipass welding, for fillet welds and multi wire applications. The weld has an excellent appearance and the slag is self-releasing. The basicity index is 0,9 ca. (Boniszewski).

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Type of wire	C	Si	Mn	Weld metal classification acc. to EN ISO 14171-A AWS A 5.17 – SFA 5.17
H 60	0,05	0,2	1,1	S 42 0 MS S1 F7A0-EL12
H 100	0,05	0,2	1,3	S 42 0 MS S2 F7A0-EM12K

Mechanical properties, weld metal – typical:

Condition A = as welded		0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J	
					20°C	-20°C
H 60	A	≥ 400	≥ 490	≥ 22	≥ 40	≥ 27
H 100	A	≥ 420	≥ 520	≥ 22	≥ 40	≥ 27

Packaging data:

Type	Weight / kg.
bag	25 kilo

HILCO HW430

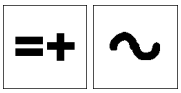
SAW fluxes – unalloyed steel

EN ISO 14174: S A AR 1 87 AC

Flux type:
Agglomerated rutile, Mn/Si alloying

Grain size:
EN ISO 14174: 2-16

Current:



Welding positions:

HW430 is our agglomerated rutile flux for submerged arc welding unalloyed and low alloyed structural steels in combination with solid wires H100. HW430 is suitable for single and multipass welding, for fillet welds and multi wire applications. The weld has an excellent appearance and the slag is self-releasing. The basicity index is 0,4 ca. (Boniszewski).

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation

Chemical composition, wt.% weld metal – typical:

Type of wire	C	Si	Mn	Weld metal classification acc. to EN ISO 14171-A AWS A 5.17 – SFA 5.17
H 100	0,04	0,6	1,3	S 42 0 AR S2 / S 4T 0 AR S2 F7A0-EM12K

Mechanical properties, weld metal – typical:

Condition A = as welded		0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J -20°C
H 100	A	≥ 400	≥ 520	≥ 22	27

Packaging data:

Type	Weight / kg.
bag	25 kilo

HILCO HW530

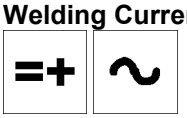
SAW fluxes – unalloyed steel

EN ISO 14174: S A AB 1 67 AC H5

Flux type:
Agglomerated (semi) basic

Grain size:
EN ISO 14174: 2-16

Welding Current:



Welding positions:

HW530 is our agglomerated semi-basic flux for submerged arc welding unalloyed and low alloyed structural steels in combination with solid mild steel wires H100. HW530 is suitable for single and multipass welding, for fillet welds and multi wire applications. The weld has an excellent appearance and the slag is self-releasing. The weld metal, produced in combination with corresponding wires, offers good mechanical properties also at low temperatures. The basicity index is 1,3 ca. (Boniszewski).

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Type of wire	C	Si	Mn	Weld metal classification acc. to EN 14171-A AWS A5.17 – SFA 5.17
H 100	0,05	0,6	1,5	S 42 3 AB S2 F7A2-F7P4-EM12K

Mechanical properties, weld metal – typical:

Condition A = as welded S = stress relieved 620ºC 1 hr.		0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J		
					-20°C	-30°C	-40°C
H 100	A	≥ 420	≥ 510	≥ 24	≥ 100	≥ 60	≥ 27
H 100	S	≥ 400	≥ 490	≥ 22	≥ 100	≥ 60	≥ 47

Packaging and welding data:

Type	Weight / kg.
bag	25 kilo

HILCO HILCORD 40

Cored wires – unalloyed steel

AWS A5.20: E 71 T-1M

EN ISO 17632-A: T 42 2 P M 1 H10

Wire type:
Rutile cored wire

Current:
=+

Welding positions:


Shielding gas:
M21

Hilcord 40 is our rutile flux cored wire for MAG welding unalloyed and low alloyed structural steels in all positions. This wire offers excellent weldability, good mechanical properties, practically no spatter and allows you to weld in spray arc mode. Hilcord 40 can be used in single and multipass applications, typical are: shipbuilding, machinery, bridge construction, rolling stock, and structural fabrication.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	S	P
0.06	1.30	0.45	≤ 0,030	≤ 0,030

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 400	≥ 480	≥ 22	-20ºC ≥ 27

Packaging and welding data:

Dia. mm.	Spooltype	Weight / spool kg.	Current A	Voltage V
1.2	D300	15	150-300	22-32

Other sizes and spool types available on request

HILCO HILCORD 40C

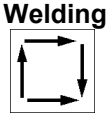
Cored wires – unalloyed steel

AWS A5.20: E 71 T-1C

EN ISO 17632-A: T 42 2 P C 1 H10

Wire type:
Rutile cored wire

Current:
=+

Welding positions:


Shielding gas:
C1

Hilcord 40C is our rutile flux cored wire for MAG welding unalloyed and low alloyed structural steels under CO_2 gas shielding. This wire offers excellent weldability, good mechanical properties, practically no spatter and allows you to weld in spray arc mode. Hilcord 40C can be used in single and multipass applications, typical are: shipbuilding, machinery, bridge construction, rolling stock, and structural fabrication.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, P355NH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	S	P
0,06	1,40	0,35	≤ 0,030	≤ 0,030

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 400	≥ 480	≥ 22	-20°C ≥ 27

Packaging and welding data:

Dia. mm.	Spooltype	Weight / package kg.	Current A	Voltage V
1,2	D300	15	160-260	18-26

Other sizes and spool types available on request

Weather-resistant steel

Weather-resistant steels of Cor-Ten type have excellent weldability. All welding methods can be used when proper precautions are taken. In general, matching filler metals should be used. For dissimilar joining i.e. weather-resistant steel grades of different strength under matching filler metals can be used, in such cases we recommend that you contact us for information.
When welding weather-resistant steels it is important to minimize the risk of cold cracking (also known as hydrogen cracking or delayed cracking). Hydrogen in weld metal combined to stresses in the welded structure is the main reason for such cracking. The risk of cracking can be minimized by:

- preheating the base materials before welding
- ensuring that the joint surfaces are perfectly clean and dry
- minimizing the shrinkage stresses
- use a low hydrogen filler metal (H_{DM} < 5 ml / 100 gr. deposit weld metal)

Creep resisting steel

Such steels are used for the creep resistance in medium-high to high temperature applications. Depending on the temperature for which they are intended, both base material and filler metals should guarantee strength properties at their respective working temperature. For exact welding recommendations, we advise you to contact us.
In general, low alloyed creep resisting steels are excellently weldable. Before, during and after welding special precautions should be taken on heat-treatment (preheating), interpass temperatures and post-weld heat-treatment (PWHT).
For more details, we recommend that you contact us for information about the exact treatment for your application. In such a case, please specify the base materials used and provide us with as much specific information as possible.

High strength steel

Low alloyed high strength steels offer users the possibility of reducing the dead weight of a construction and so increasing the possibilities of the same. Steels of this kind are widely used for pressure vessels, mobile cranes, lifting equipment, vehicle frames etc.
Low alloyed high strength steels owe their strength to their lowest possible alloying content and to their specific production process. As a result, they can be welded easily when special precautions are taken. After welding it is important that the steel structure has maintained its specific microstructure giving the steel its high strength and toughness. It is therefore of utmost importance to pay special attention to shear cutting, machining, forming, cold bending, folding as well as thermal cutting and welding. The welding process may cause a change in the steel's microstructure. If not done properly the base materials will lose their strength.

Take special and extra precautions when welding low alloyed high strength steels:

- ensure that the joint surfaces are perfectly clean and dry
- minimize the shrinkage stresses
- use the lowest heat input possible
- use a low hydrogen filler metal (H_{DM} < 5 ml / 100 gr. deposit weld metal)
- follow the PWHT recommendations of your filler metal supplier, post-heat the welded joint immediately after welding, the PWHT temperature should be the same as the preheat temperature.

When welding low alloyed high strength steels it is important to minimize the risk of cold cracking (also known as hydrogen cracking or delayed cracking). Hydrogen in weld metal combined to stresses in the welded structure is the main reason for such cracking.

The known DIN designations 1629, 1681, 17100, 17102, 17155 and 17172 have been replaced by EN standards. A summary of both old designations and their replacements is as follows:

	OLD DESIGNATION (DIN)		EN STANDARD (NEW)	
Base materials	**DIN**	**designation**	**EN**	**designation**
Pipe steel	DIN 1629 / 1630	St. 37.0	EN 10216-1	P235T1
		St. 37.4		P235T2
		St. 44.0		P275T1
		St. 44.4		P275T2
		St. 52.0		P355N
Cast steel	DIN 1681	GS-45	EN 10213	GP240R
		GS-52		GP240H T1/T2
Structural steel	DIN 17100	St. 33	EN 10025	S185
		St. 37-2		S235JR
		USt. 37-2		S235JRG1
		RSt. 37-2		S235JRG2
		St. 37-3U		S235J0
		St. 37-3N		S235J2G3
		St. 44-2		S275JR
		St. 44-3U		S275J0
		St. 44-3N		S275J2G3
		St. 52-3U		S355J0
		St. 52-3N		S355J2G3
		St. 50-2		E295
		St. 60-2		E335
		St. 70-2		E360
Fine grain steel	DIN 17 102	StE 285	EN 10028-3	P275N
		WStE 285		P275NH
		TStE 285		P275NL1
		EStE 285		P275NL2
		StE 355		P355N
		WStE 355		P355NH
		TStE 355		P355NL1
		EStE 355		P355NL2
		StE 460		P460N
		WStE 460		P460NH
		TStE 460		P460NL1
		EStE 460		P460NL2
		StE 285 / -	EN 10113	S275N / S275M
		TStE 285 / -		S275NL / S275ML
		StE 355 / BStE 355 TM		S355N / S355M
		TStE 355 / BTStE355 TM		S355NL / S355ML
		StE 420 / BStE 420 TM		S420N / S420M
		TStE 420 / BTStE420 TM		S420NL / S420ML
		StE 460 / BStE 460 TM		S460N / S460M
		TStE 460 / BTStE460 TM		S460 NL / S460 ML

	OLD DESIGNATION (DIN)		EN STANDARD (NEW)	
Base materials	**DIN**	**designation**	**EN**	**designation**
Boiler steel	DIN 17 155	H I	EN 10028-2	P235GH
		H II		P265GH
		17 Mn 4		P295GH
		19 Mn 6		P355GH
		15 Mo 3		16 Mo 3
		13 CrMo 4 4		13 CrMo 4-5
		10 CrMo 9 10		10 CrMo 9-10

Fine grain steel (high strength steel)	-	TStE 460 V	EN 10025	S460QL
		StE 500 V / TStE 500 V		S500Q / S500QL
		StE 550 V / TStE 550 V		S550Q / S550QL
		StE 620 V / TStE 620 V		S620Q / S620QL
		StE 690 V / TStE 690 V		S690Q / S690QL
		TStE 890 V / TStE 960 V		S890QL / S960QL

Fine grain steel (weather-resistant)		S235JRW-S355JRW	S235J2G3Cu-S355J2G3Cu

	OLD DESIGNATION (DIN)		EN STANDARD (NEW)		API 5L
Base materials	**DIN**	**designation**	**EN**	**designation**	**design.**
Pipe steel	DIN 17 172	StE290.7	EN 10208-2	L240MB	X42
		StE290.7TM		L290MB	
		StE240.7		L240NB	
		StE290.7		L290NB	
		StE320.7		L320NB	X46
		StE360.7TM		L360MB	X52
		StE360.7		L360NB	
		StE385.7		L385NB	X56
		StE415.7		L415NB	
		StE415.7TM		L415MB	X60
		StE445.7TM		L445MB	X65
		StE480.7TM		L480MB	X70
		StE550.7TM		L550MB	X80

	DESIGNATION	EN STANDARD (NEW)
Ships plate	Grade A	S235JRS2
	Grade AH32	S315G1S
	Grade AH36	S355G1S
	Grade AH40	-
	Grade B	-
	Grade D	S235J2S1.0
	Grade DH32	S315G2S
	Grade DH36	S355G2S
	Grade DH40	-
	Grade E	S235J4S
	Grade EH32	EN 17102: P315N
	Grade EH36	S355G3S
	Grade EH40	-

HILCO B12Mo

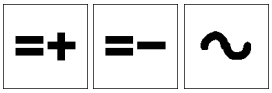
Stick electrodes – low alloyed steel – creep resisting

AWS A5.5: E 7018-A1 H4R

EN ISO 3580-A: E Mo B 32 H 5

Coating type:
Basic

Current:



Welding positions:

B12Mo is our basic-coated low hydrogen (H_{DM} < 5 ml. / 100 gr. deposit weld metal) electrode for welding low alloyed fine grain and creep resisting steels like 16Mo3 up to a maximum operating temperature of 500°C. Typical applications include the construction of pressure vessels, boilers and pipes. B12Mo is preferably welded on DC current, root pass and narrow gap welding on DC-polarity.

Base materials to be welded:

- Boiler steel P235GH-P310GH, 16Mo3, 17Mo3, 16Mo5, 14Mo6, 15NiCuMoNb5, 17MnMoV64, A355 Grade P1
- Fine grain steel S275N-S500N, P355NH-P460NH, S355NL-S500NL
  API 5L X52-X70

Applications:

- Power Generation
- Oil & Gas Industry
- Repair & Maintenance
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P	Mo
0,05	0,8	0,6	0,01	0,02	0,55

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	550	610	25	-20°C ≥ 70
Stress relieved	560	620	25	-20°C ≥ 50

Note: stress relieved condition 620ºC / 1 h.

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	22,8	80-85
3,2	350	37,9	120-130
4,0	350	54,8	140-150

HILCO B19CrMo

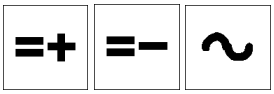
Stick electrodes – low alloyed steel – creep resisting

AWS A5.5: E 8018-B2 H4

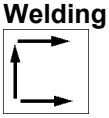
EN ISO 3580-A: E Cr Mo 1 B 32 H5

Coating type:
Basic

Current:



Welding positions:



B19CrMo is our basic-coated low hydrogen (H_{DM} < 5 ml. / 100 gr. deposit weld metal) electrode for welding low alloyed fine grain and creep resisting steels like 13CrMo4 5 up to a maximum operating temperature of 550°C. Typical applications include the construction of pressure vessels, boilers and pipes. B19CrMo is preferably welded on DC current, root pass and narrow gap welding on DC-polarity.

Base materials to be welded:

- Boiler steel 13CrMo4-5, 15CrMo5, 16CrMoV4, A 333 Grade P 11, P 12, G-17CrMo5-5, 22Mo4, G-22CrMo 5-4, 42CrMo4
- Heat treatable steels up to 780 MPa tensile strength
- Case hardening and nitriding steels

Applications:

- Power Generation
- Oil & Gas Industry
- Repair & Maintenance
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P	Cr	Mo
0,06	0,75	0,6	0,01	0,015	1,10	0,50

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
Stress relieved	570	640	24	20°C 180 -20°C 100

Notes: stress relieved condition 700ºC / 1 h. - preheat, interpass and PWHT are essential for obtaining properties as indicated. Recommended preheat 200-250ºC, PWHT 660-700ºC.

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	21,0	80-85
3,2	350	37,9	120-130
4,0	350	54,9	140-150

HILCO B20CrMo

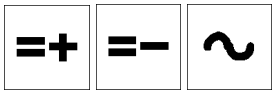
Stick electrodes – low alloyed steel – creep resisting

AWS A5.5: E 9018-B3 H4

EN ISO 3580-A: E Cr Mo 2 B 32 H5

Coating type:
Basic

Current:



Welding positions:

B20CrMo is our basic-coated low hydrogen (H_{DM} < 5 ml. / 100 gr. deposit weld metal) electrode for welding low alloyed fine grain and creep resisting steels like 10CrMo9.10 up to a maximum operating temperature of 600°C. Typical applications include the construction of pressure vessels, boilers and pipes. B20CrMo is preferably welded on DC current, root pass and narrow gap welding on DC-polarity.

Base materials to be welded:

- Boiler steel 10CrMo9.10, A335 Grade P22, 10CrSiMoV7 (1.8075), G17CrMo9.10 (1.7379)
- Heat treatable steels up to 980 MPa tensile strength
- Case hardening and nitriding steels

Applications:

- Power Generation
- Oil & Gas Industry
- Repair & Maintenance
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P	Cr	Mo
0,06	0,8	0,6	0,010	0,015	2,3	1,0

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
Stress relieved	530	650	22	-10°C 90 20°C 150

Notes: stress relieved condition 695ºC / 1 h. - preheat, interpass and PWHT are essential for obtaining properties as indicated. Recommended preheat 200-300ºC, PWHT 690-750ºC

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	350	37,6	120-130
4,0	350	56,7	140-150

HILCO K80

MAG wires – low alloyed steel – high strength

AWS A5.28: ER 110 S-G

EN ISO 16834-A: G 69 4 M Mn3Ni1CrMo

Wire type:
MAG Solid wire

Current:
=+

Welding positions:


Shielding gas:
M21

K80 is our solid wire for MAG welding low alloyed high strength steels having a nominal yield strength of 690 MPa such as: HY 80, N-A-XTRA 63, N-A-XTRA 70, Weldox 700, Grade 100, USS T-1 and similar HSLA steel grades. Typical applications include crane fabrication, automotive and transport industries. A low heat input is recommended to obtain the mechanical properties desired.

Base materials to be welded:

- Fine grain steel S620QL1, S690QL1, S700MC
  N-A-XTRA 63-70, TStE620-TStE690, T1, Weldox 700
- Pipe steel L480-L550, API 5L X65-X80

Applications:

- General fabrication & construction
- Oil & Gas Industry
- Transport & Lifting Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	S	P	Cr	Ni	Mo	Cu	V
0,08	1,50	0,60	≤ 0,025	≤ 0,025	0,35	1,50	0,25	< 0,25	0,09

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 690	≥ 750	≥ 17	-40°C > 47

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.	Current A
1,2	B300	15	120-350

HILCO HILCORD 43

Cored wires – low alloyed steel – cryogenic

AWS A5.36: E 81 T1- M21A8 – Ni1 - H4

EN ISO 17632-A: T 50 6 1 Ni P M 1 H5

Wire type:
Rutile cored wire

Current:
=+

Welding positions:


Shielding gas:
M21

Hilcord 43 is our seamless copper coated rutile flux cored wire for all position MAG welding of low alloyed structural steels having a nominal yield strength > 500 MPa used in applications where good sub-zero toughness is required down to -60°C. Typical applications include open butt-joints using non-fusible backing materials.
The specific properties of seamless cored wires offer you a guaranteed problem-free usage at all times!

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355K2G4, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH
- Fine grain steel SP355NL2-S500QL1, S275N-S420ML
- Pipe steel P235T1-P355N, L360-L485MB/NB, St37.0-St52.4, St45.8, X52-X70
- Cast steel GP240R, GS45

Applications:

- Shipyards / offshore
- Construction works
- Bridge & road constructions
- Pressure vessel & boiler industry
- Repair shops

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	S	P	Ni
0,07	1,30	0,45	≤ 0,025	≤ 0,025	0,85

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 500	≥ 560	≥ 18	-60°C ≥ 47
Stress relieved	≥ 500	≥ 560	≥ 18	

Note: stress relieved condition 620°C / 2 h.

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.	Current A
1,2	BS300	16	190-320

HILCO FER SGMo

TIG rods – low alloyed steel – creep resisting

AWS A5.28: ER 70S-A1
EN ISO 636-A: W 46 4 2Mo
EN ISO 21952-A: W MoSi

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1

Fer SGMo is our solid wire for TIG welding low alloyed fine grain and creep resisting steels like 16Mo3 up to a maximum operating temperature of 500°C. Typical applications include the construction of pressure vessels, boilers and pipes. To be used in combination with tungsten electrodes type WS2 WITSTAR®.

Base materials to be welded:

- Boiler steel P235GH-P310GH, 16Mo3, 17Mo3, 16Mo5, 14Mo6, 15NiCuMoNb5, 17MnMoV64, A355 Grade P1
- Fine grain steel S275N-S500N, P355NH-P460NH, S355NL-S500NL
- Pipe steel L320NB-L415NB, L360MB-L415MB API 5L X52-X70

Applications:

- Power Generation
- Oil & Gas Industry
- Repair & Maintenance
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Mo
0,10	1,15	0,60	0,52

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 460	≥ 560	≥ 22	20°C ≥ 60 -40°C ≥ 47

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
2,4	1000	5

HILCO FER SGCrMo1

TIG rods – low alloyed steel – creep resisting

AWS A5.28: ER 80S-B2

EN ISO 21952-B : 1 CM

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1

Fer SGCrMo1 ER 80S-B2 is our solid wire for TIG welding low alloyed fine grain and creep resisting steels like 13CrMo4 5 up to a maximum operating temperature of 550°C. Typical applications include the construction of pressure vessels, boilers and pipes. To be used in combination with tungsten electrodes type WS2 WITSTAR®.

Base materials to be welded:

- Boiler steel 13CrMo4-5, 15CrMo5, 16CrMoV4, A 333 Grade P 11, P 12, G-17CrMo5-5, 22Mo4, G-22CrMo 5-4, 42CrMo4,
- Heat treatable steels up to 780 MPa tensile strength
- Case hardening and nitriding steels

Applications:

- Power Generation
- Oil & Gas Industry
- Repair & Maintenance
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Mo
0,09	0,55	0,55	1,35	0,50

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 510	≥ 620	≥ 24	20°C ≥ 120

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
2,4	1000	5

HILCO FER SGCrMo2

TIG rods – low alloyed steel – creep resisting

AWS A5.28: ER 90S-B3

EN ISO 21952-B : 2 C1M

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1

Fer SGCrMo2 ER 90S-B3 is our solid wire for TIG welding low alloyed fine grain and creep resisting steels like 10CrMo9.10 up to a maximum operating temperature of 600°C. Typical applications include the construction of pressure vessels, boilers and pipes. To be used in combination with tungsten electrodes type WS2 Witstar®.

Base materials to be welded:

- Boiler steel 10CrMo9.10, A335 Grade P22, 10CrSiMoV7 (1.8075), G17CrMo9.10 (1.7379)
- Heat treatable steels up to 980 MPa tensile strength
- Case hardening and nitriding steels

Applications:

- Power Generation
- Oil & Gas Industry
- Repair & Maintenance
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Mo
0,09	0,55	0,55	2,50	1,05

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 540	≥ 620	≥ 17	20°C ≥ 100 -40°C ≥ 47

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5

HILCO FER SGNi1

TIG rods – low alloyed steel – cryogenic

AWS A5.28: ER 80S-Ni 1

EN ISO 636-A: W 46 6 W3Ni1

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1

Fer SGNi1 is our solid wire for TIG welding low alloyed structural steel having a nominal yield strength up to 550 MPa used in applications where good sub-zero toughness is required down to -60ºC. Typical applications include heavy machinery, petrochemical equipment and offshore constructions. To be used in combination with tungsten electrodes type WS2 Witstar®.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355K2G4, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH
- Fine grain steel SP355NL2-S500QL1, S275N-S420ML
- Pipe steel P235T1-P355N, L360-L485MB/NB, St37.0-St52.4, St45.8, X52-X70
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Ni
0,09	1,05	0,50	0,90

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 470	≥ 550	≥ 20	20°C ≥ 100 -60°C ≥ 47

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5

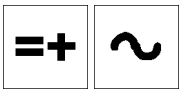
HILCO HW590

SAW fluxes – low alloyed steel

EN ISO 14174: S A FB 1 55 AC H5

Flux type:
Agglomerated high basic

Current:



Welding positions:

HW590 is our agglomerated basic flux with high basicity and neutral metallurgical behaviour. It is suitable for single (DC) and tandem (DC and AC) welding. Very good slag detachability. Excellent for narrow gap welding. HW 590 can be used in combination with suitable sub arc wires for joint welding of mild, medium alloyed, low tempered, creep resistance and high tensile steels. Very good impact toughness of weld metal at low temperatures. The basicity index is 3.1 ca. (Boniszewski). Prior to use the flux should be redried for about 4 h. at 300-350°C (572-662 °F).

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Oil & Gas Industry
- Transport & Lifting Industry

Chemical composition, wt.% weld metal – typical:

Type of wire	C	Si	Mn	Ni	Mo	Cr	Weld metal classification acc. to EN ISO 14171 / EN ISO 26304 AWS A 5.17 – SFA 5.17 AWS A 5.23 – SFA 5.23
H 100	0,07	0,20	0,9				S 35 4 FB S2 F7A6-F6P8-EM12K
H 100 Mo	0,07	0,20	0,9		0,5		S 46 4 FB S2Mo F8A4/F8P4-EA2-A2
H 150 Si	0,07	0,30	1,6				S 46 5 FB S3Si F7A8/F7P8-EH12K
H 100 CrMo1	0,07	0,30	0,9		0,5	1,0	F8P4-EB2-B2
H 100 CrMo2	0,08	0,30	0,6		1,0	2,2	F8P2-EB3-B3
H 100 Ni2	0,07	0,30	0,9	2,3			S 46 6 FB S2Ni2 F7A10-ENi2-Ni2

Mechanical properties, weld metal – typical:

Condition A = as welded		0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J 0ºC	-20°C	-40°C	-60°C
H 100	A	≥ 360	≥ 450	≥ 28	160	100	50	
H 100 Mo	A	≥ 470	≥ 550	≥ 24	120	100	50	
H 150 Si	A	≥ 450	≥ 530	≥ 25	180		100	70
H 100 Ni2	A	≥ 450	≥ 550	≥ 24	140	120	100	70

Packaging data:

Type	Weight / kg.
bag	25 kilo

What is Stainless Steel?
Stainless steel is the generic term for a number of different steels used primarily for their resistance to corrosion. The key element they all share is a certain minimum percentage (by mass) of chromium: 12%. Although other elements, particularly nickel and molybdenum, are added to improve corrosion resistance, chromium is always the deciding factor.

What causes corrosion?
Corrosion is a natural phenomenon as nature seeks to combine other elements which man has produced in a pure form for his own use. Iron occurs naturally as iron ore. Pure iron is therefore unstable and wants to "rust"; that is to combine with oxygen in the presence of water. For most of the Iron Age, which began about 1000 BC, cast and wrought iron was used; iron with a high carbon content and various unrefined impurities. The production of steel did not begin until the 19th century. At present, the majority of steel produced in the world is carbon steel, which can be defined as an alloy of a small content of carbon combined with well-refined iron. Despite its various additions stainless steel still behaves as steel. It is not like the nickel alloys that are really alloys of a number of different metals, iron ore being only one. Even highly alloyed grades of stainless steel, such as 316, have a minimum of 62% iron.

Carbon steels without any protection will form a coating of rust that will in a sense protect the rest of the steel. So constantly removing the rust exposes a new fresh layer of steel to be attacked. This is called general corrosion. Various coatings will impede the rusting process, in particular painting, coating with zinc (galvanised steel), and epoxy resins. Another lateral way of reducing corrosion is to put corrosion inhibitors into the solutions that would otherwise cause iron to corrode.

The unique advantage of stainless steel.
For a wide range of applications, stainless steel competes with carbon steels supplied with protective coatings, as well as other metals such as aluminium, brass and bronze. The success of stainless steel is based on the fact that it has one big advantage. The chromium in stainless steel has a great affinity for oxygen, and will form on the surface of the steel at a molecular level a film of chromium oxide. This thin layer is described as passive, tenacious and self-renewing. Passive means that it does not react or influence other materials; tenacious means that it clings to the layer of steel and is not transferred elsewhere; self-renewing means that if damaged or forcibly removed, more chromium from the steel will be exposed to the air and form more chromium oxide. This means that over a period of years a stainless steel knife can literally be worn away by daily use and by being re-sharpened on a sharpening stone, it will still remain stainless. Manhole and access covers in the water treatment and chemical industries are widely made out of both galvanised steel and stainless steel. In normal use, galvanised steel can last many years without corrosion occurring, and in such cases there would be little advantage apart from aesthetic reasons to switch to stainless steel. Where stainless comes into its own is where the galvanised coating is constantly being worn away, for example by chains being dragged across it, or constantly being walked over, or where highly corrosive chemicals are being randomly splashed onto it.

This leads to the fact that the initial investment costs of fabrication in stainless steel will always be more expensive than using ordinary steel, not just because of the higher cost of stainless steel, but also because it is more difficult to machine. However, it is the better life-cycle costs of stainless steel that makes it attractive, both in terms of much longer service life, lower maintenance costs, and high scrap value on de-commissioning.

Product characteristics.
Stainless steel can be selected for use compared to other materials for a number of reasons, not just its corrosion resistance. These include:

- Aesthetic qualities: it can be polished to a satin or mirror finish;
- "Dry corrosion" affects steel at higher temperatures where it oxidises or scales up. Stainless steel is far more resistant to this than ordinary carbon steel and grades such as 310 (25% chromium 20% nickel) were specifically developed for use at high temperatures;
- Non-contamination of the liquids that stainless steel comes into contact with, because there is no coating to break down and dissolve;
- Weight savings: since thinner sections and more innovative design structures can be used, with cost savings on foundations and platform weights;
- Many anti-corrosion coatings are fire hazards or the materials themselves have a low melting point.

Applications.
The most frequent everyday use of stainless steel is obviously in **cutlery**. Very cheap cutlery is made out of grades 409 and 430, with the finest quality cutlery using specially produced 410 and 420 for the knives and grade 304 (18/8 stainless, 18% chromium 8% nickel) for the spoons and forks. The different grades are used as 410/420 can be hardened and tempered so that the knife blades will take a sharp edge, whereas the more ductile 18/8 stainless steel is easier to work and therefore more suitable for objects that need to undergo numerous shaping, buffing and grinding processes.

Very large amounts of stainless steel are used in **food production and storage.** The most commonly used grades are 304 and 316. Typical uses would be dairy, milk storage, ham curing, and frozen and salted fish storage. Whereas 304 is used for normal temperatures and acid concentrations, 316 is used for harsher environments. For example, 304 is used in cheese production, but where salted ham is being prepared 316 is used. For low concentrations of phosphoric acid (one of the constituents of cola) 304 is used, but at higher temperatures and concentrations 316 is used. Food slicers are made out of 420 and 440. Very often in food production stainless steel is used not because the food itself is corrosive but the use of stainless allows for faster and more efficient cleaning. For example, in ice cream production 316 is specified so that strong anti-bacteriological cleaning and rinsing systems can be used. One of the great advantages of stainless steel is that it imparts no taste to the food that it comes into contact with.

The **pumping and containment of oils, gases and acids** has created a large market for stainless steel tanks, pipes, pumps and valves. The storage of dilute nitric acid was one of the first major success stories for 18/8 stainless steel as it could be used for thinner sections and was more robust than other materials. Special grades of stainless steel have been developed to have greater corrosion resistance. These are used in desalination plants, sewage plants, offshore oilrigs, harbour supports and ships' propellers.

Architecture is a growing market. Many modern buildings use stainless steel for cladding. When reinforced concrete first started to be used it was considered that the carbon steel used would not rust, as cement, obviously derived from limestone, is alkaline. However, constantly using grit salt on bridges can change the pH to acidic thereby rusting the steel, which expands and cracks the concrete. A stainless steel reinforcing bar, although initially expensive, is proving to have good life-cycle costs. The low maintenance cost and anti-vandal characteristics of stainless steel provide a growing market in public transport, ticket machines and street furniture.

The **nuclear power industry** uses large quantities of stainless steel, often specified with a low cobalt content, for both power and radiation containment. Special louvered ventilation shafts are made, which are used in case of emergencies to seal off plants for years if necessary. Steam and gas turbines use stainless steel because of its corrosion resisting and heat resisting qualities.

Especially clean melted stainless steel is used for **medical implants** and artificial hips. A great deal of **medical equipment** – such as orthopaedic beds, cabinets and examination machines – are made as standard from stainless steel because of its hygienic and easy-clean qualities. Pharmaceutical companies use stainless steel for pill funnels and hoppers and for piping creams and solutions.

Automobile industries are making increasing use of stainless steel, primarily for exhaust systems (grade 409) and catalytic converters, but also for structural purposes.

Classification of Stainless Steel.
Stainless steel is commonly divided into five groups, depending on the specific amounts of alloying elements, which control the microstructure of the alloy.

Austenitic Stainless Steel.
Austenitic Stainless Steel is the most weldable of the stainless steel grades and can be divided rather loosely into three groups: common chrome-nickel (300 series), manganese-chromium-nickel-nitrogen (200 series) and special alloys. Austenitic is the most popular stainless steel group and is used for numerous industrial and consumer applications, such as in chemical plants, power plants, food processing and dairy equipment.

Ferritic Stainless Steel.
Ferritic Stainless Steel consists of iron-chromium alloys with body-centred cubic crystal structures. They can have good ductility and formability, but high-temperature strengths are relatively poor when compared to austenitic grades. Some ferritic grades (such as type 409 and 405) used, for example, in mufflers, exhaust systems, kitchen counters and sinks, cost less than other grades of stainless steel. Other more highly alloyed steels low in C and N (such as types 444 and 261) are more expensive but are highly resistant to chlorides.

Martensitic Stainless Steel.
Martensitic Stainless Steel, such as type 403, 410, 410NiMo and 420, are similar in composition to the ferrite group, but contain a balance of C and Ni vs. Cr and Mo; hence austenite at high temperatures transforms to martensite at low temperatures. Like ferrite, they also have a body-centred cubic crystal structure in the hardened condition. The carbon content of these hardenable steels affects forming and welding. To obtain useful properties and prevent cracking, the weldable martensitics usually require preheating and post-weld heat treatment.

Duplex
Primarily used in chemical plants and piping applications, the duplex stainless steels are developing rapidly nowadays, and have a microstructure of approximately equal amounts of ferrite and austenite. Duplex stainless steels typically contain about 22%-25% Chromium and 5% Nickel with Molybdenum and Nitrogen. Although duplex and some austenitics have similar alloying elements, duplex has a higher yield strength and greater stress corrosion cracking resistance to chloride than austenitic stainless steels.

Precipitation Hardening
Precipitation-hardening Stainless Steel is chromium-nickel stainless steel, that contains alloying additions such as aluminium, copper or titanium which allow them to be hardened by a solution and aging heat treatment. They can be either austenitic or martensitic in the aged condition. Precipitation-hardening stainless steels are grouped into three types: martensitic, semi-austenitic and austenitic. The martensitic (such as type 630) and semi-austenitic (such as type 631) can provide higher strength than the austenitic (such as type 660, also known as A286) types.

Selecting the welding process.
Since stainless steel is more expensive than regular steel, it is important to choose a process that provides the best results, avoiding such common problems as melt-through (especially when welding thin sections). The following are the different processes recommended for welding stainless steel. Process selection is to be made on a case-by-case basis depending on the particular application and availability of equipment.

MMA Manual metal arc welding (ASME: SMAW)
MMA, using covered electrodes, is still the most widely used welding process when it comes to welding stainless steel. The process is suited to all weldable grades, in thickness of 1 mm. and upward. In principle, there is no upper limit of thickness. However, for heavier material, the automatic welding processes are often more economical. Although there is a trend towards these wire-processes, manual welding still represents the major proportion of total welding operations.

Factors to consider when choosing an electrode.
The electrode should be of the same basic analysis as the parent metal. This gives the weld its optimum corrosion resistance. However, certain exceptions are permissible. For example a high-alloy electrode may sometimes be used for welding a low alloy parent metal. The reason for doing so is weldability and mechanical strength. In all cases the corrosion conditions must be considered. In citric acid, grade 18-10L is more resistant than 17-12-2,5L. In such applications, grade 18-10L should be welded with HILCHROME 308R electrodes and not with a higher alloyed type.

There are basically four different types of covered electrodes for stainless applications: lime or basic (-15), titania or rutile-basic (-16), silica-titania or rutile (-17) and heavy coated for flat and horizontal welding (-26). Electrode selection will be based mainly on the welding position.

Basic coated **(-15)**	DC only	1. Vertical and overhead welding and all-positions applications such as pipe-welding 2. Root passes on heavy plate 3. Fully austenitic high alloyed stainless steels subject to weld-centreline cracking
Rutile-basic coated **(-16)**	AC / DC, DC preferred	1. Applications in the flat position 2. Uphill and overhead welding when lime covered electrodes are not available
Rutile coated **(-17)**	AC / DC, DC preferred	1. Flat- and horizontal position welding when minimum cleanup is desired 2. When a concave bead appearance is desired
Heavy coated **(-26)**	AC / DC, DC preferred	1. Recommended for flat position; horizontal fillet is possible 2. High-current, high-deposition rate welding

Gas Metal Arc Welding (MIG/MAG Welding)
The main advantage of MIG/MAG welding is its speed. Using a spool of solid wire, an operator can produce high deposition rates. Solid wire can be used in short-circuiting, globular and spray modes of arc transfer, giving GMAW a wide range of deposition rates and heat inputs. While pulsed GMAW can be used on thinner sections or for out-of-position welding, conventional spray transfer is used to join thicker sections because of its high deposition rates. Short-circuiting transfer is extensively used for stainless steel sheet and thin tubing.
MIG welding requires a shielding gas to prevent oxidation of the stainless steel alloys in the welding arc. Depending on the location and regional tendencies, mixtures of argon, helium and CO_2 are used.
The MIG process is either semi-automatic or fully automatic. It is a more economical process than welding with covered electrodes. However, all gas-shielded processes are sensitive to draughts, meaning they are not suitable for outdoor work or for welding in open vessels in which a chimney effect may easily occur.

Flux Cored Arc Welding (ASME: FCAW)
Traditionally, the most frequently used processes for welding stainless steels were MMA followed by MIG, TIG and SAW. The fifth process FCAW has been developed more recently and offers fabricators a genuine opportunity to increase productivity. Nowadays FCAW is the most used process for welding stainless steel.
FCAW is commonly used for welding stainless steel in the flat position as well as out of position. Cored Wires uses basically the same wire feed equipment and power supply as the MIG process. Unlike MIG wires, however, some Cored Wires contain a very fast freezing flux to form a slag shelf, which allows for out of position welding without a special power supply.
Like MIG welding FCAW requires a shielding gas. We recommend either a mixed gas 75%Ar-25%CO_2 or pure CO_2. The difference between these concerns mainly the weldability and possibility to weld vertically upwards.

Gas Tungsten Arc Welding (TIG Welding)
Although slower than MIG and FCAW, TIG Welding can produce high quality, clean welds with minimal defects. Able to weld thin sheets without melt-through, manual and automatic TIG Welding are used for joining conventional and PH stainless steel – particularly in thicknesses up to 5 mm. To avoid contaminating the stainless steel with tungsten, the tungsten electrode should never touch the workpiece.
TIG Welding is typically used for critical welds where strict conformance to code is mandatory, such as in the food service and nuclear industries. In pipe and pressure-vessel welding, TIG is often used for root passes before switching to other processes for the fill passes.
Normally, DC electrode negative (DCEN) is used with a power supply having a constant current output. Alternating Current (AC) is sometimes used for more cleaning action while welding stainless steels containing aluminium. Shielding gas is normally argon, though helium or an argon-helium mixture might be used for greater penetration. The tungsten electrode should be alloyed with rare earths when welding stainless steel.

Submerged Arc Welding (ASME: SAW)
Submerged Arc Welding is used for heavy workpieces. Usually, one or two bottom weld beads are deposited first by some other welding process. The joint is then filled by SAW. In certain cases, the bottom bead may also be submerged-arc welded. In such case we use root-backing tapes.
The flux is supplied through a funnel located ahead of the filler wire, which is fed continuously. The flux exercises a shielding function. During welding, part of it is converted into a readily removable slag. Welding is generally performed using DC electrode positive (DCEP). During SAW, extensive interaction occurs between the welding wire and the flux. Chemical elements can be exchanged.

POINTS TO REMEMBER WHEN WELDING STAINLESS STEEL

Before welding
Adjust the root gap and joint angle in such a way to secure good penetration, for duplex types a wider root gap is recommended
1. Clean the joint and base metal thoroughly
2. Use only stainless brushes for cleaning
3. Preheating is normally not recommended
4. Always use dry electrodes, if necessary redry covered electrodes at 250-350ºC for 2 hours

During welding
1. The heat input should be related to the plate thickness and welding method
2. Avoid striking the arc outside the joint. Arc strikes can act as initiation points for pitting corrosion and cracks
3. A correct root gas shielding is important. Suitable backing gases are high purity Ar or mixtures containing N_2 and H_2
4. Excessive weaving should be avoided. This can result in an overly high heat input

After welding
1. Thorough cleaning after welding is essential to obtain good corrosion resistance. All slag and oxide on and around the weld must be removed
2. Brushing should be done manually and only with stainless brushes
3. Rotating brushes can result in micro-crevices in the weld metal
4. Subsequent heat treatment is normally not necessary
5. Stress relieving should be avoided since this can cause embrittlement of the steel and weld metal
6. When polishing, use a new grinding stone. Small iron particles in a grinding stone might get pushed into the steel, thus initiating corrosion.

Base materials		Service condition	HILCO WELDING CONSUMABLES FOR WELDING STAINLESS STEEL	
Wrought	**Cast**		**Stick electrodes**	**Other filler metals**
201 202 301 302 304 305 308	CF-8 CF-20	As welded or annealed	Hilchrome 308R	Hilchrome G308L Si Hilchrome W308L
302B	-	As welded	Hilchrome 309R Hilchrome 310R	Hilchrome G309L Si Hilchrome W309L
303 303Se	-	As welded or annealed	Hilchrome 312R Hilchrome 309R	Hilchrome G309L Si Hilchrome W309L
304L	CF-3	As welded	Hilchrome 308R Hilchrome 347R	Hilchrome G308L Si Hilchrome W308L
308L	-	As welded	Hilchrome 308R	Hilchrome G308L Si Hilchrome W308L
309	CH-20	As welded	Hilchrome 309R	Hilchrome G309L Si Hilchrome W309L
310	CK-20	As welded	Hilchrome 310R	-
310S	-	As welded	Hilchrome 310R	-
316	CF-8M CF-12M	As welded or annealed	Hilchrome 316R	Hilchrome G316L Si Hilchrome W316L
316L	CF-3M	As welded or stress relieved	Hilchrome 316R	Hilchrome G316L Si Hilchrome W316L
321 321H	-	As welded	Hilchrome 347R	-
347 347H 348 348H	-	As welded	Hilchrome 347R	-
410	-	As welded	Hilchrome 308R, 309R, 310R	308, 309 Grades
405	-	As welded	Hilchrome 308R, 309R, 310R	308, 309 Grades
420	-	As welded	Hilchrome 308R, 309R, 310R	308, 309 Grades
430	-	As welded	Hilchrome 308R, 309R, 310R	308, 309 Grades
431	-	As welded	Hilchrome 308R, 309R, 310R	308, 309 Grades
442	-	As welded	Hilchrome 308R, 309R, 310R	308, 309 Grades

For other base materials we recommend that you contact us for more detailed information.

	347, 347H	321, 321H	317	316L	316, 316H	310S	310	309S	309	308	304
304H, 305, 304	308R	308R	308R 316R	308R 316R	308R 316R	308R 309R 310R	308R 309R 310R	308R 309R	308R 309R	308R	308R
304L	308R 347R	308R 347R	308R 316R	308R 316R	308R 316R	308R 309R 310R	308R 309R 310R	308R 309R	308R 309R	308R	
308	308R 347R	308R	308R 316R	308R 316R	308R 316R	308R 309R 310R	308R 309R 310R	308R 309R	308R 309R		
309	309R 347R	309R 347R	309R 316R	309R 316R	309R 316R	309R 310R	309R 310R	309R			
309S	309R 347R	309R 347R	309R 316R	309R 316R	309R 316R	309R 310R	309R 310R				
310	308R 310R	308R 310R	309MoR 310R	316R 309MoR 310R	316R 309MoR 310R	310R					
310S	308R 310R	308R 310R	309MoR	316R 309MoR	316R 309MoR						
316H, 316	308R 316R 347R	308R 316R	316R	316R							
316L	316R 347R	316R									
317	308R 347R	308R									
321H, 321	308R 347R										

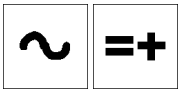
For other base materials we recommend that you contact us for more detailed information.

HILCO HILCHROME 307R

Stick electrodes – stainless steel – special purpose

AWS A5.4: E307-16 (mod.)
EN ISO 3581-A: E 18 8 Mn R 1 2
Werkstoffnr. 1.4370

Coating type:
Rutile-basic

Current:


Welding positions:


Hilchrome 307R is our rutile basic coated electrode for joining dissimilar steels and difficult-to-weld steels. Typical applications include joining 14Mn steels, spring steels, tool steels, and high carbon steels. This electrode is recommended for buffer layers prior to surfacing. The deposit weld metal features strain hardenability, excellent cavitation resistance, thermal shock resistance, crack resistance and scaling resistance up to 850ºC. Hilchrome 307R is a core wire alloyed all-current type (AC/DC).

Base materials to be welded:

- Armour plate
- Hardenable steels incl. DFTW-steels
- Non-magnetic austenitic steels
- Work hardening austenitic manganese steels
- Heat resisting ferritic chromium steels
- Dissimilar joining

Applications:

- Repair & Maintenance
- Transport & Lifting Industry
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni
0,10	7,0	0,60	18,5	8,0

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 390	≥ 620	≥ 35	20ºC ≥ 70

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	350	34,6	65-105
4,0	350	51,1	110-140

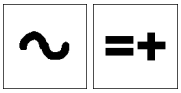
HILCO HILCHROME 309R

Stick electrodes – stainless steel – special purpose

AWS A5.4: E309L-17
EN ISO 3581-A: E 23 12 L R 3 2
Werkstoffnr. 1.4332

Coating type:
Rutile

Current:



Welding positions:

Hilchrome 309R is our rutile coated electrode for welding corrosion resistant and heat resistant CrNi steels, joining dissimilar metals and buffering. Typical applications include joining high-strength steels, un- and low alloyed heat treatable steels, stainless, ferritic chromium and austenitic chrome-nickel steels, austenitic manganese steels. The electrode suitable for joining clad steels. The FN content (FN ~17) ensures good cracking resistance. Hilchrome 309R is a core wire alloyed all-current type (AC/DC).

Base materials to be welded:

- High strength, unalloyed and alloyed heat treatable steels; stainless, ferritic chromium and austenitic CrNi steels; austenitic manganese steels
- Chemically resistant weld claddings ranging from ferritic-pearlitic steels to fine grain steels, incl. high temperature fine grain steels
- Dissimilar joining

Applications:

- Power Generation
- Repair & Maintenance
- Oil & Gas Industry
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni
0,02	0,8	0,7	23,2	12,5

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 400	≥ 550	≥ 30	20ºC ≥ 47 -60ºC ≥ 32

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	300	18,0	60-80
3,2	350	33,8	80-110
4,0	350	51,1	110-140

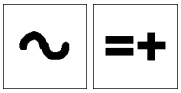
HILCO HILCHROME 309MoR

Stick electrodes – stainless steel – special purpose

AWS A5.4: E309LMo-17
EN ISO 3581-A: E 23 12 2 L R 3 2
Werkstoffnr. 1.4459

Coating type:
Rutile

Current:



Welding positions:

Hilchrome 309MoR is our rutile coated electrode for joining similar and dissimilar steels, buffering, joining hardenable and difficult-to-weld steels. Typical applications include joining high strength steels, un- and low alloyed structural steels and heat treatable steels. The electrode is suitable for joining clad steels. The Mo-alloyed electrode has an increased FN content (FN ~20) ensuring maximum cracking resistance. Hilchrome 309MoR is a core wire alloyed all-current type (AC/DC).

Base materials to be welded:

- Similar and dissimilar joining high strength, unalloyed and alloyed structural steels and heat treatable steels
- Un- and low alloyed boiler steels, CrNi(Mo) steels
- Combinations between ferritic and austenitic steels
- First layer in CrNiMo claddings AISI 316L and similar austenitic stainless steels
- Dissimilar joining

Applications:

- Power Generation
- Repair & Maintenance
- Oil & Gas Industry
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni	Mo
0,02	0,8	0,7	23,0	12,5	2,7

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 490	≥ 630	≥ 25	20ºC ≥ 47 -20ºC ≥ 32

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	300	18,5	60-80
3,2	350	36,8	80-120
4,0	350	52,2	100-160

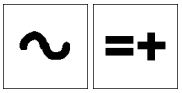
HILCO HILCHROME 312R

Stick electrodes – stainless steel – special purpose

AWS A5.4: ~E312-17
EN ISO 3581-A: E 29 9 R 3 2
Werkstoffnr. 1.4337

Coating type:
Rutile

Current:



Welding positions:

Hilchrome 312R is our rutile coated electrode which is to be considered as a problem solver for all kinds of steel grades including stainless and difficult-to-weld steels. Typical applications for this WELD-ALL include joining hard manganese steels, tool steels, spring steels, buffering as well as joining dissimilar steel grades. The electrode deposits a crack-resistant weld metal with an increased ferrite content of approx. FN50. Hilchrome 312R is a core wire alloyed all-current type (AC/DC).

Base materials to be welded:

- Armour plate
- Hardenable steels incl. DFTW-steels
- Tool, die and spring steels
- Austenitic manganese steels
- Hardfacing clutches, gear wheels, shafts
- Buffer layers prior to hardfacing
- Dissimilar joining

Applications:

- Repair & Maintenance
- Transport & Lifting Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni
0,11	0,7	1,1	28,8	9,5

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	650	790	24	20ºC 30

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	300	17,5	60-80
3,2	350	32,3	80-110
4,0	350	47,8	110-140

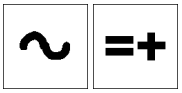
HILCO HILCHROME 308R

Stick electrodes – stainless steel – acid resistant

AWS A5.4: E308L-17
EN ISO 3581-A: E 19 9 L R 3 2
Werkstoffnr. 1.4316

Coating type:
Rutile

Current:



Welding positions:

Hilchrome 308R is our rutile coated electrode for welding low carbon 18Cr10Ni austenitic stainless steel grades like AISI 304, 304L. Typical applications include all industries where similar materials (incl. higher carbon types) as well as ferritic 13% Cr steels are used. Hilchrome 308R is also suitable for Nb (Cb) or Ti stabilised grades 347 and 321. Weld metal has an excellent resistance to general and intergranular corrosion (up to 350°C), good resistance to oxidising acids and cold reducing acids. Hilchrome 308R is a core wire alloyed all-current type (AC/DC).

Base materials to be welded:

- ASTM/AISI Grade 302, 304, 304L, 304LN, 321, 347
- WNr 1.4306, 1.4301, 1.4541, 1.4550, 1.4311, 1.4300
- CrNi 18 10 and similar stainless steel grades

Applications:

- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Repair & Maintenance
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni
0,03	0,8	0,8	19,8	10,2

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 350	≥ 520	≥ 35	20ºC ≥ 47 -196ºC ≥ 32

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,0	300	11,3	40-60
2,5	300	17,5	50-90
3,2	350	33,3	80-120
4,0	350	50,6	110-160

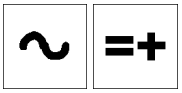
HILCO HILCHROME 347R

Stick electrodes – stainless steel – acid resistant

AWS A5.4: E347-17
EN ISO 3581-A: E 19 9 Nb R 3 2
Werkstoffnr. 1.4551

Coating type:
Rutile

Current:



Welding positions:

Hilchrome 347R is our stabilised electrode for welding low carbon 18Cr10NiNb (Cb) austenitic stainless steel grades like AISI 347, 321. Typical applications include all industries where similar materials (incl. higher carbon types) as well as ferritic 13% Cr steels are used. Hilchrome 347R is also suitable for unstabilised grades 304 and 304L. Weld metal has an excellent resistance to general and intergranular corrosion (up to 400°C). Hilchrome 347R is a core wire alloyed all-current type (AC/DC).

Base materials to be welded:

- ASTM/AISI Grade 347, 321, A 296 CF8C, 304, A157 C9, A320 B8C and D, 307L, 304LN, 302
- WNr. 1.4550, 1.4541, 1.4552, 1.4301, 1.4312, 1.4878, 1.6905, 1.4311, 1.4306, 1.4300
- Stabilised CrNiNb 18 10 and similar stainless steel grades

Applications:

- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Repair & Maintenance
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni	Nb
0,03	0,8	0,8	19,5	10,0	10xC

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 390	≥ 550	≥ 30	20ºC ≥ 55 -120ºC ≥ 32

Packaging and welding data:

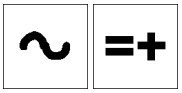
Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	300	17,5	50-90
3,2	350	34,2	80-120

HILCO HILCHROME 316R

Stick electrodes – stainless steel – acid resistant

AWS A5.4: E316L-17
EN ISO 3581-A: E 19 12 3 L R 3 2
Werkstoffnr. 1.4430

Coating type:
Rutile

Current:


Welding positions:


Hilchrome 316R is our multi-purpose electrode for welding low carbon 17Cr12Ni3Mo austenitic acid resistant stainless steel grades like AISI 316, 316L. Universal in applications but typical for all industries where superior corrosion resistance is required: textile industry, paper mills, chemical industry, cellulose industry etc., resistance to general and intergranular corrosion (up to 400ºC), good resistance to hot cracking. Hilchrome 316R is a core wire alloyed all-current type (AC/DC).

Base materials to be welded:

- ASTM/AISI Gr. 316, 316L, 316LN, 316Cb, 316Ti
- WNr 1.4583, 1.4435, 1.4436, 1.4404, 1.4401, 1.4571 1.4580, 1.4406*, 1.4429*
  * without postweld quenching
- CrNiMo 17 12 3 and similar stainless steel grades

Applications:

- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Repair & Maintenance
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni	Mo
0,03	0,8	0,8	18,8	11,5	2,7

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 350	≥ 540	≥ 30	20ºC ≥ 47 -120ºC ≥ 32

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
1,5	250	5,7	25-40
2,0	300	11,3	40-60
2,5	300	17,5	50-90
3,2	350	34,2	80-120
4,0	350	50,6	110-160

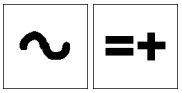
HILCO HILCHROME 310R

Stick electrodes – stainless steel – heat resistant

AWS A5.4: E310-16
EN ISO 3581-A: E 25 20 R 1 2
Werkstoffnr. 1.4842

Coating type:
Rutile-basic

Current:



Welding positions:

Hilchrome 310R is our rutile-basic coated electrode for joining and surfacing 25Cr20Ni austenitic heat resistant Cr-, CrSi, CrNi and CrNiSi as well as ferritic-pearlitic CrAl steel grades. Maximum operating temperature in a non-sulphurous environment is 1150ºC. When exposed to sulphurous gases (max. 2 g S/Nm3) we recommend a maximum working temperature up to 1040ºC. Typical applications include annealing plants, hardening plants, steam boiler construction, crude oil industry and ceramic industry. Hilchrome 310R is core wire alloyed, AC/DC.

Base materials to be welded:

- ASTM/AISI Gr. 310 and similar heat resistant steels
- WNr. 1.4841, 1.4828, 1.4845, 1.4713, 1.4724, 1.4742, 1.4762
- Heat resisting rolled, forged and cast steels

Applications:

- Power Industry
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni
0,12	2,0	0,5	26,0	21,0

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 380	≥ 570	≥ 35	20°C ≥ 80

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	350	35,4	65-105
4,0	350	48,0	100-140

HILCO HILCHROME 600

Stick electrodes – stainless steel – nickel base

AWS A5.11: E NiCrFe3
EN ISO 14172 : E Ni 6182 (NiCr15Fe6Mn)
Werkstoffnr. 2.4807

Coating type:
Basic

Current:
=+

Welding positions:


Hilchrome 600 is our basic coated DC electrode for welding high-grade nickel-base alloys like Inconel® 600. Typical applications include joining and surfacing high-temperature and creep resisting steels, heat resisting and cryogenic materials i.e. cold-tough steels (9% Ni), dissimilar joining and low-alloyed problem steels. Electrode is suitable for usage between -196ºC up to +650ºC, maximum operating temperature of 1200º (in a S-free environment), highly resistant to hot cracking. Hilchrome 600 is core wire alloyed.

Base materials to be welded:
- ASTM/AISI Grade Alloy 600/B168, Alloy 75, Alloy 80A
- Inconel® 600, 601, 690 - Incoloy® 800
- WNr. 2.4816, 2.4951, 2.4952
- NiCr15Fe and nickel alloys of similar composition
- Ni-steel up to and including 9% Ni
- Dissimilar joining

Applications:
- Power Generation
- Repair & Maintenance
- Oil & Gas Industry
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni	Nb	Fe
0,025	6,0	0,40	16,0	Bal.	2,2	6,0

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 360	≥ 600	≥ 30	20ºC ≥ 90 -196°C ≥ 32

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	300	17,7	50-70
3,2	350	27,4	70-95
4,0	350	50,0	90-120

HILCO HILCHROME G307

MAG wires – stainless steel – special purpose

AWS A5.9: ~ER 307

EN ISO 14343-A: G 18 8 Mn

Werkstoffnr. 1.4370

Wire type:
MAG Solid wire

Current:
=+

Welding positions:


Shielding gas:
M12, M13, M21

Hilchrome G307 is our solid wire for MAG welding dissimilar steels and difficult-to-weld steels. Typical applications include joining 14Mn steels, spring steels, tool steels, and high carbon steels. Hilchrome G307 is recommended for buffer layers prior to surfacing. The deposit weld metal features strain hardenability, excellent cavitation resistance, thermal shock resistance and scaling resistance up to 850ºC.

Base materials to be welded:
- Armour plate
- Hardenable steels incl. DFTW-steels
- Non-magnetic austenitic steels
- Work hardening austenitic manganese steels
- Heat resisting ferritic chromium steels
- Dissimilar joining

Applications:
- Repair & Maintenance
- Transport & Lifting Industry
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Ni
0,08	7,00	0,80	19,00	9,00

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	370	600	35	20ºC ≥ 100

Note: properties under M13

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.
1,2	BS300	15

HILCO HILCHROME G309LSi

MAG wires – stainless steel – special purpose

AWS A5.9: ER 309LSi
EN ISO 14343-A: G 23 12 L Si
Werkstoffnr. 1.4332

Wire type:
MAG Solid wire

Current:

Welding positions:

Shielding gas:
M12-M13

Hilchrome G309LSi is our solid wire for MAG welding corrosion resistant and heat resistant CrNi steels, dissimilar metals and buffering. Typical applications include joining high-strength steels, un- and low alloyed heat treatable steels, stainless, ferritic chromium and austenitic chrome-nickel steels, austenitic manganese steels. Hilchrome G309L Si is suitable for joining clad steels.

Base materials to be welded:

- High strength, unalloyed and alloyed heat treatable steels; stainless, ferritic chromium and austenitic CrNi steels; steels; austenitic manganese steels
- Chemically resistant weld claddings ranging from ferritic-pearlitic steels to fine grain steels, incl. high temperature fine grain steels
- Dissimilar joining

Applications:

- Power Generation
- Repair & Maintenance
- Oil & Gas Industry
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Ni
0,03	2,00	0,90	24,0	13,0

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 400	≥ 550	≥ 30	20ºC ≥ 55

Note: properties under M13

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.
0,8	BS300	15
1,0	BS300	15
1,2	BS300	15

HILCO HILCHROME G308LSi

MAG wires – stainless steel – acid resistant

AWS A5.9: ER 308LSi
EN ISO 14343-A: G 19 9 L Si
Werkstoffnr. 1.4316

Wire type:
MAG Solid wire

Current:
=+

Welding positions:


Shielding gas:
M12-M13

Hilchrome G308LSi is our solid wire for MAG welding low carbon 18Cr10Ni austenitic stainless steel grades like AISI 304, 304L. Typical applications include all industries where similar materials (incl. higher carbon types) as well as ferritic 13% Cr steels are used. Hilchrome G308L Si is also suitable for Nb (Cb) or Ti stabilised grades 347 and 321. Weld metal has an excellent resistance to general and intergranular corrosion (up to 350°C), good resistance to oxidising acids and cold reducing acids.

Base materials to be welded:
- ASTM/AISI Grade 302, 304, 304L, 304LN, 321, 347
- WNr 1.4306, 1.4301, 1.4541, 1.4550, 1.4311, 1.4300
- CrNi 18 10 and similar stainless steel grades

Applications:
- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction works
- Repair & Maintenance
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Ni
0,02	1,70	0,90	20,0	10,0

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 320	≥ 550	≥ 35	20ºC ≥ 75 -196ºC ≥ 32

Note: properties under M13

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.
0,8	BS300	15
1,0	BS300	15
1,2	BS300	15
1,6	BS300	15

HILCO HILCHROME G316LSi

MAG wires – stainless steel – acid resistant

AWS A5.9: ER 316LSi
EN ISO 14343-A: G 19 12 3 L Si
Werkstoffnr. 1.4430

Wire type:
MAG Solid wire

Current:
=+

Welding positions:


Shielding gas:
M12-M13

Hilchrome G316LSi is our solid wire for MAG welding low carbon 17Cr12Ni3Mo austenitic acid resistant stainless steel grades like AISI 316, 316L. Universal in applications but typical for all industries where superior corrosion resistance is required: textile industry, paper mills, chemical industry, cellulose industry etc., resistance to general and intergranular corrosion (up to 400ºC), good resistance to hot cracking.

Base materials to be welded:

- ASTM/AISi Gr. 316, 316L, 316LN, 316Cb, 316Ti
- WNr 1.4583, 1.4435, 1.4436, 1.4404, 1.4401, 1.4571 1.4580, 1.4406*, 1.4429*
  * without postweld quenching
- CrNiMo 17 12 3 and similar stainless steel grades

Applications:

- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Repair & Maintenance
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Ni	Mo
0,02	1,7	0,8	18,8	12,5	2,8

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 320	≥ 510	≥ 25	20ºC ≥ 70

Note: properties under M13

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.
0,8	BS300	15
1,0	BS300	15
1,2	BS300	15
1,6	BS300	15

HILCO HILCHROME W309L

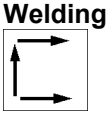
TIG rods – stainless steel – special purpose

AWS A5.9: ER 309L
EN ISO 14343-A: W 23 12 L
Werkstoffnr. 1.4332

Wire type:
TIG Solid wire

Current:

Welding positions:



Shielding gas:
I1

Hilchrome W309L is our solid wire for TIG welding corrosion resistant and heat resistant CrNi steels, joining dissimilar metals and buffering. Typical applications include joining high-strength steels, un- and low alloyed heat treatable steels, stainless, ferritic chromium and austenitic chrome-nickel steels, austenitic manganese steels. Hilchrome W309L is suitable for joining clad steels.
To be used in combination with tungsten electrodes type WS2 Witstar®.

Base materials to be welded:

- High strength, unalloyed and alloyed heat treatable steels; stainless, ferritic chromium and austenitic CrNi steels; austenitic manganese steels
- Chemically resistant weld claddings ranging from ferritic-pearlitic steels to fine grain steels, incl. high temperature fine grain steels
- Dissimilar joining

Applications:

- Power Generation
- Repair & Maintenance
- Oil & Gas Industry
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Ni
0,02	1,7	0,5	24,0	13,0

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 320	≥ 510	≥ 25	20ºC ≥ 80

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,2	1000	5

HILCO HW120

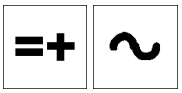
SAW fluxes – repair & maintenance – stainless steel

EN ISO 14174: S A FB 2 53 AC

Flux type:
Agglomerated high basic

Grain size:
EN ISO 14174: 2-16

Current:



Welding positions:

HW120 is our agglomerated high-basic flux for submerged arc welding stainless steel grades incl. duplex. HW120 is suitable for single and multipass welding, for fillet welds and multi wire applications. The weld has an excellent appearance and the slag is self-releasing, even when hot. HW120 is suitable for high speed welding on thin sheet metals. The basicity index is 2,2 ca. (Boniszewski).

Base materials to be welded:

- CrNi 18 10 (AISI 304) and similar stainless steel grades
- CrNiMo 17 12 3 (AISI 316) and similar stainless steels
- Duplex steel grades UNS S31803, 1.4462 and similar materials
- Chemically resistant claddings

Applications:

- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Repair & Maintenance
- Process Industry

Chemical composition, wt.% weld metal – typical:

Type of wire	C	Si	Mn	Ni	Mo	Cr
Hilchrome S309L	0,02	0,50	1,5	13,0		22,0
Hilchrome S308L	0,02	0,50	1,5	9,0		18,0
Hilchrome S316L	0,02	0,50	1,5	10,0	2,5	18,0
Hilchrome S2209	0,03	0,50	1,5	8,5	3,0	22,0

Mechanical properties, weld metal – typical:

Condition A = as welded	0,2% Yield strength MPa	Tensile strength MPa	Elongation A5 - %	Impact Values ISO-V J +20°C	Impact Values ISO-V J -60°C
Hilchrome S309L A	≥ 400	≥ 550	≥ 30	≥ 70	≥ 70
Hilchrome S308L A	≥ 350	≥ 500	≥ 35	≥ 75	-
Hilchrome S316L A	≥ 350	≥ 520	≥ 30	≥ 75	-
Hilchrome S2209 A	≥ 600	≥ 700	≥ 30	≥ 50	-

Packaging data:

Type	Weight / kg.
bag	25

HILCO HILCHROME W308L

TIG rods – stainless steel – acid resistant

AWS A5.9: ER 308L

EN ISO 14343-A: W 19 9 L

Werkstoffnr. 1.4316

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1

Hilchrome W308L is our solid wire for TIG welding low carbon 18Cr10Ni austenitic stainless steel grades like AISI 304, 304L. Typical applications include all industries where similar materials (incl. higher carbon types) as well as ferritic 13% Cr steels are used. Hilchrome W308L is also suitable for Nb (Cb) or Ti stabilised grades 347 and 321. Weld metal has an excellent resistance to general and intergranular corrosion (up to 350°C), good resistance to oxidising acids and cold reducing acids. To be used in combination with tungsten electrodes type WS2 WITSTAR®.

Base materials to be welded:

- ASTM/AISI Grade 302, 304, 304L, 304LN, 321, 347
- WNr 1.4306, 1.4301, 1.4541, 1.4550, 1.4311, 1.4300
- CrNi 18 10 and similar stainless steel grades

Applications:

- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Repair & Maintenance
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Ni
0,02	1,65	0,42	20,10	10,30

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 320	≥ 510	≥ 25	20ºC ≥ 100 -196ºC ≥ 35

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,2	1000	5

HILCO HILCHROME W316L

TIG rods - stainless steel - acid resistant

AWS A5.9: ER 316L
EN ISO 14343-A: W 19 12 3 L
Werkstoffnr. 1.4430

Wire type:
TIG Solid wire

Current:


Welding positions:


Shielding gas:
I1

Hilchrome W316L is our solid wire for TIG welding low carbon 17Cr12Ni3Mo austenitic acid resistant stainless steel grades like AISi 316, 316L. Universal in applications but typical for all industries where superior corrosion resistance is required: textile industry, paper mills, chemical industry, cellulose industry etc., resistance to general and intergranular corrosion (up to 400ºC), good resistance to hot cracking. To be used in combination with tungsten electrodes type WS2 WITSTAR®.

Base materials to be welded:

- ASTM/AISi Gr. 316, 316L, 316LN, 316Cb, 316Ti
- WNr 1.4583, 1.4435, 1.4436, 1.4404, 1.4401, 1.4571 1.4580, 1.4406*, 1.4429*
  * without postweld quenching
- CrNiMo 17 12 3 and similar stainless steel grades

Applications:

- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Repair & Maintenance
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Ni	Mo
0,02	1,70	0,50	18,5	12,3	2,6

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 320	≥ 510	≥ 25	20ºC ≥ 100 -196°C ≥ 32

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,2	1000	5

Repair & Maintenance is one of the widest application fields in welding. In principle, all activities not being involved in joining new structures are to be considered as repair & maintenance. Generally speaking, repair & maintenance is an everyday routine in all aspects of the welding industry.

Hardfacing
A particular area of the repair & maintenance field is hardfacing or surfacing parts subject to wear. Hardfacing is a low-cost method of depositing wear resistant surfaces on metal components to extend their service life. Although used primarily to restore worn parts to usable condition, hardfacing is also applied to new components before being placed into service. Hardfacing provides the following benefits:

- Extension of the life cycle of workpieces
- Fewer replacement parts needed
- Increased operating efficiency by reducing downtime
- Less expensive base materials can be used
- Reduction of overall costs

Restoring worn parts normally involves the following steps:
1. Buttering = a deposit will dilute the C and alloy content of base materials
2. Build-up = seriously worn areas are rebuilt close to their working size using crack resistant welding materials
3. Hardfacing = wear resistant surfaces are deposited on the base materials or on build-up deposits

Welding material selection depends on three major factors:
1. Base metal - primarily affects the choice of build-up materials
2. Type of wear -
   a. metal-to-metal friction - wear from steel parts rolling or sliding against each other with little or no lubrication
   b. severe impact - wear from severe pounding tends to squash, gouge and crack the surface
   c. abrasion + impact - wear from gritty material accompanied by heavy pounding which tends to chip or crack, grind away the surface
   d. severe abrasion - wear from gritty materials which grind or erode the surface. Severe abrasion is often accompanied by heavy compression or moderate impact
   e. metal-to-earth abrasion - wear from earth like materials accompanied by moderate impact
   f. corrosion - chemical attack.

3. Arc welding method - depends primarily upon the size and number of components, available equipment and frequency of hardfacing. All general welding techniques can be applied.

Fighting wear
In order to combat against wear, it is important to determine the types of wear as well as the situation of the workpiece in practice i.e. its function. For each type of wear guidelines can be given with which a hardfacing alloy should comply. Some of these guidelines are to be found on the following pages. For general information about hardfacing and specific information on how to combat wear in your typical application we recommend that you contact us.

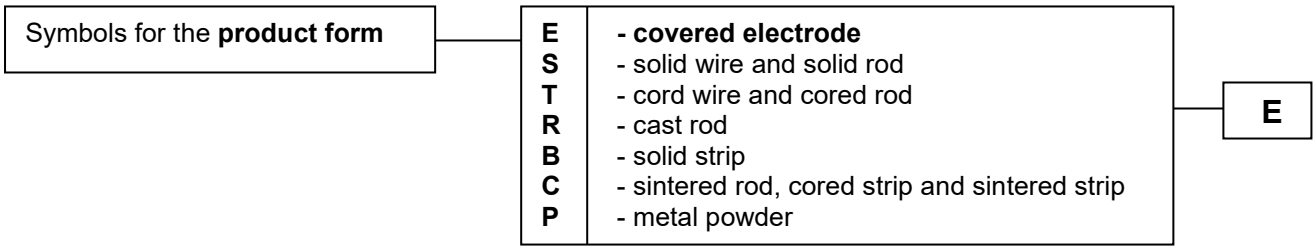
Base material	Description	Welding process / filler metals					
		Stick electrodes (1st choice)	Stick electrodes (2nd choice)	GMAW	FCAW	SAW	
Cast Iron	Grey CI	Pure Nickel	Nickel Iron	On request	On request	-	A,B
	Nodular CI	Nickel Iron	Pure Nickel	On request	On request	-	B
	Malleable CI	Nickel Iron	-	On request	On request	-	A,B
	CI to steel	Nickel Iron	Pure Nickel	On request	On request	-	A,B
Difficult-to-weld steel (DFTW)	C45	Hilchrome 312R	Hilchrome 307R	Hilchrome G307	On request	-	C
	42CrMo4	Hilchrome 312R	Hilchrome 307R	Hilchrome G307	On request	-	C
	42MnV7	Hilchrome 312R	Hilchrome 307R	Hilchrome G307	On request	-	C
	Tool steel	Hilchrome 312R	Hilchrome 307R	Hilchrome G307	On request	-	C
	Cast steel	Hilchrome 307R	Hilchrome 312R	Hilchrome G307	On request	-	C
	Mn-steel	Hilchrome 307R	Hilchrome 312R	Hilchrome G307	On request	-	D
	Armour plate	Hilchrome 307R	Hilchrome 312R	Hilchrome G307	On request	-	C
	Spring steel	Hilchrome 312R	Hilchrome 307R	Hilchrome G307	On request	-	C
	Unknown materials	Hilchrome 312R	Hilchrome 307R	Hilchrome G307	On request	-	C
Wear resistant surfacing	Medium abrasion, high impact	Hardmelt 600	-	H-600	Hilcord 600	-	E
	Heavy abrasion, medium impact	Hardmelt 638	Hardmelt 643	-	On request	-	E
	Extreme abrasion, low impact	Hardmelt 643	Hardmelt 645	-	On request	-	E
	Extreme impact, low abrasion	-	-	-	On request	-	-
	Sliding wear, heavy impact	Hardmelt 620	Hardmelt 600	H-600	On request	-	E
	Sliding wear, impact, corrosion	Hilchrome 312R	Hilchrome 307R	-	On request	-	-
	Extreme sliding, abrasion, heat and corrosion	Hilcostel 6E	Hilcostel 12E	Hilcostel 6T	On request	-	F
	Buffer layers prior to surfacing	Hilchrome 312R	-	-	On request	-	G

Remarks		
	A	Preening, hammering of the weld deposit helps to reduce welding stress
	B	A temperature (interpass) of 60ºC should be maintained to avoid heat stress
	C	Preheat thick workpieces up to 150-200ºC
	D	Do not preheat, keep interpass temperature at max. 150ºC
	E	Preheat crack sensitive base materials, apply a buffer layer prior to surfacing
	F	Preheat base materials: • Small workpieces: 200-300ºC • Large workpieces: 300-400ºC
	G	First choice for crack sensitive base materials and filler metals

Scope:

This European Standard (EN 14700) applies to welding consumables for hard facing. The range of application includes surfaces of new structural components, semi-finished products as well as the repair of surfaces of structural components which have to resist mechanical, chemical, thermal or combined stress.

This European Standard (EN 14700) specifies requirements for classification of the consumables based on the chemical composition of all the weld metal of covered electrodes, cored wires, cored rods, sintered strips, sintered rods and metal powders and on the chemical composition of solid wires, solid rods, solid strips and cast rods.



Hardmelt 600 - EN 14700: E Fe8

Alloy symbols and chemical composition

Alloy symbol	Suitability	Chemical composition in % (m/m)									
		C	Cr	Ni	Mn	Mo	W	V	Nb	Other	Balance
Fe1	p	≤ 0,4	≤ 3,5	-	0,5 to 3	≤ 1	≤ 1	≤ 1	-	-	Fe
Fe2	p	0,4 to 1,2	≤ 7	≤ 1	0,5 to 3	≤ 1	≤ 1	≤ 1	-	-	Fe
Fe3	s t	0,2 to 0,5	1 to 8	≤ 5	≤ 3	≤ 4,5	≤ 10	≤ 1,5	-	Co, Si	Fe
Fe4	s t (p)	0,2 to 1,5	2 to 6	≤ 4	≤ 3	≤ 10	≤ 19	≤ 4	-	Co, Ti	Fe
Fe5	c p s t w	≤ 0,5	≤ 0,1	17 to 22	≤ 1	3 to 5	-	-	-	Co, Al	Fe
Fe6	g p s	≤ 2,5	≤ 10	-	≤ 3	≤ 3	-	-	≤ 10	Ti	Fe
Fe7	c p t	≤ 0,2	4 to 30	≤ 6	≤ 3	≤ 2	-	≤ 1	≤ 1	Si	Fe
Fe8	**g p t**	**0,2 to 2**	**5 to 18**	**-**	**0,3 to 3**	**≤ 4,5**	**≤ 2**	**≤ 2**	**≤ 10**	**Si, Ti**	**Fe**
Fe9	k (n) p	0,3 to 1,2	≤ 19	≤ 3	11 to 18	≤ 2	-	≤ 1	-	Ti	Fe
Fe10	c k (n) p z	≤ 0,25	17 to 22	7 to 11	3 to 8	≤ 1,5	-	-	≤ 1,5	Fe	Fe
Fe11	c n z	≤ 0,3	18 to 31	8 to 20	≤ 3	≤ 4	-	-	≤ 1,5	Cu	Fe
Fe12	c (n) z	≤ 0,08	17 to 26	9 to 26	0,5 to 3	≤ 4	-	-	≤ 1,5	-	Fe
Fe13	g	≤ 1,5	≤ 6,5	≤ 4	0,5 to 3	≤ 4	-	-	-	B, Ti	Fe
Fe14	g (c)	1,5 to 4,5	25 to 40	≤ 4	0,5 to 3	≤ 4	-	-	-	-	Fe
Fe15	g	4,5 to 5,5	20 to 40	≤ 4	0,5 to 3	≤ 2	-	-	≤ 10	B	Fe
Fe16	g z	4 to 7,5	10 to 40	-	≤ 3	≤ 9	≤ 8	≤ 10	≤ 10	B, Co	Fe
Fe20	c g t z	hard metal [b]	-	-	-	-	-	-	-	-	Fe
Ni1	c p t	≤ 0,6	15 to 30	Balance	0,3 to 1	≤ 6	≤ 2	≤ 1	-	Si, Fe, B	Ni
Ni2	c k p t z	0,6 to 3	15 to 30	Balance	≤ 1,5	≤ 28	≤ 8	≤ 1	≤ 4	Co, Si, Ti	Ni
Ni3	c p t	1 to 3	1 to 15	Balance	0,3 to 1	≤ 6	≤ 2	≤ 1	-	Si, Fe, B	Ni
Ni4	c k p t z	-	1 to 15	Balance	≤ 1,5	≤ 28	≤ 8	≤ 1	≤ 4	Co, Si, Ti	Ni
Ni20	c g t z	-	-	-	-	-	-	-	-	-	Ni
Co1	c k t z	1 to 5	20 to 30	≤ 10	0,1 to 2	≤ 10	≤ 15	-	≤ 1	Fe	Co
Co2	t z (c s)		20 to 35	≤ 4	0,1 to 2	-	4 to 10	-	-	Fe	Co
Co3	t z (c s)		20 to 35	≤ 4	≤ 2	≤ 1	6 to 14	-	-	Fe	Co
Cu1	c (n)		-	≤ 6	≤ 15	-	-	-	-	Al, Fe, Sn	Cu
Al1	c n		-	10 to35	≤ 0,5	-	-	-	-	Cu, Si	Al
Cr1	c g		Balance	-	≤ 1	-	-	15 to 30	-	Fe, B, Si, Zr	Cr

Suitability:
c: resistance to rusting
g: resistance to abrasion
k: work hardenable
n: cannot be magnetized
p: impact resistance
s: edge retention
t: heat resistance
z: scaling resistance
w: precipitation hardened

( ) may not apply to all alloys of this type

[a] Alloys which are not included in this table are analogies signified, but the letter Z shall be put in front
[b] Tungsten fused carbide or tungsten carbide broken or spherical.

With this conversion table you can determine the approximate hardness of deposit weld metal. Please note that conversion tables must be regarded only as an estimate of comparative values.

Rm = tensile strength (MPa)
HV = Vickers hardness
HB = Brinell hardness
HRc = Rockwell hardness

Rm	HV	HB	HRc	Rm	HV	HB	HRc	Rm	HV	HB	HRc
200	63	60	-	1000	311	296	~31	1800	547	-	~52
220	69	66	-	1020	317	301	32	1820	553	-	-
240	75	71	-	1040	323	307	-	1840	559	-	-
260	82	78	-	1060	330	314	~33	1860	564	-	~53
280	88	84	-	1080	367	349	34	1880	570	-	-
300	94	89	-	1100	342	325	-	1900	575	-	-
320	100	95	-	1120	349	332	~35	1920	580	-	~54
340	107	102	-	1140	355	337	36	1940	586	-	-
360	113	107	-	1160	361	343	-	1960	591	-	-
380	119	113	-	1180	367	349	~37	1980	596	-	55
400	125	119	-	1200	373	354	38	2000	602	-	-
420	132	125	-	1220	380	361	-	2020	607	-	-
440	138	131	-	1240	385	366	~39	2040	613	-	-
460	143	136	-	1260	392	371	40	2060	618	-	~56
480	150	143	-	1280	397	377	-	2080	623	-	-
500	157	149	-	1300	403	383	41	2100	629	-	-
520	163	155	-	1320	410	390	-	2120	634	-	-
540	168	160	-	1340	417	396	~42	2140	639	-	57
560	175	166	-	1360	423	402	43	2160	644	-	-
580	181	172	-	1380	430	409	-	2180	650	-	-
600	187	178	-	1400	434	413	44	2200	655	-	58
620	193	184	-	1420	440	418	-	-	675	-	59
640	200	190	-	1440	446	424	~45	-	698	-	60
660	205	195	-	1460	452	429	-	-	720	-	61
680	212	201	-	1480	458	435	46	-	745	-	62
700	219	208	-	1500	464	441	-	-	773	-	63
720	225	214	-	1520	470	447	-	-	800	-	64
740	230	219	-	1540	473	449	~47	-	829	-	65
760	237	225	-	1560	481	-	-	-	864	-	66
780	243	231	21	1580	486	-	~48	-	900	-	67
800	250	238	22	1600	491	-	-	-	940	-	68
820	255	242	23	1620	497	-	49				
840	262	249	~24	1640	503	-	-				
860	268	255	25	1660	509	-	-				
880	275	261	~26	1680	514	-	50				
900	280	266	27	1700	520	-	-				
920	287	273	28	1720	525	-	-				
940	293	278	29	1740	527	-	~51				
960	299	284	-	1760	536	-	-				
980	305	290	~30	1780	541	-	-				

Welding of cast iron material

Application fields for cast iron welding are

- Repair welding
- Production welding
- Construction welding.

Repair welding is to recondition damaged (cracked, broken or worn out) cast iron parts by welding to ensure further use.

Production welding means that a welding is needed within a production process of a cast iron part to ensure particular properties. Such weldings may be repair of foundry defects, correction of measurements or claddings.

Construction welding is to join cast iron parts to components of other materials in a construction unit. Casting parts used in this field are usually made of nodular- or malleable cast iron. Typical weldings are
- tubes and flanches made of ductile cast iron
- joining of cast iron with un- or high alloyed steel
- welding of wear resistant Mn-steel plates on to cast iron.

In general, 2 methods of cast iron welding are used:
- cold welding with non-matching consumables
- hot welding with matching consumables.

Hot welding
Hot welding is done with electrodes, gas welding rods or cored wires giving a colour and structure matching deposit.

Hot welding of cast iron needs a high pre-heating temperature of 400-650°C, depending on the size and shape of the part to be welded. Due to the high pre-heating and the additional high heat input through the welding process a large welding pool with a slow cooling rate is made. In consequence, hot welding is only suitable for flat position welding. The slow cooling or eventual post weld heat treatment gives a crack-free weld without any hardness peaks. The mechanical values can, depending on the heat treatment, reach the values of the base material.

Cold welding
For cold welding of cast iron electrodes MIG- and TIG-wires on iron-, nickel- and copper base are used. Parameters and procedures are selected to prevent excessive heating in the weld area. A temperature of max. 60°C should be maintained to avoid heat stress. Peening of the weld deposit helps to reduce welding stress. The advantages of cold welding in a repair weld are the possibility of positional welding and the prevention of deformations. In many cases the parts can be welded without having to be dismantled.

Production- and construction welding can be made without long thermal treatments and within a short time span. The heat load on the welder is very small by comparison to hot welding.

Groove preparation
For repairs the groove is made by gouging, by grinding or by chiselling. The gouging electrode is preferably used on heavy sections and on dirty, burnt or chemically affected cast iron parts.

The casting skin should be removed in the welding area to prevent binding failures due to impurities and oxides usual in such a skin. Prior to welding, residues of grinding wheels should be removed carefully. Oily parts can be treated with an oxyacetylene flame. On bad quality cast iron it may be necessary to remove the first deposit several times over, due to poor binding or due to excessive porosity, until a sound deposit can be obtained.

The notch effect of cracks can be reduced by drilling holes, one at each end of a crack. The crack itself should be prepared in a tulip form with generously rounded edges.

HILCO RED EXTRA

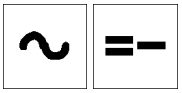
Stick electrode – repair & maintenance – unalloyed steel

AWS A5.1: E 6013

EN ISO 2560-A: E 42 0 RC 11

Coating type:
Rutile

Current:



Welding positions:

Red Extra is our universal electrode for all welding positions, including vertical-down position. This electrode is characterised by easy handling, smooth arc transfer, easy slag removal and a finely rippled bead surface. Red Extra is the ideal choice for construction work where the use of one type of electrode is permissible. Typical applications include assembly, workshop and repair welding of mild and low-alloyed structural steels. Red Extra is an all-current type (AC/DC), which also operates on transformers with low OCV, min. 42V.

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,09	0,5	0,4	0,005	0,015

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 22	0ºC ≥ 47 20ºC ≥ 47

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,0	300	10,5	40-60
2,5	350	18,2	60-100
3,2	350	28,9	90-140
4,0	350	44,2	150-190
5,0	350	70,4	180-240

HILCO BASIC 55

Stick electrode – repair & maintenance – unalloyed steel

AWS A5.1: E 7016

EN ISO 2560-A: E 38 3 B 12 H10

Coating type:
Basic-rutile

Current:
~ =+ =−* *root pass

Welding positions:


Basic 55 is our double coated basic-rutile electrode for all welding positions, except vertical down position. The electrode is characterised by easy handling, a well controllable arc, excellent root penetration, easy slag removal and excellent metallurgical properties up to -30ºC. Typical applications include shipbuilding, general constructions, bridges, storage tanks as well as root pass and positional welding. Basic 55 is an all-current type (AC/DC).

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0- St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,06	0,90	0,70	≤ 0,025	≤ 0,025

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 400	≥ 490	≥ 22	-20ºC ≥ 90

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	19,5	55-95
3,2	350	32,8	80-150
3,2	450	42,4	95-150
4,0	450	65,0	120-190

HILCO BASIC

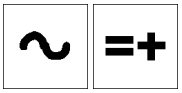
Stick electrode – repair & maintenance – unalloyed steel

AWS A5.1: E 7018-1

EN ISO 2560-A: E 42 5 B 32 H5

Coating type:
Basic

Current:



Welding positions:

Basic is our high quality low hydrogen (H_{DM} < 5 ml. / 100 gr. deposit weld metal) electrode for all welding positions, except vertical down position. This electrode is characterised by a smooth, quiet arc, very low spatter, an easy slag removal and good mechanical properties up to -50°C. Typical applications include shipbuilding, general constructions and offshore constructions. Basic is welded on DC (+) current, has 120% recovery and is suitable to weld fine-grain steel grades.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,07	1,3	0,3	0,006	0,011

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 420	≥ 510	≥ 25	-50ºC ≥ 47 20ºC ≥ 120

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	21,0	65-110
3,2	350	39,1	100-145
4,0	450	72,5	135-200
5,0	450	103,6	180-280

HILCO B19CrMo

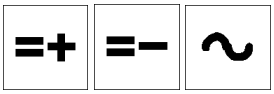
Stick electrode – repair & maintenance – low alloyed steel

AWS A5.5: E 8018-B2 H4

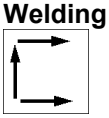
EN ISO 3580-A: E Cr Mo 1 B 32 H5

Coating type:
Basic

Current:



Welding positions:



B19CrMo is our basic-coated low hydrogen (H_{DM} < 5 ml. / 100 gr. deposit weld metal) electrode for welding low alloyed fine grain and creep resisting steels like 13CrMo4 5 up to a maximum operating temperature of 550°C. Typical applications include the construction of pressure vessels, boilers and pipes. B19CrMo is preferably welded on DC current, root pass and narrow gap welding on DC-polarity.

Base materials to be welded:

- Boiler steel 13CrMo4-5, 15CrMo5, 16CrMoV4, A 333 Grade P 11, P 12, G-17CrMo5-5, 22Mo4, G-22CrMo 5-4, 42CrMo4
- Heat treatable steels up to 780 MPa tensile strength
- Case hardening and nitriding steels

Applications:

- Power Generation
- Oil & Gas Industry
- Repair & Maintenance
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P	Cr	Mo
0,06	0,75	0,6	0,01	0,015	1,10	0,50

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
Stress relieved	570	640	24	20°C 180 -20°C 100

Notes: stress relieved condition 700ºC / 1 h. - preheat, interpass and PWHT are essential for obtaining properties as indicated. Recommended preheat 200-250ºC, PWHT 660-700ºC.

Packaging and welding data:

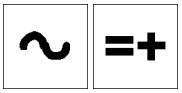
Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	21,0	80-85
3,2	350	37,9	120-130
4,0	350	54,9	140-150

HILCO HILCHROME 307R

Stick electrode – repair & maintenance – unalloyed steel

AWS A5.4: E307-16 (mod.)
EN ISO 3581-A: E 18 8 Mn R 1 2
Werkstoffnr. 1.4370

Coating type:
Rutile-basic

Current:


Welding positions:


Hilchrome 307R is our rutile basic coated electrode for joining dissimilar steels and difficult-to-weld steels. Typical applications include joining 14Mn steels, spring steels, tool steels, and high carbon steels. This electrode is recommended for buffer layers prior to surfacing. The deposit weld metal features strain hardenability, excellent cavitation resistance, thermal shock resistance, crack resistance and scaling resistance up to 850ºC. Hilchrome 307R is a core wire alloyed all-current type (AC/DC).

Base materials to be welded:

- Armour plate
- Hardenable steels incl. DFTW-steels
- Non-magnetic austenitic steels
- Work hardening austenitic manganese steels
- Heat resisting ferritic chromium steels
- Dissimilar joining

Applications:

- Repair & Maintenance
- Transport & Lifting Industry
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni
0,10	7,0	0,60	18,5	8,0

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 390	≥ 620	≥ 35	20ºC ≥ 70

Packaging and welding data:

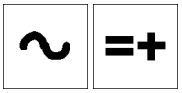
Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	350	34,6	65-105
4,0	350	51,1	110-140

HILCO HILCHROME 312R

Stick electrodes – repair & maintenance – stainless steel

AWS A5.4: ~E312-17
EN ISO 3581-A: E 29 9 R 3 2
Werkstoffnr. 1.4337

Coating type:
Rutile

Current:


Welding positions:


Hilchrome 312R is our rutile coated electrode which is to be considered as a problem solver for all kinds of steel grades including stainless and difficult-to-weld steels. Typical applications for this WELD-ALL include joining hard manganese steels, tool steels, spring steels, buffering as well as joining dissimilar steel grades. The electrode deposits a crack-resistant weld metal with an increased ferrite content of approx. FN50. Hilchrome 312R is a core wire alloyed all-current type (AC/DC).

Base materials to be welded:

- Armour plate
- Hardenable steels incl. DFTW-steels
- Tool, die and spring steels
- Austenitic manganese steels
- Hardfacing clutches, gear wheels, shafts
- Buffer layers prior to hardfacing
- Dissimilar joining

Applications:

- Repair & Maintenance
- Transport & Lifting Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni
0,11	0,7	1,1	28,8	9,5

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	650	790	24	20ºC 30

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	300	17,5	60-80
3,2	350	32,3	80-110
4,0	350	47,8	110-140

HILCO HILCHROME 600

Stick electrode – repair & maintenance – unalloyed steel

AWS A5.11: E NiCrFe3
EN ISO 14172 : E Ni 6182 (NiCr15Fe6Mn)
Werkstoffnr. 2.4807

Coating type:
Basic

Current:
=+

Welding positions:

Hilchrome 600 is our basic coated DC electrode for welding high-grade nickel-base alloys like Inconel® 600. Typical applications include joining and surfacing high-temperature and creep resisting steels, heat resisting and cryogenic materials i.e. cold-tough steels (9% Ni), dissimilar joining and low-alloyed problem steels. Electrode is suitable for usage between -196ºC up to +650ºC, maximum operating temperature of 1200º (in a S-free environment), highly resistant to hot cracking. Hilchrome 600 is core wire alloyed.

Base materials to be welded:

- ASTM/AISI Grade Alloy 600/B168, Alloy 75, Alloy 80A
- Inconel® 600, 601, 690 - Incoloy® 800
- WNr. 2.4816, 2.4951, 2.4952
- NiCr15Fe and nickel alloys of similar composition
- Ni-steel up to and including 9% Ni
- Dissimilar joining

Applications:

- Power Generation
- Repair & Maintenance
- Oil & Gas Industry
- Process Industry

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni	Nb	Fe
0,025	6,0	0,40	16,0	Bal.	2,2	6,0

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 360	≥ 600	≥ 30	20ºC ≥ 90 -196°C ≥ 32

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	300	17,7	50-70
3,2	350	27,4	70-95
4,0	350	50,0	90-120

HILCO HARDMELT 600

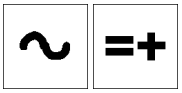
Stick electrodes – repair & maintenance – wear resistant

EN 14700: E Fe8

DIN 8555 : E 6-UM-60

Coating type:
Basic

Current:



Welding positions:

Hardmelt 600 is our basic coated electrode for wear resistant surfacing parts of steel, cast steel and high Mn-steel, subject to abrasion, metal-to-metal wear, impact and/or compression stresses. Deposit weld metal has a martensitic structure, hardness of pure weld deposit approx. 600HB. After welding the deposit can be machined by grinding only.

Applications:
Hardmelt 600 is particularly suitable under conditions of heavy abrasion and friction, combined with impact. Ideally suitable for applications involving rolling, sliding and metal-to-metal wear.

Applications are universal but typical for hardfacing parts e.g. agricultural, earth moving and stone crushing industry, hardfacing crane and mine car wheels, sprockets and gear teeth, skip guides, dredger buckets, scrapper blades, transfertables, cable sheaves, tractor and shovel parts, dragline buckets, conveyor chains, hammer heads, clutch jaws.

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Fe
0,50	0,40	2,30	9,0	bal.

Mechanical properties, weld metal – typical:

Condition	Hardness	
As welded	1 layer	56-58 HRc
	After soft annealing 780-820ºC / oven	approx. 25 HRc
	After hardening 1000-1050ºC / oil	approx. 60 HRc
	1 layer on high Mn-steel	approx. 22 HRc
	2 layer on high Mn-steel	approx. 40 HRc

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	350	34,6	100-140
4,0	450	65,6	140-180
5,0	450	105,5	180-210

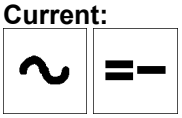
HILCO HARDMELT 620

Stick electrodes – repair & maintenance – wear resistant

AWS A5.13 : E Fe 5-B (mod.)
EN 14700: E Fe4
DIN 8555: E 4-UM-60-ST

Coating type:
Rutile

Current:



Welding positions:

Hardmelt 620 is our rutile coated electrode for wear resistant surfacing tool steels subject to metal-to-metal wear at elevated temperatures up to 550ºC. Deposit weld metal is a high speed steel (HSS) similar to M-1 tool steel, structure is fine precipitated carbides in a martensitic matrix, hardness of pure weld metal is 62 HRc. This hardness can be increased after tempering. After welding the deposit can be machined by grinding only.

Applications:
Hardmelt 620 produces a crack-free wear resistant tool steel deposit and is particularly suitable for applications involving severe metal-to-metal wear coupled with elevated temperatures (up to 550ºC).

Typical applications include building up worn steel dies, high speed cutting tools, wire guides, punch and forging dies, cold and hot shear blades, trimmers or the application of wear resistant surfaces to unalloyed and low alloy steel.

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Mo	V	W
0,9	0,5	0,8	4,5	8,0	1,2	2,0

Mechanical properties, weld metal – typical:

Hardness	
Pure weld metal	approx. 62 HRc
After soft annealing 840ºC / oven	approx. 25 HRc
After hardening 1180-1240ºC and tempered 550ºC 2 h	approx. 64 - 66 HRc

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	28,2	70-90
3,2	350	43,4	90-110
4,0	450	86,2	110-130

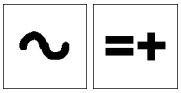
HILCO HARDMELT 638

Stick electrodes – repair & maintenance – wear resistant

EN 14700: E Z Fe14

Coating type:
Basic

Current:



Welding positions:

Hardmelt 638 is our basic coated high efficiency (205%) electrode for wear resistant surfacing parts subject to grinding abrasion and moderate impact. Deposit weld metal is a near eutectic mix of chromium carbides and austenite, hardness of pure weld metal is 60 HRc. After welding the deposit can be machined by grinding, due to the homogeneous and finely rippled seam this is, for most applications, not necessary.

Applications:
Hardmelt 638 produces an abrasion resistant deposit and is particularly suitable for applications involving grinding abrasion with moderate impact at service temperatures up to 600ºC. The weld deposit is extreme resistant to mineral wear. Hardmelt 638 is also suited as a final layer on tough-hard deposits (Hardmelt 600) or high Mn-steel.

Typical applications are found in heavy constructions, mining, stone crushing and dredging industries e.g. shovel and dragline buckets, bucket teeth, scraper cutters, scoop lift buckets, crusher hammers, cement mixers, dredge pump parts, rubber industry mixing machines, shaker pans, excavator buckets, gyratory and impact crusher parts, conveyor screws.

Chemical composition, wt. % weld metal – typical:

C	Mn	Cr
5,0	0,3	31,8

Mechanical properties, weld metal – typical:

Hardness	
Pure weld metal	60 HRc
1 layer on steel with C = 0,15%	approx. 55 HRc
1 layer on high Mn-steel	approx. 52 HRc

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	350	53,5	110-140
4,0	350	81,5	160-190
5,0	450	174,2	220-260

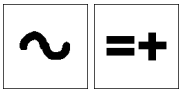
HILCO SUGARHARD

Stick electrodes – repair & maintenance – wear resistant

EN 14700: E Fe14

Coating type:
Basic

Current:



Welding positions:

Sugarhard is our basic coated high efficiency (205%) electrode for roughening the wet mill rollers used in the sugar cane crushing process. Striking the arc with Sugarhard is very easy and the welding characteristics are superb in the environment to which the electrodes are exposed. The welding is done with a striking arc roughening the roller surface during processing with wear resistant chromium carbide globules; hardness of pure deposit weld metal is 63 HRc.

Applications:
Enormous rollers are used in the sugar cane crushing process and are subject to excessive wear during the season. These rollers have to be continuously welded, even when the process is in full swing. The roller, which is located near the end of the crushing process, is smothered in crushed, sludgy cane and its surface is wet. Sugarhard accommodates these conditions and deposits a dispersion of small, hard and very wear-resistant globules that fastens to the side walls of the ridges of the roller.

Roller arcing (welding method)
For arcing of sugar mill rollers you have to hold the Sugarhard electrode at right angles to the flans of the profile. Maintain contact with the electrode coating and the base material. Use "cold welding" technique, avoid excessive heat in the weld area.

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr
3,5	1,0	4,5	20,0

Mechanical properties, weld metal – typical:

Condition	Hardness	
As welded	Deposit weld metal	63 HRc

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	450	72,4	110-130
4,0	450	104,0	160-210

HILCO PURE NICKEL

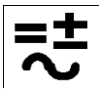
Stick electrodes – repair & maintenance – cast iron

EN ISO 1071: E C Ni-CI 1

AWS A5.15: E Ni-CI

Coating type:
Basic

Current:



Welding positions:

Pure Nickel is our basic coated electrode for cold welding grey and malleable cast iron grades and for joining these base metals to steel, copper and copper alloys. The electrode deposits a high-grade pure nickel weld metal: ideal for repair welding cracked and worn castings including highly contaminated cast materials. Both weld metal and HAZ are soft and easily machine able using files. Pure Nickel is ideally suited for the combined welding with Nickel Iron (E NiFe-CI), buttering with Pure Nickel and filling with Nickel Iron.

Base materials to be welded:

- Lamellar grey cast irons GG10 to GG40
- Malleable cast irons GTS35-GTS 60, GTW35-GTW60
- Joining and repairing
- Dissimilar joining cast iron to steel, copper, copper alloys

Applications:

- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Ni	Cu
0,7	1,0	0,3	balance	0,6

Mechanical properties, weld metal – typical:

Condition	Tensile strength MPa	Elongation Lo=5d - %	Hardness
As welded	400	8	Approx. 160 HB

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	20,0	55-60
3,2	350	33,9	80-90
4,0	350	51,3	100-120

HILCO NICKEL IRON

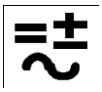
Stick electrodes – repair & maintenance – cast iron

EN ISO 1071: E C Ni Fe-1 1

AWS A5.15: E Ni Fe-CI

Coating type:
Basic

Current:



Welding positions:

Nickel Iron is our basic coated electrode for repair, construction and production welding all cast commercial iron grades including grey, malleable, nodular and phosphorous (P > 0,02%) cast iron. The electrode deposits a high-grade nickel-iron weld metal: ideal for highly restrained or thick walled work pieces including applications where toughness and crack resistance is important. Both weld metal and transition zone are easily machine able using cutting tools.

Base materials to be welded:

- Lamellar grey cast irons GG10 to GG40
- Malleable cast irons GTS35-GTS 65, GTW35-GTW65
- Nodular cast irons GGG40-GGG70
- Joining and repairing
- Dissimilar joining cast iron to steel

Applications:

- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Ni	Fe
1,1	0,95	1,2	54	42

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Hardness
As welded	350	500	12	Approx. 170 HB

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	300	15,9	60-80
3,2	350	31,3	70-100
4,0	350	47,4	95-130

HILCO HILCOSTEL 6E

Stick electrodes – repair & maintenance – cobalt base

AWS A5.13: E CoCr-A

EN 14700: EZ Co2

Current:

Welding positions:

Hilcostel 6E is our coated electrode for high-grade surfacing parts subject to a combination of metal-to-metal wear, impact, pressure, abrasion, erosion, corrosion, cavitation and high temperatures up to 500ºC. Deposit weld metal is Co-Cr-W alloyed, hardness is 41 HRc, has excellent gliding characteristics, good polish ability, good toughness, and is non-magnetic. After welding the deposit can be machined by grinding or with tungsten carbide cutting tools.

Applications:

Hilcostel 6E produces a cobalt base weld metal, resistant to metal-to-metal wear or erosion at service temperatures up to 500ºC. Weld metal is highly resistant to the most aggressive chemicals.

Applications are universal but typical for hardfacing parts e.g. running and sealing faces on gas, water, steam and acid fittings, valve seats and cones for combustion engines, gliding surfaces metal-to-metal, highly stressed hot working tools without thermal shock, milling mixers, drilling tools.

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni	Fe	W	Co
1,2	0,9	1,1	27,3	2,5	3,3	4,6	Bal.

Mechanical properties, weld metal – typical:

Hardness	
As welded	41 HRc

Packaging and welding data:

Dia. mm.	Length mm.	Current A
3,2	350	115-135

HILCO HILCOSTEL 12E

Stick electrodes – repair & maintenance – cobalt base

AWS A5.13: E CoCr-B

EN 14700: E Co3

Current:

Welding positions:

Hilcostel 12E is our coated electrode for highly wear resistant surfacing parts subject to a combination of metal-to-metal wear, abrasion, erosion, corrosion, pressure and high temperatures up to 700ºC. Deposit weld metal is Co-Cr-W alloyed, hardness is 46 HRc. After welding the deposit can be machined by grinding or with tungsten carbide cutting tools.

Applications:

Hilcostel 12E produces a cobalt base weld metal, resistant to metal-to-metal wear or erosion at service temperatures up to 700ºC. Weld metal is highly resistant to the most aggressive chemicals.

Applications are universal but typical for hardfacing parts e.g. running, sealing and gliding faces on fittings and pumps, tools for wood, paper, plastic, shredding tools, highly stressed hot working tools without thermal shock.

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Ni	Fe	W	Co
1,50	0,9	1,1	28,7	2,6	3,1	8,5	Bal.

Mechanical properties, weld metal – typical:

Hardness	
As welded	46 HRc

Packaging and welding data:

Dia. mm.	Length mm.	Current A
3,2	350	115-135

HILCO ALUMINIL Si5

Stick electrodes – repair & maintenance – aluminium

AWS A5.3: E 4043
EN ISO 18273: E Al 4043 (AlSi5)
Werkstoffnr. 3.2245

Coating type:
Special

Current:
=+

Welding positions:


Aluminil Si5 is our special coated aluminium electrode for welding, repairing and surfacing forged and cast aluminium-silicon alloys and joining dissimilar aluminium alloys with max. 7%Si content. The easy flowing characteristics make the electrode suitable for welding all aluminium castings (except AlMg castings). The electrode has a pure white coating specifically designed to reduce moisture pick-up. For thicker plate materials (≥15 mm) it is recommended to preheat at 150°C to 250°C before welding.

Base materials to be welded:
- Aluminium-MgSi alloys
- Aluminium-Mg alloys up to 2,5% Mg
- Aluminium-MnCu alloys
- Aluminium-Si cast alloys
- Joining dissimilar aluminium alloys

Applications:
- General fabrication & construction
- Shipbuilding & Offshore
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

Mn	Si	Cu	Zn	Fe	Al
0,05	5	0,05	0,10	0,20	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %
As welded	90	160	15

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	9,2	50-80
3,2	350	13,7	70-120
4,0	350	19,6	110-150

HILCO ALUMINIL Si12

Stick electrodes – repair & maintenance– aluminium

EN ISO 18273: E Al 4047 (AlSi12)

Werkstoffnr. 3.2585

Coating type:
Special

Current:
=+

Welding positions:

Aluminil Si12 is our special coated electrode developed for welding all types of aluminium castings and applications where good colour matching with base materials is important. Typical applications include repair welding, surfacing and construction welding: window frames, aluminium tubes, furniture, aluminium castings, engine blocks, and automotive parts. The electrode has a pure white coating specifically designed to reduce moisture pick-up. For thicker plate materials (≥15 mm) it is recommended to preheat at 150°C to 250°C before welding.

Base materials to be welded:

- Aluminium-Si cast alloys up to 12% Si content:
  G-AlSi 12 (Cu), G-AlSi 10 Mg (Cu), G-AlSi 6 Cu 4

Applications:

- General fabrication & construction
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

Mn	Si	Cu	Zn	Fe	Al
0,10	12	0,05	0,10	0,40	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %
As welded	80	180	5

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	9,2	50-80
3,2	350	13,7	70-120
4,0	350	19,6	110-150

HILCO BRONSIL

Stick electrodes – repair & maintenance – non ferrous

AWS A5.6: E CuSn-C (mod.)
EN ISO 17777: Cu 5180B (CuSn7)
Werkstoffnr 2.1025

Coating type:
Basic

Current:

Welding positions:

Bronsil is our basic coated tin-bronze electrode for joining and surfacing copper and copper alloys, phosphor- and tin-bronzes as well as copper-clad plates in mechanical and plant engineering and shipbuilding. The electrode is also suitable for cladding steel and minor repair jobs in cast iron and C/Mn steel. Typical applications include repairing rotors and ship screws.

Base materials to be welded:

- Tin-bronze alloys CuSn 2, CuSn 6, CuSn 8, CuSn 6 Zn
- WNr. 2.1010, 2.1020, 2.1030, 2.1080

Applications:

- Shipbuilding & Offshore
- Repair & Maintenance
- Process Industry

Chemical composition, wt. % weld metal – typical:

Sn	Cu
7,00	Bal.

Mechanical properties, weld metal – typical:

Condition	Tensile strength MPa	Elongation Lo=5d - %	Hardness
As welded	Approx. 300	> 30	Approx. 100 HB

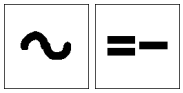
Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	18,5	60-80
3,2	350	34,5	80-100
4,0	350	52,6	100-120

HILCO CUTIL

Stick electrodes – cutting & gouging

Current:



Welding positions:

Cutil is our electrode for cutting, gouging, chamfering and piercing of all metals, including stainless, aluminium, cast iron and non-ferrous alloys. Cutil guarantees welders easy performance, high cutting and gouging rates and easy handling. No oxygen is required. Take precautions when using: when grooving it is advised to lift the work so that the molten parent metal can run off better. The electrode should be set as horizontal as possible to the workpiece and kept in contact constantly. Push the electrode slightly to increase the working speed.

Base materials to be welded:

- Structural steels
- Stainless steels
- Aluminium
- Nickel alloys
- Cast iron
- Copper

Applications:

- All industries related to welding

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
3,2	350	32,3	170-250
4,0	350	50,0	220-330
5,0	350	55,0	300-450

HILCO CARBON GOUGING RODS

Air carbon arc cutting (CAC-A) rods – cutting & gouging

Current: DC

Carbon gouging rods are copper-coated air carbon arc cutting rods made from a mixture of graphite and pure carbon. Typical applications can be found in every field of metalworking, in foundries, steel constructions, shipbuilding, repair & maintenance. Carbon gouging rods are used for weld edge preparations, back-gouging in multipass welding, removing unsatisfactory welds, bolt and wire ends, spatter removal, all kinds of cutting.

Base materials to be welded:

- Carbon, low-alloyed steels
- Stainless steels
- Aluminium
- Nickel alloys
- Cast iron
- Copper alloys
- Magnesium

Applications:

- All industries related to welding

Process description, recommendations for usage

Carbon gouging rods remove molten metal with a jet of air. The intense heat of an arc between the carbon-graphite electrode and a workpiece melts a portion of the metal, while simultaneously a jet of air is passed through the arc to blow away the molten metal. The process (Air carbon arc cutting - CAC-A) is used for cutting and gouging, and it can be done manually or mechanized. Carbon steel, stainless steel, copper alloys, cast irons, aluminium, magnesium and nickel alloys can all be cut with Carbon gouging rods. The process requires an electrode holder, cutting electrodes, a power source and an air supply. Manual electrode holders are similar to shielded metal arc electrode holders (stick electrode holders). The electrode is held in a rotatable head containing air orifices. A valve is provided to turn the air on and off. Carbon gouging rods are round, pointed and copper coated. They are intended to use at DC current.

Packaging and welding data:

Dia. mm.	Length mm.	Current A
6,3	305	250-400
8,0	305	350-500
10,0	305	450-600
12,7	305	600-1000

HILCO HILCHROME G307

MAG wires – repair & maintenance – stainless steel

AWS A5.9: ~ER 307
EN ISO 14343-A: G 18 8 Mn
Werkstoffnr. 1.4370

Wire type:
MAG Solid wire

Current:
=+

Welding positions:


Shielding gas:
M12, M13, M21

Hilchrome G307 is our solid wire for MAG welding dissimilar steels and difficult-to-weld steels. Typical applications include joining 14Mn steels, spring steels, tool steels, and high carbon steels. Hilchrome G307 is recommended for buffer layers prior to surfacing. The deposit weld metal features strain hardenability, excellent cavitation resistance, thermal shock resistance and scaling resistance up to 850ºC.

Base materials to be welded:
- Armour plate
- Hardenable steels incl. DFTW-steels
- Non-magnetic austenitic steels
- Work hardening austenitic manganese steels
- Heat resisting ferritic chromium steels
- Dissimilar joining

Applications:
- Repair & Maintenance
- Transport & Lifting Industry
- Process Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si	Cr	Ni
0,08	7,00	0,80	19,00	9,00

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	370	600	35	20ºC 100

Note: properties under M13

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kg.
1,2	BS300	15

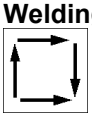
HILCO H-600

MAG wires – repair & maintenance – wear resistant

EN 14700: S Fe8
Werkstoffnr. 1.4718

Wire type:
MAG Solid wire

Current:
=+

Welding positions:


Shielding gas:
M1, M2, M3

H-600 is our solid wire for wear resistant surfacing parts of steel, cast steel and high Mn-steel, subject to abrasion, metal-to-metal wear, impact and/or compression stresses. Deposit weld metal has a martensitic structure, hardness of pure weld deposit approx. 600HB. After welding the deposit can be machined by grinding only.

Applications:
H-600 is particularly suitable under conditions of heavy abrasion and friction, combined with impact. Ideally suitable for applications involving rolling, sliding and metal-to-metal wear.

Applications are universal but typical for hardfacing parts e.g. agricultural, earth moving and stone crushing industry, hardfacing crane and mine car wheels, sprockets and gear teeth, skip guides, dredger buckets, scrapper blades, transfertables, cable sheaves, tractor and shovel parts, dragline buckets, conveyor chains, hammer heads, clutch jaws.

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr
0,45	0,40	3,00	9,20

Mechanical properties, weld metal – typical:

Hardness: 57 – 62 HRc

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kgs.	Current A	Voltage V
1,2	B300	15	130-260	26-31

HILCO HILCORD 600

Cored wires – repair & maintenance – wear resistant

EN 14700: T Fe 6

DIN 8555: MSG 6 – GF – 60 -GP

Werkstoffnr. 1.4718

Wire type:
Metal cored wire

Current:

Welding positions:

Shielding gas:
M21

Hilcord 600 is our seamless metal cored copper coated wire for wear resistant surfacing parts of steel, cast steel and high Mn-steel, subject to abrasion, metal-to-metal wear, impact and/or compression stresses. Deposit weld metal has a martensitic structure, hardness of pure weld deposit approx. 600HB. After welding the deposit can be machined by grinding only.

Applications:
Hilcord 600 is particularly suitable under conditions of heavy abrasion and friction, combined with impact. Ideally suitable for applications involving rolling, sliding and metal-to-metal wear.

Applications are universal but typical for hardfacing parts e.g. agricultural, earth moving and stone crushing industry, hardfacing crane and mine car wheels, sprockets and gear teeth, skip guides, dredger buckets, scrapper blades, transfertables, cable sheaves, tractor and shovel parts, dragline buckets, conveyor chains, hammer heads, clutch jaws.

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	Cr	Mo
0,50	1,50	0,60	5,50	0,60

Mechanical properties, weld metal – typical:

Condition	Hardness
As welded	57 – 62 HRc

Packaging and welding data:

Dia. mm.	Spool type	Weight / spool kgs.	Current A	Voltage V
1,2	B300	16	50-320	12-35

HILCO FLUXCORED Al99,5

Gas welding rods – repair and maintenance – aluminium

AWS A5.10: ~ER 1070

Werkstoffnr. 3.0259

Wire type:
OAW Cored wire

Shielding gas:
Oxy-acetylene

Welding positions:

Fluxcored Al99,5 is our flux cored aluminium wire rod for oxy-acetylene gas welding, repairing and surfacing pure aluminium and wrought aluminium alloys. The internal flux core makes the need of additional fluxes unnecessary.

Base materials to be welded:

- Pure aluminium acc. to DIN 1712 Al99,8 and Al99
- Pure aluminium Werkstoffnr nr. 3.0285 and 3.0205
- Similar aluminium and wrought aluminium alloys

Applications:

- Construction works (aluminium base metals)
- Repair shops

Chemical composition, wt.% weld metal – typical:

Mn	Si	Fe	Cu	Ti	Zn	Mg	Al
0,01	0,1	0,3	0,001	0,01	0,01	0,02	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength Mpa	Tensile strength MPa	Elongation %	Melting range °C
As welded	35	80	30	647 - 658

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
3,0	820	1

HILCO FLUXCORED AlSi5

Gas welding rods – repair & maintenance – aluminium

AWS A5.10: ~ER 4043

Werkstoffnr. 3.2245

Wire type:
OAW Cored wire

Shielding gas:
Oxy-acetylene

Welding positions:

Fluxcored AlSi5 is our flux cored aluminium wire rod for oxy-acetylene gas welding, repairing and surfacing forged and cast aluminium-silicon alloys and joining dissimilar aluminium alloys with max. 7% Si content. The internal flux core makes the need of additional fluxes unnecessary.

Base materials to be welded:

- Aluminium-MgSi alloys
- Aluminium-Mg alloys up to 2,5% Mg
- Aluminium-MnCu alloys
- Aluminium-Si cast alloys
- Joining dissimilar aluminium alloys

Applications:

- General fabrication & construction
- Shipbuilding & Offshore
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Si	Mg	Fe	Cu	Zn	Ti	Al
0,01	4,5	0,01	0,24	0,01	0,02	0,02	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation %	Melting range °C
As welded	60	120	20	573 – 632

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
3,0	820	1

HILCO BRONZE C

Gas welding rods – repair & maintenance – brazing

AWS A5.8: ~RB CuZnA
ISO 17672: ~CU 471
Werkstoffnr. 2.0531

Wire type:
OAW Solid wire

Shielding gas:
Oxy-acetylene

Welding positions:

Bronze C is our low fuming bronze (brass) brazing rod for joining and surfacing steel, copper and copper alloys, brass, grey and malleable cast iron, nickel and nickel alloys. Bronze C produces poreless joints, colour matching with brass. Applications are universal but typical for joining galvanized steel (without destroying its zinc layer), joining non-ferrous metals, tube structures, sanitary installations, fitting and repair work, bicycles, motorcycles, automotive industries, furniture industry. The Mn content guarantees strong and high quality joints.

Base materials to be welded:

- Similar and dissimilar joining
- To be used in combination with HILCO Bronze Flux.

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Repair & Maintenance
- Transport & Lifting Industry
- Process Industry

Chemical composition, wt.% weld metal – typical:

Mn	Si	Sn	Fe	Cu	Zn
0,6	0,25	0,3	0,03	60,0	Bal.

Melting range °C
870 – 900

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,5	1000	5
2,0	1000	5
2,5	1000	5
3,0	1000	5
4,0	1000	5

HILCO BRONZE F

Gas welding rods – repair & maintenance – brazing

AWS A5.8: RB CuZn-C
ISO 17672: CU 671
Werkstoffnr. 2.0533

Wire type:
OAW Solid wire (flux coated)

Shielding gas:
Oxy-acetylene

Welding positions:

Bronze F is our flux coated low fuming bronze (brass) brazing rod for joining and surfacing steel, copper and copper alloys, brass, grey and malleable cast iron, nickel and nickel alloys. Bronze F produces poreless joints, colour matching with brass. The flux coating makes use of additional brazing fluxes unnecessary.

Base materials to be welded:

- Similar and dissimilar joining

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Repair & Maintenance
- Transport & lifting Industry
- Process Industry

Chemical composition, wt.% weld metal – typical:

Mn	Si	Sn	Cu	Zn
0,25	0,10	1,00	58,00	Bal.

Melting range °C
910 – 955

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
2,0	500	2,5
2,5	500	2,5
3,0	500	2,5

HILCO PIPEWELD 6010

Stick electrodes – repair & maintenance – unalloyed steel

AWS A5.1: E 6010

EN ISO 2560-A: E 38 3 C 21

Coating type:
Cellulose

Current:
=+ =−* * Root pass!

Welding positions:

Pipeweld 6010 is our cellulose coated electrode recommended for all welding positions, particularly in vertical down and overhead position. The electrode is characterised by a deeply penetrating, forceful, spray type arc and readily removable slag. The majority of applications are in joining carbon steel, but performance on galvanised and some low-alloy steels is proven to be excellent. Typical applications include shipbuilding, general constructions, bridges, storage tanks, piping and pressure vessel fittings.

Base materials to be welded:

- Ships plate A-E, A(H)32-E(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2G3, St.33-St.52.3, C(K)10-C(K)35
- Boiler steel P235GH-P355GH, HI, HII, 17Mn4, 19Mn6
- Fine grain steel P275N-P355NL2, S275N-S420N, StE285-EStE355, StE285TM-EStE355TM
- Pipe steel P235T1-P355N, L210-L415MB, St37.0-St52.4, St45.8, X42-X60, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance
- Oil & Gas Industry

Chemical composition, wt.% weld metal – typical:

C	Mn	Si
0,12	0,5	0,14

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 390	≥ 470	≥ 22	-30ºC ≥ 47 20ºC ≥ 70

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	17,7	50-80
3,2	350	25,5	80-130

HILCO E6011

Stick electrode – repair & maintenance - unalloyed steel

AWS A5.1: E 6011

Coating type:
Cellulose

Current:

Welding positions:

E6011 is our universal electrode for all welding positions. The electrode is characterised by a deeply penetrating, easy handling, forceful, spray type arc and readily removable slag. E6011 is the ideal choice for welding through light to medium amounts of dirty, rusty, painted or galvanized materials. Typical applications include general-purpose fabrication, repair work, galvanized steel work, structural work and shipbuilding.

Base materials to be welded:

- Ships plate A-D, A(H)32-D(H)36, S315G1S-S355G3S
- Structural steel S185-S355J2, St.33-St.52, C(K)10-C(K)35
- Boiler steel P235GH-P295GH, HI, HII, 17Mn4
- Fine grain steel P275N-P355N, S275N-S355M, StE285-StE 355, StE285-StE355TM
- Pipe steel P235T1-P355N, L210-L360NB, St37.0-St52, St45.8, X42-X52, StE210.7-StE360.7TM
- Cast steel GP240R, GS45

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Power Generation
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

C	Mn	Si	S	P
0,105	0,30	0,092	0,010	0,015

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Impact Values ISO-V J
As welded	≥ 380	≥ 445	≥ 25	-30ºC ≥ 34

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	20,8	50-90
3,2	350	28,8	80-120
4,0	350	43,1	110-150

Welding of Aluminium

Aluminium is successfully welded only after careful thought and preparation. Through correct preparation, it is easier to avoid the pitfalls that can trap the unwary. Therefore, this introduction includes facts on base metals, welding methods, types of joint and filler metals. This introduction is just a general guideline. Please contact us for more information.

Base metals

Aluminium and its alloys can be divided into three major groups:

- Aluminium
- Non-hardenable / non-heat treatable alloys
- Hardenable / heat treatable alloys

Aluminium is developed in various grades of purity. The most common commercial grades contain 99.7-99.5% or 99,0% aluminium. Non-hardenable alloys, i.e. not suitable for heat treatment, contain small amounts of Mn or Mg. AlMn alloys are often made up of between 1.0-1.2%Mn, while AlMg alloys with up to 5% are quite common. AlMgMn alloys are also used. The hardenable alloys contain copper (Cu), magnesium and silicon (Mg+Si), or zinc and magnesium (Zn+Mg).
Aluminium and most of the non-heat treatable and heat treatable alloys possess good weldability. In the case of hardenable alloys with copper and lead additives, there is a risk of hot cracking and therefore they are difficult to weld. Many casting alloys are also suitable for welding except in the case of those, which have a high content of copper or magnesium which cannot be welded.

Welding methods

Aluminium can be welded easily. Consideration must be given to both the welding method, the type of joint and the filler metal. The two dominating welding processes are GMAW (MIG) and GTAW (TIG) welding, but also gas, plasma and resistance welding are used, as well as welding with stick electrodes (SMAW).
Determining the welding process depends on numerous factors. TIG welding is better for thin light-gauge materials, when there is a need for good surface finish and for single sided welding (such as when welding pipes) as well as repair welding. TIG welding is generally done on AC current.
MIG welding is used primarily in the case of thicker or heavy-gauge materials and when high speed is a priority in combination with long continuous welds. Due to the lower heat input, MIG welding results in less distortion in the welding zone. Pulse-arc welding with MIG is an interesting technology.
Stick electrodes are used mainly for repair jobs. The advantage of this process is the simple controllability, as well as the possibility to be flexible in any environment. Low investment costs can be a factor for choosing SMAW.

Types of joint

The type of joint depends on the thickness of the base materials and the type and shape of the workpiece. As a rule no preparation is required for thinner materials. An ordinary I-joint is recommended for single-sided TIG welding plates ≤ 4mm. plate thickness, a 50º V-joint with a 2 to 3 mm. bevelled edge is recommended for double-sided welding plates > 4 mm. thickness. Alternatively, a 90º double V-joint can be applied.
Good joint preparation makes welding easier, saves shielding gas and filler metals, and contributes to the quality of the weld.
A special characteristic of aluminium is the higher melting point of oxide that forms on its surface. To avoid welding defects the joint surface must be scraped or brushed using stainless steel wire brushes.
Bear in mind that welding causes greater deformation in aluminium than it does in steel. It is therefore essential to give careful consideration to all aspects of the welding process.

Filler metals

The choice of which filler metal to use, is based on the composition of the base materials and the requirements of the finished product. Generally speaking, aluminium and non-heat treatable alloys should be welded with matching filler metals. Alloys, which are suitable for hardening, should be welded with a filler metal with a high content of Si or Mg in order to avoid the risk of hot cracking.
If there is a need for a good match in colour between the welded joint and the base materials after anodic treatment, a suitable filler metal should be used.
As in the case of base materials, care must be taken to keep the filler metals clean and free from any contamination (especially oil, grease or dust). Keep your filler metals in warm and dry conditions. In storing stick electrodes take extra precautions and store the electrodes in their original hermetically sealed aluminium cans.

Welding application	Special considerations	Common base materials	Filler metal selection
Shipbuilding and sub-suppliers **Requirements:** **Saltwater corrosion resistance, pressure vessel service, thick plate welding**			
Structural frames	Strength & fatigue, corrosion, extrusions & cut plate	6061 to 6061 6061 to 5086 5086 to 5086 5083 to 5083	AL Mg5 AL Mg5 AL Mg5 AL Mg4,5Mn
Skin	Strength & corrosion	5052 to 5052 5086 to 5086 6061 to 6061 5083 to 5083	AL Mg5, AL Si5 (2nd choice) AL Mg5 AL Mg5 AL Mg4,5Mn
Desalination units	Corrosion & high temperatures	5454 to 5454 5052 to 5052	AL Mg3 AL Mg3
Tube railings	Strength & anodize	6061 to 6061 6063 to 6063	ÁL Mg5 AL Mg5
Structural plate & LNG tanks	Impact strength & cold temperature properties	5083 to 5083	AL Mg4,5Mn
Marine cast hardware	Strength & corrosion	5180 to 5180 5350 to 5350	AL Mg5 AL Mg5
Cars, manufacturing and sub-suppliers **Requirements:** **Thin wall brazing for heat exchangers, corrosion resistant high strength wheels, high torque drive components, body and frame joining**			
Heat exchangers	Pressure seal, corrosion resistance & thin wall burst pressure	3003 to 3003 3003 to 6061 6061 to 6061	AL Si12, AL Si5 (2nd choice) AL Si12, AL Si5 (2nd choice) AL Si12, AL Si5 (2nd choice)
Wheels	Shear strength, fatigue and high temperature	5454 to 5454 5454 to 6061 5356 to 5454	AL Mg3 AL Mg3 AL Mg3
Drive shafts	Torque / shear strength & fatigue	6061 to 6061	AL Mg5
Bumpers & supports	Impact strength, corrosion resistance & extrusions	7005 to 7005 7029 to 7029	AL Mg5
Body panels	Tensile strength, corrosion resistance & thin wall welding	6009 to 6009 6011 to 6011	AL Si5, AL Si12 (2nd choice) AL Si5, AL Si12 (2nd choice)
Frame sections	Strength & fatigue	6061 to 6061	AL Si5
Trucks, buses and trailers **Requirements:** **High quality production welding technology, product cost optimization, product reliability engineering**			
Formed truck panels	Formability & corrosion resistance	5052 to 5052 5052 to 5454 5454 to 5454	AL Mg5 AL Mg5 AL Mg5
Engine blocks cast housings	Weld cracking	356 to 356	AL Si12
Cylinder heads	Weld cracking	A201.0 to A201.0 240.0 to 240.0 242.0 to 242.0	AL Si12 AL Si12 AL Si12
Forged pistons	Weld cracking	2218 to 2218 2618 to 2618	AL Si5 AL Si5

Welding application	Special considerations	Common base materials	Filler metal selection
Trucks, buses and trailers **Requirements:** **High quality production welding technology, product cost optimization, product reliability engineering**			
Truck panels	Strength, cost efficiency & fatigue	5454 to 5454 5086 to 5086 5083 to 5083	AL Mg5, AL Mg3 (2nd choice) AL Mg5 AL Mg5, AL Mg4,5Mn (2nd choice)
Chemical tankers	Strength & corrosion resistance	5254 to 5254	AL Mg4,5Mn
Line heaters & steam liners	Strength & high temperature	5454 to 5454	AL Mg3
Trim	Formability, anodize & polish	5050 to 5050 5005 to 5005	AL Mg5 AL Mg5
Trains, railway cars **Requirements:** **High quality production welding technology, product cost optimization, product reliability engineering**			
Train panels	Strength & fatigue cost efficiency	5454 to 5454 5086 to 5086 5083 to 5083	AL Mg5, AL Mg3 (2nd choice) AL Mg5 AL Mg4,5Mn
Aerospace & defence industry **Requirements:** **Extreme temperature service, maximum strength-to-weld ratios, X-ray inspection standards, armour plate technology, complex joint designs**			
Aerospace hardware	Strength-to-weight ratio	6061 to 6061 6013 to 6013 If anodized PWHT	AL Si5 AL Si5 AL Mg5 AL Si5
Turbine blades and torque converters	Strength-to-weight ratio	711.0 to 711.0	AL Mg5
Armour plate	Impact strength & strength-to-weight ratio	5083 to 5083 7039 to 7039	AL Mg5 AL Mg5
Military bridges	Strength-to-weight ratio	7039 to 7039 PWHT	AL Mg5
Other transport equipment **Requirements:** **Alloys for maximum strength-to-weight ratios, high strength thin wall joining, complex heat treatment**			
Bicycle frames & sport wheels	Strength fatigue & anodize	6061 to 6061 6061 to 6061 PWHT 7005 to 7005 7046 to 7046 5086 to 5086	AL Mg5 AL Si5 AL Mg5, AL Mg4,5Mn (2nd choice) AL Mg5, AL Mg4,5Mn (2nd choice) AL Mg5
Tops & sleds	Deep drawing & forming	1070 to 1070 1100 to 1100	AL 99,7 AL Si5
Frame extrusions & body sheet	Strength-to-weight ratio & forming	6061 to 6061 5454 to 5454 5086 to 5086 5052 to 5052	AL Mg5 AL Mg5 AL Mg5 AL Mg5

Welding application	Special considerations	Common base materials	Filler metal selection
Energy generation incl. boilers and pressure vessels. Turbines. power plants, windmills **Requirements:** **Defect free production welding technology, special alloys for specific environments**			
Pressure vessel	Strength	5456 to 5456	AL Mg4,5Mn AL Mg4,5MnZr (on request) AL Mg5Mn (on request)
Marine & cryogenic tanks	Temperature & strength	5083 to 5083	AL Mg4,5Mn
Chemical tanks	Chemical (acids), processing (food), H_2O_2, corrosion & strength	1060 to 1060 1100 to 1100 3003 to 3003 5254 to 5254	AL Si5 AL Si5 AL Si5 AL Mg3
General repair & maintenance **Requirements:** **In field repair of cast aluminium objects, in workshop repair of aluminium objects, anodized aluminium parts**			
General repairs of aluminium products e.g. cylinders heads, machine bases, small engine crank cases, marine etc.	Pure/cast Al anodized, Mn & Mg Al alloys, AlMgSi alloys, unalloyed aluminium cast silicon aluminium alloys general grades	N/A N/A 6060 / 6083 N/A N/A all	AL 99,7 AL Mg3

Aluminium base materials, the alloy designation, their application		
International registration	**Alloy**	**Typical applications**
1070, 1200	Al99,7 Al99,0	Body panels for tanks used for chemical and food industry, dairy industry, breweries, packaging industry, household appliances, electronic industry
3103	AlMn1	Buildings, heat exchangers, roof coverings
5052, 5251	AlMg2,5 AlMg2Mn0,3	Tanks, body panels and construction in contact with seawater and -air
5083	AlMg4,5Mn	Shipbuilding, tanks and tubes for transportation liquid gases, armour plate
5086	AlMg4Mn	Shipbuilding and car bodies
5454	AlMg2,7Mn	Shipbuilding, car bodies, transportation industry
6005A	AlMgSi0,7	General construction grade, roof constructions, light poles, pipelines
6060, 6063	AlMgSi0,5	Building materials, windows, doors
6061	AlMg1SiCu	General construction grade for dynamic stressed constructions, bridges
6082	AlMgSi1	Car body industry
7020	AlZn4,5Mg1	Non-marine applications, cars, armour plate

No.	**HILCO**	**AWS Spec.**	**Werkstoffnr.**	**Available as**			
				SMAW	**GMAW**	**GTAW**	**OAW**
1	AL 99,7	-	3.0259		•	•	•
2	AL Si5	ER 4043	3.2245	•	•	•	•
3	AL Si12	ER 4047	3.2585	•	•	•	•
4	AL Mg3 on request	ER 5754	3.3536		•	•	
5	AL Mg4,5Mn	ER 5183	3.3548		•	•	
6	AL Mg5	ER 5356	3.3556		•	•	

Consumable selector							
Base materials	**7020**	**6005A, 6060, 6061, 6063, 6082**	**5083**	**5086**	**5454**	**5052, 5251**	**1070, 1200, 3103**
1070, 1200, 3103	2	6, 2	6	6	5, 2	5, 2	1
5052, 5251	5	5, 2	6	6	6	6	
5454	5	6	6	6	6		
5086	5	6	6	6			
5083	5	6	5				
6005A, 6060, 6061, 6063, 6082	5, 2	6					
7020	5						

Notes: for welding alloy 7020 it is possible to use filler metal no. 6 instead of no. 5.
For workpieces subject to anodic treatment we recommend filler metal no. 6.

HILCO ALUMINIL Si5

Stick electrodes – aluminium

AWS A5.3: E 4043
EN ISO 18273: E Al 4043 (AlSi5)
Werkstoffnr. 3.2245

Coating type:
Special

Current:
=+

Welding positions:

Aluminil Si5 is our special coated aluminium electrode for welding, repairing and surfacing forged and cast aluminium-silicon alloys and joining dissimilar aluminium alloys with max. 7% Si content. The easy flowing characteristics make the electrode suitable for welding all aluminium castings (except AlMg castings). The electrode has a pure white coating specifically designed to reduce moisture pick-up. For thicker plate materials (≥15 mm) it is recommended to preheat at 150°C to 250°C before welding.

Base materials to be welded:

- Aluminium-MgSi alloys
- Aluminium-Mg alloys up to 2,5% Mg
- Aluminium-MnCu alloys
- Aluminium-Si cast alloys
- Joining dissimilar aluminium alloys

Applications:

- General fabrication & construction (aluminium base metals)
- Shipbuilding & Offshore
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

Mn	Si	Cu	Zn	Fe	Al
0,05	5	0,05	0,10	0,20	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %
As welded	90	160	15

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	9,2	50-80
3,2	350	13,7	70-120
4,0	350	19,6	110-150

HILCO ALUMINIL Si12

Stick electrodes – aluminium

EN ISO 18273: E Al 4047 (AlSi12)

Werkstoffnr. 3.2585

Coating type:
Special

Current:
=+

Welding positions:

Aluminil Si12 is our special coated electrode developed for welding all types of aluminium castings and applications where good colour matching with base materials is important. Typical applications include repair welding, surfacing and construction welding: window frames, aluminium tubes, furniture, aluminium castings, engine blocks, and automotive parts. The electrode has a pure white coating specifically designed to reduce moisture pick-up. For thicker plate materials (≥15 mm) it is recommended to preheat at 150°C to 250°C before welding.

Base materials to be welded:

- Aluminium-Si cast alloys up to 12% Si content:
  G-AlSi 12 (Cu), G-AlSi 10 Mg (Cu), G-AlSi 6 Cu 4

Applications:

- General fabrication & construction
- Repair & Maintenance

Chemical composition, wt. % weld metal – typical:

Mn	Si	Cu	Zn	Fe	Al
0,10	12	0,05	0,10	0,40	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %
As welded	80	180	5

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	9,2	50-80
3,2	350	13,7	70-120
4,0	350	19,6	110-150

HILCO AlSi5

MIG wire – aluminium

AWS A5.10: ER 4043

EN ISO 18273: S Al 4043A (AlSi5(A))

Werkstoffnr. 3.2245

Wire type:
MIG Solid wire

Current:
=+

Welding positions:


Shielding gas:
I1-I3

AlSi5 is aluminium wire for MIG welding, repairing and surfacing forged and cast aluminium-silicon alloys and joining dissimilar aluminium alloys with maximum 7%Si content. The easy flowing characteristics make the wire suitable for welding all aluminium castings (except AlMg castings).

Base materials to be welded:

- Aluminium-MgSi alloys
- Aluminium-Mg alloys up to 2,5% Mg
- Aluminium-MnCu alloys
- Aluminium-Si cast alloys
- Joining dissimilar aluminium alloys

Applications:

- General fabrication & construction (aluminium base metals)
- Shipbuilding & Offshore
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Si	Fe	Cu	Al
≤ 0,15	5,0	≤ 0,60	≤ 0,30	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Physical properties	
As welded	≥ 40	≥ 120	≥ 8	Melting range 573-625ºC	Density 2,68 g/cm^3

Packaging data:

Dia. mm.	Spool type	Weight / spool kg.
1,2	BS300	7

HILCO AlMg4,5Mn

MIG wire – aluminium

AWS A5.10: ER 5183

EN ISO 18273: S Al 5183 (AlMg4,5Mn0,7(A))

Wire type:
MIG Solid wire

Current:
=+

Welding positions:


Shielding gas:
I1-I3

AlMg4,5Mn is our aluminium wire for MIG welding forged and cast aluminium-manganese and aluminium-magnesium alloys in applications where high tensile strengths and/or excellent resistance to sea water is required. Typical applications include shipbuilding, tank building and general construction welding.

Base materials to be welded:
- Aluminium-manganese alloys
- Aluminium-magnesium alloys
- Aluminium-MgSi alloys
- Similar aluminium alloys

Applications:
- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Cr	Mg	Fe	Al
0,80	0,15	4,7	0,40	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Physical properties	
As welded	≥ 130	≥ 275	≥ 18	Melting range 574-638ºC	Density 2,66 g/cm^3

Packaging data:

Dia. mm.	Spool type	Weight / spool kg.
1,2	BS300	7

HILCO AlMg5

MIG wire – aluminium

AWS A5.10: ER 5356

EN ISO 18273: S Al 5356 (AlMg5Cr(A))

Wire type:
MIG Solid wire

Current:
=+

Welding positions:


Shielding gas:
I1-I3

AlMg5 is our aluminium wire for MIG welding forged and cast aluminium-manganese and aluminium-magnesium alloys with a maximum of 5% Mg content. Typical applications include shipbuilding, tank building, railway and car industry.

Base materials to be welded:
- Aluminium-manganese alloys
- Aluminium-magnesium alloys
- Aluminium-MgSi alloys
- Similar aluminium alloys

Applications:
- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Transport & Lifting Industry

Chemical composition, wt.% weld metal – typical:

Mn	Cr	Mg	Ti	Al
0,15	0,15	5,0	0,09	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Physical properties	
As welded	≥ 120	≥ 250	18	Melting range 575-633ºC	Density 2,64 g/cm^3

Packaging data:

Dia. mm.	Spool type	Weight / spool kg.
0,8	BS300	7
1,0	BS300	7
1,2	BS300	7

HILCO Al99,7

TIG rods – aluminium

AWS A5.10: ~ER1100
EN ISO 18273: S Al 1070 (Al 99,7)

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1

Al99,7 is our aluminium wire for TIG welding pure aluminium and wrought aluminium alloys. Highly resistant to chemical attack and weathering. It is a relatively soft alloy that is very formable and it is used extensively in thin-gauge and foil products. Deposit weld metal has good mechanical properties. Typical applications include repair welding engine blocks, oil-castings, automotive parts and aluminium pump housings. To be used in combination with tungsten electrodes type WP.

Base materials to be welded:

- Pure aluminium Al99,5, Al99,7, Al99,8 and Al99
- Pure aluminium Werkstoffnr. 3.0255, 3.0275, 3.0285 and 3.0205
- Similar aluminium and wrought aluminium alloys

Applications:

- General fabrication & construction
- (aluminium base metals)
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Si	Mg	Fe	Cu	Ti	Zn	Al
0,03	0,20	0,03	0,25	0,03	0,03	0,07	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %
As welded	20	65	35

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,2	1000	5

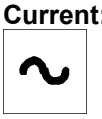
HILCO AlSi5

TIG rods – aluminium

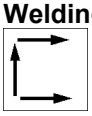
AWS A5.10: ER 4043
EN ISO 18273: S Al 4043A (AlSi5(A))
Werkstoffnr. 3.2245

Wire type:
TIG Solid wire

Current:



Welding positions:



Shielding gas:
I1 – I3

AlSi5 is aluminium wire for TIG welding, repairing and surfacing forged and cast aluminium-silicon alloys and joining dissimilar aluminium alloys with max. 7% Si content. The easy flowing characteristics make the wire suitable for welding all aluminium castings (except AlMg castings). This type can be used in combination with tungsten electrodes type WP.

Base materials to be welded:

- Aluminium-MgSi alloys
- Aluminium-Mg alloys up to 2,5% Mg
- Aluminium-MnCu alloys
- Aluminium-Si cast alloys
- Joining dissimilar aluminium alloys

Applications:

- General fabrication & construction (aluminium base metals)
- Shipbuilding & Offshore
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Si	Fe	Cu	Al
≤ 0,15	5,0	≤ 0,60	≤ 0,30	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Physical properties	
As welded	≥ 40	≥ 120	≥ 8	Melting range 573-625ºC	Density 2,68 g/cm^3

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,2	1000	5

HILCO AlSi12

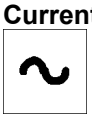
TIG rods - aluminium

AWS A5.10: ER 4047

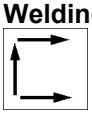
EN ISO 18273: S Al 4047A / AlSi12(A)

Wire type:
TIG Solid wire

Current:



Welding positions:



Shielding gas:
I1-I3

AlSi12 is our aluminium wire for TIG welding all types of aluminium castings and applications where good colour matching with base materials is important. Typical applications include repair welding, surfacing and construction welding: window frames, aluminium tubes, furniture, aluminium castings, engine blocks, and automotive parts. To be used in combination with tungsten electrodes type WP.

Base materials to be welded:

- Aluminium-Si cast alloys up to 12% Si content: G-AlSi 12 (Cu), G-AlSi 10 Mg (Cu), G-AlSi 6 Cu 4

Applications:

- General fabrication & construction (aluminium base metals)
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Si	Fe	Cu	Al
≤ 0,15	12,0	≤ 0,60	≤ 0,30	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Physical properties	
As welded	≥ 60	≥ 130	≥ 5	Melting range 573-585ºC	Density 2,65 g/cm^3

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,2	1000	5

HILCO AlMg4,5Mn

TIG rods – aluminium

AWS A5.10: ER 5183

EN ISO 18273: S Al 5183 (AlMg4,5Mn0,7(A))

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1-I3

AlMg4,5Mn is our aluminium wire for TIG welding forged and cast aluminium-manganese and aluminium-magnesium alloys in applications where high tensile strengths and/or excellent resistance to seawater is required. Typical applications include shipbuilding, tank building and general construction welding. To be used in combination with tungsten electrodes type WP.

Base materials to be welded:

- Aluminium-manganese alloys
- Aluminium-magnesium alloys
- Aluminium-MgSi alloys
- Similar aluminium alloys

Applications:

- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Cr	Mg	Ti	Al
0,80	0,15	4,7	< 0,15	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Physical properties	
As welded	≥ 130	≥ 275	≥ 18	Melting range 574-638ºC	Density 2,66 g/cm^3

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,2	1000	5

HILCO AlMg5

TIG rods – aluminium

AWS A5.10: ER 5356

EN ISO 18273: S Al 5356 (AlMg5Cr(A))

Wire type:
TIG Solid wire

Current:

Welding positions:

Shielding gas:
I1-I3

AlMg5 is our aluminium wire for TIG welding forged and cast aluminium-manganese and aluminium-magnesium alloys with a maximum of 5% Mg content. Typical applications include shipbuilding, tank building railway and car industry. To be used in combination with tungsten electrodes type WP.

Base materials to be welded:

- Aluminium-manganese alloys
- Aluminium-magnesium alloys
- Aluminium-MgSi alloys
- Similar aluminium alloys

Applications:

- Shipbuilding & Offshore
- Power Generation
- General fabrication & construction
- Transport & Lifting Industry

Chemical composition, wt.% weld metal – typical:

Mn	Cr	Mg	Ti	Al
0,15	0,15	5,0	0,09	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Physical properties	
As welded	≥ 120	≥ 250	≥ 18	Melting range 575-633ºC	Density 2,64 g/cm^3

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
2,0	1000	5
2,4	1000	5
3,2	1000	5

HILCO AlSi5 (OAW)

Gas welding rods – aluminium

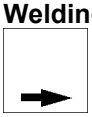
AWS A5.10: ER 4043

EN ISO 18273: S Al 4043A (AlSi5(A))

Wire type:
OAW Solid wire

Shielding gas:
Oxy-acetylene

Welding positions:



AlSi5 is our aluminium wire for oxy-acetylene gas welding, repairing and surfacing forged and cast aluminium-silicon alloys and joining dissimilar aluminium alloys with maximum 7% Si content. The easy flowing characteristics make the wire suitable for welding all aluminium castings (except AlMg castings).

Base materials to be welded:

- Aluminium-MgSi alloys
- Aluminium-Mg alloys up to 2,5% Mg
- Aluminium-MnCu alloys
- Aluminium-Si cast alloys
- Joining dissimilar aluminium alloys

Applications:

- General fabrication & construction (aluminium base metals)
- Shipbuilding & Offshore
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Si	Fe	Cu	Al
≤ 0,15	5,0	≤ 0,60	≤ 0,30	Bal.

Physical properties	
Melting range 573-625ºC	Density 2,68 g/cm^3

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,2	1000	5

HILCO AlSi12 (OAW)

Gas welding rods – aluminium

AWS A5.10: ER 4047

EN ISO 18273: S Al 4047A / AlSi12(A)

Wire type:
OAW Solid wire

Shielding gas:
Oxy-acetylene

Welding positions:

AlSi12 is our aluminium wire for oxy-acetylene gas welding all types of aluminium castings and applications where good colour matching with base materials is important. Typical applications include repair welding, surfacing and construction welding: window frames, aluminium tubes, furniture, aluminium castings, engine blocks, and automotive parts.

Base materials to be welded:

- Aluminium-Si cast alloys up to 12% Si content:
- G-AlSi 12 (Cu), G-AlSi 10 Mg (Cu), G-AlSi 6 Cu 4

Applications:

- General fabrication & construction
- (aluminium base metals)
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Si	Fe	Cu	Al
≤ 0,15	12,0	≤ 0,60	≤ 0,30	Bal.

Physical properties	
Melting range 573-585ºC	Density 2,65 g/cm^3

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,6	1000	5
2,0	1000	5
2,4	1000	5
3,2	1000	5

HILCO FLUXCORED Al99,5

Gas welding rods – aluminium

AWS A5.10: ~ER 1070

Werkstoffnr. 3.0259

Wire type:
OAW Cored wire

Shielding gas:
Oxy-acetylene

Welding positions:

Fluxcored Al99,5 is our flux cored aluminium wire rod for oxy-acetylene gas welding, repairing and surfacing pure aluminium and wrought aluminium alloys. The internal flux core makes the need of additional fluxes unnecessary.

Base materials to be welded:

- Pure aluminium acc. to DIN 1712 Al99,8 and Al99
- Pure aluminium Werkstoffnr nr. 3.0285 and 3.0205
- Similar aluminium and wrought aluminium alloys

Applications:

- Construction works (aluminium base metals)
- Repair shops

Chemical composition, wt.% weld metal – typical:

Mn	Si	Fe	Cu	Ti	Zn	Mg	Al
0,01	0,1	0,3	0,001	0,01	0,01	0,02	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation Lo=5d - %	Melting range °C
As welded	35	80	30	647 – 658

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
3,0	820	1

HILCO FLUXCORED AlSi5

Gas welding rods – aluminium

AWS A5.10: ~ER 4043

Werkstoffnr. 3.2245

Wire type:
OAW Cored wire

Shielding gas:
Oxy-acetylene

Welding positions:

Fluxcored AlSi5 is our flux cored aluminium wire rod for oxy-acetylene gas welding, repairing and surfacing forged and cast aluminium-silicon alloys and joining dissimilar aluminium alloys with maximum 7% Si content. The internal flux core makes the need of additional fluxes unnecessary.

Base materials to be welded:

- Aluminium-MgSi alloys
- Aluminium-Mg alloys up to 2,5% Mg
- Aluminium-MnCu alloys
- Aluminium-Si cast alloys
- Joining dissimilar aluminium alloys

Applications:

- General fabrication & construction
- Shipbuilding & Offshore
- Repair & Maintenance

Chemical composition, wt.% weld metal – typical:

Mn	Si	Mg	Fe	Cu	Zn	Ti	Al
0,01	4,5	0,01	0,24	0,01	0,02	0,02	Bal.

Mechanical properties, weld metal – typical:

Condition	0,2% Yield strength MPa	Tensile strength MPa	Elongation %	Melting range °C
As welded	60	120	20	573 – 632

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
3,0	820	1

Copper and copper alloys and their weldability
Copper and copper alloys are often chosen because of their corrosion resistance and electrical and thermal conductivity. This introduction identifies the various types of copper alloys and gives information about the production process of these materials and their weldability.

Material types
Copper and copper alloys are grouped by their principal alloying element:

- **C** Pure copper
- **CH** Copper with small alloy additions
- **CZ** Copper-zinc / brass
- **NS** Copper-zinc-nickel / nickel silver
- **PB** Copper-tin-bronze (phosphor bronze alloys also contain phosphorous in their alloy)
- **G** Copper-tin-zinc, gun metal (some alloys contain lead)
- **CA** Copper-aluminium, aluminium bronze (most alloys also contain iron and nickel)
- **CN** Copper-nickel, cupronickel

Pure Copper (C)
Is normally supplied in one of three forms i.e. oxygen bearing, phosphorous deoxidised copper, or oxygen-free copper. For welding jobs, oxygen-free and phosphorous deoxidised copper should be selected as they are more easily welded. TIG and MIG are the preferred welding processes; OAW and SMAW can be used for repair jobs on oxygen bearing tough pitch copper. In order to counteract the high thermal conductivity, He and NO-based gases can be used as an alternative to argon.

Copper with small alloy additions (CH)
Grades with additions of sulphur and tellurium are considered as not weldable. Copper with small additions of chromium, zirconium or beryllium can be welded but with care.

Copper-zinc alloys / brass (CZ) - Copper-zinc-nickel / nickel silver (NS)
Brasses can be separated into two weldable groups, low zinc (≤ 20% Zn) and high zinc (30% - 40% Zn). Nickel silvers contain 20% to 45% Zn and nickel to improve strength. The main problem in fusion welding these alloys is the volatilisation of the zinc, which results in white fumes of zinc oxide and weld metal porosity. Only low zinc brasses are considered suitable for fusion welding using TIG and MIG.

Bronzes – Tin bronze, Phosphor bronze (PB), Silicon bronze and gun metal (G)
Tin bronze contains between 1% and 10% Sn, phosphorbronze contains up to 10% phosphorous. Gunmetal is essentially a tin bronze with up to 5% Zn and may also have 5% lead. Silicon bronze contains typically 3% Si and 1% Mn and is the easiest to weld.
Bronzes are weldable using matching filler metals. Gas welding of phosphor bronzes is subject to porosity which can be avoided by using a higher level of deoxidants. Gun metal cannot be welded.

Aluminium bronze (CA)
There are two types of aluminium bronzes: single phase alloys containing between 5% and 10% aluminium, with a small amount of iron or nickel, and, two phase alloys containing up to 12% aluminium and about 5% iron with specific alloys containing Ni, Mn, Si. Gas shielded welding processes are preferred, TIG welding requires AC under Argon gas shielding or DC with a Helium gas.

Cupro-Nickels (CN)
Cupro-nickel alloys contain between 5% and 30% nickel with specific alloys having additions of iron and manganese; 90-10 and 70-30 (Cu-Ni) are commonly welded grades. These alloys are single phase and are weldable using inert gas processes and SMAW. A matching filler metal is normally used but 70-30 is often regarded as a universal filler metal for these alloys.

Brazing with silver-containing filler metals
Brazing with a silver-containing filler metal is one of the most versatile methods of metal joining used, for a number of reasons:

- It is cost-effective and very little braze alloy is required to produce a brazed joint. With properly designed joints, brazing will compare favourably to any other metal joining method;
- The joints produced are strong. Strength data are typically close to, and on occasions exceed the typical strength of the base materials brazed;
- Joints produced are ductile, able to withstand considerable shock and vibration;
- The joints are generally produced easily and quickly;
- Brazing is excellent for dissimilar joining. You can easily join metals with widely different melting points;
- It can join metals with different cross sections. For example, joining 0.1 mm. thick copper foil to a 2.5 mm. thick steel plate is relatively easy to braze. It is almost impossible to weld;
- Joints have excellent stress distribution and heat transfer. The braze fillet formed is ideally shaped to resist fatigue;
- The process is highly suitable for automation. Typical automation methods include torch, furnace, induction and resistance heating;
- After brazing there is seldom any need for grinding, filling or mechanical finishing after the joint is completed. This is cost-reducing and particularly beneficial for assemblies to be plated;
- The joints virtually make themselves by capillary action, complex geometries are as easy to join as simple ones;
- Brazing is done at relatively low temperature ranges, excellent for heat input sensitive materials and workpieces subject to hot cracking.

The process
Silver brazing uses a silver-containing alloy with a melting temperature above 450ºC but below the melting point of the metals to be joined. In brazing, the base metals are heated, usually to a point slightly above the liquidus (flow point) of the filler metal, causing it to melt. The filler metal then flows into the parallel joint clearance between the two base materials by capillary attraction and bonds to their surfaces through atomic attraction and diffusion. Unlike other methods of metal joining, in brazing we are interested in the alloy flowing between closely fitted members. For successful brazing you need to understand the fundamentals of brazing. When the following brazing fundamentals are understood, problem solving becomes a simple matter:

- **Good fit and proper clearance**
- **Clean base metals**
- **Proper fixturing**
- **Proper fluxing/atmosphere**
- **Heating the assembly**
- **Cleaning the brazed assembly**

Good fit and proper clearance
Any braze alloy relies on capillary action to distribute the brazing filler metal throughout the joint interface. Capillary action is the force that pulls a liquid through two parallel surfaces. In brazing, the clearance at which capillary action is most effective is in the 0.03 to 0.10 mm. range. Joint clearance also has a profound impact on joint strength. Upon brazing stainless steel the strongest joint (930 MPa) is achieved with a joint clearance of 0.038 mm. In every day practice any slip fit will give you a perfectly adequate brazed joint between two tubular parts. If you are joining two flat parts, you can simply rest one on top of the other. The clearance provided by the average "mill finish" is usually adequate to create capillary paths for the flow of molten filler metal.

Cleaning the metals
Capillary action will work properly only when the surfaces of the metals are clean. Contaminants, such as oil, grease, rust, scale or dirt, must be removed. If they remain, they will form a barrier between the base metal surfaces and the brazing materials. Start by getting rid of oil and grease, usually done by dipping the part into a degreasing solvent, or by vapour degreasing, alkaline or aqueous cleaning. If the metal surfaces are coated with oxide or scale, remove these chemically or mechanically. For chemical removal, used an acid pickle treatment. Mechanical removal calls for abrasive cleaning. Particularly in repair brazing, where parts can be very dirty or rusted, you can speed the cleaning process by using emery cloth, a grinding wheel, a file or metallic shot blast.
Once the parts are thoroughly clean, it is recommended to flux and braze as soon as possible. This way, there is the least chance for recontamination of surfaces.

Fluxing the parts
Flux is a chemical compound applied to the joint surfaces before brazing. Its use is essential for brazing as the coating of flux on the joint area will shield the surfaces from the air, preventing oxide formation. The flux will also dissolve and absorb any oxides that form during heating or those not completely removed during the cleaning process. HILCO brazing fluxes conventionally come in powder form, which is made into a paste by stirring in water. Flux the assembly just before brazing, if possible.
Fluxing is usually an essential step in the brazing operation. There are a couple of exceptions to this rule. You can join copper to copper without flux by using a brazing filler metal specially formulated for the job, such as silver-copper-phosphorus alloys (L-Ag2P, L-Ag5P, L-Ag15P). The P content in these alloys acts as a fluxing agent on copper.

Proper fixturing
If the shape and weight of the part permit, the simplest way to hold them together is by gravity. If you have a number of assemblies to braze it may be a good idea to use a brazing support fixture. If you need to fixture close to the joint use a non-wetting material for the fixture, such as titanium.

Heating the assembly
This step brazes the joint. It involves heating the joint to brazing temperature and flowing the filler metal through the joint. Both metals in the assembly should be heated as uniformly as possible to reach brazing temperature at the same time. Therefore, when joining a thick section to a thin section, more heat should be applied to the thick section. Or, when joining a good conductor of heat to a poor conductor, such as copper to stainless steel, more heat will have to be applied to the good conductor (copper). The flux is used as an indicator for even heating.
In manual brazing, when the assembly reaches brazing temperature, hold the brazing rod carefully against the joint area. Do not heat the brazing rod directly. The heated assembly will melt off a portion of the brazing rod, which will instantly be drawn by capillary action throughout the entire joint area. We recommend that you heat the side of the assembly opposite the point where you are going to feed the filler metal.
If using preforms (slugs, washers, shims or special shapes of filler metal) preplace them in the joint before applying heat to the assembly.

Cleaning the brazed assembly
Post cleaning of brazed assemblies is done primarily to remove flux residue. Flux removal is a simple, but essential, operation to prevent flux residue attacking the base metal, thereby possibly weakening the joint. Most fluxes are soluble in water. The easiest way to remove them is to submerse the assembly in hot water.

Application	Metal to metal		Filler metal	Brazing flux	Working temperature ºC
Water and gas installations	Copper	Copper	L-Ag 2P	Silver solder flux	710
	Copper	Copper	L-Ag 45 Sn	Silver solder flux	670
Refrigeration units without ammonia	Copper	Copper	L-Ag 5P	-	710
	Copper	Tin-bronze	L-Ag 15P	Silver solder flux	710
Heating installations	Copper	Tin-bronze	L-Ag 2P	Silver solder flux	710
Heat exchangers, oil coolers, air conditioners, gas burners, boilers	Copper	Copper	L-Ag 2P	-	710
Instrument parts	Copper	Copper	L-Ag 2P	-	710
	Copper	Copper	L-Ag 5P	-	710
	Brass	Copper	L-Ag 15P	-	650
Parts in contact with drinking water	Stainless	Stainless	L-Ag 55 Sn	Silver solder flux	650
	Stainless	Copper	L-Ag 45 Sn	Silver solder flux	670
	Stainless	Brass	L-Ag 45 Sn	Silver solder flux	670
Heating, cooling and kitchen equipment for in-house usage	Copper	Copper	L-Ag 2P	-	710
	Copper	Copper	L-Ag 5P	-	710
	Copper	Copper	L-Ag 15P	-	710
	Brass	Brass	L-Ag 34 Sn	Silver solder flux	710
	Brass	Copper	L-Ag 45 Sn	Silver solder flux	670
	Brass	Stainless	L-Ag 45 Sn	Silver solder flux	670
Tubular furniture and camping gas equipment	Stainless	Stainless	L-Ag 55 Sn	Silver solder flux	650
	Stainless	Copper	L-Ag 55 Sn	Silver solder flux	650

HILCO BRONSIL

Stick electrodes – non ferrous

AWS A5.6: E CuSn-C (mod.)
EN ISO 17777: Cu 5180B (CuSn7)
Werkstoffnr 2.1025

Coating type:
Basic

Current:

Welding positions:

Bronsil is our basic coated tin-bronze electrode for joining and surfacing copper and copper alloys, phosphor- and tin-bronzes as well as copper-clad plates in mechanical and plant engineering and shipbuilding. The electrode is also suitable for cladding steel and minor repair jobs in cast iron and C/Mn steel. Typical applications include repairing rotors and ship screws.

Base materials to be welded:

- Tin-bronze alloys CuSn 2, CuSn 6, CuSn 8, CuSn 6 Zn
- WNr. 2.1010, 2.1020, 2.1030, 2.1080

Applications:

- Shipbuilding & Offshore
- Repair & Maintenance
- Process Industry

Chemical composition, wt. % weld metal – typical:

Sn	Cu
7,00	Bal.

Mechanical properties, weld metal – typical:

Condition	Tensile strength MPa	Elongation Lo=5d - %	Hardness
As welded	Approx. 300	> 30	Approx. 100 HB

Packaging and welding data:

Dia. mm.	Length mm.	Weight (kgs) 1000 pcs.	Current A
2,5	350	18,5	60-80
3,2	350	34,5	80-100
4,0	350	52,6	100-120

HILCO BRONZE C

Gas welding rods – non ferrous – brazing

AWS A5.8: ~RB CuZnA
ISO 17672: ~CU 471
Werkstoffnr. 2.0531

Wire type:
OAW Solid wire

Shielding gas:
Oxy-acetylene

Welding positions:

Bronze C is our low fuming bronze (brass) brazing rod for joining and surfacing steel, copper and copper alloys, brass, grey and malleable cast iron, nickel and nickel alloys. Bronze C produces poreless joints, colour matching with brass. Applications are universal but typical for joining galvanized steel (without destroying its zinc layer), joining non-ferrous metals, tube structures, sanitary installations, fitting and repair work, bicycles, motorcycles, automotive industries, furniture industry. The Mn content guarantees strong and high quality joints.

Base materials to be welded:

- Similar and dissimilar joining
- To be used in combination with HILCO Bronze Flux.

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Repair & Maintenance
- Transport & Lifting Industry
- Process Industry

Chemical composition, wt.% weld metal – typical:

Mn	Si	Sn	Fe	Cu	Zn
0,6	0,25	0,3	0,03	60,0	Bal.

Melting range
870-900ºC

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
1,5	1000	5
2,0	1000	5
2,5	1000	5
3,0	1000	5
4,0	1000	5

HILCO BRONZE F

Gas welding rods – non ferrous – brazing

AWS A5.8: RB CuZn-C
ISO 17672: CU 671
Werkstoffnr. 2.0533

Wire type:
OAW Solid wire (flux coated)

Shielding gas:
Oxy-acetylene

Welding positions:

Bronze F is our flux coated low fuming bronze (brass) brazing rod for joining and surfacing steel, copper and copper alloys, brass, grey and malleable cast iron, nickel and nickel alloys. Bronze F produces poreless joints, colour matching with brass. The flux coating makes use of additional brazing fluxes unnecessary.

Base materials to be welded:

- Similar and dissimilar joining

Applications:

- Shipbuilding & Offshore
- General fabrication & construction
- Repair & Maintenance
- Transport & lifting Industry
- Process Industry

Chemical composition, wt.% weld metal – typical:

Mn	Si	Sn	Cu	Zn
0,25	0,10	1,00	58,00	Bal.

Melting range °C
910 – 955

Packaging data:

Dia. mm.	Length mm.	Weight / package kg.
2,0	500	2,5
2,5	500	2,5
3,0	500	2,5

Silver-Copper-Phosphorus Brazing rods							
Type	**Composition**				**Melting range**	**Classification**	
	Ag	Cu	P	others		AWS A5.8	ISO 17672
L-Ag 2 P	2,0	91,8	6,2	-	645-825ºC	~BCuP-6	CuP 279
L-Ag 5 P	5,0	89,0	6,0	-	645-815ºC	BCuP-3	CuP 281[a]
L-Ag 15 P	15,0	80,0	5,0	-	645-800ºC	BCuP-5	CuP 284

Cadmium free Silver Brazing Rods							
Type	**Composition**				**Melting range**	**Classification**	
	Ag	Cu	Zn	others		AWS A5.8	ISO 17672
L-Ag 20 Si [1]	20,0	43,9	Bal.	Si: 0,1	690-810ºC	-	Ag 220
L-Ag 30 Sn	30,0	36,0	Bal.	Sn: 2,0	665-755ºC	-	Ag 130
L-Ag 34 Sn [1]	34,0	36,0	Bal.	Sn: 3,0	630-730ºC	~BAg-35	Ag 125
L-Ag 45 Sn [1]	45,0	27,0	Bal.	Sn: 3,0	640-660ºC	BAg-36	Ag 145
L-Ag 55 Sn [1]	55,0	21,0	Bal.	Sn: 3,0	630-660ºC	~BAg-7	Ag 155

Note:

[1] these Silver Brazing Rods are also available as flux coated rods (FC)

HILCO Bronze Flux is suitable for use on copper, brass, mild steel and most other common materials.

HILCO Bronze Flux is available in powder only. This powder can be made into a paste by stirring in water until the mixture has the consistency of thick cream. The flux can be applied by hot prodding i.e. dipping a warm rod into flux powder and the flux adhering to the rod is transferred to the joint area.

A molten brazing alloy will only wet and flow over a parent metal if both are substantially free of surface oxide. Simply removing surface oxide before brazing is not effective, since a new oxide layer is rapidly formed on heating. To achieve a oxide free surface it is necessary to:

- Remove oxide as it is formed using a suitable brazing flux, or
- Prevent oxidation during brazing by heating in a protective atmosphere, or
- Use a self-fluxing brazing alloy (possible when copper-to-copper brazing only!)

Brazing Flux	Application	EN 1045	Temperature range	Packaging	To be used in combination with
Bronze flux	General purpose, brazing cast iron, steel, brass, bronze and copper	FH 21	750-1100ºC	500 gr. jars	Bronze C

Flux residue removal
We recommend to remove flux residues after brazing, due to the danger of corrosive attack when the flux hydrolyses on exposure to moist air. The method of removal depends on the classification of the brazing flux.

Classification	Removal of residues
FH21	Residues are non-corrosive and have to be removed mechanically or by pickling

Tungsten electrodes are used for TIG welding and for plasma welding and cutting. In order to improve the service life and arc striking characteristics oxides are added to them during production.

Type	Composition			Colour code	Application	Current
	W	Oxides (%)	Cont.			
WP AWS A5.12: EWP	Bal.	-	≤0,2	Green	TIG welding aluminium, aluminium alloys	
WS 2 Witstar® AWS A5.12: EWG	Bal.	Rare earths	≤0,2	Turquoise	TIG welding stainless steel, low alloyed steel, copper and copper alloys, aluminium, titanium **Thorium free**!	 

Type	Standard length 175 mm. Packaging 10 pieces per package			
	Ø 1,6 mm.	Ø 2,0 mm.	Ø 2,4 mm.	Ø 3,2 mm.
WP	•	•	•	•
WS 2 Witstar®	•	•	•	•

HILCO CARBON GOUGING RODS

Air carbon arc cutting (CAC-A) rods – cutting & gouging

Current: DC

Carbon gouging rods are copper-coated air carbon arc cutting rods made from a mixture of graphite and pure carbon. Typical applications can be found in every field of metalworking, in foundries, steel constructions, shipbuilding, repair & maintenance. Carbon gouging rods are used for weld edge preparations, back-gouging in multipass welding, removing unsatisfactory welds, bolt and wire ends, spatter removal, all kinds of cutting.

Base materials to be welded:

- Carbon, low-alloyed steels
- Stainless steels
- Aluminium
- Nickel alloys
- Cast iron
- Copper alloys
- Magnesium

Applications:

- All industries related to welding

Process description, recommendations for usage

Carbon gouging rods remove molten metal with a jet of air. The intense heat of an arc between the carbon-graphite electrode and a workpiece melts a portion of the metal, while simultaneously a jet of air is passed through the arc to blow away the molten metal. The process (Air carbon arc cutting - CAC-A) is used for cutting and gouging, and it can be done manually or mechanized. Carbon steel, stainless steel, copper alloys, cast irons, aluminium, magnesium and nickel alloys can all be cut with Carbon gouging rods. The process requires an electrode holder, cutting electrodes, a power source and an air supply. Manual electrode holders are similar to shielded metal arc electrode holders (stick electrode holders). The electrode is held in a rotatable head containing air orifices. A valve is provided to turn the air on and off. Carbon gouging rods are round, pointed and copper coated. They are intended to use at DC current.

Packaging and welding data:

Dia. mm.	Length mm.	Current A
6,3	305	250-400
8,0	305	350-500
10,0	305	450-600
12,7	305	600-1000

Neoprene insulated black welding cable in accordance with H01N2-D. Conductor made of plain annealed copper stranded wires

Maximum conductor operating temperature	Electrical conductivity
85ºC	At 20ºC $4{,}6 \times 10^{12} \Omega$

Packaging and welding data:

Cable Size mm²	Length bundle meters	Approx net weight kg/km.	Maximum resistance of conductor at 20ºC Ω/km.	Current carrying capacity / duty cycle - Amps			
				100%	85%	60%	35%
25	100	291	0,795	180	195	230	300
35	50	394	0,565	225	245	290	375
50	50	551	0,393	285	305	365	480
70	50	766	0,277	355	385	460	600

Our Hildiscs – cutting-off and grinding wheels – are made from abrasive grains bonded together with resins and fillers and reinforced with fibre glass.

The Hildiscs are available in several thicknesses for various machines and applications. They can be used in many industrial sectors (petrochemical, food, ship building, construction, MRO and Metal Fabrication etc.) Our Hildiscs are made in The Netherlands.

Packaging data:

Flat cutting discs **Machine: angle grinder**
Shape: 41

Hilco art no.	*Size mm*	*Size inch*	*Specification*	*Weight in grams per disc*	*Application*	*Pieces per box*
77955	115x1,0x22,23	4 1/2” x 3/64” x 7/8”	A 46/60 V-BF41	27	Steel-Inox	25
78092	125x1,0x22,23	5” x 3/64” x 7/8”	A 46/60 V-BF41	32	Steel-Inox	25
78121	125x1,6x22,23	5” x 1/16” x 7/8”	A 30/46 V-BF41	48	Steel-Inox	25
78107	180x1,6x22,23	7” x 1/16” x 7/8”	A 30/46 V-BF41	87	Steel-Inox	25
78108	230x1,9x22,23	9” x 5/64” x 7/8”	A 30/46 V-BF41	184	Steel-Inox	25
78077	115x2,5x22,23	4 1/2” x 3/32” x 7/8”	A 24/30 S-BF41	55	Steel-Inox	25
78078	125x2,5x22,23	5” x 3/32” x 7/8”	A 24/30 S-BF41	67	Steel-Inox	25
78079	180x2,5x22,23	7” x 3/32” x 7/8”	A 24/30 S-BF41	149	Steel-Inox	25
78096	230x2,5x22,23	9” x 3/32” x 7/8”	A 24/30 S-BF41	241	Steel-Inox	25

Flat cutting discs **Machine: chop saw 80 m/s**
Shape: 41

Hilco art no.	*Size mm*	*Size inch*	*Specification*	*Weight in grams per disc*	*Application*	*Pieces per box*
78086	300x2,6x25,4	12” x 3/32” x 1”	A 30 S-BF41/80 Chop Saw	410	Steel-Inox	10
78087	356x2,6x25,4	14” x 3/32” x 1”	A 30 S-BF41/80 Chop Saw	600	Steel-Inox	10

Depressed Centre Cutting discs **Machine: angel grinder**
Shape: 42

Hilco art no.	*Size mm*	*Size inch*	*Specification*	*Weight in grams per disc*	*Application*	*Pieces per box*
78080	100x3,0x16,0	4” x 1/8” x 5/8”	A 24/30 S-BF42	60	Steel-Inox	25
77956	115x3,0x22,23	4 1/2” x 1/8” x 7/8”	A 24/30 S-BF42	75	Steel-Inox	25
78081	125x3,0x22,23	5” x 1/8” x 7/8”	A 24/30 S-BF42	84	Steel-Inox	25
77957	180x3,0x22,23	7” x 1/8” x 7/8”	A 24/30 S-BF42	175	Steel-Inox	25
77958	230x3,0x22,23	9” x 1/8” x 7/8”	A 24/30 S-BF42	298	Steel-Inox	25

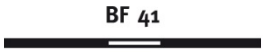
HILCO HILDISC

Certificate of quality

Grinding discs **Machine: angle grinder**
Shape: 27

Hilco art no.	*Size mm*	*Size inch*	*Specification*	*Weight in grams per disc*	*Application*	*Pieces per box*
78082	100x6,4x16,0	4” x 1/4” x 5/8”	A 24/30 Q-BF27	116	Steel-Inox	10
78083	115x6,4x22,23	4 1/2” x 1/4” x 7/8”	A 24/30 Q-BF27	155	Steel-Inox	10
78084	125x6,4x22,23	5” x 1/4” x 7/8”	A 24/30 Q-BF27	188	Steel-Inox	10
77959	180x6,4x22,23	7” x 1/4” x 7/8”	A 24/30 Q-BF27	379	Steel-Inox	10
78085	230x6,4x22,23	9” x 1/4” x 7/8”	A 24/30 Q-BF27	630	Steel-Inox	10

Explanation of the specification:

Grain type	Grit size	Hardness	Bond type	Glass cloth	Shape
A	24	Q	B	F	27 = depressed centre grinding wheels 
	to	to			41 = Flat cutting-off wheels 
	30	V			42 = depressed centre cutting-off wheels 

Grain type:
A: aluminium oxide

Hardness:
represented by a letter:
Medium: Q and S
Hard: V

Bond type:
B: Bakelite

Glass cloth:
F: glass Fibre reinforcement

Features and benefits HILDISCs:

- Easy and comfortable cutting
- Burr free cutting result
- Stable quality
- Low vibration
- Free of iron, Sulphur and chlorine

Grit size:
FEPA grit size = the number of grain aligned on one inch (25,4 mm)

FEPA grit size (Mesh)	Average grit size in µm
24	745
30	625

HILDISCS comply with: OSA 10038
EN 12413

Other types and sizes are available on request.

Our Hildiscs – cutting-off and grinding wheels – are made from abrasive grains bonded together with resins and fillers and reinforced with fibre glass.

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Packaging data:

Flat cutting discs **Machine: angle grinder**
Shape: 41

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77955	115x1,0x22,23	A 46/60 V-BF41	27	Steel-Inox	25
78092	125x1,0x22,23	A 46/60 V-BF41	32	Steel-Inox	25
78121	125x1,6x22,23	A 30/46 V-BF41	48	Steel-Inox	25
78107	180x1,6x22,23	A 30/46 V-BF41	87	Steel-Inox	25
78108	230x1,9x22,23	A 30/46 V-BF41	184	Steel-Inox	25
78077	115x2,5x22,23	A 24/30 S-BF41	55	Steel-Inox	25
78078	125x2,5x22,23	A 24/30 S-BF41	67	Steel-Inox	25
78079	180x2,5x22,23	A 24/30 S-BF41	149	Steel-Inox	25
78096	230x2,5x22,23	A 24/30 S-BF41	241	Steel-Inox	25

Flat cutting discs **Machine: chop saw 80 m/s**
Shape: 41

Hilco art no.	*Size*	*Specification*	*Weight in grams per disc*	*Application*	*Pieces per box*
78086	300x2,6x25,4	A 30 S-BF41/80 Chop Saw	410	Steel-Inox	10
78087	356x2,6x25,4	A 30 S-BF41/80 Chop Saw	600	Steel-Inox	10

Depressed Centre Cutting discs **Machine: angel grinder**
Shape: 42

Hilco art no.	*Size*	*Specification*	*Weight in grams per disc*	*Application*	*Pieces per box*
78080	100x3,0x16,0	A 24/30 S-BF42	60	Steel-Inox	25
77956	115x3,0x22,23	A 24/30 S-BF42	75	Steel-Inox	25
78081	125x3,0x22,23	A 24/30 S-BF42	84	Steel-Inox	25
77957	180x3,0x22,23	A 24/30 S-BF42	175	Steel-Inox	25
77958	230x3,0x22,23	A 24/30 S-BF42	298	Steel-Inox	25

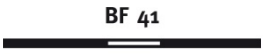
HILCO HILDISC

Certificate of quality

Grinding discs **Machine: angle grinder**
Shape: 27

Hilco art no.	*Size*	*Specification*	*Weight in grams per disc*	*Application*	*Pieces per box*
78082	100x6,4x16,0	A 24/30 Q-BF27	116	Steel-Inox	10
78083	115x6,4x22,23	A 24/30 Q-BF27	155	Steel-Inox	10
78084	125x6,4x22,23	A 24/30 Q-BF27	188	Steel-Inox	10
77959	180x6,4x22,23	A 24/30 Q-BF27	379	Steel-Inox	10
78085	230x6,4x22,23	A 24/30 Q-BF27	630	Steel-Inox	10

Explanation of the specification:

Grain type	Grit size	Hardness	Bond type	Glass cloth	Shape
A	24	Q	B	F	27 = depressed centre grinding wheels 
	to	to			41 = Flat cutting-off wheels 
	30	V			42 = depressed centre cutting-off wheels 

Grain type:
A: aluminium oxide

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represented by a letter:
Medium: Q and S
Hard: V

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B: Bakelite

Glass cloth:
F: glass Fibre reinforcement

Features and benefits HILDISCs:

- Easy and comfortable cutting
- Burr free cutting result
- Stable quality
- Low vibration
- Free of iron, Sulphur and chlorine

Grit size:
FEPA grit size = the number of grain aligned on one inch (25,4 mm)

FEPA grit size (Mesh)	Average grit size in µm
24	745
30	625

HILDISCS comply with: OSA 10038
EN 12413

Other types and sizes are available on request.

Our HILCO FLAPDISCs provide a high level of performance and offer consistent quality throughout their product life. The high quality zirconium grain provides greater aggression and faster stock removal than standard zirconia or aluminium oxide flap discs. The grain offers self-sharpening properties with controlled grain fractures, continuously producing sharp, new abrasive edges. The cotton cloth offers high strength, flexibility and wear resistance.

Our HILCO FLAPDISCs provide an excellent grinding solution for all applications, delivering long life on hard to grind materials including steel and stainless steel, as well as softer metals like aluminium.
Ideal for low & medium pressure applications.

FLAPDISCs are used for weld grinding, edge chamfering, de-burring, cleaning, rust & paint removal.
They are used in many industrial sectors (MRO, Metal fabrication and welding, General engineering, Transport)

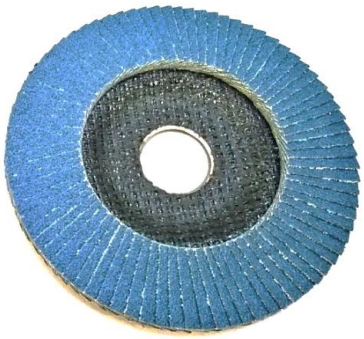
Our HILCO FLAPDISCs are conical and made with fibre backing pad for grinding at an angle of 15°- 25°

Machine: angle grinder

Shape: Conical

Hilco art no.	*Size mm*	*Size inch*	*Grit*	*Specification*	*Application*	*Pieces per box*
78176	115x22,23	4 1/2” x 7/8”	P40	Zirconia	Steel/Inox/Alu	10
78177	115x22,23	4 1/2” x 7/8”	P60	Zirconia	Steel/Inox/Alu	10
78178	115x22,23	4 1/2” x 7/8”	P80	Zirconia	Steel/Inox/Alu	10
78179	115x22,23	4 1/2” x 7/8”	P120	Zirconia	Steel/Inox/Alu	10
78182	125x22,23	5” x 7/8”	P40	Zirconia	Steel/Inox/Alu	10
78183	125x22,23	5” x 7/8”	P60	Zirconia	Steel/Inox/Alu	10
78184	125x22,23	5” x 7/8”	P80	Zirconia	Steel/Inox/Alu	10
78185	125x22,23	5” x 7/8”	P120	Zirconia	Steel/Inox/Alu	10

- High performance zirconium grain
- Regular & constant cut
- Longer life time
- Standard density
- Comfortable to use
- Excellent price performance ratio.



HILCO FLAPDISC comply with: EN 13743

Other sizes and grits are available on request.

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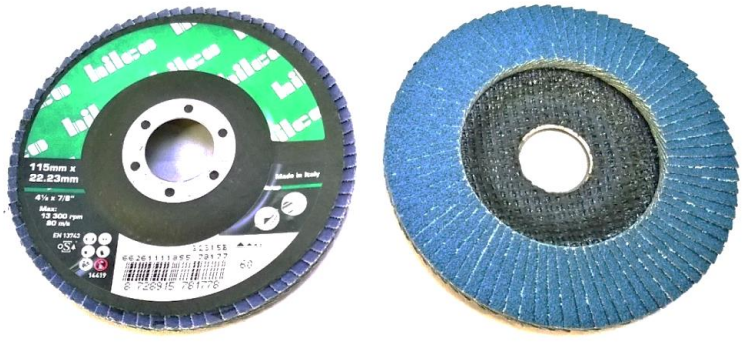
Shape: Conical

Hilco art no.	*Size mm*	*Grit*	*Specification*	*Application*	*Pieces per box*
78176	115x22,23	P40	Zirconia	Steel/Inox/Alu	10
78177	115x22,23	P60	Zirconia	Steel/Inox/Alu	10
78178	115x22,23	P80	Zirconia	Steel/Inox/Alu	10
78179	115x22,23	P120	Zirconia	Steel/Inox/Alu	10
78182	125x22,23	P40	Zirconia	Steel/Inox/Alu	10
78183	125x22,23	P60	Zirconia	Steel/Inox/Alu	10
78184	125x22,23	P80	Zirconia	Steel/Inox/Alu	10
78185	125x22,23	P120	Zirconia	Steel/Inox/Alu	10

- High performance zirconium grain
- Regular & constant cut
- Longer life time
- Standard density
- Comfortable to use
- Excellent price performance ratio.



HILCO FLAPDISC comply with: EN 13743

Other sizes and grits are available on request.

HILCO WELDING HELMET FLIP-UP

Accessories

The Welding Helmet Flip-up is a light-weight welding helmet with maximum protection for the welder, optimal user comfort, easy in usage and a long lifetime. Complete with head harness, sweatband and flip-up lens holder welding lens shade 10. Available for various sizes of welding lenses.

- Maximum protection
- Optimal wearing comfort
- Clear view
- Fully adjustable
- Long-life

HILCO WELDING HELMET AUTOMATIC

Accessories

The Welding Helmet Automatic is a light-weight welding helmet appropriate for most welding, cutting and gouging activities. The helmet gives a maximum protection of the eyes and face against sparks and spatter and optical and heat radiation. This is combined with an optimal wearing comfort, easy use and a long-life. Complete with an automatic cartridge that has three adjustable options by which the light sensitivity, shade colour and opening speed can be altered.

- Maximum protection
- Optimal wearing comfort
- Clear view
- Fully adjustable
- Fast reaction time
- Long-life

The Welding Helmet Automatic is made of high quality heat resistant material. The design of the helmet gives optimal protection against welding smoke.

- The head harness is fully adjustable for optimal wearing comfort.
- The shade colour is continuously variable from 9 to 13.
- When open the shade colour of the cartridge is 4.
- The automatic cartridge is powered by solar cells as a result of which battery replacements are things of the past.
- The two sensors on the cartridge provide a very fast reaction.

Our Hilblend discs were specifically designed to reduce downtime and eliminate processes. With its unique grain technology this disc will remove, blend and condition... All at the same time.

Hilblend discs are constructed with thick, synthetic fibres and extra-coarse abrasive. The open web construction provides fast cutting action with very little loading. Hilblend discs are suitable for use in many industries for applications including removal of surface rust and residue, corrosion, light weld splatter, dirt, mill scale and other similar surface contaminants. Can also be used for paint and epoxy coating removal, surface preparation before applying coating or prior to welding and even for cleaning and conditioning after welding.

OVERVIEW	KEY APPLICATIONS
• Grain technology	• Remove, blend and condition light welds, scratches, surface defects, grinding marks on metal materials
• 3D open web construction	• Remove small weld joints while simultaneously blending and conditioning
• 3 in 1 disc – combines the job of a coarse, medium and fine surface conditioning disc	• Blend and condition in hard to reach areas
• Combines the cutting speed of a coarse disc with the finish of a fine grit disc	• Remove and condition thermal damage (bluing)
• Grain technology significantly reduces smear preventing rework	• Deburr and remove sharp metal edges
• Does not load on aluminium or soft metal	• Efficiently condition prior for re-painting/coating
• Reduces process and downtime costs	• Safe to use on titanium, stainless steel, copper, cast iron and aluminium metals

Advantages of using Hilblend discs

- Compact 3 dimensional construction provides long life and comfortable handling.
- Light metal removal, de-burring, blending and finishing with a single product, eliminates unnecessary steps reducing time and saving money.
- Special design offers versatility of material removal while imparting a final finish.
- Provides a controlled, sustained finish for maximum productivity.
- Less vibration and quieter for easy, comfortable use.

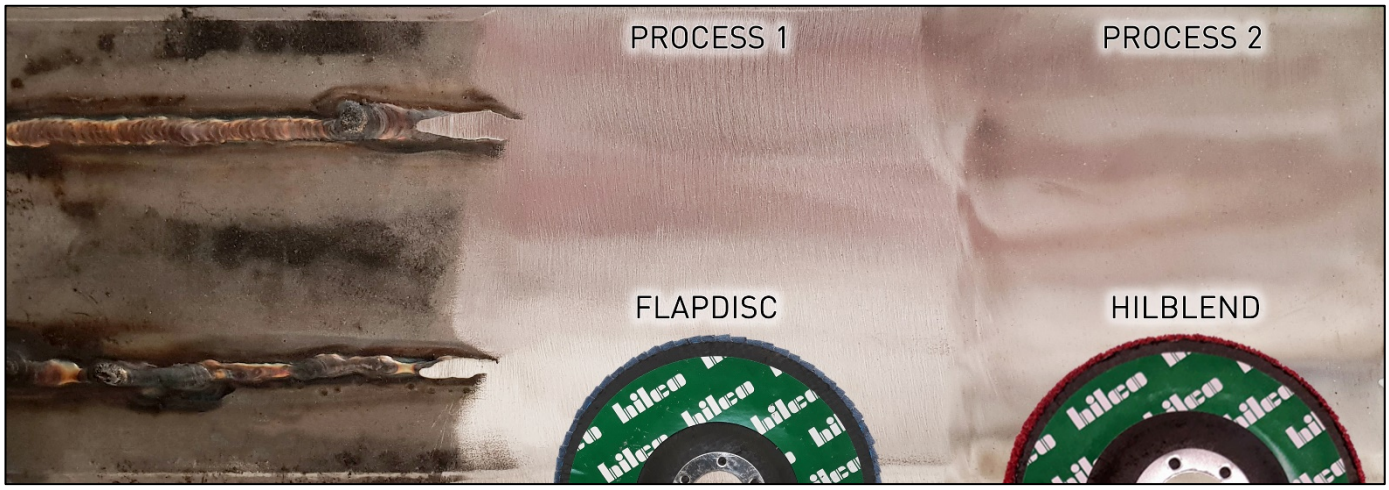
Machine: Angle grinder

Hilco art. nr.	*Size in mm*	*Size in inch*	*Max. RPM*	*Application*	*Pieces per box*
78240	115 x 22,23	4 1/2” x 7/8”	12.200	Steel/Inox/Alu	5
78241	125 x 22,23	5” x 7/8”	12.200	Steel/Inox/Alu	5

To achieve maximum benefit:

Process 1:
Use Hilco Flapdisc for metal removal and heavy duty grinding.

Process 2 (3 in 1):
Use Hilblend disc for light weld removal, grindlines/scratch removal, de-burring and finishing.



HILCO WELDING GLOVES

Accessories

Quality welding gloves made from cowhide split leather. Reinforced thumb seam and lined with heat resistant flannel. Fully stitched with Kevlar thread.

- Fully lined
- Reinforced thumb seam
- 35cm model
- Kevlar stitching
- Size: 10.5/11/12
- Colour: black

According to:
EN 12477: type A
EN 388: 4133
EN 407: 413X4X

Small, robust and lightweight. The ideal MMA power pack for construction sites!

Highlights

- Very portable due to its compact design and low weight (5.1 kg) with the latest inverter technology.
- Ideal for electrodes up to 4 mm, due to the excellent ignition and welding properties.
- The intelligent casing design provides an optimised air guidance for a longer duty cycle, as well as an easy to clean ventilation filter for less contamination in the machine.
- The HM 160 MV adapts automatically to country-specific mains (115 V - 230 V), giving it a universal usage.
- 100 % suitable for usage on construction sites, due to safe operation on long mains leads (up to 50 m) and on generators.
- Due to its intelligent casing design and robust materials, the functionality and safety of the inverter stays intact if being dropped or knocked over.

Areas of application

- Repair of construction and agricultural machinery, machines, systems, etc.
- Coated electrodes (rutile, rutile/basic, basic, rutile/cellulose).
- Unalloyed, low-alloy and high-alloy steels, nickel-, copper-, and aluminium alloy.

*TIG torch set not included.

WELDING MACHINE HM 160 MV				
	MMA		TIG	
Setting range welding current	10 A – 150 A		10 A – 160 A	
Duty cycle at ambient temperature	40 °C	25 °C	40 °C	25 °C
30%			160 A	
35%	150 A			
45%				160 A
50%		150 A		
60%	120 A		130 A	
100%	100 A	120 A	100 A	120 A
Open circuit voltage	105 V			
Mains frequency	50 Hz / 60 Hz			
Mains fuses (slow-blow)	1 x 16 A, Mains fuses (slow-blow) 1 x 25 A			
Mains voltage (tolerances)	1 x 230 V (-40 % - +15 %), Mains voltage (tolerances) 1 x 115 V (-15 % - +15 %)			
Max. connected load	5.5 kVA		3.7kVA	
Recommended generator power	7.5 kVA			
Cos φ	0.99			
Efficiency	86%			
Dimensions L x W X H (mm)	430 x 115 x 225			
Weight	5.1 kg			

Page	Process	Group	Product name	AWS	Specification	EN ISO	Classification
15	SMAW	Unalloyed	HILCO Red Extra	A5.1	E 6013	2560-A	E 42 0 RC 11
16	SMAW	Unalloyed	HILCO Red	A5.1	E 6013	2560-A	E 42 0 RC 11
17	SMAW	Unalloyed	HILCO Brown	A5.1	E 6013	2560-A	E 42 0 RC 11
18	SMAW	Unalloyed	HILCO Pipeweld 6010	A5.1	E 6010	2560-A	E 38 3 C 21
19	SMAW	Unalloyed	HILCO Pipeweld 7010	A5.5	E 7010-P1	2560-A	E 42 3 C 25
20	SMAW	Unalloyed	HILCO Velora	A5.1	E 6013	2560-A	E 42 0 RR 12
21	SMAW	Unalloyed	HILCO Velveta	A5.1	E 6013	2560-A	E 42 0 RR 32
22	SMAW	Unalloyed	HILCO Basic 55	A5.1	E 7016	2560-A	E 38 3 B 12 H10
23	SMAW	Unalloyed	HILCO Basic	A5.1	E 7018-1	2560-A	E 42 5 B 32 H5
24	SMAW	Unalloyed	HILCO Basic Super	A5.1	E 7018-1	2560-A	E 42 5 B 32 H5
25	SMAW	Unalloyed	HILCO Regina 150	A5.1	E 7024-1	2560-A	E 42 2 RA 53
26	SMAW	Unalloyed	HILCO Regina 160	A5.1	E 7024-1	2560-A	E 42 0 RR 53
27	GMAW	Unalloyed	HILCO SG 1A Superflow	A5.18	ER 70S-2	14341-A	G 46 A M21 2Ti
28	GMAW	Unalloyed	HILCO K60	A5.18	ER 70S-6	14341-A	G 38 2 C G3 Si 1 G 42 3 M G3 Si 1
29	FCAW	Unalloyed	HILCO Hilcord 41	A5.36	E 71T1 – M21A4-CS1-1 E 71T1 – C1A2-CS1-DH4	17632-A	T 46 4 P M 1 H5 T 46 2 P C 1 H5
30	FCAW	Unalloyed	HILCO Hilcord 52	A5.36	E 70T15-M21A2-CS1-H4	17632-A	T 46 6 M M 1 H5
31	GTAW	Unalloyed	HILCO Fer SG1	A5.18	ER 70S-3	636-A	W 42 2 W 2 Si 1
32	GTAW	Unalloyed	HILCO Fer SG1A	A5.18	ER 70S-2	636-A	W 42 2 W 2 Ti
33	GTAW	Unalloyed	HILCO Fer SG2	A5.18	ER 70S-6	636-A	W 46 2 W 3 Si 1
34	Gas welding	Unalloyed	HILCO Fer G1	A5.2	~ R 45	EN 12536	O I
35	SAW	Unalloyed	HILCO HW 150	-	-	14174	S F MS 1 67 AC
36	SAW	Unalloyed	HILCO HW 155	-	-	14174	S F MS 1 56 AC
37	SAW	Unalloyed	HILCO HW 430	-	-	14174	S A AR 1 87 AC
38	SAW	Unalloyed	HILCO HW 530	-	-	14174	S A AB 1 67 AC H5
39	FCAW	Unalloyed	HILCO Hilcord 40	A5.20	E 71T-1M	17632-A	T 42 2 P M 1 H10
40	FCAW	Unalloyed	HILCO Hilcord 40C	A5.20	E 71T-1C	17632-A	T 42 2 P C 1 H10
44	SMAW	Low alloyed	HILCO B12Mo	A5.5	E 7018-A1 H4R	3580-A	E Mo B 32 H5
45	SMAW	Low alloyed	HILCO B19CrMo	A5.5	E 8018-B2 H4	3580-A	E CrMo 1 B 32 H5
46	SMAW	Low alloyed	HILCO B20CrMo	A5.5	E 9018-B3 H4	3580-A	E CrMo 2 B 32 H5
47	GMAW	Low alloyed	HILCO K80	A5.28	ER 110S-G	16834-A	G 69 4 M Mn3Ni1CrMo

Page	Process	Group	Product name	AWS	Specification	EN ISO	Classification
48	FCAW	Low alloyed	HILCO Hilcord 43	A5.36	E 81 T1- M21A8 - Ni1 – H4	17632-A	T 50 6 1 Ni P M 1 H5
49	GTAW	Low alloyed	HILCO Fer SG Mo	A5.28	ER 70S-A1	636-A	W 46 4 W2Mo
						21952-A	W MoSi
50	GTAW	Low alloyed	HILCO Fer SG CrMo1	A5.28	ER 80S-B2	21952-B	1 CM
51	GTAW	Low alloyed	HILCO Fer SG CrMo2	A5.28	ER 90S-B3	21952-B	2 C1M
52	GTAW	Low alloyed	HILCO Fer SGNi1	A5.28	ER 80S-Ni1	636-A	W 46 6 W3Ni1
53	SAW	Low alloyed	HILCO HW 590	-	-	14174	S A FB 1 55 AC H5
61	SMAW	Stainless	HILCO Hilchrome 307R	A5.4	E307-16 (mod.)	3581-A	E 18 8 Mn R 1 2
62	SMAW	Stainless	HILCO Hilchrome 309R	A5.4	E309L-17	3581-A	E 23 12 L R 3 2
63	SMAW	Stainless	HILCO Hilchrome 309MoR	A5.4	E309LMo-17	3581-A	E 23 12 2 L R 3 2
64	SMAW	Stainless	HILCO Hilchrome 312R	A5.4	~E312-17	3581-A	E 29 9 R 3 2
65	SMAW	Stainless	HILCO Hilchrome 308R	A5.4	E308L-17	3581-A	E 19 9 L R 3 2
66	SMAW	Stainless	HILCO Hilchrome 347R	A5.4	E347-17	3581-A	E 19 9 Nb R 3 2
67	SMAW	Stainless	HILCO Hilchrome 316R	A5.4	E316L-17	3581-A	E 19 12 3 L R 3 2
68	SMAW	Stainless	HILCO Hilchrome 310R	A5.4	E310-16	3581-A	E 25 20 R 1 2
69	SMAW	Stainless	HILCO Hilchrome 600	A5.11	E NiCrFe3	14172	E Ni 6182 (NiCr15Fe6Mn)
70	GMAW	Stainless	HILCO Hilchrome G307	A5.9	~ER 307	14343-A	G 18 8 Mn
71	GMAW	Stainless	HILCO Hilchrome G309LSi	A5.9	ER 309LSi	14343-A	G 23 12 L Si
72	GMAW	Stainless	HILCO Hilchrome G308LSi	A5.9	ER 308LSi	14343-A	G 19 9 L Si
73	GMAW	Stainless	HILCO Hilchrome G316LSi	A5.9	ER 316LSi	14343-A	G 19 12 3 L Si
74	GTAW	Stainless	HILCO Hilchrome W309L	A5.9	ER 309L	14343-A	W 23 12 L
75	SAW	Stainless	HILCO HW 120	-	-	14174	S A FB 2 53 AC
76	GTAW	Stainless	HILCO Hilchrome W308L	A5.9	ER 308L	14343-A	W 19 9 L
77	GTAW	Stainless	HILCO Hilchrome W316L	A5.9	ER 316L	14343-A	W 19 12 3 L
84	SMAW	Repair & M.	HILCO Red Extra	A5.1	E 6013	2560-A	E 42 0 RC 11
85	SMAW	Repair & M.	HILCO Basic 55	A5.1	E 7016	2560-A	E 38 3 B 12 H10
86	SMAW	Repair & M.	HILCO Basic	A5.1	E 7018-1	2560-A	E 42 5 B 32 H5
87	SMAW	Repair & M.	HILCO B19CrMo	A5.5	E 8018-B2 H4	3580-A	E Cr Mo 1 B 32 H5
88	SMAW	Repair & M.	HILCO Hilchrome 307R	A5.4	E307-16 (mod.)	3581-A	E 18 8 Mn R 1 2
89	SMAW	Repair & M.	HILCO Hilchrome 312R	A5.4	~E312-17	3581-A	E 29 9 R 3 2
90	SMAW	Repair & M.	HILCO Hilchrome 600	A5.11	E NiCrFe3	14172	E Ni 6182 (NiCr15Fe6Mn)
91	SMAW	Repair & M.	HILCO Hardmelt 600	-	-	EN 14700	E Fe8

Page	Process	Group	Product name	AWS	Specification	EN ISO	Classification
92	SMAW	Repair & M.	HILCO Hardmelt 620	A5.13	E Fe 6 (mod.)	EN 14700	E Fe4
93	SMAW	Repair & M.	HILCO Hardmelt 638	-	-	EN 14700	E Z Fe14
94	SMAW	Repair & M.	HILCO Sugarhard	-	-	EN 14700	E Fe14
95	SMAW	Repair & M.	HILCO Pure Nickel	A5.15	E Ni-CI	1071	E C Ni-CI 1
96	SMAW	Repair & M.	HILCO Nickel Iron	A5.15	E Ni Fe-CI	1071	E C Ni Fe-1 1
97	SMAW	Repair & M.	HILCO Hilcostel 6E	A5.13	E CoCr-A	EN 14700	EZ Co2
98	SMAW	Repair & M.	HILCO Hilcostel 12E	A5.13	E CoCr-B	EN 14700	E Co3
99	SMAW	Repair & M.	HILCO Aluminil Si5	A5.3	E 4043	18273	E Al 4043 (AlSi5)
100	SMAW	Repair & M.	HILCO Aluminil Si12	-	-	18273	E Al 4047 (AlSi12)
101	SMAW	Repair & M.	HILCO Bronsil	A5.6	E CuSn-C (mod.)	17777	Cu 5180B (CuSn7)
102	SMAW	Repair & M.	HILCO Cutil	-	-	-	-
103	CAC-A	Repair & M.	HILCO Carbon gouging rods	-	-	-	-
104	GMAW	Repair & M.	HILCO Hilchrome G307	A5.9	~ER 307	14343-A	G 18 8 Mn
105	GMAW	Repair & M.	HILCO H-600	-	-	EN 14700	S Fe8
106	FCAW	Repair & M.	HILCO Hilcord 600	-	-	EN 14700	T Fe 6
107	Gas welding	Repair & M.	HILCO Fluxcored Al99,5	A5.10	~ER 1070	-	-
108	Gas welding	Repair & M.	HILCO Fluxcored AlSi5	A5.10	~ER 4043	-	-
109	Gas welding	Repair & M.	HILCO Bronze C	A5.8	~RB CuZn-A	EN 1044	~CU 304
110	Gas welding	Repair & M.	HILCO Bronze F	A5.8	RB CuZn-C	EN 1044	CU 306
111	SMAW	Repair & M.	HILCO Pipeweld 6010	A5.1	E 6010	2560-A	E 38 3 C 21
112	SMAW	Repair & M.	HILCO E6011	A5.1	E 6011	-	-
118	SMAW	Aluminium	HILCO Aluminil Si5	A5.3	E 4043	18273	E Al 4043 (AlSi5)
119	SMAW	Aluminium	HILCO Aluminil Si12	-	-	18273	E Al 4047 (AlSi12)
120	GMAW	Aluminium	HILCO AlSi5	A5.10	ER 4043	18273	S Al 4043A (AlSi5(A))
121	GMAW	Aluminium	HILCO AlMg4,5Mn	A5.10	ER 5183	18273	S Al 5183 (AlMg4,5Mn0,7(A))
122	GMAW	Aluminium	HILCO AlMg5	A5.10	ER 5356	18273	S Al 5356 (AlMg5Cr(A))
123	GTAW	Aluminium	HILCO Al99,7	A5.10	~ER1100	18273	S Al 1070 (Al 99,7)
124	GTAW	Aluminium	HILCO AlSi5	A5.10	ER 4043	18273	S Al 4043A (AlSi5(A))
125	GTAW	Aluminium	HILCO AlSi12	A5.10	ER 4047	18273	S Al 4047A / AlSi12(A)
126	GTAW	Aluminium	HILCO AlMg4,5Mn	A5.10	ER 5183	18273	S Al 5183 (AlMg4,5Mn0,7(A))
127	GTAW	Aluminium	HILCO AlMg5	A5.10	ER 5356	18273	S Al 5356 (AlMg5Cr(A))

Page	Process	Group	Product name	AWS	Specification	EN ISO	Classification
128	Gas welding	Aluminium	HILCO AlSi5 (OAW)	A5.10	ER 4043	18273	S Al 4043A (AlSi5(A))
129	Gas welding	Aluminium	HILCO AlSi12 (OAW)	A5.10	ER 4047	18273	S Al 4047A / AlSi12(A)
130	Gas welding	Aluminium	HILCO Fluxcored Al99,5	A5.10	ER 1100	-	-
131	Gas welding	Aluminium	HILCO Fluxcored AlSi5	A5.10	~ER 4043	-	-
136	SMAW	Non ferrous	HILCO Bronsil	A5.6	E CuSn-C (mod.)	17777	CU5180B (CuSn7)
137	Gas welding	Non ferrous	HILCO Bronze C	A5.8	~RB CuZn-A	EN 1044	~CU 304
138	Gas welding	Non ferrous	HILCO Bronze F	A5.8	RB CuZn-C	EN 1044	CU 306
139	Gas welding	Non ferrous	HILCO L-Ag 2 P	A5.8	~BCuP-6	EN 1044	CP 105
139	Gas welding	Non ferrous	HILCO L-Ag 5 P	A5.8	BCuP-3	EN 1044	CP 104
139	Gas welding	Non ferrous	HILCO L-Ag 15 P	A5.8	BCuP-5	EN 1044	CP 102
139	Gas welding	Non ferrous	HILCO L-Ag 20 Si	-	-	EN 1044	AG 206
139	Gas welding	Non ferrous	HILCO L-Ag 30 Sn	-	-	EN 1044	AG 107
139	Gas welding	Non ferrous	HILCO L-Ag 34 Sn	A5.8	~BAg-35	EN 1044	AG 106
139	Gas welding	Non ferrous	HILCO L-Ag 45 Sn	A5.8	BAg-36	EN 1044	AG 104
139	Gas welding	Non ferrous	HILCO L-Ag 55 Sn	A5.8	~BAg-7	EN 1044	AG 103
140	Gas welding	Non ferrous	HILCO Bronze flux	-	-	EN 1045	FH 21
141	GTAW	Accessories	HILCO WP	A5.12	EWP	-	-
141	GTAW	Accessories	HILCO WS 2 Witstar®	A5.12	EWG	-	-
142	CAC-A	Accessories	HILCO Carbon gouging rods	-	-	-	-
143	-	Accessories	HILCO Welding cable	-	-	-	-
144/7	-	Accessories	HILCO Hildisc	-	-	-	-
148/9	-	Accessories	HILCO Flapdisc	-	-	-	-
150	-	Accessories	HILCO Welding Helmet Flip-up	-	-	-	-
151	-	Accessories	HILCO Welding Helmet Automatic	-	-	-	-
152/3	-	Accessories	HILCO Hilblend				
154	-	Accessories	HILCO Welding gloves				
155	-	Accessories	HILCO Welding machine				

Page	Process	Group	Product name	AWS	Specification	EN ISO	Classification
123	GTAW	Aluminium	HILCO Al99,7	A5.10	~ER1100	18273	S Al 1070 (Al 99,7)
121	GMAW	Aluminium	HILCO AlMg4,5Mn	A5.10	ER 5183	18273	S Al 5183 (AlMg4,5Mn0,7(A))
126	GTAW	Aluminium	HILCO AlMg4,5Mn	A5.10	ER 5183	18273	S Al 5183 (AlMg4,5Mn0,7(A))
122	GMAW	Aluminium	HILCO AlMg5	A5.10	ER 5356	18273	S Al 5356 (AlMg5Cr(A))
127	GTAW	Aluminium	HILCO AlMg5	A5.10	ER 5356	18273	S Al 5356 (AlMg5Cr(A))
125	GTAW	Aluminium	HILCO AlSi12	A5.10	ER 4047	18273	S Al 4047A / AlSi12(A)
129	Gas welding	Aluminium	HILCO AlSi12 (OAW)	A5.10	ER 4047	18273	S Al 4047A / AlSi12(A)
120	GMAW	Aluminium	HILCO AlSi5	A5.10	ER 4043	18273	S Al 4043A (AlSi5(A))
124	GTAW	Aluminium	HILCO AlSi5	A5.10	ER 4043	18273	S Al 4043A (AlSi5(A))
128	Gas welding	Aluminium	HILCO AlSi5 (OAW)	A5.10	ER 4043	18273	S Al 4043A (AlSi5(A))
100	SMAW	Repair & M.	HILCO Aluminil Si12	-	-	18273	E Al 4047 (AlSi12)
119	SMAW	Aluminium	HILCO Aluminil Si12	-	-	18273	E Al 4047 (AlSi12)
99	SMAW	Repair & M.	HILCO Aluminil Si5	A5.3	E 4043	18273	E Al 4043 (AlSi5)
118	SMAW	Aluminium	HILCO Aluminil Si5	A5.3	E 4043	18273	E Al 4043 (AlSi5)
44	SMAW	Low alloyed	HILCO B12Mo	A5.5	E 7018-A1 H4R	3580-A	E Mo B 32 H5
45	SMAW	Low alloyed	HILCO B19CrMo	A5.5	E 8018-B2 H4	3580-A	E CrMo 1 B 32 H5
87	SMAW	Repair & M.	HILCO B19CrMo	A5.5	E 8018-B2 H4	3580-A	E CrMo 1 B 32 H5
46	SMAW	Low alloyed	HILCO B20CrMo	A5.5	E 9018-B3 H4	3580-A	E CrMo 2 B 32 H5
23	SMAW	Unalloyed	HILCO Basic	A5.1	E 7018-1	2560-A	E 42 5 B 32 H5
86	SMAW	Repair & M.	HILCO Basic	A5.1	E 7018-1	2560-A	E 42 5 B 32 H5
22	SMAW	Unalloyed	HILCO Basic 55	A5.1	E 7016	2560-A	E 38 3 B 12 H10
85	SMAW	Repair & M.	HILCO Basic 55	A5.1	E 7016	2560-A	E 38 3 B 12 H10
24	SMAW	Unalloyed	HILCO Basic Super	A5.1	E 7018-1	2560-A	E 42 5 B 32 H5
101	SMAW	Repair & M.	HILCO Bronsil	A5.6	E CuSn-C (mod.)	17777	CU 5180B (CuSn7)
136	SMAW	Non ferrous	HILCO Bronsil	A5.6	E CuSn-C (mod.)	17777	CU 5180B (CuSn7)
109	Gas welding	Repair & M.	HILCO Bronze C	A5.8	~RB CuZn-A	EN 1044	~CU 304
137	Gas welding	Non ferrous	HILCO Bronze C	A5.8	~RB CuZn-A	EN 1044	~CU 304
110	Gas welding	Repair & M.	HILCO Bronze F	A5.8	RB CuZn-C	EN 1044	CU 306
138	Gas welding	Non ferrous	HILCO Bronze F	A5.8	RB CuZn-C	EN 1044	CU 306
140	Gas welding	Non ferrous	HILCO Bronze flux	-	-	EN 1045	FH 21
17	SMAW	Unalloyed	HILCO Brown	A5.1	E 6013	2560-A	E 42 0 RC 11
142	CAC-A	Accessories	HILCO Carbon gouging rods	-	-	-	-
103	CAC-A	Repair & M.	HILCO Carbon gouging rods	-	-	-	-

Page	Process	Group	Product name	AWS	Specification	EN ISO	Classification
102	SMAW	Repair & M.	HILCO Cutil	-	-	-	-
112	SMAW	Repair & M.	HILCO E6011	A5.1	E 6011	-	-
34	Gas welding	Unalloyed	HILCO Fer G1	A5.2	~R 45	EN 12536	O I
31	GTAW	Unalloyed	HILCO Fer SG1	A5.18	ER 70S-3	636-A	W 42 2 W 2 Si 1
32	GTAW	Unalloyed	HILCO Fer SG1A	A5.18	ER 70S-2	636-A	W 42 2 W 2 Ti
33	GTAW	Unalloyed	HILCO Fer SG2	A5.18	ER 70S-6	636-A	W 46 2 W 3 Si 1
50	GTAW	Low alloyed	HILCO Fer SGCrMo1	A5.28	ER 80S-B2	21952-B	1 CM
51	GTAW	Low alloyed	HILCO Fer SGCrMo2	A5.28	ER 90S-B3	21952-N	2 C1M
49	GTAW	Low alloyed	HILCO Fer SGMo	A5.28	ER 70S-A1	636-A 21952-A	W 46 4 W2Mo W MoSi
52	GTAW	Low alloyed	HILCO Fer SGNi1	A5.28	ER 80S-Ni1	636-A	W 46 6 W3Ni1
148/9	-	Accessories	HILCO Flapdisc	-	-	-	-
107	Gas welding	Repair & M.	HILCO Fluxcored Al99,5	A5.10	~ER 1070	-	-
130	Gas welding	Aluminium	HILCO Fluxcored Al99,5	A5.10	~ER 1070	-	-
108	Gas welding	Repair & M.	HILCO Fluxcored AlSi5	A5.10	~ER4043	-	-
131	Gas welding	Aluminium	HILCO Fluxcored AlSi5	A5.10	~ER4043	-	-
105	GMAW	Repair & M.	HILCO H-600	-	-	EN 14700	S Fe8
91	SMAW	Repair & M.	HILCO Hardmelt 600	-	-	EN 14700	E Fe8
92	SMAW	Repair & M.	HILCO Hardmelt 620	A5.13	E Fe 6 (mod.)	EN 14700	E Fe4
93	SMAW	Repair & M.	HILCO Hardmelt 638	-	-	EN 14700	E Z Fe14
152/3	-	Accessories	HILCO Hilblend	-	-	-	-
88	SMAW	Repair & M.	HILCO Hilchrome 307R	A5.4	E307-16 (mod.)	3581-A	E 18 8 Mn R 1 2
61	SMAW	Stainless	HILCO Hilchrome 307R	A5.4	E307-16 (mod.)	3581-A	E 18 8 Mn R 1 2
65	SMAW	Stainless	HILCO Hilchrome 308R	A5.4	E308L-17	3581-A	E 19 9 L R 3 2
62	SMAW	Stainless	HILCO Hilchrome 309R	A5.4	E309L-17	3581-A	E 23 12 L R 3 2
63	SMAW	Stainless	HILCO Hilchrome 309MoR	A5.4	E309LMo-17	3581-A	E 23 12 2 L R 3 2
68	SMAW	Stainless	HILCO Hilchrome 310R	A5.4	E310-16	3581-A	E 25 20 R 1 2
64	SMAW	Stainless	HILCO Hilchrome 312R	A5.4	~E312-17	3581-A	E 29 9 R 3 2
89	SMAW	Repair & M.	HILCO Hilchrome 312R	A5.4	~E312-17	3581-A	E 29 9 R 3 2
67	SMAW	Stainless	HILCO Hilchrome 316R	A5.4	E316L-17	3581-A	E 19 12 3 L R 3 2
66	SMAW	Stainless	HILCO Hilchrome 347R	A5.4	E347-17	3581-A	E 19 9 Nb R 3 2
69	SMAW	Stainless	HILCO Hilchrome 600	A5.11	E NiCrFe3	14172	E Ni 6182 (NiCr15Fe6Mn)
90	SMAW	Repair & M.	HILCO Hilchrome 600	A5.11	E NiCrFe3	14172	E Ni 6182 (NiCr15Fe6Mn)

Page	Process	Group	Product name	AWS	Specification	EN ISO	Classification
70	GMAW	Stainless	HILCO Hilchrome G307	A5.9	~ER 307	14343-A	G 18 8 Mn
104	GMAW	Repair & M.	HILCO Hilchrome G307	A5.9	~ER 307	14343-A	G 18 8 Mn
72	GMAW	Stainless	HILCO Hilchrome G308LSi	A5.9	ER 308LSi	14343-A	G 19 9 L Si
71	GMAW	Stainless	HILCO Hilchrome G309LSi	A5.9	ER 309LSi	14343-A	G 23 12 L Si
73	GMAW	Stainless	HILCO Hilchrome G316LSi	A5.9	ER 316LSi	14343-A	G 19 12 3 L Si
76	GTAW	Stainless	HILCO Hilchrome W308L	A5.9	ER 308L	14343-A	W 19 9 L
74	GTAW	Stainless	HILCO Hilchrome W309L	A5.9	ER 309L	14343-A	W 23 12 L
77	GTAW	Stainless	HILCO Hilchrome W316L	A5.9	ER 316L	14343-A	W 19 12 3 L
39	FCAW	Unalloyed	HILCO Hilcord 40	A5.20	E 71T-1M	17632-A	T 42 2 P M 1 H10
40	FCAW	Unalloyed	HILCO Hilcord 40C	A5.20	E 71T-1C	17632-A	T 42 2 P C 1 H10
29	FCAW	Unalloyed	HILCO Hilcord 41	A5.20	E 71T1 – M21A4-CS1-1 E 71T1 – C1A2-CS1-DH4	17632-A	T 46 4 P M 1 H5 T 46 2 P C 1 H5
48	FCAW	Low alloyed	HILCO Hilcord 43	A5.36	E 81 T1-M21A8 - Ni1 – H4	17632-A	T 50 6 1 Ni P M 1 H5
30	FCAW	Unalloyed	HILCO Hilcord 52	A5.36	E 70T15-M21A2-CS1-H4	17632-A	T 46 6 M M 1 H5
106	FCAW	Repair & M.	HILCO Hilcord 600	-	-	EN 14700	T Fe 6
98	SMAW	Repair & M.	HILCO Hilcostel 12E	A5.13	E CoCr-B	EN 14700	E Co3
97	SMAW	Repair & M.	HILCO Hilcostel 6E	A5.13	E CoCr-A	EN 14700	EZ Co2
144/7	-	Accessories	HILCO Hildisc	-	-	-	-
75	SAW	Stainless	HILCO HW 120	-	-	14174	S A FB 2 53 AC
35	SAW	Unalloyed	HILCO HW 150	-	-	14174	S F MS 1 67 AC
36	SAW	Unalloyed	HILCO HW 155	-	-	14174	S F MS 1 56 AC
37	SAW	Unalloyed	HILCO HW 430	-	-	14174	S A AR 1 87 AC
38	SAW	Unalloyed	HILCO HW 530	-	-	14174	S A AB 1 67 AC H5
53	SAW	Low alloyed	HILCO HW 590	-	-	14174	S A FB 1 55 AC H5
28	GMAW	Unalloyed	HILCO K60	A5.18	ER 70S-6	14341-A	G 38 2 C G3 Si 1 G 42 3 M G3 Si 1
51	GMAW	Low alloyed	HILCO K80	A5.28	ER 110S-G	16834-A	G 69 4 M Mn3Ni1CrMo
139	Gas welding	Non ferrous	HILCO L-Ag 15 P	A5.8	BCuP-5	EN 1044	CP 102
139	Gas welding	Non ferrous	HILCO L-Ag 2 P	A5.8	~BCuP-6	EN 1044	CP 105
139	Gas welding	Non ferrous	HILCO L-Ag 20 Si	-	-	EN 1044	AG 206
139	Gas welding	Non ferrous	HILCO L-Ag 30 Sn	-	-	EN 1044	AG 107
139	Gas welding	Non ferrous	HILCO L-Ag 34 Sn	A5.8	~BAg-35	EN 1044	AG 106
139	Gas welding	Non ferrous	HILCO L-Ag 45 Sn	A5.8	BAg-36	EN 1044	AG 104

Page	Process	Group	Product name	AWS	Specification	EN ISO	Classification
139	Gas welding	Non ferrous	HILCO L-Ag 5 P	A5.8	BCuP-3	EN 1044	CP 104
139	Gas welding	Non ferrous	HILCO L-Ag 55 Sn	A5.8	~BAg-7	EN 1044	AG 103
96	SMAW	Repair & M.	HILCO Nickel Iron	A5.15	E Ni Fe-Cl	1071	E C Ni Fe-1 1
18	SMAW	Unalloyed	HILCO Pipeweld 6010	A5.1	E 6010	2560-A	E 38 3 C 21
19	SMAW	Unalloyed	HILCO Pipeweld 7010	A5.1	E 7010-P1	2560-A	E 42 3 C 25
111	SMAW	Repair & M.	HILCO Pipeweld 6010	A5.1	E 6010	2560-A	E 38 3 C 21
95	SMAW	Repair & M.	HILCO Pure Nickel	A5.15	E Ni-Cl	1071	E C Ni-Cl 1
16	SMAW	Unalloyed	HILCO Red	A5.1	E 6013	2560-A	E 42 0 RC 11
15	SMAW	Unalloyed	HILCO Red Extra	A5.1	E 6013	2560-A	E 42 0 RC 11
84	SMAW	Repair & M.	HILCO Red Extra	A5.1	E 6013	2560-A	E 42 0 RC 11
25	SMAW	Unalloyed	HILCO Regina 150	A5.1	E 7024-1	2560-A	E 42 2 RA 53
26	SMAW	Unalloyed	HILCO Regina 160	A5.1	E 7024-1	2560-A	E 42 0 RR 53
27	GMAW	Unalloyed	HILCO SG1A Superflow	A5.18	ER 70S-2	14341-A	G 46 A M21 2Ti
94	SMAW	Repair & M.	HILCO Sugarhard	-	-	EN 14700	E Fe14
20	SMAW	Unalloyed	HILCO Velora	A5.1	E 6013	2560-A	E 42 0 RR 12
21	SMAW	Unalloyed	HILCO Velveta	A5.1	E 6013	2560-A	E 42 0 RR 32
143	-	Accessories	HILCO Welding cable	-	-	-	-
154	-	Accessories	HILCO Welding Gloves	-	-	-	-
151	-	Accessories	HILCO Welding Helmet Automatic	-	-	-	-
150	-	Accessories	HILCO Welding Helmet Flip-up	-	-	-	-
155	-	Accessories	HILCO Welding Machine	-	-	-	-
141	GTAW	Accessories	HILCO WP	A5.12	EWP	-	-
141	GTAW	Accessories	HILCO WS 2 Witstar®	A5.12	EWG	-	-

BIJ KONINKLIJKE BESCHIKKING HOFLEVERANCIER
BY APPOINTMENT TO THE COURT OF THE NETHERLANDS
FOURNISSEUR DE LA COUR PAR ORDONNANCE ROYALE
DURCH KÖNIGLICHEN ERLASS HOFLIEFERANT
PROVEEDORES DE LA REAL CASA DE LOS PAISES BAJOS

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