



REPAIR & MAINTENANCE WELDING PRODUCTS

HANDBOOK





StarBlaze India (A Division of Stellaris Specialities India Ltd.)

StarBlaze India - (A Division of Stellaris Specialities India Ltd.), is a value based organization in the field of Repair & Maintenance welding committed to provide worthy techno –economical solutions to its esteemed customers for their problems related to welding.

StarBlaze India - (A Division of Stellaris Specialities India Ltd.). has a vivid range of technologically superior products & solutions with capacity to upgrade the existing performance datum for the industries with respect to enhancement of component's operating life.

The organization has its state of art manufacturing facility at Gurugram in the industrial hub of Haryana & has laid its foundation on delivering goods (products, solutions and services) of the highest quality with consistency with a vision to excel on its customer's satisfaction matrix.

Having expanded its horizon in multiple countries globally Stanvac Prime is poised to bring in the best technology products & solutions in the field of:

- Sealants.
- Adhesive.
- Special lubricants.
- Water proofing system.
- Floor coating system.
- Touch up paints.

With the above products in the anvil which are to be launched soon besides the full range of existing MRO solutions & coatings, the organization naturally becomes the best choice for all type of industries because of having multiple products & solutions for all most industries under a same flagship.

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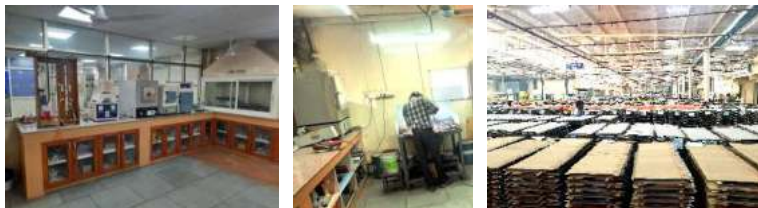
ISO Certified Manufacturing Facilities



MECHANICAL & CHEMICAL TESTING EQUIPMENTS



QUALITY CONTROL FACILITIES



APPLICATIONS OF WELDING



A

ALUMINIUM ALLOYS



STARALLOY AL 911

Joining of all Types of Weldable Aluminium & Its Alloys

TECHNICAL DATA SHEET

TDS#S11_22.08_01

TYPICAL APPLICATIONS:

Automotive Engine blocks, Cast housings, Desalination parts & pumps, holding tanks, moulds, piston, fans, frames & parts in dairies and breweries.

OUTSTANDING FEATURES:

Excellent arc stability.
Hermetically sealed packs for longer shelf life.
Corrosion resistant Joining, overlaying and filling.
Rapid deposition.
Compatible with wrought aluminium alloys.

TYPICAL WELD METAL CHEMICAL COMPOSITION (%)

Si	Fe	Al
4.50-5.50	0.50 max.	Rem.

ALL WELD METAL MECHANICAL PROPERTIES (TYPICAL)

Heat Treatment (BHN)	Tensile Strength	Yield Strength	Elongation
-	R_m (N/mm) ²	R_m (N/mm) ²	$A_5\%$
-	-	-	240

RECOMMENDATIONS:

Can be used for most types of weldable Aluminum & its alloys, including rolled, extruded and forged profiles. Highly suitable for site work and positional use. The electrodes have a high shelf life because of the unique packing in pull ring cans. Highly versatile alloy and ideal for production and maintenance welding jobs. Rapid solidification of the alloys helps in situ welding of the same.

PROCEDURE:

Use DC Reverse Polarity for welding aluminium. Prepare the surface free from oil, grease and oxidation deposits. Preheat the base metal to 200° C. Bevel thicker section to 75° vee, for better strength and defect free welding. Maintain short arc with electrode at right angle to the workpiece, backwhip craters. Chip slag and allow to cool slowly.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.00	110-150

B

COPPER ALLOYS

B

B

STARALLOY CU 912

Joining & cladding on Bronze, Castiron & Steel

TECHNICAL DATA SHEET

TDS#S12_22.08_01

TYPICAL APPLICATIONS:

Marine impellers, cast gun metal pump housing, bushes, missing gear teeth, dissimilar metals & wearing sleeves

OUTSTANDING FEATURES:

- Dense, porosity-free deposits and fully machinable deposits.
- Excellent arc Stability.
- Joining, overlaying and filling.
- Rapid deposition.
- Excellent colour match to Bronze.
- Versatile electrode, can be used on steel, cast iron and bronze.
- Deposits have low coefficient of friction.

TYPICAL WELD METAL CHEMICAL COMPOSITION (%)

Si	Fe	Al
4.00	5.00-6.00 max.	Rem.

ALL WELD METAL MECHANICAL PROPERTIES (TYPICAL)

Heat Treatment	Tensile Strength R_m (N/mm) ²	Yield Strength R_m (N/mm) ²	Elongation A_5 %	Hardness (BHN)
As welded	300	-	>20	

RECOMMENDATIONS:

High strength and versatile electrode which can be used on variety of base metals. The deposits are absolutely free from pinholes and porosities. Has good machinability. The deposits exhibit a low coefficient of friction & excellent corrosion resistance to marine atmosphere too.

PROCEDURE:

Clean weld area. Bevel heavier thickness to a 75° vee, preheat of up 300-350°C. Deposit short beads with a short arc. Peen the deposits immediately after welding use dc reverse. Strike arc by lightly drawing electrode on work piece or with copper starting block. Maintain a short arc with electrode almost perpendicular.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.00	110-140
3.15	80-110

TYPICAL APPLICATIONS:

Refinery crude columns, marine structures, pumps, impellers, dissimilar metals, glands & Sleeves along with dissimilar steel joining

OUTSTANDING FEATURES:

- Excellent arc Stability.
- Joining, overlaying and filling.
- Rapid deposition.
- Working Temperature of -196°C to 450°C
- Versatile electrode, can be used on steel, cast iron and bronze & all Monels
- Deposits have low coefficient of friction.
- Suitable for positional welding.

TYPICAL WELD METAL CHEMICAL COMPOSITION (%)

C	Mn	Cu	Fe	Ni	Mo	V
0.03	4.00-5.00	29.00-31.00	3.00 max.	65.00 or Bal.	0.20	0.30

ALL WELD METAL MECHANICAL PROPERTIES (TYPICAL)

Heat Treatment	Tensile Strength R _m (N/mm) ² 490	Yield Strength R _m (N/mm) ² -	Elongation A ₅ % -	Hardness (BHN) -

RECOMMENDATIONS:

High strength and versatile electrode, which can be used on variety of base metals. The deposits are absolutely free from pinholes and porosities. The deposits exhibit an excellent corrosion resistance to seawater, salts & reducing acids at higher temperatures. Recommended for joints between monel, Cupro Nickel alloys, carbon steel, low alloy steels, copper and copper alloys. Weld deposit has a low coefficient of friction.

PROCEDURE:

Clean weld area. Bevel heavier thickness to a 75° vee, preheat of up 300-350°C, Deposit short beads with a short arc. Peen the deposits immediately after welding. Use dc reverse. Strike arc by lightly drawing electrode on work piece or with copper starting block. Maintain a short arc with electrode almost perpendicular. Backwhip craters. Chip slag between passes. Allow to cool slowly.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.00	110-140
3.15	80-110

C

STEEL



STARALLOY ST 921

All position welding electrode for Low alloy & Low Carbon steel.

TECHNICAL DATA SHEET

TDS#S21_22.08_01

TYPICAL APPLICATIONS:

General applications like containers, steel bus bodies, air conditioning units, machine guards, and other low alloy and low carbon steels.

OUTSTANDING FEATURES:

- Contact type of welding alloy-hence minimum heat input
- Self-lifting slag-minimal welders effort & defect free welding
- Rapid depositing-quicker completion of jobs.
- All positional welding electrodes.
- Finely rippled deposits, exhibiting good weld characteristics & uniformity
- Fantastic strike & restrike capability

RECOMMENDATIONS:

Highly recommended for the welding of thin gauge sheets, forms and plates, where distortion, warpage and residual stresses are to be minimized and burn through areas eliminated. A universal all position welding electrode for low carbon steels, producing quality weld deposits with rapid deposits. The deposits are uniform without any weld defects. The welders efforts are minimal like slag cleaning etc.

PROCEDURE:

Clean joint area. Use either AC or DC power source. On DC, use straight polarity for shallow penetration & reverse polarity for deep penetration. Tack weld sections to maintain alignment. Hold electrode at slight incline in the direction of travel, about 20° off the perpendicular. Do no weave on contact welding. High arc gap to be avoided where distortion and positional welding are important factors. Slag is self releasing. Deposits have very fine ripples.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.00	110-140
3.15	100-130
2.50	65-90

TENSILE STRENGTH:

72,000 PSI (500N/mm²)

STARALLOY ST 922

TECHNICAL DATA SHEET

Low diffusible Hydrogen electrode for Low, Medium alloy & High tensile steel. TDS#S22_22.08_01

TYPICAL APPLICATIONS:

Heavy machinery castings, Crane jibs, Truck chassis, Steel castings, Heavy equipment maintenance..

OUTSTANDING FEATURES:

- Ultra low diffusible hydrogen with high elongation - No hydrogen induced cracking.
- Self lifting slag-minimal welder's effort & defect free welding.
- Extremely smooth and spatter & turbulence free arc transfer.
- All positional welding electrode.
- Excellent self-lifting slag, no slag inclusion-welders comfort.
- Fantastic strike & restrike capability combined with low smoke.
- High strength reliability

RECOMMENDATIONS:

For low alloy & medium alloy, high tensile steels. Has superior moisture resistant coating. Excellent for problem steels, having sulphur and other alloys added to base metal to improve machinability. These elements which produce porosity and other hidden defects are purged from the molten pool by electrode arc action. Recommended where toughness and reliability of weld are of prime importance. Can work in subzero temperatures too as deposits has high impact values.

PROCEDURE:

Clean weld area. Maintain a close arc length. Horizontal fillet welds can be made using the contact technique. Vertical joints should be welded from the bottom up by weaving rapidly. Do not whip. Slag is self lifting and hence easy removal.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.00	180-225
4.15	140-180
3.15	100-135

TENSILE STRENGTH:

88,000 PSI (610N/mm²)

STARALLOY ST 923

TECHNICAL DATA SHEET

Low diffusible Hydrogen electrode for Low, Medium alloy & High tensile steel. TDS#S23_22.08_01

TYPICAL APPLICATIONS:

Heavy machinery castings, die repairs build up, Crane wheels, Earth moving equipment cracks and cast steel joining.

OUTSTANDING FEATURES:

- Low diffusible hydrogen with high elongation-No Hydrogen induced Cracking.
- Self lifting slag-minimal welders effort & defect free welding.
- Extremely smooth and spatter & turbulence free arc transfer.
- All positional welding electrode.
- Excellent self lifting slag, no slag inclusion-welders comfort
- Fantastic strike & restrike capability combined with low smoke.
- High strength reliability.

RECOMMENDATIONS:

For low alloy & medium alloy, high tensile steels. Has super moisture resistant coating. Excellent for problem steels, having sulphur and other alloys added to base metal to improve machinability. These elements which produce porosity and other hidden defects are purged from the molten pool by electrode arc action. Recommended where toughness and reliability of weld are of prime importance. Can work in subzero temperatures too as deposits has high impact values.

PROCEDURE:

Clean weld area. Maintain a close arc length. Horizontal fillet welds can be made using the contact technique. Vertical joints should be welded from the bottom up by weaving rapidly. Do not whip. Slag is self lifting and hence easy removal.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	200-240
4	160-200
3.15	120-160

STARALLOY DS 931

Welding of V-Mo Spring Steel, Low Medium & High Carbon steel.

TECHNICAL DATA SHEET

TDS#S31_22.08_01

TYPICAL APPLICATIONS:

Commercial & Earth moving chasis frames, gears, springs, tool steels, cushion layer prior to hard facing protection, dissimilar alloy steels, joining.

OUTSTANDING FEATURES:

- Perfect balance of Fermite giving maximum strength combined with high strength No crack welding of high alloy steels.
- Easy to use low amperage.
- Resistance to surface contaminants.
- Excellent Impact resistance.
- Tough high crack resistance combined with smooth arc transfer.
- All position welding capability

RECOMMENDATIONS:

Deposits have high strength, wear resistant welds and overlays on all steels, requiring best possible properties. For leaf and coil springs, Vanadium-moly spring steels, mild and medium & high carbon steels. Ideal for use as a padding layer prior to applying hard facing alloy. Can be use on contaminated surfaces with ease.

PROCEDURE:

Clean weld area and follow usual joint preparation. Bevel heavy Sections 60°-90°. For high alloy steels, a preheat up 200°C is recommended. Hold a short arc. Run stringer beads. Intermittent welding may be used-specially on high alloy steels. Peening will relieve internal stresses. Cool each pass before chipping. Self lifting slag help in getting sound defect free welding. Interpass temperature has to be below 300°C.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-140
3.15	90-110
2.5	50-80
1.6	35-50

TENSILE STRENGTH:

1,20,000 PSI (830N/mm²)

STARALLOY DS 932

TECHNICAL DATA SHEET

Welding & cladding of all steel & stainless steel types at elevated temperature. TDS#S32_22.08_01

TYPICAL APPLICATIONS:

Alloy with outstanding corrosion resistance at high temperatures. Suited for dissimilar steel joining and also unknown stainless steels. Overlaying of shafts, furnace parts, valves and steel pumps.

OUTSTANDING FEATURES:

- Contact type with superior arc characteristics.
- Excellent corrosion resistance at high temperatures also.
- Retains strength till 1000°C & also corrosion resistant.
- Self-lifting slag design-minimal welders fatigue.
- No red hotness during welding of the electrode.
- Minimal wastage
- All position welding capability.

RECOMMENDATIONS:

Versatile electrode for overlaying or joining applications across variety of steels & stainless steels. Frostarc formulation enables welding at low amphereages and eliminating distortion and warping. Ideal alloy for overlay of wear resistant and impact strength. Good alloy for most stainless steels of any grade. High Cr Ni content enables better functioning in variety of applications.

PROCEDURE:

Clean weld area and follow usual joint preparation. Bevel heavy Sections 60-90°. For high alloy steels, a preheat up 200°C is recommended. Hold a short arc. Run stringer beads. Intermittent welding may be used-specially on high alloy steels. Self lifting slag help in getting sound defect free welding.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-140
3.15	75-110
2.5	50-80

TENSILE STRENGTH:

87,000 PSI (600N/mm²)

STARALLOY DS 933

Rutile basic electrode suitable for high alloy joining & forged – extruded components.

TECHNICAL DATA SHEET

TDS#S33_22.08_01

TYPICAL APPLICATIONS:

Ideal for Shaft repairs, bearing areas surfacing, springs, cushion layer before hardfacing. Joining dissimilar & unknown steel & stainless steel combinations.

OUTSTANDING FEATURES:

- Rutile basic electrode with austenitic deposit with blend of ferrite balance making it suitable for high alloy joining.
- Contact type & Self lifting slag electrode design.
- Resistance to surface contaminants & excellent impact resistance
- Soft welding with no spatter
- Self lifting slag design-minimal welders fatigue.
- All position welding capability.

RECOMMENDATIONS:

Deposits have high strength, wear resistant welds and overlays on all steels, requiring best possible properties, can be ideally used for forged or extruded steel components. Special formulation allow this alloy to be welded on a very short arc and at a very low amphereages. Ideally suited for die cracks, heavy equipment's booms and chassis.

PROCEDURE:

Clean weld area and follow usual joint preparation. Bevel heavy Sections 60°-90°. For high alloy steels, a preheat up 200°C is recommended. Hold a short arc, run stringer beads, intermittent welding may be used - specially on high alloy steels. Peening will relieve internal stresses. Self lifting slag help in getting sound defect free welding. Interpass temperature has to be below 300°C.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-150
3.15	80-110
2.5	50-80

TENSILE STRENGTH:

1,00,000 PSI (690N/mm²)

STARALLOY DS 934

Rutile basic electrode suitable for high alloy joining & forged – extruded components.

TECHNICAL DATA SHEET

TDS#S33_22.08_01

TYPICAL APPLICATIONS:

Suited for Dies, tools, springs, cushion layer, joining dissimilar & unknown steel & stainless steel combinations. Machine able build-up and overlay. Commercial & Earth moving Chassis frames, gears, springs, tool steels, cushion layer prior to hard Facing protection, dissimilarly steels joining.

OUTSTANDING FEATURES:

- Frostarc Formulation leading to low amperage welding with superior penetrations at low amperages.
- Superior ferrite balance" chemistry engineered to give superior crack free weld deposits on high alloys and
- high carbon steels with HAZ cracking.
- Contact type & Self lifting slag electrode design.
- Resistance to surface contaminants & excellent impact resistance.
- Tough, high crack resistance combined with smooth arc transfer.
- All position welding capability.

TYPICAL WELD METAL CHEMICAL COMPOSITION (%)

C	Mn	Si	Cr	Ni	Mo
0.08-0.12	0.50-1.50	1.25	28.00-32.00	9.50-11.00	0.50-1.00

ALL WELD METAL MECHANICAL PROPERTIES (TYPICAL)

Tensile Strength	Yield Strength	Elongation	Hardness
Rm (N/mm) ²	Rm (N/mm) ²	A5%	(HB)
>850	>550	>27	1st Layer –180 2nd Layer - 210

RECOMMENDATIONS:

Frostarc coating plus high-alloy core generates highly ionized arc for "spray-type" transfer of weld metal. Outstanding strength and weldability. CDS produces fine & dense grain structure for high strength, high toughness and ductility. For combinations of similar and dissimilar steels and joining steels of different thicknesses. High versatility of the electrode, makes it universal alloy for welding all dissimilar and unknown combinations of base metals.

PROCEDURE:

Clean weld area and follow usual joint preparation. Bevel heavy Sections 60°-90°. For high alloy steels, a preheat up 200°C is recommended. Hold a short arc. Run stringer beads. Intermittent welding may be used - specially on high alloy steels. Peening will Relieve internal stresses Self lifting slag help in getting sound defect free welding. Interpass temperature has to be below 300° C.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE	SIZE (mm)	RANGE
4.00	110-140	2.5	50-70
3.15	80-110	1.6	35-50

STARALLOY EM 935

TECHNICAL DATA SHEET

High elongation weld for joining of Mn Steel to Carbon Steel & dissimilar Steel. TDS#S35_22.08_01

TYPICAL APPLICATIONS:

Ideal electrode for joining manganese steels to carbon steels, earth moving equipment buckets, manganese steel liners joining, shot blast machine liners joining, weld clad wear plate joining and also for joining earth moving equipments-chassis repairs.

OUTSTANDING FEATURES:

- Best in class electrode for Mn steel to Carbon steel joining
- Self releasing slag design.
- Good temperature and corrosion resistant.
- Superior corrosion resistance to intergranular corrosion at high temperature.
- Strong and tough weld deposits with out of position capability.
- Versatile for joining dissimilar steels, austenitic to ferritic steels and including carbon steels
- Good ductility of the weld deposits.

RECOMMENDATIONS:

Highly ductile electrodes makes it ideal for joining manganese steel to carbon steel joining thereby eliminating any HAZ cracks. Best suited as a base layer or a cushion layer for hard surfacing. Doesn't pick up hardness and can be deposited for multiple layers or build up. Can with stand corrosion at high temperature too. High impact values makes it suitable for joining heavy earth moving machinery.

PROCEDURE:

Clean weld area and follow usual joint preparation. Bevel heavy Sections 60-90°. For high alloy steels, a preheat up 200°C is recommended. The alloys can be used by stringer beads and also 2X beads depending on the applications. Maintain a short arc, minimum amperage and backwhip craters. Chip slag between passes and peen deposits. Cool slowly.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	90-140
3.15	75-110
2.50	55-75

TENSILE STRENGTH:

1,00,000 PSI (690N/mm²)

ELONGTION:

40%

STARALLOY TC 941

Welding of widest range of Steel and can withstand thermal cyclic load.

TECHNICAL DATA SHEET

TDS#S41_22.08_01

TYPICAL APPLICATIONS:

Kiln support tyres of Cement plants, sponge iron units. Heat treatment ovens, like retorts, heat treatment baskets, walking beam furnaces, walking beam buttons, cryogenic equipment's, heavy earth moving machinery and general dissimilar and unknown steel joining.

OUTSTANDING FEATURES:

- Widest base metal compatibility.
- All position welding capability.
- Excellent corrosion resistance combined with strength at high temperatures.
- Good thermal cycling capability.
- Strong and tough weld deposits.
- Complete length welding without electrode overheating.
- Excellent ductility and deposits doesn't need PWHT.

RECOMMENDATIONS:

Versatile electrode for all steel including heat treatable kinds. Can be best suited for difficult to weld steels and unknown compositions. Suited ideally for nickel based alloys and their different combinations. The deposits doesn't undergo heat treatment which enables to be used on thermal cycling applications. These can take care of the strains caused by weld shrinkage in massive sections due to its good elongation properties.

PROCEDURE:

Clean weld area and follow usual joint preparation. Bevel heavy Sections 60-90°. For high alloy steels, a preheat up 200°C is recommended. The alloys can be used by stringer beads and also 2X beads depending on the applications. Maintain a short arc, minimum amperage and backwhip craters. Chip slag between passes and peen deposits. Cool slowly

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-140
3.15	75-90
2.50	40-60

TENSILE STRENGTH:

87,000 PSI (600N/mm²)

STARALLOY TC 942

TECHNICAL DATA SHEET

Welding of widest range of Steel and can withstand thermal cyclic load.

TDS#S42_22.08_01

TYPICAL APPLICATIONS:

Highly suited for applications where high temperature combined with corrosion and heat involved, like heat retorts, Furnace applications, heavy machinery with high sections. Support tyres of kin etc. Highly recommended for dissimilar and unknown steel joining at high temperatures.

OUTSTANDING FEATURES:

- Widest base metal compatibility.
- All position welding capability.
- Excellent corrosion resistance combined with strength at high temperatures and also thermal cycling.
- 105% Electrode Recovery.
- Strong and tough weld deposits.
- Niobium bearing high composite alloy for high strength & quality welds.
- Excellent ductility and deposits doesn't need PWHT.

RECOMMENDATIONS:

Versatile electrode for all steel including heat treatable kinds. Can be best suited for difficult to weld steels and unknown compositions. Suited ideally for nickel based alloys and their different combinations. The deposits doesn't undergo heat treatment which enables to be used on thermal cycling applications. These can take care of the strains caused by weld shrinkage in massive sections due to its good elongation properties.

PROCEDURE:

Clean weld area and follow usual joint preparation. Bevel heavy Sections 90°. For high alloy steels, a preheat up 200°C is recommended. The alloys can be used by stringer beads and also 2X beads depending on the applications. Maintain a short arc, minimum amperage and backwhip craters. Chip slag between passes and peen deposits. Cool slowly.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	120-160
3.15	90-120
2.5	70-100

TENSILE STRENGTH:

1,00,000 PSI (600N/mm²)

OUTSTANDING FEATURES

- High alloy content allows use in high temperature applications for scale resistance up to 1200°C.
- Extra low spatter emission minimizes clean up.
- Weld metal is non-magnetic.
- Short arc length, Ultra low heat input.
- Fully austenitic structure.
- Highly resistant to hot-cracking & chemical corrosion.

Description: Stargold 010 XD is an AC-weldable rutile-coated electrode with an alloyed core, suitable for joining corrosion-proof, highly heat-proof, & non-scaling CrNi-steels which are subject to service temperatures upto 12000 C. The electrode is also suitable for joint welding Cr-, CrSi-, and CrAl steels and for cladding low alloy base metals. The weld metal alloy is highly hot-crack-proof & chemical corrosion resistant. Keep temperature as low as possible during welding, Annealing to 250°C and post-weld tempering to 700°C is required joining, kiln anchor joining ferritic base materials.

Stargold 010 XD is mainly used in furnace-construction, for fittings and pipelines, heat exchangers, valves, canthel wire joining, kiln anchor joining

Microstructure: Fully austenitic.

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile Strength

Yield Strength

Elongation

Impact Energy

Hardness

Recommended Current:

Recommended Amperage Settings:

Maximum Value Up to:

84,000 PSI (580 N/mm2)

59,000 PSI (410 N/mm2)

37%

100J: 68°F (20°C).

60J: -320°F (-196°C)

Brinell 200, Rockwell B88

DC reverse (+) or AC

Diameter (mm)	3/32(2.50)	1/8(3.15)	5/32(4.00)
Minimum Amperage	55	75	90
Minimum Amperage	75	110	140

Welding Positions

Welding Techniques

Applications

: Flat, Vertical up, Horizontal, Overhead.

: Material to be welded should be clean of all contaminants. Maintain a short arc and use stringer beads rather than a weave technique.

: Ideal for joining unknown grades of stainless to themselves and to carbon steels.

STARGOLD 60 NH

Extra low hydrogen-Moisture resistant steel electrode
for unalloyed construction steels

TECHNICAL DATA SHEET

TDS#SNH_22.08_01

OUTSTANDING FEATURES

- Ultra low diffusible hydrogen values with unique resistance to moisture pick-up.
- Uniquely superior balance of high tensile strength, high elongation & high Impact values exceeding AWS requirements.
- Extremely smooth-spatter and turbulence free arc transfer.
- Excellent self peeling slag. No slag interference.
- Unusually good AC welding characteristics, including out of position.
- Easy re-strike. Strong arc drive & excellent alloy wash.
- Up to 25% higher deposition rate than conventional low hydrogen welding

Description: High quality electrode for crack resistant, reliable welds and excellent toughness values at low temperatures on unalloyed & low alloyed steels, high tensile fine grained steels upto (-) 60°C, ship steels & offshore work. Low moisture absorption properties (LMA-type).

Microstructures: In the stress-relieved condition, the microstructures consists of acicular ferrite with some tempered bainite.

Materials:

Construction steels	: EN 10025: S 235, 5 275, 8355
Ship steels	: A-E, A 32 E 32, A 30 E 30, A 40 E 40
Fine grained steels	:
Boiler steels	: EN 10113-2: S 275, 5 356, 5 420, S 460, EN 10113-3: S 275, 5 356, 5 420, S 460, EN 10025-2: P 235, P 205, P 355
Pipe steels	: EN 10216-1: P 235, P 275, EN 10217-1: P 355
Cast steel	: EN 10213-2: OP 240 R

All weld metal mechanical properties:

Yield Strength R_e , N/mm ²	Tensile Strength R_m , N/mm ²	Elongation A^b %	Charpy Impact Value ISO-V J -40°C
500	610	30%	>_47

Welding recommendations: \Rightarrow \sim Re-drying: 300-350 C/2h

Recommended Amperage Settings:

Diameter (mm)	3/32(2.5)	1/8 (3.15)	5/32 (4.0)	3/16(5.0)
Minimum Amperage	65	100	140	190
Maximum Amperage	110	140	190	250

Welding positions: Flat, Vertical up, Horizontal, Overhead.

Welding Techniques: Remove all surface contaminants. Maintain a short arc gap and use a stringer or alight weave technique Chip slag thoroughly between passes.

Applications: For joining and repairing boiler plate, pipe steels, shipbuilding steels and cast steels. Excellent for weathering steels, such as "Corten".

STARGOLD 70 HT

TECHNICAL DATA SHEET

AC-weldable rutile-coated electrode with an alloyed core,
suitable for joining corrosion-proof, highly heat-proof and non scaling CrNi steels

TDS#SHT_22.08_01

Stargold 070 HT is an AC-weldable rutile-coated electrode with an alloyed core, suitable for joining corrosion-proof, highly heat-proof and non scaling CrNi-steels which are subject to service temperatures up to 1200°C

The electrode is also suitable for joint welding Cr-, CrSi-, and CrAl steels and for cladding low alloy base metals. The weld metal alloy is highly hotcrack-proof.

Keep temperature as low as possible during welding.

Annealing to 250°C and post-weld tempering to 700°C is required on ferritic base materials.

The electrode is mainly used in furnace-construction, for fittings and pipelines.

Operating temperature: From room temperature up to + 1200° C

Base materials:

1.4710	GX30CrSi6	1.4832	GX 25CrNiSi20-14
1.4713	X10CrAl7	1.4841	X15CrNiSi25-20
1.4762	X10CrAl24	1.4845	X12CrNi25-21
1.4825	GX25CrNiSi18-9	1.4846	GX40 CrNiSi25-21
1.4826	GX40CrNiSi22-9	1.4848	GX40CrNiSi25-20
1.4828	X15CrNiSi20-12		

Mechanical properties of all-weld metal	Tensile Strength R _m N/mm ²	Yield strength R _{p0.2} N/mm ²	Elongation A ⁵ %	Impact strength ISO - V J At room temperature
(typical values)	600	350	30	80

Current = + / ~ / 50 V

Welding positions PA, PB, PC, PD, PE, PF

Rebaking 1 h, 300° C +/- 10° C (if necessary)

Dimensions Current intensity No. of pieces/net weights (typical values)

Dia./Length	Amperage (A)
3,2 x 350	75-110
4,0 x 350	100-145

STARGOLD 222 HD

Inconel electrode that performs on AC current as well as DC current

TECHNICAL DATA SHEET

TDS#SHD_22.08_01

- Rare version of this "Super Alloy" that works perfectly on small AC machines.
- Welds can withstand temperature extremes ranging from 1900°F to -140°F (1050°C to -196°C).
- Welding characteristics and weld appearance are exceptional.

Description: Universal high nickel maintenance electrode for welding nickel alloys, dissimilar steels, high temperature steels, difficult to weld steels, creep resistant steels, tool steels. Low temperature resistant as well as oxidation resistant up to 1000°C. Applied in the chemical and petrochemical industry, in cement works, for furnaces, in thermal power stations.

Flux color: Blue-Grey

Typical mechanical properties:

Undiluted Weld Metal	Maximum Value Up to:
Tensile Strength	136,000 PSI (950 N/mm2)
Yield Strength	95,000 PSI (660 N/mm2)
Elongation	40%
Impact Energy	65J:-320°F (-196°C)
Hardness	Brinell 238, Rockwell C22
Work Hardness	Brinell 428, Rockwell C45

Recommended current: DC Reverse (+), or AC

Recommended amperage settings:

Diameter (mm)	3/32(2.5)	1/8(3.25)	5/32(4.0)
Minimum Amperage	70	100	130
Maximum Amperage	35	135	175

Welding positions: Flat, Vertical up, Horizontal, Overhead

Deposition Rates

Diameter (mm)	Length (mm)	Weldmetal/ Electrode	Electrodes per lb (kg) of weld metal	Are time of deposition min/lb (kg)	Amperage Setting	Recovery Rate
3/32 (2.5)	14" (350)	.67oz (19.5g)	23 (50)	16 (36)	85	160%
1/8 (3.25)	14" (350)	1.14oz (32g)	14 (30)	11 (25)	110	160%
5/32 (4.0)	14" (350)	1.78oz (50g)	09 (20)	09 (19)	145	160%

Welding techniques: Weld with lowest amperage feasible using a very short arc gap. Welds can be deposited using the stringer or 3X weave technique.

Applications: For joining and cladding most nickel alloys, stainless steels, and carbon steels. Excellent for oxidation and corrosion resistant applications.

STARGOLD 222 IN

A Niobium Manganese bearing, all position Inconel electrode for joining Cryogenic steels and nickels

TECHNICAL DATA SHEET

TDS#SIN_22.08_01

- Excellent out of position welding.
- Phenomenal physical properties.
- Excellent corrosion resistance at normal and elevated temperatures.
- High Mn-Nb inconel formulation for superior resistance to hot cracking & high thermal shock resistance.
- High tolerance to dilution by many combinations of nickel-base and ferrous alloys, with stable properties over a wide range of service temperatures from -269°C to above 900°C.

Microstructure: In the as welded condition this nickel base weld metal consists of austenite with a few carbides.

Materials to be welded: Nickel alloys such as Inconel 600, Nimonic 75. Nickel base alloys to themselves and to mild, low alloy and stainless steels. High temperature transition joints. Cryogenic 3% and 5% Ni steels.

Applications: For dissimilar welds on nickel base alloys to themselves, to alloyed steels or to stainless steels. Universal problem solver for welding of inconel to monel, Inconel to inconel, clad steels to unclad steels, monel to stainless steels, ferritic stainless steels to austenitic stainless steels

- High temperature and cryogenic service equipments
- Corrosion resistant tanks and containers
- Blast furnace components up to 900°C
- Liquid gas handling equipments in service from -269°C

Typical mechanical properties:

Undiluted Weld Metal	Maximum Value Up to:
Tensile Strength	90,000 (620 N/mm ²)
Yield Strength	55,000 (400 N/mm ²)
Elongation	40%
Impact Energy - 196° C	100 J

Recommended current: DC (+)

Recommended amperage settings:

Diameter (mm)	3/32(2.5)	1/8(3.15)	5/32(4.0)
Minimum Amperage	50	70	90
Minimum Amperage	70	100	120

Welding positions: Flat, Vertical up, Horizontal, Overhead

Welding techniques: Weld at minimum amperage to maintain low heat input. Ensure short arc and use stringer bead or slight weaving technique. Fill the craters properly to avoid crater cracks Dry electrodes at 250-300 deg. C for 1-2 hours prior to use.

Requirements for preheat and PWHT will be dependent on the base material being welded. For most nickel-base materials, no preheat is required.

STARGOLD 10 XD

Welding of V-Mo Spring Steel, Low Medium & High Carbon Steel.

TECHNICAL DATA SHEET

TDS#SXD_22.08_01

Standards:

Material No.	1.4842
EN 1600	E 25 20 R 12
AWS A 5.4	E310-17

Typical Application: Ferrokon FK 010XD is an AC-weldable rutile-coated electrode with an alloyed core, suitable for joining corrosion-proof, highly heat-proof, & non-scaling CrNi- steels which are subject to service temperatures upto 1200° C

The electrode is also suitable for joint welding Cr-, CrSi-, and CrAl steels and for cladding low alloy base metals. The weld metal alloy is highly hot-crack-proof & chemical corrosion resistant.

Keep temperature as low as possible during welding. Annealing to 250° c and post-weld tempering to 700 c is required on ferritic base materials.

Ferrokon FK 010XD is mainly used in furnace-construction, for fittings and pipelines.

Operating Temperature: From room temperature upto +1200° C.

All weld metal Mechanical Properties:

Yield strength R _p 0.2 N/mm ²	Tensile Strength R _m N/mm ²	Elongation A ^s %	Impact energy ISO-V J at -196°C
350	600	30	80

Current: = + / ~ / 50 V

Welding positions: PA, PB, PC, PD, PE, PF

Rebaking: 1 h, 300 °C +/- 10 °C (if required)

Welding Current:

Dia./Length	Amperage (A)
3,2 x 350	75-110
4,0 x 350	100-145

STARGOLD 301

TECHNICAL DATA SHEET

Extra strong and tough stainless steel electrode for joining steel to stainless steel, manganese steels. Ideal "Black" to "White" welding electrode.

TDS#S01_22.08_01

- Highly recommended for joining hard to weld steels.
- Moisture resistant coating provides sound porosity free deposits.
- Slag is self-removing.
- Versatile for joining dissimilar steels, austenitic steels to ferritic steels, carbon steels to stainless steels... for buffer layers and for austenitic cladding
- Superior weldability, even out of position.
- Good temperature & corrosion resistance.
- Niobium stabilised for superior resistance to intergranular corrosion & retaining mechanical properties when working at high service temperature upto 1000° C.

Applications: Wherever maximum ductility is required when joining dissimilar steels to themselves or to stainless steels, manganese steels also excellent as a cushion layer in tool steel hardfacing applications where high hardness pick up is not desired in the final overlays.

Microstructure: Austenite with a ferrite of approx 15%.

Typical mechanical properties:

Undiluted Weld Metal

Tensile Strength	100,000 Psi (690 N/mm ²)
Yield Strength	76,000 Psi (530 N/mm ²)
Elongation	40%
Impact Energy	50J: 680F (200C)
Hardness	Brinell 219, Rockwell C14
Recommended current:	DC reverse (+) AC

Maximum Value Up to:

Recommended amperage settings:

Diameter (mm)	3/32(2.50)	1/8(3.15)	5/32(4.00)
Minimum Amperage	55	75	90
Maximum Amperage	75	110	140

Welding Positions: Flat, Horizontal, Vertical up, Overhead.

Welding Techniques: Material to be welded should be clean of all contaminants. Maintain a short arc and use stringer beads rather than a weave technique.

STARGOLD 302

Non-magnetic, High manganese stainless for joining and buffer layers

TECHNICAL DATA SHEET

TDS#SO2_22.08_01

- Rare Combination of toughness, crack resistance & impact resistance.
- Austenite with 5 FN
- Easy position welding
- Easy & complete slag removal qualities as are generally not found in manganese steel joining & buffering electrodes.
- Resists scaling upto 850°C.
- "Non-magnetic" weld metal is not susceptible to cracking and possesses high deformation capacity
- Joins armour steels to themselves as well as to mild, stainless and manganese steels.
- Offers a rare combination of toughness, crack resistance and impact resistance.

Description: Non-magnetic high manganese stainless steel electrode for joining manganese steels, to themselves as well as to other steel without pre heat. Excellent for buffering & claddings on manganese steels as well as welding of hard to weld steels.

Key Repair Application: Welding & repairing difficult to weld steels, manganese & armour steels, steels with high sulfur & phosphorus contents. railways, mining...buffer layers before cold hardfacing on manganese steels as well as cast Irons. for reclaiming and joining 14% manganese steels, as well as non alloy and alloy structural and heat treatable steels

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile Strength	100,000 psi (690 N/mm ²)
Yield Strength	76,000 psi (510 N/mm ²)
Elongation	40%
Impact energy	80J: +20°C
Hardness	Brinell 200, Rockwell C25
Work Hardness	Brinell 450, Rockwell C48

Maximum Value Up to:

Recommended Current

DC Reverse (+) or AC

Recommended Amperage Settings:

Diameter (mm)	3/32 (2.50)	1/8 (3.15)	5/32 (4.00)
Minimum amperage	70	90	120
Maximum amperage	90	120	150

Welding Positions: Flat, Vertical up, Horizontal, Overhead

Welding Techniques: Never preheat manganese steels due to crack sensitivity. Always use minimal amperage.

1. Lowest Heat Input in Class-

Best fusion & penetration at lowest welding amperages..... minimises heat affected zones... highest quality repairs... this is the central concept of "Low heat input repair welding and our product is today the best in this class.

Excellent all-position weldability in both AC & DC. Unusually fine drop type "ionised- arc" transfer, even on alternating current, reduces spatter & prevents overheating. Insensitive arc gap - can be varied from contact to medium long without loss of arc stability

2. Best Balance of Ultra High Tensl Strength and Elongation

High strength with high ductility high toughness. Superb resistance to heat corrosion & shock. Good machine-ab Excellent fatigue resistance for long lasting repairs. Super high nota toughness

Exceptionally high elongation enable the weld to stretch & absorb wit contraction without either the weld or the base cracking

3. Best Ferrite Balance... Best Crack Resistance in Class.

Unmatched fine grained micro structure. Excellent ferrite-austenite balance with perfectly distributed ferrite throughout the weld deposit.

Ferrite rich structure is highly resistant to fissures, cracking, hot cracking & under bead cracking... practically any type of cracking under practically all conceivable conditions.

X-ray quality welds of outstanding quality even on dissimilar steels & composite steel structures.

Restricted trace elements. Highly controlled penetration for minimum harmful dilution & harmful carbon or contamination pick-up.

4. Best Handling of Surface Contaminants

Rust/Oil/Water.... No defects/ porosities... Strong penetration, even at low amperages, ensures perfect weld beads, despite such contaminants. Virtually Insensitive to surface contaminants. Enables secure welding even over- painted, rusted, oily, dirty & wet surfaces.

Unique tool for successful emergency repair work, especially on site & at odd hours, when time inadequacy & where the damage situation does not allow proper surface cleaning.

5. Best Slag Removal Features

No slag interference despite contaminants... defect free repairs.. every time.. on all surfaces. Special slag formulation eliminates slag interference in horizontal fillets. Virtually self-releasing slag Eliminates the possibility of slag entrapment & makes electrode excellent even for multi-pass weldments. Does not under cut, overlap or fill-up. Smooth, regular well formed beads, uniform in cross section. Reduces need for pre-heating on "problem steel", welding.

6. Excellent for Repairs in Adverse Conditions

Against water flow... dissimilar joints...Jolly & rusty surfaces... perfect leak proof joints.

STARGOLD 303

Ferrite Balanced, Super Strength For All Steels

TECHNICAL DATA SHEET

TDS#S03_22.08_01

Unparalleled versatility. Fully compatible with the chemistry of every standard grade of steel manufactured today.

- 7. Best Welder Friendliness in Class...** extreme ease of use in adverse conditions.. will operate even with low quality power sources... minimal smoke... easy to handle out of position.

Mechanical Properties	Tensile Strength R_m (Mpa)	Yield strength $R_p 0,2$ (Mpa)	Elongation A_5 %
	>850	>550	>27

Hardness:	1st layer-180 HD 2nd layer-210 HB	Temperature Resistance: 20°C to +900°C
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Welding Instruction Current (A)

1.6mm	2.5 mm	3.2 mm	4.0 mm	5.0 mm
25-35	35-70	60-110	75-140	130-200

Application:

Spring Steel	Air Hardening Tool Steel	Vanadium Moly Spring Steel	Low Alloy Steel
High Carbon Steel	Water Hardening Tool Steel	Chrome Moly Steel	High Alloy Steel
Medium Carbon Steel	Hot Working Tool Steel	Heat-Resistant Steel	Martensitic Stainless Steel
Low Carbon Steel	High Speed steel	Shock-Resistant Steel	Ferritic Stainless Steel
Manganese Steel	Cast Steel	U.S.T 1 Steel	Austenitic Stainless Steel

And All Dissimilar Steels.... Completely Eliminates Guesswork... 100% reliable & fool proof... extremely safe & durable joint welding of difficult-to-weld steels & surfacing of hard alloys. Ideal for repair of spring plates, drill bits, moulds, dies, chains, crane booms, shafts, cog wheels, tools, armour plates... buffering layer under hardfacing....

STARGOLD 500

Niobium – Molybdenum bearing, all position Inconel electrode for heat resistant and cold-tough joints

TECHNICAL DATA SHEET

TDS#S03_22.08_01

- Excellent out of position welding.
- Excellent scaling resistant at high temperature.
- Excellent corrosion resistant even at elevated temperatures.

Classification AWS/ASME A 5.11: E NiCrFe-2

Applications: For welding of inconel, monel, nickel, iron-nickel-chrome alloys, to themselves, to alloyed steels or to stainless and heat resisting steels.

Alloy: Ni Cr, Mn, Fe, Nb, Mo

Typical Mechanical Properties:

Undiluted Weld Metal	Maximum Value Up to:
Tensile Strength	600 N/mm ²
Yield Strength	400 N/mm ²
Elongation	40%

Recommended Current: DC (+)

Recommended Amperage Settings:

Diameter (mm)	3/32 (2.50)	1/8 (3.15)	5/32 (4.00)
Minimum Amperage	40	70	100
Maximum Amperage	60	90	140

Welding Positions: Flat, Vertical up, Horizontal, Overhead

Redry : Dry electrode prior to welding at 300°C for 1 to 2 Hours,

Welding Techniques : Clean the surface thoroughly, welds with minimum amperage to maintain very short arc. Use stringer bead or slight weaving technique. Maintain root gap 2 mm and "V should be between 70-80° angle.

STARGOLD 501

A Niobium bearing, all position Inconel electrode for joining high temperature and cryogenic steels and nickels

TECHNICAL DATA SHEET

TDS#SF3_22.08_01

- Excellent out of position.
- Phenomenal physical properties.
- Extremely easy slag removal.
- Performs unusually well on AC current.

INTERNATIONAL SPECIFICATIONS	AWS/ASME A 5.11: E NIC/Fe-3 DIN 1736 EL-NiCr 16 FeMn NFA 81-347: EF 20.70 NiCrMnFe B 20 BH
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Applications: For dissimilar welds on nickel base alloys to themselves, to alloyed steels or to stainless steels.

Microstructure: In the as welded condition this nickel base weld metal consists of austenite with a few carbides.

Alloy: C, Mn, Si, Nb, Cr, Fe, Co, Ti, Ni.

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile Strength

Yield Strength

Elongation

Maximum Value Up to:

100.000 PSI (700 Nimm²)

60.000 PSI (420 Nimm²)

43%

Recommended Current:

DC Positive (+), AC

Recommended Amperage Settings:

Diameter(mm)	3/32(2.50)	1/8(3.15)	5/32(4.00)
Minimum Amperage	50	70	90
Maximum Amperage	70	95	120

Welding Positions: Flat, Vertical up, Horizontal, Overhead

Deposition Rates

Diameter (mm)	Length (mm)	Weldmetal/ Electrode	Electrodes per lb (kg) of weld metal	Are time of deposition	Amperage Setting min/lb (kg)	Recovery Rate
3/32 (2.5)	12" (300)	.37oz (10g)	43 (95)	37 (82)	60	105%
1/8 (3.25)	14" (350)	0.76oz (22g)	21 (47)	24 (53)	90	105%
5/32 (4.0)	14" (350)	1.14oz (32g)	14 (31)	17 (38)	105	105%

Welding Techniques: Weld at minimum amperage to maintain low heat input.

STARGOLD 502

TECHNICAL DATA SHEET

Inconel 625 electrode that performs on AC current as well as for DC current TDS#SF2_22.08_01

- Rare version of this "Super Alloy that works perfectly on small AC machines.
- Welds can withstand temperature extremes ranging from 1050C to -196C.
- Welding characteristics and weld appearance are exceptional.
- Excellent strength ductility & toughness. Capable of with standing high stresses even under severe impact loading and thermal cycling.
- Versatile, Will join practically any dissimilar steel combination.
- Self peeling slag. Soft arc drive. Minimum spatter, excellent wash & fluidity.

Applications: For joining and cladding most nickel alloys, stainless steels, and carbon steels. Excellent for oxidation and corrosion resistant applications-Furnaces, heat treatment, kilns, heavy highly restrained sections

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile Strength

Yield Strength

Elongation

Impact Energy

Hardness (As Welded)

Work Hardness

Maximum Value Up to:

1,38,000 PSI (950 N/mm2)

95,000 PSI (660 N/mm2)

40%

65J:-320°F (-196°C)

Brinell 238, Rockwell C22

Brinell 428, Rockwell C45

Recommended Current:

DC Reverse (+) or AC

Recommended Amperage Settings:

Diameter(mm)	3/32(2.50)	1/8(3.15)	5/32(4.00)
Minimum Amperage	70	100	130
Maximum Amperage	95	135	175

Welding Positions: Flat, Vertical up. Horizontal, Overhead

Deposition Rates: >60% higher than conventional nickel-chromium alloy electrode

Deposition Rates

Diameter (mm)	Length (mm)	Weldmetal/ Electrode weld metal	Electrodes per lb (kg) of min/lb (kg)	Are time of deposition	Amperage Setting	Recovery Rate
3/32 (2.50)	14" (350)	.69oz (19.5g)	23 (50)	16 (36)	85	160%
1/8 (3.25)	14" (350)	1.14oz (32g)	14 (30)	11 (25)	110	160%
5/32 (4.0)	14" (350)	1.78oz (50g)	9 (20)	9 (19)	145	160%

Welding Techniques: Weld with lowest amperage feasible using a very short are gap Welds can be deposited using the stringer or 3X weave technique

- Universal - all position offers the convenience of flat, vertical up & down, overhead welding without changing amperage settings.
- Contact (drag) type welding alloys electrode to weld by itself.
- Minimises welder fatigue.
- Extreme ease of use.
- Superior weld bead with ultra low heat input.
- Rapid deposition.

Description and Applications:

Rutile type multi purpose all position contact type welding electrode featuring outstanding welding properties. Exceptional ease of operability. Very smooth finely rippled weld beads blending into the base metal without undercutting. Self releasing slag. Excellent arc striking and re-striking Welds are of radiographic quality the as welded condition this nickel base weld metal consists of austenite with a few carbides.

Typical applications-repair of tank, bridge, ducts, pressure vessels, containers, bus bodies, pipe lines etc.

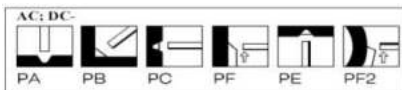
Typical Mechanical Properties:

Yield strength N/mm ²	Tensile Strength N/mm ²	Elongation A ₅ %	Charpy Impact value ISO-V (J) 0°C
40	450-520	26.00	80 J

Materials: S(P) 235 to S(P) 355; GP 240; GP 280

Storage and redrying: Keep dry and avoid condensation. Re-drying not generally required. If necessary: 100-110°C for 1 hour.

Welding Positions:



Diameter (mm)	Length (mm)	Current (A)
2.50	350	65 – 90
3.15	350	100-130
4.00	350	140-180
5.00	350	190-230

STAR MS ALL PURPOSE

TECHNICAL DATA SHEET

TDS#SAE_22.08_01

International Specification: ASW/ASME SFA E 11018-M
DIN 8529 EY 6965 Mn2NiCrMoB
BS 2493 2NiMo. BH

Description/ fine- Properties: Basic coated electrode especially suitable for welding of high tensile grained steels with a yield strength about 700N/mm² Finerippled seams, low spatter, easy slag removal.

Materials: Fine grained steels: STE 500-STE 690

Weld metal Composition	C	Si	Mn	Ni	Cr	Mo
	0,08%	0,4%	1,7%	2,2%	0,4%	0,4%

All Weld Metal Mechanical Properties:

Yield strength R _e N/mm ²	Tensile Strength R _m N/mm ²	Elongation A ₅ %	Charpy Impact value ISO-V (J) ISO-V J at -400 C
>750	775-850	>18	>47

Welding: =+~ **Redrying:** 300-350°C/2h

Recommendations

Welding positions: all positions, except vertical down

Welding current: Packing data:	Article-No.	Dia/Length mm	Amperage A	kg/pack	appr. pcs/ pack
	00.165.323	3.25/350	100-140	5	139
	00.165.403	4.0 /350	130-180	5	88

STAR HEAT PLUS

Coated Electrode for protection against high abrasion

TECHNICAL DATA SHEET

TDS#STU_22.08_01

Electrodes with a high alloy content of elements which form carbides. Therefore especially used for hardfacing of parts subject to high abrasion, friction, heat and corrosion.

The electrode is easy to weld, has a smooth drop transfer and only a negligible slag content. Recovery approx 200%.

Applications: ash plows, coke crusher segments, screw conveyers, valves, exhaust fans, agitator fingers, mill guides, mixer paddles, rake teeth in furnaces, long bits, slag ladles, elevator bucket-tips etc. operation temperatures up to 650°C.

Classification: DIN 8555: E10-UM-65-GRZ
EN 14700: E Fe 16

Mechanical properties :
of all-weld metal
(typical values)


Hardness HRC
~ 65

Weld metal analysis: (typical, wt.%)

C	Si	Cr	Mo	Nb	W	V	Fe
5.0	1.5	22	7.0	7.0	2.0	1.0	Base

Current: =+~50V

Welding positions:

	1G/PA
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Welding current & Instructions	Electrode	Current
	3.2 x 350	110-140
	4.0 x 450	140-190
	5.0 x 450	190-250

Hold a short arc and the electrode almost vertical. Select lowest amperage possible to keep dilution low and weave only slightly.

Electrode for joint welding between unalloyed or low alloyed steels with high alloyed steels or casted steels, for austenitic-ferrite joints at working temperatures upto 300° C. for high carbon containing and difficult to weld steels. Austenitic manganese steels, for buffering layers, wear resistant build-up for stock, pressure and rolling load. The weld metal is austenitic, corrosions resistant, scale resistant upto 850 c and work hardenable upto approx. 350 HB.

Weld metal	C	Si	Mn	Cr	Ni	Structure: Fully austenite
Composition	0.10%	0.9%	6.0%	19.0%	9.0%	

All Weld Metal Mechanical Properties:

Yield strength R _{p0.2} 2% N/mm ²	Tensile Strength R _m N/mm ²	Elongation A ₅ %	Charpy Impact value ISO-V J RT
>350	> 550	>35	>75

Welding: ==+~ **Redrying:** 300-3500C/2h
Recommendations

Heat treatment: Pre-heating depending of the ferritic base material necessary, low heat input required, otherwise welding without pre-heating possible.

Welding positions:



Welding current:

Article-No.	Dia/Length mm	Amperage A
.00.721.323	3,2/350	80-120
.00.721.403	4,0 /350	100-150

Nickel-base electrode for joint welding and claddings on similar and similar like corrosion resistant, heat proofed and high temperature resistant steels and alloys bis 1000° C. Also for joints on cold tough austenitic CrNi-steels and castings, kaltzah bis-196° C.

Applications: Nickel-base electrode for joint welding and claddings on similar and similar-like corrosion resistant, heat proofed and high temperature resistant steels and alloys up to 1000° c. Also for joints on cold tough austenitic CrNi-steels and castings, cold tough upto -196° C. The electrode is well suitable for joints and surfacings at the following materials:1.4876, 2.4816, 2.4856, cold tough annealable Ni-steels. Can also be used to join aged/ fragile cast iron & practically any steel to any steel.

Operating Temperature: -196° C upto 1000° C.

Base Materials:

1.4558 X2NiCrAlTi32-20	2.4660 NiCr20CuMo	1.5662 X8Ni9
2.4631 NiCr20TiAl	2.4951 NiCr20Ti	1.5680 X12Ni5
2.4605 NiCr23Mo16Al	2.4816 NiCr15Fe	1.5681 GX10Ni5
2.4618 NiCr22Mo6Cu	2.4817 LC-NiCu15Fe	1.6907 X3CrNiN18-10
2.4619 NiCr22Mo7Cu	2.4851 NiCr23Fe	1.6967 X3CrNiMoN18-4
2.4630 NiCr20Ti	2.4856 NiCr22Mo9Nb	1.4876 X10NiCrAlTi32-20
2.4641 NiCr21M06Cu	2.4858 NiCr21Mo	Alloy 800
		104959 X8NiCrAlTi32-21
		Alloy 800HT

All Weld Metal Mechanical Properties:

Yield strength R _{0,2%} N/mm ²	Tensile Strength R _m N/mm ²	Elongation A ₅ %	Charpy Impact ISO-V J at - 196°C
500	750	35	40

Weld metal analysis:
(typical, wt.%)

C	Si	Mn	Cr	Ni	Mo	Nb	Fe
0,04	0,8	0,6	22	Basis	9,8	3,5	< 6

Current = + / ~ 50 V

Welding positions: PA, PB, PC, PD, PE, PF.

Rebaking 1 h, 300 °C +/- 10 °C (if required)

Dimensions Current intensity No. of pieces/net weights (typical values)

Dia./ Length	Amperage (A)	Pcs./Packet	Kg/packet
2,5 x 350	65-100	143	5,0

STARSTEEL HT

120% Recovery, Superior Moisture Resistant Electrode.

TECHNICAL DATA SHEET

TDS#SLT_22.08_01

Standards:

Material No.	1.4842
EN 1800	E25 20 R 12
AWS A 5.4	E310-17

Typical Application: Starsteel HT is an AC-weldable rutile-coated electrode with an alloyed core, suitable for joining corrosion- proof, highly heat-proof, & non-scaling Cr Ni-steels which are subject to service temperatures up to 1200° C.

The electrode is also suitable for joint welding Cr-, Cr Si-, and Cr Al steels and for cladding low alloy base metals. The weld metal alloy is highly hot-crack-proof & chemical corrosion resistant.

Keep temperature as low as possible during welding. Annealing to 250° C and post-weldtempering to 700°C is required on ferritic base materials.

Starsteel HT is mainly used in furnace-construction, for fittings and pipelines.

Operating Temperature: **From room temperature up to +1200°C.**

Base Materials:-	1.4710 GX30CrSi6	1.4832	Gx 25CrNiSi20-14.
	1.4713X10CrAl7	1.4841	X15CrNiSi25-20.
	1.4762X10CrAl24	1.4845	X12CrNiSi25-21.
	1.4825 GX25CrNiSi18-9	1.4846	GX40CrNiSi 25-21.
	14826 GX40CrNiSi22-9	1.4848	Gx40CrNiSi 25-20.
	1.4828 X15CrNiSi202-129		

All Weld Metal Mechanical Properties:

Yield strength R _{p0.2} 2% N/mm ²	Tensile Strength R _m N/mm ²	Elongation A ₅ %	Charpy Impact ISO-V J at - 196°C
350	600	30	80

Weld metal analysis: (typical, wt.%)	C	Si	Mn	Cr	Ni
	0,10	0,6	3	25	21

Current = + / ~ 50 V

Welding positions: PA, PB, PC, PD, PE, PF.

Rebaking 1 h, 300°C +/- 10°C (if required)

Dimensions Current intensity No. of pieces/net weights (typical values)

Dia./ Length	Amperage (A)	Pcs./Packet	Kg/packet
3,2 x 350	75-110	138	5,0
4,0 x 350	100-145	91	5,0

STARSTEEL LH PLUS

A Niobium Manganese bearing, all position Inconel electrode for joining Cryogenic steels and nickels

TECHNICAL DATA SHEET

TDS#SES_22.08_01

- Extra low moisture content is below.
- Smooth running AC/DC coating operates in all positions.
- Low spatter yield, self-releasing slag and uniform rippled deposit.
- Ultra-high tensile & yield strength with excellent elongation & impact values.

Applications: Structural and repair welds on high strength fine grained steels.

Microstructure: In the as welded condition, the microstructure is ferritic/ bainitic with a proportion of acicular ferrite.

Flux Color: Grey

Typical Mechanical Properties:

Undiluted Weld Metal

Maximum Value Up to:

Tensile Strength	120,000 PSI (845 N/mm ²)
Yield Strength	96,000 PSI (665 N/mm ²)
Elongation	23%
Impact Energy	82J (60ft. lbs.): 68°F (20°C) 50J (36ft.lbs.): -60°F (-51°C)
Hardness (As Welded)	Brinell 238, Rockwell C22
Work Hardness	Brinell 428, Rockwell C45
Recommended Current:	DC Reverse (+) or AC

Recommended Amperage Settings

Diameter (mm)	3/32(2.5)	1/8(3.25)	5/32(4.00)	3/16 (5.0)
Minimum Amperage	65	100	140	190
Maximum Amperage	100	140	190	250

Welding Positions: Flat, Vertical up, Vertical down, Horizontal, Overhead

Deposition Rates:

Diameter	Length	Weldmetal/	Electrodes per	Arc Time of	Amperage	
Recovery (mm)	(mm)	Electrode metal	lb (kg) of weld min/lb (kg)	deposition	Setting	Rate
3/32 (2.50)	14" (350)	.42oz (20g)	38 (83)	38 (84)	80	115%
1/8 (3.25)	14" (350)	.59oz (17g)	27 (60)	21 (47)	115	115%
5/32 (4.0)	14" (350)	1.1oz (50g)	15 (32)	18 (39)	175	115%
3/16 (5.0)	14" (350)	1.8oz (50g)	9 (20)	13 (28)	220	115%

Welding Techniques: For the majority of materials to be welded with these electrodes, minimum preheats between 212°F (100°C) and 392°F (200°C) are required to avoid hydrogen induced "cold" cracking. Remove all surface contaminants. Maintain a short arc gap and use a stringer or slight weave technique. Chip slag thoroughly between passes

20% Recovery, Superior Moisture Resistant Electrode:

High quality electrode for crack resistant, reliable welds and excellent toughness values at low temperatures on unalloyed & low alloyed steels, high tensile fine-grained steels up to (-) 60 c, ship steels & offshore work. CTOD tested. Low moisture absorption properties (LMA-type).

Applications: Tough & reliable x-ray quality welds on cast steels, low alloy, high tensile steels...pressure vessels, tubes, cement kilns, heavy equipment's, machine frames & chassis.

Materials: Construction steels: EN 10025: S 235, S 275, S 355

Ship steels: A-E, A 32-E 32, A 36-E 36, A 40-E 40

Fine grained steels: EN 10113-2 S 275, S 355, S 420, S 460

EN 10113-3 S 275 S 355, S 420, S 460

Boiler steels: EN 10028-2 P 235, P 265, P 295, P 355

Pipe steels: EN 10216-1 P 235, P 275

EN 10217-1: P 355

Cast steel: EN 10213-2: GP 240 R

Approvals: ABS, BV, DB, GL, LR, NV, RS, TUV, UDT, PRS-see appendix

Weld metal composition:

Welding Positions:	C	Si	Mn	Ni
	0.07%	0.45%	1.35%	0.5%

All Weld Metal Mechanical Properties:

Yield strength R _e N/mm ²	Tensile Strength R _m N/mm ²	Elongation A ₅ %	Charpy Impact ISO-V J-40°C
>460	500-600	>22	>47

Welding =+~ Re-drying: 300-350C/2h

recommendations:

Welding Positions:



Welding Current: Article-No. Dia/Length Amperage kg/pack appr.
 pcs/pack
 packing data

	mm	A		
.00.140.323	3.25/350	120-160	4,5	110.
.00.140.404	4.0 /450	160-200	4,8	85

STARSTEEL OMNI

High temperature joining & buffering nickel basic Inconel.

TECHNICAL DATA SHEET

TDS#SOI_22.08_01

- Useable from -196°C to +1150°C
- Fully austenitic weld metal is chemical resistant, cold tough, high temperature resistant & insensitive against embrittlement.

Applications: Nickel-base electrode for high grade joint welding and claddings on similar and dissimilar alloys at working temperatures from -196°C up to 1150°C. the fully austenitic weld metal is chemical resistant, cold tough, heat proofed, high temperature resistant and insensitive against embrittlement. The electrode is well suitable for joints and surfacing at the following materials: 1.4876,2.4816, cold tough Ni-steels, dissimilar steels, for example 1.4583 with 16 Mo3.

Base Alloys: C, Si, Cr, Ni, Mo & Nb

All Weld Metal Mechanical Properties:

Yield strength $R_p 0.2\%$ N/mm ²	Tensile Strength R_m N/mm ²	Elongation A_5 %	Charpy Impact ISO-V JRT
>350	>620	>35	>90

Welding recommendations: =+~ Re-drying: 300-350°C/2h

Pre-heating depending on base material

Welding Positions:



Welding Current:

Article-No.	Dia/Length	Amperage
	mm	A
.00.760.323	3,2/350	80-110
.00.760.403	4,0 /350	90-120

Core Wire Alloyed, High Chrome – Nickel Austenite.

Adapted for welding dissimilar steels (high alloyed with low alloyed steels) difficult to weld steels (tool steels, Mn steels, spring steels) & unknown steels. Metal deposit highly resistant to cracks acids & scale to 1000°C.

Superior microstructure with excellent soft fusion, nice aspect of the bead & self-releasing slag for crack proof build-up & cushioning prior to hard facing.

IMP NOTE: Used in so far as specifically tooling applications are concerned if lower hardness pick-up is desired in the final overlays, please use "Stargold 301" as a cushion layer electrode instead of Stargold 303 / Stasteel Plus.

Electrode for high strength joint welding and surfacing of similar and equal steels or cast steels, for joint welding tensile unalloyed steels, tempered and tool steels, high manganese steels, spring steels and joints between dissimilar steels with high alloyed stainless steels. Furthermore, for crack proof tough inter-passes on hard surfacing and for abrasion resistant and warm hardened surfacing. The austenitic – ferritic weld metal is stainless & corrosion resistant. Due to enhanced delta – ferrite content, black – white joints are highly resistant against hot-cracking.

UNIQUE FEATURES

- Rutile-basic electrode with austenitic-ferritic stainless-steel deposit.
- Excellent work hardening & crack resistance even in multi-pass overlays.
- Self-lifting slag.
- Ultra-low heat input.
- Soft fusion with minimal spattering
- Available even in 1.6mm dia.

KEY REPAIR APPLICATIONS

- Crack repair/ Cushion/ buffer layers before hard facing on tool steels (dies, moulds) & other highly alloyed/hardened steels
- Excellent corrosion & temperature resistance.

Applications: Dies, tools, spring steel, shaft repair superior weldability for all steels.

Weld metal Composition	C	Si	Mn	Cr	Ni	Structure: Austenite with ferrite 25-30%
	0.10%	0.9%	1.00	28.00	9.50	

All Weld Metal Mechanical Properties:

Yield strength R _e 0.2% N/mm ²	Tensile Strength R _m N/mm ² A ₅ %	Elongation
>600	> 800	>28

Welding: =+ ~ **Redrying:** 300-350°C/2h

Heat treatment: Pre-heating depending on base material, low heat input required.

Otherwise, pre-heating not necessary, Interpass temperature max. 200 °C

Welding positions: Flat, Vertical up, Horizontal, overhead.

Welding current:	Article-No.	Dia/Length mm	Amperage A
	.00.723.200	1,6/300	40-60
	.00.723.250	2,5 /300	50-80
	.00.723.323	3,2/350	80-110
	.00.723.403	4,0/350	100-140

Core Wire Alloyed. High Chrome - Nickel Austenite.

Electrode for joint welding between unalloyed or low alloyed steels with high alloyed steels or casted steels, for austenitic-ferrite joints at working temperatures up to 300C, for high carbon containing and difficult to weld steels. Austenitic manganese steels, for buffering layers, wear resistant build-up for stock, pressure and rolling load. The weld metal is austenitic, corrosion resistant, scale resistant up to 850C and work harden able up to approx. 350 HB.

Weld metal Composition

C	Si	Mn	Cr	Ni	Structure:
0.10%	0.9%	6.0%	19.0%	9.0%	Fully austenite

All Weld Metal Mechanical Impact Properties: J RT

Yield strength	Tensile Strength	Elongation	Charpy
R _{p0,2} N/mm ²	R _m N/mm ²	A ₅ %	value ISO-V
>350	> 550	>35	>75

Welding: Recommendations



Redrying: 300-350°C/2h

Heat treatment: input

Pre-heating depending of the ferritic base material necessary, low heat required, otherwise welding without pre-heating possible

Welding positions:



Welding current:

Article-No.	Dia/Length mm	Amperage A
.00.721.323	3,2/350	80-120
.00.721.403	4,0 /350	100-150

D

STAINLESS STEEL

D

STARALLOY CN 951

Welding of Stainless Steel (SS 308 & 347 type) material.

TECHNICAL DATA SHEET

TDS#S51_22.08_01

TYPICAL APPLICATIONS:

Corrosion resistant steel applications like chemical tanks, impellers, pumps, juice trays, stainless steel vessels, steam turbine, food processing equipments & distilleries.

OUTSTANDING FEATURES:

- Complete electrode deposition without wastage..
- Resists pitting caused due to acids and others.
- Smooth finely rippled deposits.
- No overheating of the electrode till the complete length.
- Low moisture absorption leading to quality welds.
- Low amphereage welding leading to no IGC.

RECOMMENDATIONS:

Superb with fine rippled beads. All purpose stainless steel electrode with high heat resistance for metallic arc welding of 18/8 and 19/9 stainless steels types like 301,302,304, 304L,305, 306, 308 and 347. Highly recommended for extra low carbon containing stainless steels to minimise the inter granular corrosion. Applicable for dairy, chemical plants and distillery equipments. Best suited for overlaying on steel where in chemical corrosion and hardness are required. High resistance to scaling, impact and corrosion.

PROCEDURE:

Clean weld area and follow usual joint preparation. Sheet thickness till 10 gauge can be butt welded and heavier sections has to bevelled to a 60° angle. Tack weld to minimise distortion of long joints. Electrode should be not more than 15° from normal. Maintain short arc and stringer beads are advised. Use skip or staggered welding to minimise heat buildup.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	110-150
3.15	80-100
2.5	50-80

TENSILE STRENGTH:

80,000 PSI (550 N/mm²)

STARALLOY CN 952

Welding of Stainless Steel (SS 316 type)
material & welds have low FN.

TECHNICAL DATA SHEET

TDS#S52_22.08_01

TYPICAL APPLICATIONS:

High corrosion resistance structures and vessel like chemical tanks, pumps, impellers, mixers and steam turbine blades.

OUTSTANDING FEATURES:

- Complete electrode deposition without wastage.
- Extra low carbon to resist corrosion problems-Low FN.
- Suitable for titanium and columbium stabilised Stainless steels.
- Resists pitting caused due to acids and others.
- Smooth finely rippled deposits.
- Has good creep resistance.
- Low moisture absorption leading to quality welds.
- Low amperage welding leading to no IGC.

RECOMMENDATIONS:

Superb weldability, with fine rippled beads. All purpose stainless steel electrode with high heat resistance for metallic arc welding of 18/8 and 19/9 stainless steels types like 301,302,304, 304L,305, 306, 308 and 347. Highly recommended for extra low carbon containing stainless steels to minimise the inter granular corrosion. Applicable for dairy, chemical plants and distillery equipments. Best suited for overlaying on steel where in chemical corrosion and hardness are required. High resistance to scaling, impact and corrosion.

PROCEDURE:

Clean weld area and follow usual joint preparation. Sheet thickness till 10 gauge can be butt welded and heavier sections has to bevelled to a 60° angle. Tack weld to minimise distortion of long joints. Electrode should be not more than 150 from normal. Maintain short arc and stringer beads are advised. Use skip or staggered welding to minimise heat buildup.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	90-140
3.15	75-110
2.5	55-75

TENSILE STRENGTH:

80,000 PSI (550 N/mm²)

STARALLOY CN 953

Welding electrode exhibits high marine corrosion resistance & have nil FN.

TECHNICAL DATA SHEET

TDS#S53_22.08_01

TYPICAL APPLICATIONS:

High corrosion resistance structures and vessel like chemical & fertilizer tanks, pumps, impellers, mixers and steam turbine blades. Highly suitable for fertiliser and chemical industries where nil ferrite is required.

OUTSTANDING FEATURES:

- Blend of Nil ferrite combined with no Cracks in weld bead.
- Complete electrode deposition without wastage.
- Extra low carbon to resist corrosion problems- Nil FN.
- Resists pitting caused fertilisers and Chemicals.
- Smooth finely rippled deposits.
- Low moisture absorption leading to quality welds.
- Low amphereage welding leading to no IGC.

RECOMMENDATIONS:

Best in class electrode for welding fertilizer and chemical industry components where Nil ferrite is required. The electrodes superbly manages the nil ferrite and also nil cracks in welding which is difficult to achieve with regular electrodes. Superb weldability, with fine rippled beads. All purpose stainless steel electrode with high heat resistance for metallic arc welding of 18/8 Moly fortified stainless steel specifically 316/316L. Also suitable for types like 315,318 and 329. Moly and extra low carbon facilitates this alloy to prevent acid corrosion and also enhanced creep. Super slag control parameters make the alloy welder friendly and also defect free welding. Can be used for a highly restrained joints.

PROCEDURE:

Clean weld area and follow usual joint preparation. Sheet thickness till 10 gauge can be butt welded and heavier sections has to bevelled to a 60° angle. Tack weld to minimise distortion of long joints. Electrode should be not more than 15° from normal. Maintain short arc and stringer beads are advised. Use skip or staggered welding to minimise heat buildup.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	90-140
3.15	75-110
2.5	55-75

TENSILE STRENGTH:

80,000 PSI (590 N/mm²)

STARALLOY CN 954

Non magnetic austenitic welds & can resist high temperature up to 1200 C.

TECHNICAL DATA SHEET

TDS#S54_22.08_01

TYPICAL APPLICATIONS:

Most suited alloy for welding all grades of stainless steels and also unknown stainless steels. Can be used in heat treatment retorts, baskets, trays and heat exchangers.

OUTSTANDING FEATURES:

- Weld metal is Non magnetic and has austenitic structure.
- Complete electrode deposition without wastage.
- Extra low carbon to resist corrosion problems-Low FN.
- Ideal for high oxidation at higher temperatures till 1200°C.
- Resists pitting caused due to acids and others.
- Smooth finely rippled deposits.
- Excellent hot cracking and chemical corrosion.
- Low moisture absorption leading to quality welds.
- Low amphereage welding leading to no IGC.

RECOMMENDATIONS:

Superb weldability, no spatter with fine rippled beads. All purpose stainless steel electrode with high heat resistance for metallic arc welding of 25/20 type of stainless steel and unknown stainless steel. Designed to take high temperature till 1200°C. Can be ideally used for stainless steels to carbon steel

PROCEDURE:

Clean weld area and follow usual joint preparation. Sheet thickness till 10 gauge can be butt welded and heavier sections has to bevelled to a 60° angle. Tack weld to minimise distortion of long joints. Electrode should be not more than 15° from normal. Maintain short arc and stringer beads are advised. Use skip or staggered welding to minimise heat buildup.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	90-140
3.15	75-110
2.5	55-75

TENSILE STRENGTH:

80,000 PSI (580 N/mm²)

STARALLOY CN 955

Welding electrode exhibits high marine corrosion & cavitation resistance.

TECHNICAL DATA SHEET

TDS#S55_22.08_01

TYPICAL APPLICATIONS:

Hydraulic & Water Turbines, pump housings, die casting moulds, Castor rolls, shafts

OUTSTANDING FEATURES:

- High corrosion resistance
- Complete electrode deposition without wastage
- Excellent toughness
- Resists pitting due to cavitation
- Smooth finely rippled deposits
- Low moisture absorption leading to quality welds
- Simplified heat treatment

RECOMMENDATIONS:

Best in class electrode for welding hydraulic turbines. An ideal alloy for hard surfacing of pelton wheels and hydraulic turbines. The weld deposits are very tough and show consistent and homogenous properties. The electrode can be used in all positions.

PROCEDURE:

Clean weld area. Tack thin parts every 3-5 cm. On 13% chrome steels, preheat to 150°C, deposit with a short to medium arc keeping the electrode almost vertical. Backwhip craters and chip slag between passes. Do not peen the deposits. For developing best mechanical properties, carryout stress relieving at 580°C for 4 hours and slow cool the component. Follow instruction of the steel manufacturer for heat treatable base metals. Machine deposits with carbide tipped tools.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	130-160
3.15	100-130

TENSILE STRENGTH:

120000 PSI (830 N/mm²)

HARDNESS:

34-38 HRc

STARALLOY CN 956

Welding electrode for 13% chrome
with resistance to corrosion & cavitation

TECHNICAL DATA SHEET

TDS#S56_22.08_01

TYPICAL APPLICATIONS:

Hydraulic & Water Turbines, pump housings, die casting moulds, Castor rolls, shafts

OUTSTANDING FEATURES:

- High corrosion resistance
- Complete electrode deposition without wastage
- Excellent toughness
- Resists pitting due to cavitation
- Smooth finely rippled deposits
- Low moisture absorption leading to quality welds
- Simplified heat treatment

RECOMMENDATIONS:

Best in class electrode for welding hydraulic turbines. An ideal alloy for hard surfacing of pelton wheels and hydraulic turbines. The weld deposits are very tough and show consistent and homogenous properties. The electrode can be used in all positions.

PROCEDURE:

Clean weld area. Tack thin parts every 3-5 cm. On 13% chrome steels, preheat to 150°C, deposit with a short to medium arc keeping the electrode almost vertical. Backwhip craters and chip slag between passes. Do not peen the deposits. For developing best mechanical properties, carryout stress relieving at 580°C for 4 hours and slow cool the component. Follow instruction of the steel manufacturer for heat treatable base metals. Machine deposits with carbide tipped tools.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	110-150
3.15	80-110
2.15	60-80

TENSILE STRENGTH:

120000 PSI (830 N/mm²)

HARDNESS:

350 BHN (Approx)

STARGOLD 16 MO

Maintenance quality smooth running
molybdenum bearing stainless steel electrode

TECHNICAL DATA SHEET

TDS#SMO_22.08_01

- Excellent all position capabilities.
- Extra low carbon content to resist pitting.
- Suitable for titanium and niobium stabilized versions of 316 L stainless.

Microstructure: Austenite with 3-9% ferrite. Typical ferrite number is 6.

Typical Mechanical Properties:

Undiluted Weld Metal	Maximum Value Up to:
Tensile Strength	80,000 PSI (550 N/mm ²)
Yield Strength	56,000 PSI (390 N/mm ²)
Elongation	42%
Impact Energy	40J: -157°F (-150°C)
Hardness	Brinell 209, Rockwell B96

Recommended Current: DC Reverse (+) or AC

Recommended Amperage Settings:

Recommended Amperage Settings

Diameter (mm)	1/16 (1.6)	5/64 (2.0)	3/32 (2.5)	1/8 (3.25)	5/32 (4.0)
Minimum Amperage	25	30	140	190	90
Maximum Amperage	35	50	190	250	140

Welding Positions: Flat, Horizontal, Vertical up, Vertical down & Overhead.

Deposition Rates:

Diameter	Length	Weldmetal/ (mm) Rate	Electrodes per		Arc Time of		
			Electrode	lb (kg)	Amperage of weld	metal	min/lb
1/16 (1.6)	10" (250)	.13oz (3.6g)	125 (275)	55 (121)	30	100%	
5/64 (2.0)	12" (300)	.14oz (4g)	14 (251)	47 (103)		40	100%
3/32 (2.5)	12" (300)	.3oz (9g)	50 (109)	35 (76)		65	100%
1/18 (3.25)	14" (350)	.7oz (20g)	22 (49)	21 (46)		95	100%
5/32 (4.0)	14" (350)	1oz (29g)	15 (33)	18 (40)		120	100%

Welding Techniques: Material to be welded should be clean of all contaminants. Maintain a short arc and use stringer beads rather than a weave technique.

Application: For molybdenum bearing stainless steels with 1.5 to 3.0% Mo. Primarily used for resistance to pitting, many acids and general corrosion.

STAR SS MO

Core Wire Alloyed, Chrome – Nickel – Moly,
Austenitic Structure.

TECHNICAL DATA SHEET

TDS#SSM_22.08_01

Corrosion resistant moly-bearing stainless steel electrode, for joint welding on low carbon unestablished austenitic, chemical resistant cr nimo-steels & alloy like claddings.

Applications: Steam turbine blades, mixers, pumps, chemical tanks.... Especially useful when welding crack-sensitive alloys

Materials:	Material No.	Steel	Material No.	Steel
	1.4401	X 5 CrNiMo 17 12 2	1.4436	X 5 rNiMo 17 13 3
	1.4404	X 2 CrNiMo 17 13 2	1.4437	G-X 6 CrNiMo 18 12
	1.4408	G-X 6CrNiMo 18 10	1.4571	X6 CrNiMoTi 17 12 2
	1.4429	X 2 CrNiMo 17 13 3	1.4580	X6 CrNiMoNb 17 12 2
	1.4435	X 2 CrNiMo 18 14 3	1.4583	X 10 CrNiMoNb 18 12

Weld metal Composition	C	Si	Mn	Cr	Ni	Mo	Structure: Austenite with Austenite Ferrite
	<0.03	0.9%	0.8%	19.0%	12.5 %	2.7%	

All Weld Metal Mechanical Properties:	Yield strength R _p 0, 2% N/mm ²	Tensile Strength R _m N/mm ²	Elongation A ₅ %	Charpy Impact value ISO-V J RT
	>350	> 550	>30	>60

Welding: **==+** **~** Redrying: 300-350°C/2h

Recommendations

Heat treatment: Pre-heating only for corrosion resistant Cr-steels, depending on
base material, otherwise without. Inter pass temperature max. 150 °C

Welding positions:



Welding current:

Article-No.	Dia/Length mm	Amperage A
.00.703.250	2,5/300	50-80
.00.703.323	3,2 /350	80-110
.00.703.403	4,0/350	110-150

Description/Properties:

Electrode for joint welding of unalloyed Cr-, CrNi- and CrNiMo- steels and casted iron, for austenitic-ferritic joints at working temperatures up to 300 °C and intermediate layers for chemical resistant claddings. The weld metal already is corrosive resistant on the first layer and also crack resistant on difficult to weld steels. Above 500 °C embrittlement possible.

Weld metal Composition	C	Si	Mn	Cr	Ni	Mo	Structure: Austenite with approx. 15 % Ferrite
	<0.03 %	0.9 %	0.7 %	23.0 %	13.0 %	2.6 %	

All Weld Metal Mechanical Properties:

Yield strength $R_{p0.2}$ N/mm ²	Tensile Strength R_m N/mm ²	Elongation A_5 %	Charpy Impact value ISO-V J RT
>450	> 600	>30	>65

Welding: =+~ **Redrying:** 300-350°C/2h

Recommendations

Heat treatment: Pre-heating depending on base material. For low dilution low heat input necessary. Interpass temperature max. 200 °C.

Welding positions:



Welding current:

Article-No.	Dia/Length mm	Amperage A
.00.724.323	3,2/350	80-110
.00.724.403	4,0 /350	100-140

STAR SS ULTIMA

Rutile Coated, Core Wire Alloyed, High Chrome – Nickel,
Fully Austenitic Structure.

TECHNICAL DATA SHEET

TDS#SUA_22.08_01

- Practically smoke & spatter free.
- Quiet, smooth welding.
- Short arc length-ultra low heat input.

Electrode for joint welding & surfacing of stainless steels of unknown analysis, similar or alloy like, heat resistant cr-ni steels & cast steels at temperatures of upto 1200 C for tough joints & inter passes on cr steels & cast steels etc. excellent spatter free.

Applications: Heat exchangers, valves, annealing furnaces, normalising furnaces, canthol wire joining, joining ss to other steels, fabricating tanks etc. made from other unknown stainless steels....

Materials: Material No.	Steel	Material No.	Steel
1.4710	G-X 30 CrSi 6	1.4832	G-X 25 CrNiSi 20 14
1.4713	X 10 CrAl 7	1.4841	X 15 CrNiSi 25 20
1.4762	X 10 CrAl 24	1.4845	X 12 CrNi 25 20
1.4825	G-X 25 CrNiSi	18 91.4846	G-X 40 CrNiSi 26 14
1.4826	G-X 40 CrNiSi 22 9	1.4848	G-X 40 CrNiSi 25 20
1.4828	X 15 CrNiSi 20 12		

Weld metal Composition	C	Si	Mn	Cr	Ni	Structure:
	0.12 %	1.0 %	3.5 %	25.0 %	20.0 %	fully austenite

All Weld Metal Mechanical Properties:

Yield strength R _{p0.2} , 2% N/mm ²	Tensile Strength R _m , N/mm ²	Elongation A ₅ , %	Charpy Impact value ISO-V J RT
>350	> 550	>30	>70

Welding:  **Redrying:** 300-350°C/2h

Recommendations

Heat treatment: When welding heat resistant Cr-steels pre-heating and interpass temperature of 200 to 400°C is recommended, otherwise no pre-heating (attention: brittleness properties of base material). Post weld heat treatment only independence of base material necessary.

Welding positions:



Welding current:	Article-No.	Dia/Length mm	Amperage A
	.00.712.250	2.5/300	60-90
	.00.712.323	3.2 /350	80-110
	.00.712.403	4.0/350	100-140

STAR GOLD DX 229

Stainless & heat resistant steel electrode

TECHNICAL DATA SHEET

TDS#SDX_22.08_01

Description: Rutile-basic 22-9-3-N type electrode for joint welding on corrosive resistant duplex-steels. Excellent resistant to intergranular corrosion, pitting and stress corrosion conditions. Low carbon content, excellent weldability, spatter free arc, very smooth bead appearance. The austenitic weld metal has a ferrite content of 40-50%.

INTERNATIONAL SPECIFICATION AWS A5.4 E2209-17

Materials:	Material no.	Steel
	1.4460	X 4 CrNiMoN 27 5 2
	1.4462	X 2 CrNiMoN 22 5 3
	1.446	3G-X 6 CrNiMo 24 8 2
	1.4582	X 4CrNiMoNb 25 7

Weld metal composition (Typical Weight %):	C	Mn	Si	Cr	Ni	Mo	P	S	N
	0.025	0.90	0.85	23.20	9.20	3.20	0.12	0.006	0.14

All Weld Metal Mechanical Properties:

Yield strength R _{s0.2} 2% N/mm ²	Tensile Strength R _m N/mm ²	Elongation A _s %	Charpy Impact value ISO-V J RT
>500	>700	>25	>50

Welding: =+ ~ **Re-drying:** 300-350°C/2h

Welding positions:

Welding current:	Article-No.	Dia/Length mm	Amperage A
	.00.708.250	2,5/350	40-60
	.00.708.323	3,15 /350	70-90.
	.00.708.403	4,0/350	110-140

CAST IRON

STARALLOY FN 961

Welding electrode suiting for buffer layers
on oil soaked contaminated CI surfaces.

TECHNICAL DATA SHEET

TDS#S61_22.08_01

TYPICAL APPLICATIONS:

Ideal electrode for welding oil soaked and highly contaminated cast irons defect rectification in cast iron foundries. Best color match to grey cast irons.

OUTSTANDING FEATURES:

- Extreme resistance to surface contaminations in cast iron.
- Spray and fast freezing capability-makes it suitable for pin hole free welding of cast irons
- Nonconductive flux coating helps in reaching deep cracks without side arcing, because of non-conductive flux coating
- All positional welding capability.
- Excellent color match to grey cast irons

RECOMMENDATIONS:

Ideal electrodes to be used as a buffer layer while doing a cast iron joining job. Best suited for highly contaminated Cast irons. Nonconductive coating makes it best suited without side arcing taking place. The deposits have a great color match to grey cast iron. Can be used for all thick and also thin section, where machining is not necessary. Fantastic performance on oxidized and contaminated surfaces.

PROCEDURE:

Clean weld area. Vee out cracks with Star Gouge after drilling holes at the end of the cracks, so that propagation of the cracks is arrested. Spray welds this deposit to minimal thickness on the face of groove. Maintain a medium short arc length for a uniform thickness. Do not weave while welding cast irons. Adopt skip, stagger and sequence welding techniques to minimize heat buildup. Remove slag by chipping and brushing.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	120-160
3.15	90-120

TENSILE STRENGTH:

60,000 PSI (440 N/mm²)

STARALLOY FN 962

Bi-metallic core wire suitable for Highest strength welding of all types of Cast Iron

TECHNICAL DATA SHEET

TDS#S62_22.08_01

TYPICAL APPLICATIONS:

Innovative core wire design alloy, which virtually allows all types of weldable cast irons to be welded. Ideally suited for high strength CI weld joints, pump housings, Rotors, compressors, valves and gear box housing.

OUTSTANDING FEATURES:

- Innovative core wire design allowing maximum penetration with maximum tensile strength in its class
- FROSTARC formulation.
- Touch weld & low amperage welding
- High resistance to surface contamination by oil, grease and others.
- Highest tensile strength in its class
- Can be ideally suited for heavy & thin thickness
- High degree of versatility, Machinability & AI position welding.

RECOMMENDATIONS:

Highly recommended alloy for welding all kinds of cast iron joining. Due to innovative core wire design, welding deposits give high penetration combined with high tensile strength. The deposits are highly resistive to surface contaminations. Can be used for thicker and also thinner sections successfully. The frostarc formulation allow this alloy to be used as touch and weld electrode Arc is generated at very low amperages. Weld deposits exhibits excellent machinability.

PROCEDURE:

Clean weld area. Vee out cracks with Stargouge after drilling holes at the end of the cracks, so that propagation of the cracks are arrested. This alloy can be directly deposited on contaminated surfaces, by using stringer beads and using, skip, stagget and sequencing technique. In case of very high contamination give a layer of Staralloy FN 961. Deposits should be peened immediately after welding. Chip slag between passes. Deposits give the maximum tensile strength and there by maximum strength in the joints.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE	SIZE (mm)	RANGE
4.0	100-130	2.5	50-70
3.15	70-100		

TENSILE STRENGTH:

76,000 PSI (525 N/mm²)

STARALLOY FN 963

Pure Nickel highly Cast Iron welding electrode.

TECHNICAL DATA SHEET

TDS#S63_22.08_01

TYPICAL APPLICATIONS:

Pump housings, rotors, compressors, valves and gear box casings.

OUTSTANDING FEATURES:

- Pure Nickel electrode for superior crack resistance.
- Frost Arc formulation coating.
- Controlled penetrations.
- Superb Machinability
- High tensile strength combined with machinability in its class

RECOMMENDATIONS:

Highly recommended for cast iron joining where machining is required like drilling and tapping. Frost arc coating allows this alloys to be used at low amperages and touch weld. The deposits can be quenched after welding for heat removal. An all position electrode.

PROCEDURE:

Clean weld area. Vee out cracks with Stargouge after drilling holes at the end of the cracks, so that propagation of the cracks are arrested. In case of high contamination give a thin layer of Staralloy FN 961. Use stringer beads and using, skip, staggered and sequencing technique. Deposits should be peened immediately after welding. Chip slag between passes. Deposits give the maximum tensile strength and there by maximum strength in the joints.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-120
3.15	70-90
2.50	50-60

TENSILE STRENGTH:

65,000 PSI (450 N/mm²)

STARALLOY FN 964

High Nickel Cast Iron welding electrode.

TECHNICAL DATA SHEET

TDS#S64_22.08_01

TYPICAL APPLICATIONS:

Automotive Engine blocks, Cast iron pulleys, gears and sliding tables and thin walled cast iron components.

OUTSTANDING FEATURES:

- High nickel electrode.
- Low temperature-Globular arc transfer design.
- Controlled penetrations.
- Excellent eachinability.
- All position electrode & has good strike and restrike properties.

RECOMMENDATIONS:

Highly recommended for cast iron joining where section thickness are low. Globular arc coating allows this alloys to be used at low amperages and touch and weld. The deposits can be quenched after welding for heat removal. An all position electrode.

PROCEDURE:

Clean weld area. Vee out cracks with Stargouge after drilling holes at the end of the cracks, so that propagation of the cracks are arrested. In case of high contamination give a thin layer of Staralloy FN 961. Use stringer beads and using, skip, staggered and sequencing technique. Deposits should be peened immediately after welding. Chip slag between passes. Deposits give the maximum tensile strength and there by maximum strength in the joints.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-140
3.15	80-100
2.50	50-80

TENSILE STRENGTH:

62,000 PSI (420 N/mm²)

STARALLOY FN 965

Free Nickel Cast Iron welding electrode for welding of Thick Section.

TECHNICAL DATA SHEET

TDS#S65_22.08_01

TYPICAL APPLICATIONS:

High walled machine bases, thicker pump castings, differential casings and heavy cast iron section.

OUTSTANDING FEATURES:

- Ferro nickel electrode.
- Highly suited for heavier thickness.
- Resistance to surface contaminations.
- Excellent penetrations.
- Good machinability.
- All position & has good strike and restrike properties.

RECOMMENDATIONS:

Highly recommended for cast iron joining where section thicknesses are high. Globular arc coating allows this alloys to be used at low amperages and touch and weld. Preheat is not required in most cases. Preheat critical parts to around 250°C. An all position electrode. Deposits can take hydrostatic pressure, which means can give pin hole free deposits. Heavy walled sections can be easily welding because of the blend of FN. Dense weld beads which are completely machinable.

PROCEDURE:

Clean weld area. Vee out cracks with Stargouge after drilling holes at the end of the cracks, so that propagation of the cracks are arrested. In case of high contamination give a thin layer of Staralloy FN 961. Use stringer beads and using, skip, staggered and sequencing technique. Deposits should be peened immediately after welding. Chip slag between passes. Slow cool the deposits. Deposits give the maximum tensile strength and there by maximum strength in the joints

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-140
3.15	80-100
2.50	50-80

TENSILE STRENGTH:

80,000 PSI (550 N/mm²)

STARALLOY FN 966

TECHNICAL DATA

SHEET

Nodular weld deposit (high crack resistive)

TYPICAL APPLICATIONS:

Ideal electrode for joining cast irons to carbon steels. Best suited for nodular cast irons malleable cast irons like Gear box housing, Hubs of automobile axles, cast iron die cladding and buildups.

OUTSTANDING FEATURES:

- Nodular deposits give high crack resistivity.
- Highly suited for heavier thickness.
- Resistance to surface contaminations.
- Excellent penetrations.
- Good machinability.
- Exceptional all position weldability properties.

RECOMMENDATIONS:

Highly recommended for cast iron of nodular or malleable grades. Superior arc coating allows this alloys to be used at low amperages and touch and weld. Preheat is not required in most cases. Preheat critical parts to around 250°C. An all position electrode. Deposits can take hydrostatic pressure, which means can give pin hole free deposits. Heavy walled sections can be easily welding because of the blend of FN. Dense weld beads which are completely machinable. Most suited for Nodular and reactive torque bearing castings

PROCEDURE:

Clean weld area. Vee out cracks with Stargouge after drilling holes at the end of the cracks, so that propagation of the cracks are arrested. In case of high contamination give a thin layer of Staralloy FN 961. Use stringer beads and using, skip, staggered and sequencing technique. Deposits should be peened immediately after welding. Chip slag between passes. Slow cool the deposits. Deposits give the maximum tensile strength and there by maximum strength in the joints.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-140
3.15	80-100
2.50	50-80

TENSILE STRENGTH:

70,000 PSI (500 N/mm²)

STARALLOY FN 967

Ferro Nickel Cast Iron welding electrode
for welding of Thick sections.

TECHNICAL DATA SHEET

TDS#S66_22.08_01

TYPICAL APPLICATIONS:

High walled machine bases, thicker pump castings, differential casings and heavy cast iron section.

OUTSTANDING FEATURES:

- Ferro Nickel Electrode.
- Highly suited for heavier thickness.
- Resistance to surface contaminations.
- Good penetrations.
- Good Machinability.
- All position & has good strike and restrike properties.

RECOMMENDATIONS:

Highly recommended for cast iron joining where section thickness are high. Globular arc coating allows this alloys to be used at low amphereages and touch and weld. Preheat is not required in most cases. Preheat critical parts to around 250°C. An all position electrode. Deposits can take hydrostatic pressure, which means can give pin hole free deposits. Heavy walled sections can be easily welding because of the blend of FN. Dense weld beads which are completely machinable.

PROCEDURE:

Clean weld area. Vee out cracks with Stargouge after drilling holes at the end of the cracks, so that propagation of the cracks are arrested. In case of high contamination give a thin layer of Staralloy FN 961. Use stringer beads and using, skip, staggered and sequencing technique. Deposits should be peened immediately after welding. Chip slag between passes. Slow cool the deposits. Deposits give the maximum tensile strength and there by maximum strength in the joints.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-140
3.15	80-100
2.50	50-70

TENSILE STRENGTH:

70,000 PSI (500 N/mm²)

STARGOLD 42PN

Soft very machinable 100% nickel cast iron electrode featuring a totally non conductive flux coating

TECHNICAL DATA SHEET

TDS#SPN_22.08_01

- Does not side arc even after being heated.
- Unusually strong arc drive penetrates oil & grease easily.
- Excellent for vertical up welding.

Basic-graphite special coated electrode with a pure nickel core wire. Suitable for cold welding on grey cast iron, malleable cast iron, and cast steel as well as repair welding on castings showing symptoms of fatigue.

Excellent welding properties also for welding with low amperage. Quietly and intensely flowing weld metal, only few spattering, easily removable slag. The weld seam is file-soft and machinable even in the transitional zone between the seam and the base material.

Welding instructions/Base materials: Thoroughly clean the surface of the work-piece make sure it is exempt from grease (previous grinding). When welding on cast iron, heat input should be as low as possible.

The bead must not be wider than twice the core wire diameter and not be longer than ten times the core wire diameter. To limit internal stress of the base metal, hammering of the beads is recommended after each pass.

When welding on DC - the weld metal flows very neatly and produces a flat bead while beads welded on the positive pole are cambered, due to the high amount of weld metal deposited as a consequence of low heat input. The aspect of the weld produced with alternate current and the welding characteristics of the electrode are something in-between the results obtained on direct current. On DC + the weld metal flows more uniformly.

Mechanical properties of all-weld metal (typical values)

Tensile Strength R_m N/mm ²	Elongation A_5 %	Hardness HB
>400	8	Approx. 160

Current:- ~ 50 V

Welding Positions: PA, PB, PC, PD, PE, PF, PG

Rebaking: 1h, 120 °C +/-10 °C (if required)

Deposition Rates:

Diameter (mm)	Length (mm)	Amperage Setting
3/32 (2.5)	12" (300)	80
1/8 (3.25)	14" (350)	110
5/32 (4.0)	14" (350)	135

STARGOLD 23 BI METAL

TECHNICAL DATA SHEET

Unique "Bi - Metal" core Ferro Nickel electrode extra strong arc

TDS#SBM_22.08_01

drive to penetrate contaminants, prior to weld metal transfer for reliable, defect free joints

- Unique dual core prevents electrode overheating even in adverse applications. Eliminates pin & blow holes & the need for pre-heating.
- Extra strong arc drive facilitates joining in all positions - degreases & cleans oily cast iron & burn's off surface contaminants, including rust, scaling & oxides, prior to weld metal transfer.
- High efficiency weld metal transfer totally eliminates electrode overheating.
- Excellent performance on poor quality porous castings - automatically cleans surface for stronger weld joints.
- Versatile-Can be used successfully on virtually all types of cast iron.
- Improved machinability - prevents hard martensitic formation.

Description and Applications:

For joining of all weldable cast iron grades to themselves or to low carbon steel alloys. Grey, nodular, malleable, ductile iron, "Ni-Resist, meehanite, nickel alloys

Microstructure: Consists of an iron-nickel- austenite with finely distributed graphite.

Typical Mechanical Properties:

<u>Undiluted Weld Metal</u>	<u>Maximum Value Up to:</u>
Tensile Strength	76,000 PSI (525 N/mm ²)
Yield Strength	53,000 PSI (370 N/mm ²)
Elongation	49%
Hardness	Rockwell B 87-90, Brinell 179, Vickers 197

Recommended Current: DC Reverse (+) or AC

Recommended Amperage Settings:

Diameter (mm)	3/32 (2.5)	1/18 (3.25)	5/32 (4.0)
Minimum Amperage	50	70	100
Maximum Amperage	100	100	130

Welding Positions:

Flat, Vertical up, Horizontal, Overhead.

Welding Techniques:

Guide the electrode at a steep angle keeping the arc length short. Use short staggered beads when welding restrained parts.

STARGOLD 24 CP

Ultra low penetration cast iron minimizes heat affected zone hardening, Base metal penetration & dilution.

TECHNICAL DATA SHEET

TDS#SCP_22.08_01

- Low temperature" gentle globular arc transfer.
- Excellent arc control in all positions.
- Weld deposits are extremely soft and machinable due to minimal dilution.
- Ideal for thin walled grey cast iron repairing, cladding, filling casting defects, crack filling....
- Easy arc, striking & re-striking.

Description and Applications:

Used where ultimate machinability is a factor. Also ideal for repairing very thin or eroded sections of cast iron, casting defects, crack repairing, cladding. Especially suited for welding cast iron with lamellar graphite, white & black heart malleable & nodular cast iron.

Microstructure: Austenitic nickel with finely distributed graphite flakes.

Typical Weld metal

Chemical composition:

C	Si	Mn	Ni	Fe
0.90	1.30	0.60	87.00	Rem.

Typical Mechanical Properties:

Undiluted Weld Metal

Maximum Value Up to:

Tensile Strength	62,000 PSI (420 N/mm ²)
Yield Strength	44,000 PSI (300 N/mm ²)
Hardness	> 140 HB

Recommended Current: DC Reverse (+) or AC

Recommended

Amperage

Settings:

Diameter (mm)	3/32 (2.5)	1/18 (3.25)	5/32 (4.0)
Minimum Amperage	50	80	110
Maximum Amperage	80	110	140

Welding Positions:

Flat, Vertical up, Vertical down, Horizontal, Overhead.

Welding Techniques:

The arc gap should be as short as feasible. Move in direction of travel according to the rate of alloy flow. For maximum machine ability pre-heat to 200°C. Employ stringer beads or weaving technique, skip weld & peen before cooling. Weld short beads, max 30-50 mm long.

Redrying generally not required. If necessary: 200-250°C for 1 hour, once only.)

- Copper clad ferro - nickel core wire for ultra low heat input-High efficiency weld metal transfer.
- High current carrying capacity totally eliminates electrode overheating.
- Uniquely versatile combination of softness, ductility & tensile strength.
- Superior crack resistance & ultra high machinability.
- Outstanding elongation.
- Insensitive to surface contaminants.
- Superb weldability.
- Will exhibit significantly lower heat input, superior weldability, superior mechanical properties to non copper clad ferro - nickel welding electrodes.

DESCRIPTION

Electrode for cold welding of machinable cast iron types, especially for nodular cast iron and dissimilar joints between nodular cast iron and carbon steel. Also used as bonding layer on dirty and oily cast irons. Exceptional mechanical properties.

Electrode has no tendency to overheat. Creates an extremely narrow heat affected zone-excellent machinability.

For cast iron tubes, press housings, foundry defects.

Uniquely versatile : Welds all types of cast irons, weld deposit uniquely diffuses with the base metal & graphite precipitates in the transition zone, making the weld metal & the base metal compatible.

Superior crack resistance: Both qualities uniquely together. Generally crack resistant nickel-irons.

Ultra high machinability : tend to be & unmachinable, especially in the transition zone, while monels/nickel types give reasonable machinability but tend to crack on many types of cast irons. Stargold 24 N however is a uniquely balanced product.

Outstanding elongation: Higher elongation than that of nickel type cast iron electrode enables the Stargold 24 FN weld to stretch & absorb weld contraction without either the weld or the base cracking.

Insensitive to surface : Arc is highly ionized & has sufficient drive to penetrate contaminated.

Insensitive to surface contaminants: Arc is highly ionized & has sufficient drive to penetrate contaminated. work pieces. Enable porosity free weld even on oily/dirty cast iron. Dense porosity free welds.

Superb weldability : May be used for "cold" welding without pre-heat or with low pre-heat on heavy sections. Excellent all position weldability. Will weld all types of cast irons. Including heavy wall thickness cast irons, cast iron to steels, welding shrinkage holes & cracks, very long welds...without any danger of cracking.

Mechanical properties	Rm (Mpa)	Rp 0,2 (Mpa)	A5(%)
	550	350	20

Hardness: 180 HB

Working Instructions:

Current (A) Max	2.5x350	3.15x350	4.0x350
	75	115	140

STARGOLD 25 MONEL

Alloyed core with smooth and forceful arc which eliminates / removes all kinds of contaminants prior to weld deposit.

TECHNICAL DATA SHEET

TDS#SML_22.08_01

- Universal monel repairing, joining, problem solver.
- Weld metal free from porosities.
- Weld metal corrosion resistant to sea water, salts and reducing acids.
- Working temperature -196°C to +450°C.
- Suitable for all position welding.

Description and Applications:

Specially designed basic type electrode for welding or facing of Monel alloys 400, R 405, K 500 and Monel clad steels. Excellent mechanical properties. The weld metal is free from porosity and resistant to corrosion by sea water, salts and reducing acids. Suitable for dissimilar - welding applications for Monel includes joints between monel, nickel-copper alloys and carbon steel, low alloy steel, copper and copper-nickel alloys, Suitable working temperature from -196°C to +450°C. Weld deposit similar to E NiCu7.

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile Strength	70,000 PSI (490 N/mm ²)
Yield Strength	35,000 PSI (230 N/mm ²)
Elongation	32%
Hardness	150 – 170 Brinell

Recommended Current:

DC (+)

Recommended Amperage

Settings:

Diameter (mm)	2.50	3.15	4.00
Minimum Amperage	50	80	110
Maximum Amperage	70	110	130

Welding Positions:

Flat, Vertical-up, Horizontal, Overhead.

Storage and redrying:

Keep dry and avoid condensation. Re-dry at 350°C for 2 hours, 5 times max.

Welding Techniques:

Preheat sections above 25 mm. Guide the electrode at a steep angle keeping the arc length short. Clean the slag completely between passes. Allow slow cooling to room temperature.)

STARGOLD 400

Nickel free non-machinable cast iron electrode

TECHNICAL DATA SHEET

TDS#S40_22.08_01

- Uniquely welds cast iron that is greasy, rusty & burnt where other electrodes will not bond.
- "Fast freeze" action minimises weld defects & porosity.
- Color & co-efficient of expansion closely matches cast iron to ensure a professional finish.
- Non-Conductive flux coating especially suited for welding in deep recesses or close quarters.
- Excellent positional welding.
- Welds successfully without preheat.

DESCRIPTION :

Nickel free non-machinable cast iron problem solver, seals in porosity generating contaminants prior to finish welding withnickels. Superior alloy for dirty or burned cast iron.

Key Repair Applications:

- Furnace gates, oil saturated cast iron, foundry casting repairs, steel to cast iron welding.
- Underlying/anchoring contaminated cast iron.

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile Strength	116,000 PSI (440 N/mm ²)
Yield Strength	(360 N/mm ²)
Elongation	20%
Hardness	35 HRC (approx)

Maximum Value Up to:

Recommended Current: DC Reverse (+) or AC

Recommended Amperage Settings:

Diameter (mm)	1/8(3.15)	5/32(4.0)	3/16(5.0)
Minimum Amperage	90	120	160
Maximum Amperage	120	160	220

Welding Positions: Flat, Vertical up, Vertical down, Horizontal, Overhead.

STARGOLD 402

Ferro nickel cast iron welding electrode

TECHNICAL DATA SHEET

TDS#SCI_22.08_01

- Unmatched crack resistance. Welds without preheating on practically any CI- Clor CI-steel joining - for easy trouble free quick cast iron repairs.
- Unmatched low heat input and low dilution-minimum HAZ. No cracking or overheating even under difficult AC amperage. Fully machinable joints even on the hardest CI.
- Unmatched tensile strength and joint fusion. Strong durable repairs on practically any type of cast iron.
- Extremely strong "controlled blast" arc drive strongly penetrates surface contaminants (Oil, scale, oxides) & burns them off before weld metal transfer.
- Special slag composition can be welded over without creating porosity.
- Extra nickel content ensures crack resistant machinable welds.
- Positional welding provides ease of use.

Description: High strength, non-cracking multi- position, universal machinable electrode for cast iron. Gives perfectly machinable welds on all types of cast iron-ductile, nodular & malleable cast irons. Ideally suited for the repair of meehanite dies. Requires no base metal pre-heating in most cases. "Makes cast iron welding as easy as MS welding"

Key repair applications:

Welders choice for virtually all types of cast iron (grey, modular, malleable, ductile, "Ni resist", "meehanite") Including joining cast iron parts to steel. Machine- housings, engine blocks, gear boxes, pumps & valves, tables, supports & machine frames

Microstructure: Consists of an iron-nickel austenite with finely distributed graphite.

STARCAST GCI

All purpose Ferro Nickel cast iron welding electrode

TECHNICAL DATA SHEET

TDS#SGC_22.08_01

Classification: AWS A 5. 15: E NiFe-C1
1 Bg11

DIN 8573: E NiFe-

Description: For welding of grey cast iron with laminar and globular graphite structure and malleable cast iron. Also for joints of cast iron (GGL and GGG - Types) with unalloyed steels The weld metal is easy to machine and crack resistant. Deposit and base metal are approx. of the same color. Soft welding electrode has good wetting abilities.

Application: Joining cast iron & steels...pump casing, water bodies, motor casings, C.I. elbows, filling blow holes

All weld metal Mechanical properties:

Tensile StrengthR_m N/mm² > 500	Hardness HB 170
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Typical weld metal remaining

Ni approx. 55%	Fe
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Composition:

Welding Recommendations: =+≡~
3500C/2h

Re-drying: 300-

Welding area must be cleaned very carefully and cast skin should be removed accordingly. Low heat input is required. Therefore weld bead width should be max. twice of electrode diameter, length max. 10 times. For reducing the tension the weld should be hammered just after welding. The Starcast GCI needs DC +polarity to have a low heat input especially with sensitive castings.

Welding positions:



Welding current

Article-No.	Dia/Length mm	Amperage A
.00.003.250	2.50/350	60
.00.003.323	3.15 /350	80
.00.003.403	4.00/350	120

Ferro nickel electrode

Classification: AWS A 5. 15: E NiFe-C1
Bg11

DIN 8573:

E NiFe-1

Description and applications: Graphite basic coated electrode with a Ferro-Nickel alloy deposit for joining and repairing nodular cast iron. Deposit homogeneous and highly resistant against cracks. Particularly recommended for dissimilar welding of cast iron to steels and constructions of cast iron. Good bonding and flow of the weld metal. Defect in foundries, repairing of engine blocks, houses of fool machines, gearboxes, reducing parts, pump bodies, cast pieces, valve bodies.

Base materials

Grey cast iron, malleable and nodular cast iron:

ASTM : A48 class 25B to 60B
: A536 Grade 60-80

DIN : GG-15 to GG-40
: GGG-40 to GGG-60
: GTS-35 to GTS-65

NFA : FLG 150 to FLG 400
: FGS 400-12 to FGS 600-3
: MN350-10 to MN650-3

All weld metal Mechanical properties:

Tensile Strength R_m N/mm ²	Hardness (BHN)
> 500	190-220

Typical weld metal Composition (%):

Ni	FE & OTHERS
50%	BALANCE

Amperes (A)

(2.50)	(3.15)	(4.00)
60	80	120

Welding instruction:

Reduce the heat input to a minimum, keep temperature low (maxi temperature 70°C) in order to reduce the risk of cracks in the base metal. Depose short beads of about 3 cm and peen immediately. Reignite on the weld metal. Weld on clean and exempt from grease surfaces (previous grinding of the joint).

STARCAST MCI

NiCu electrode for cast iron welding

TECHNICAL DATA SHEET

TDS#SMC_22.08_01

Ferro nickel electrode

Classification: AWS A 5. 15:
BG 12

E NiCu-B

DIN 8573: E NiCu

Description and applications: Graphite-basic coated electrode for cold welding grey and malleable cast iron. Due to a nearly colour matching deposit and its good welding properties this electrode is suited for repairing casting defects.

Base materials

60B

Grey cast iron

ASTM

: A48 Class 25B-A48 Class

DIN

: GG-15 to GG-40

NFA

: FLG 150 to FLG 400

All weld metal Mechanical properties:

R _m (MPa)	Hardness
> 500	Approx. 160HB

Typical weld metal Composition (%):

C	Si	Fe	CU	Ni
0.8	0.8	13	0	Rem

Amperes (A)

80	110	140
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Welding instruction:

Apply a heat input as low as possible and keep temperature low (maxi temperature 70°C) in order to reduce the risk of producing cracks in the base metal (weld with minimal current and depose short and narrow beads). To limit internal stress in the base metal, hammering of the beads is recommended after each pass (essential on rigid pieces). Weld on clean and exempt from grease surfaces (previous grinding of the joint)

STARCAST ULTIMA

Graphited, pure nickel core wire.

TECHNICAL DATA SHEET

TDS#SGC_22.08_01

Description Nickel electrode for welding of grey cast iron, malleable iron, cast iron and for welding on

Properties: fatigued casted parts. For rectification of castings. StarBlaze ultima gives perfect welding results even with low amperages. The arc is smooth and intensive, low spatters, easy removal of slag. The weld is soft Machin able, also the fusion zone.

Weld metal

Ni Approx. 98%

Composition:

All weld metal

Tensile Strength N/mm ²	Hardness HB
490	165

Mechanical

=+~

Re-drying: 300-350°C/2h

Recommendations:

Clean welding area carefully and remove cast skin from base material. Low heat input during welding is required. Weld bead width not more twice of electrode diameter, length max. 10 times. For reducing the tension the weld should be hammered just after welding. When welding with DC-polarity the seam is clean and flat. With +polarity the heat input is lower and the welding seam is more convex. When welding with AC the appearance is in between.

Welding positions:



Welding Current

Article-No.	Dia/Length	Amperage
	mm	A.
.00.002.253	2,5/350	60.
.00.002.323	3,2 /350	80
.00.002.403	4,0/350	120

F

HARDFACING

STARHARD FC 971

Abrasion resistant multilayer
hardfacing electrode with anti-spalling property

TECHNICAL DATA SHEET

TDS#S71_22.08_01

TYPICAL APPLICATIONS:

Back hoe buckets, Excavating equipments, Ploughs, scrapers, sugar mill pinions, couplings, Hammers etc.

OUTSTANDING FEATURES:

- Basic coated electrode with impact resistance
- High hardness resisting abrasion
- Rapid deposition with self lifting slag
- All position electrode
- Can take compressive loads combined with abrasion without spalling.

RECOMMENDATIONS:

Suitable alloy for hardfacing and coating of wear prone equipments due to abrasive wear. This can be used on carbon steels, manganese steels and also on malleable iron. Best recommended for worn out parts and can be deposited on multi layers. The alloy has high hardness combined with spalling resistance. The deposits can take compressive loads and to some extent impact too.

PROCEDURE:

Clean weld area. Vee out cracks with Star Ferro Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited with out the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. Controlling of heat buildup by maintaining interpass temperature can be best. Chip slag between passes.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	180-200
4.0	130-160
3.15	100-130

HARDNESS:

58 - 60 HRC

STARHARD FC 972

Hardfacing & buildup electrode on components subjected to Abrasion & Impact.

TECHNICAL DATA SHEET

TDS#S71_22.08_01

TYPICAL APPLICATIONS:

Sugar mill Pinions, couplings, tailbars, hammers, fibrizors, wobblers, excavators iders, ros gear teeth, TMT roll passes rolls etc..

OUTSTANDING FEATURES:

- Hardfacing alloys for protective coating of all ferrous metals.
- Superior toughness and deposits doesn't spall under severe loads.
- Deposits are highly machinable.
- Weld Deposits exhibits low coefficient of friction.
- Basic coated electrode with easy slag removal and all position weldability.

RECOMMENDATIONS:

Suitable alloy for hardfacing and coating of ferrous metals prone to severe impact and abrasion The components subjected to heavy loads and pressures can be hardfacing with this products as these deposits can take good compressive loads and can work under pressure without spalling The weld metal solidified rapidly making the alloy weldable at all positions. The deposits can be easily machined with tipped tools.

PROCEDURE:

Clean weld area. Vee out cracks with Star Ferro Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 100°C to 150°C. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited with out the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. Controlling of heat buildup by maintaining interpass temperature can be best. Chip slag between passes.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	180-230
4.0	130-160
3.15	100-130

HARDNESS:

28 -32 HRc

STARHARD MN 973

Nickel & Fortified elements formulation suitable for Hadfield/Mn-Steel welding.

TECHNICAL DATA SHEET

TDS#S73_22.08_01

TYPICAL APPLICATIONS:

Manganese steel hammers, Impactor arms, grizzly bars, sprockets, heavy equipment tumblers, wear pads and track pads of Heavy earth moving equipments.

OUTSTANDING FEATURES:

- Ideally suited for Hadfield/Manganese steels.
- Ultimate toughness and deposits doesn't spall under severe loads.
- Deposits are machinable. Rapid deposition along with quick freeze deposits makes its applications in all positions.
- Low temperature welding adds to the merit of the electrode particularly for
- Manganese steel surfacing.
- Work hardening type of alloys.

RECOMMENDATIONS:

Suitable alloy for building up worn out manganese steel wear parts which are subjected to heavy impact. A manganese compatible electrode with additions of Nickel and fortified elements makes it an ideal electrode for buildup and surfacing Manganese steels. Superior alloy for cushioning and also buildup. The deposits can take good impact and can work under pressure without spalling, The deposits work harden to give good abrasion resistance.

PROCEDURE:

Clean weld area. Vee out cracks with Star Ferro Gouge and also gouge out the fatigued and worn damaged metal. Do not preheat Manganese steels. Maintain a short arc and deposits short beads of 5-7 cm at a time to avoid heat build up. The interpass weld temperature should not cross 150°C for best performance and fault free service. Peening the deposits are highly recommended for optimum stress free life.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	160-225
4.0	140-170
3.15	90-130

HARDNESS:

20 HRc (As deposited)
45-50 HRc (Work hardened)

STARHARD FW 974

Nickel & Fortified elements formulation suitable for Hadfield/Mn-Steel welding

TECHNICAL DATA SHEET

TDS#S74_22.08_01

TYPICAL APPLICATIONS:

Front idlers, track rolls, track pads and links of earth moving machinery, Sprockets, conveyor rolls, railway crossings, crusher hammers, blow bars. Best for cushioning layers before hard facing.

OUTSTANDING FEATURES:

- Ideally suited for Hadfield/Manganese steels.
- Ultimate toughness and deposits doesn't spall under severe loads.
- Deposits are machinable. Rapid deposition along with quick freeze deposits makes its applications in all positions.
- Low temperature welding adds to the merit of the electrode particularly for
- Manganese steel surfacing.
- Work hardening type of alloys.

RECOMMENDATIONS:

Suitable alloy for building up worn out manganese steel wear parts which are subjected to heavy impact. A Chrome manganese electrode with additions of Nickel and makes it an ideal electrode for buildup and surfacing Manganese steels. Superior alloy for cushioning and also buildup. The deposits work harden rapidly to high hardness making it ideally suited for earth moving applications and crushers. The multiple pass build is possible without chunking of the deposit.

PROCEDURE:

Clean weld area. Vee out cracks with Star Ferro Gouge and also gouge out the fatigued and worn damaged metal. Do not preheat Manganese steel. Maintain a short arc and deposits short beads of 5-7 cm at a time to avoid heat build up. The interpass weld temperature should not cross 150°C for best performance and fault free service. Peening the deposits are highly recommended for optimum stress free life.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	160-225
4.0	140-180

HARDNESS:

22 HRc (As deposited)
50 HRc (Work hardened)

STARHARD NA 975

Nickel based austenitic welds suiting
for hardfacing & joining applications

TECHNICAL DATA SHEET

TDS#S74_22.08_01

TYPICAL APPLICATIONS:

Forged/Alloyed sprockets, Heavy earthmoving tumpers, idlers, Crusher jaws, conical crusher mantle, coke crushers etc.,

OUTSTANDING FEATURES:

- Deposits work harden in service.
- Nickel based austenitic deposits gives high temperature.
- Unique alloy for hardfacing & joining
- Excellent crack resistivity.
- Deposits has low coefficient of friction.
- Deposits are galling & Spalling resistant.
- All position welding alloys.

RECOMMENDATIONS:

A high alloys nickel based austenitic deposit, exhibiting high temperature properties in strength, corrosion and also compressive galling. Deposits have very low coefficient of friction and also polishes in service. Highly recommended for buildup, cladding and joining of high alloy/ medium alloyed forged earthmoving components and heavy machinery like crushers and impactors.

PROCEDURE:

Clean weld area. Vee out cracks with Star Ferro Gouge and also gouge out the fatigued and worn damaged metal. In case of joining bevel the edges to 60-90°C. Deposit stringer beads or 2X beads as the application warrants. Remove and chip slag between passes. Peening of deposits is required when used on high carbon and high alloyed steels. When used on managanese steel do not allow the interpass temperature and the base metal temperature to exceed 150°C.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	160-225
4.0	140-180

HARDNESS:

20-22 HRc (As deposited)
45-48 HRc (Work hardened)

TENSILE STRENGTH:

1,20,000 PSI (830N/mm2)

STARHARD AC 976

High abrasive resistant layer hardness hardfacing electrode.

TECHNICAL DATA SHEET

TDS#S76_22.08_01

TYPICAL APPLICATIONS:

Earthmoving cations like, buckets, track pads, lip plates, teeth points, scrappers, blades etc.

OUTSTANDING FEATURES:

- Very High Single layers hardness and resists high abrasion.
- Very mild stress relieving checks-no uprooting of hardfaced deposit
- Smooth bead appearance and whitish appearance.
- All position electrode.
- Touch weld, excellent weldability and high deposition rates.
- Can take temperatures up to 400°C.

RECOMMENDATIONS:

Suitable alloy for hardfacing and coating of wear prone equipments due to abrasive wear. This can be used on carbon steels, manganese steels and also on malleable iron. Deposits polish in service and offers low coefficient of friction. All position compatibility of the electrodes makes welding easy. Extensily can be used on earth moving machinery, crushing applications.

PROCEDURE:

Clean weld area. Vee out cracks with Super Stan Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. Do not preheat 14% Mn Steels. If the build up is high it is recommended to use Super Starhard MN 973 as a cushion layers for best performances. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited with out the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. In case of Cast irons, a base layer of Staralloy FN 965 is recommended for best bonding.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	150-190
4.0	115-150
3.15	85-120

HARDNESS:

60-65 Hrc

STARHARD CR 977

High Chromium bearing hardfacing electrode
for resistance to multiple wear factors

TECHNICAL DATA SHEET

TDS#S77_22.08_01

TYPICAL APPLICATIONS:

Fibrizor hammers, anvil plates, trash plates of sugar mills, ID fan Hardfacing, Rubber processing machinery chambers, augers, pulper screws, hammers etc.

OUTSTANDING FEATURES:

- Outstanding electrode with combination of wear properties
- Ultimate alloy Resisting Abrasion, Erosion, Heat, moderate impact & Moderate corrosion.
- Bald deposit, giving best results in erosive atmosphere.
- Temperature resistance up to 550°C.
- Can take good Compressive loads too.
- High recovery Electrode.

RECOMMENDATIONS:

Ideal alloys for hardfacing applications which warrants, high hardness to resist abrasion, abrasion combined with heat upto 550°C. Deposits exhibits balds appearance without any ripples, enables best results in erosive atmospheres. The deposits are whitish in colour which shows that corrosion can be tackled better by the deposits, apart from taking compressive and also impact loads.

Clean weld area. Vee out cracks with Star Ferro Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. Do not preheat 14% Mn Steels. If the build up is high it is recommended to use Super Starhard NA 975 as a cushion layer for best performances. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited without the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. In case of Cast irons, a base layer of Super Staralloy FN965 is recommended for best bonding. Remove slag by chipping.

SIZE (mm)	RANGE
5.0	120-160
4.0	110-140

57-60 Hrc

STARHARD CC 978

High abrasion resistant hardfacing electrode
withstanding elevated temperature.

TECHNICAL DATA SHEET

TDS#S78_22.08_01

TYPICAL APPLICATIONS:

Fibrizor hammers, anvil plates, trash plates of sugar mills, ID fan Hardfacing, Rubber processing machinery chambers, augers, pulper screws, hammers etc.

OUTSTANDING FEATURES:

- Outstanding electrode with combination of wear properties
- Ultimate alloy Resisting Abrasion, Erosion, Heat, moderate impact & Moderate corrosion.
- Bald deposit, giving best results in erosive atmosphere.
- Temperature resistance up to 550°C.
- Can take good Compressive loads too.
- High recovery Electrode.

RECOMMENDATIONS:

Ideal alloys for hardfacing applications which warrants, high hardness to resist abrasion, abrasion combined with heat upto 550°C. Deposits exhibits balds appearance without any ripples, enables best results in erosive atmospheres. The deposits are whitish in colour which shows that corrosion can be tackled better by the deposits, apart from taking compressive and also impact loads.

PROCEDURE:

Clean weld area. Vee out cracks with Star Ferro Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. Do not preheat 14% Mn Steels. If the build up is high it is recommended to use Super Starhard NA 975 as a cushion layer for best performances. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited without the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. In case of Cast irons, a base layer of Super Staralloy FN965 is recommended for best bonding. Remove slag by chipping.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	170-200
3.15	130-170

HARDNESS:

57-60 HRc

STARHARD HT 979

Resistant to high abrasion & Erosion resistance
at temperatures up to 750 C.

TECHNICAL DATA SHEET

TDS#S79_22.08_01

TYPICAL APPLICATIONS:

Clinker crusher hammers, Sinter crusher hammers, sinter & clinker hubs, Sinter and clinker knifebars, 10 fans handling high temperature flue gases, alum pumps, billet conveyor rolls, hot slag conveyors.

OUTSTANDING FEATURES:

- Outstanding electrode for High Heat combined with grinding abrasion & Erosion.
- Excellent resistance to wear at high temperatures til 750°C.
- Slag free deposit, with 170% metal recovery.
- Hair line stress relieving checks ensuring no chunking of deposits.
- Rapid deposition rates.
- Can withstand temperature 850°C.

RECOMMENDATIONS:

Innovative high coated and heavily alloyed electrode for high heat combined with gouging abrasion & erosion. Can be used on manganese steels and also carbon steels with ease. The weld deposits resists grinding abrasion combined with high Heat & Erosion.

PROCEDURE:

Clean weld area. Vee out cracks with Super Stan Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. In Mn steels use a baselayer of Starhard 975 & do not preheat. In carbon steels, If the buildup is high, is recommended to use Super Staralloy DS 934 as a cushion layer for best performances. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited without the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. In case of Cast irons, a base layer of Super Staralloy FN 965 is recommended for best bonding. Remove slag by chipping.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	170-200
3.15	130-170

HARDNESS:

63-67 HRc

STARHARD HS 980

HSS type weld deposits with edge retention properties.

TECHNICAL DATA SHEET

TDS#S80_22.08_01

TYPICAL APPLICATIONS:

Composite high steel steel dies punches, trimming dies, shears, piercing dies, bar outers & coke cutters.

OUTSTANDING FEATURES:

- Heat treatable deposits.
- High speed steel type overlays with ultimate frictional resistance.
- Excellent edge retention properties even at elevated temperatures.
- High hardness combined with knife edge properties.

RECOMMENDATIONS:

Superb alloy which retains hardness at high temperatures combined with very low coefficient of friction. The deposits retain edge inspite of high friction and abrasion due to the high alloy electrode. Excellent for knife edges and machine tool parts subject to heavy frictional wear. Ideal for building composite blanking or punching dies.

PROCEDURE:

Clean weld area. Vee out cracks with Star Ferro Gouge and also gouge out the fatigued and worn damaged metal. Pre Heat die steel and high alloys to 350°-400°C. Use stringer beads deposition and also peen the deposits to relieve stresses. Chip slag in between passes and also maintain the temperature in the base metal while depositing on die steels & high carbon/ alloyed steels. Post heating will help in better performance. Use Staralloy DS 934 as a cushion layers for best results.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	150-180
3.15	120-150
2.5	90-120

HARDNESS:

60-65 HRc

STARHARD UL 981

Complex Carbide deposits with high hardness & resistance at temperatures up to 800 C.

TECHNICAL DATA SHEET

TDS#S81_22.08_01

TYPICAL APPLICATIONS:

Sintered carbide table rolls, table lines buttoning, Clinker crusher hammers, Sinter crusher hammers, sinter & clinker hubs, Sinter & clinker knife bars, ID fans handling high temperature flue gases, slurry pumps, billet conveyor rolls, hot slag conveyors.

OUTSTANDING FEATURES:

- Ultimate single layer hardness of around 70 HRC.
- Highest Volume fraction of complex carbides with optimised matrix.
- High temperature hardness till 800°C.
- High metal recovery up to 170%.
- All position welding alloy.

RECOMMENDATIONS:

An unique alloys with high volume fraction of complex carbides in an martensitic matrix, giving best performance against grinding abrasion combined with erosion and also high heat. The bonding of the alloy on the high carbon/ alloyed base metal is superb. Deposits are rich in Chromium, boron and other complex carbides making is ideally suitable for high performance delivery.

PROCEDURE:

Clean weld area. Vee out cracks with Star Ferro Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250 c. In Mn steels use a base layer of Starhard NA 975 & do not preheat, in carbon steels, If the build up is high it is recommended to use Staralloy DS 934 as a cushion layers for best performances. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited with out the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. In case of Cast irons, a base layer of Staralloy FN 965 is recommended for best bonding. Remove slag by chipping.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	120-170
3.15	90-130

HARDNESS:

68-70 HRc

STARHARD CR 982

Erosion resistance hardfacing electrode

TECHNICAL DATA SHEET

TDS#S82_22.08_01

TYPICAL APPLICATIONS:

Fibrizor hammers, anvil plates, trash plates of sugar mills, ID fan Hardfacing, Rubber processing machinery chambers, augers, pulper screws hammers etc.,

OUTSTANDING FEATURES:

- Outstanding electrode with combination of wear properties
- Ultimate alloy Resisting Abrasion, Erosion, Heat moderate impact & Moderate corrosion
- Bald deposit, giving best results in erosive atmosphere
- Temperature resistance up to 450°C
- Can take good Compressive loads too.
- High recovery Electrode.

RECOMMENDATIONS:

Ideal alloys for hardfacing applications which warrants, high hardness to resist abrasion, abrasion combined with heat up to 450°C. Deposits exhibits balds appearance without any ripples, enables best results in erosive atmospheres. The deposits are whitish in colour which shows that corrosion can be tackled better by the deposits, apart from taking compressive and also impact loads.

PROCEDURE:

Clean weld area. Vee out cracks with Star Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. Do not preheat 14% Mn Steels. If the build up is high it is recommended to use Starhard NA975 as a cushion layers for best performances. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited with out the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. In case of Cast irons, a base layer of Staralloy FN 965 is recommended for best bonding. Remove slag by chipping.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	160-190
3.15	120-150

HARDNESS:

57-60 Hrc

STARHARD PASTE 983

Boron bearing highest erosion resistant alloy in paste form.

TECHNICAL DATA SHEET

TDS#S83_22.08_01

TYPICAL APPLICATIONS:

ID Fans, Impellers, Chutes, Ploughs, Mixer blades, etc.

OUTSTANDING FEATURES:

- Superior alloy formulation leading to high hardness.
- Retains hardness at elevated temperatures.
- Boron fortified with a blend of high resilient matrix. Stress relief check free deposit.
- Uniform thorough hardness on a thinnest deposit.
- No wastage.
- Paste formulation for ease of use.

RECOMMENDATIONS:

Special performance paste, which when fused to the base metals exhibits, high hardness combined with best erosion resistance at elevated temperatures like 900°C. The highly alloyed paste has rich and complex carbides offering the superior wear resistance properties. The deposits when fused doesn't have any stress relieving checks making it ideal for a erosive atmosphere. Specially of this paste is it gives the hardness in just 1.5mm of the paste applied without much of dilution in the base metal, making it ideal for fan applications, without increasing the weight of the fan much and hence lower power consumption.

PROCEDURE:

Clean weld area. Spread the paste to the uniform thickness of 1.5mm with a spatula after properly mixing the contents in the container. Allow the paste to touch dry say fo 2- 3 hours. After touch dry, arc the electrode with Star Fuse to fuse the same to the base metal. Maintain short arc and doesn't allow the pointed tip of the Star Fuse to touch the base metal. Use 2X or more weaving technique to fuse the complete surface. Stagger the fusing to avoid distortion of warpage.

HARDNESS:

68-70 HRc

STARHARD CC 984

Multi layer buildup crack free hardfacing
electrode resisting Impact & Abrasion.

TECHNICAL DATA SHEET

TDS#S84_22.08_01

TYPICAL APPLICATIONS:

Die build ups, Punches, wobblers, Dam ring buildup, impactor arm, grizzly bars, hammers, clinker crushers etc.

OUTSTANDING FEATURES:

- Very high build up capability with stress relieving checks.
- Good edge retention properties.
- Deposits can take impact and compressive loads without spalling at high temperatures. Rich chemistry deposits for best performance.
- All position welding alloy & high metal recovery.
- Very thin slag.

RECOMMENDATIONS:

High suited alloys for building up worn out dies, punches and other components like wobblers, impactor arms etc, where in the buildup requirements are high more than 8-10 layers. The deposits can take good impact and pressures without the deposits spalling. The deposits inspite of being hard doesn't have any stress relieving checks due to its unique chemistry. The deposits can take temperatures up to 550°C.

PROCEDURE:

Clean weld area. Vee out cracks with Star Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. In Mn steels use a base layer of Starhard NA 975 & do not preheat. In carbon stools, If the build up is high it is recommended to use Staralloy DS 934 as a cushion layers for best performances. Use 2X /3X weaving beads holding a short arc. The deposits can be deposited with out the danger of cracking. In case of Cast irons, a base layer of Super Staralloy FN 965 is recommended for best bonding. Remove slag by chipping.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	110-175
3.15	80-120

HARDNESS:

54-57 HRc

STARHARD CC 985

Out of position best Corrosion resistant
to Cane Juice Arcing electrode.

TECHNICAL DATA SHEET

TDS#S85_22.08_01

TYPICAL APPLICATIONS:

Sugar mill Journal areas, general shaft bearing areas, Ideal electrode for joining manganese steels to carbon steels, earth moving equipment buckets, Manganese steel liners joining, shot blast cleaning liners joining, weld clad wear plate joining and also for joining earth moving equipments chassis repairs.

OUTSTANDING FEATURES:

- Excellent finish along with low coefficient of friction
- Self releasing slag design
- Best corrosion resistance to sugar cane juice
- Superior corrosion resistance to intergranular corrosion at high temperatures
- Strong and tough weld deposits with out of position capability
- Good ductility of the weld deposits.

RECOMMENDATIONS:

Highly ductile electrodes makes it ideal for joining manganese steel to carbon steel joining thereby eliminating any HAZ cracks. Best suited as a base layer or a cushion layer for hard surfacing. Doesn't pick up hardness and can be deposited for multiple layers or build up. Can withstand corrosion at high temperatures too. High impact values makes it suitable for joining heavy earth moving machinery.

PROCEDURE:

Clean weld area and follow usual joint preparation. Bevel heavy Sections 60-90°. For high alloy steels, a preheat up to 200°C is recommended. The alloys can be used by stringer beads and also 2X beads depending on the applications. Maintain a short arc, minimum amperage and backwhip craters. Chip slag between passes and peen deposits. Cool slowly.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE	SIZE (mm)	RANGE
4.0	110-175	2.5	55-75
3.15	80-120		

TENSILE STRENGTH:

1,00,000 PSI (690 N/mm²)

ELONGATION:

40%

STARHARD CC 986

Suitable for welding and cladding of Hot Forging & Press Dies.

TECHNICAL DATA SHEET

TDS#S86_22.08_01

TYPICAL APPLICATIONS:

Specially crafted alloy for forging and pressing die buildups.

OUTSTANDING FEATURES:

- Cobalt Fortified alloy for highest performance
- Deposits can take ultimate impact and pressure Best compatibility with high alloys and die steels
- Crack free buildups and no galling/Spalling
- Excellent creep resistance & high toughness
- Excellent machinability facilitating die repairs.

RECOMMENDATIONS:

Alloy designed for buildup and repairs of hot working tools forging dies and press dies. The deposits work harden and the retains its edge without deformation. Highly compatible to Die steels and high alloyed steels. The deposits are fortified with Moly, vanadium and cobalt for best performance in its class.

PROCEDURE:

Clean weld area and follow usual joint preparation. Bevel heavy Sections 60-90°. For high alloy steels, a preheat up 200°C is recommended. The alloys can be used by stringer beads and also 2X beads depending on the applications. Maintain a short arc, minimum amperage and backwhip craters. Chip slag between passes and peen deposits. Cool slowly.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	200-240
4.0	140-185
3.15	90-130

HARDNESS:

34-39 HRc

STARHARD CC 987

Suitable for die welding requiring high temperature hardness & edge retention.

TECHNICAL DATA SHEET

TDS#S87_22.08_01

TYPICAL APPLICATIONS:

Composite high steel steel dies, punches, trimming dies, shears, piercing dies, bar cutters & coke cutters.

OUTSTANDING FEATURES:

- Heat treatable deposits.
- High speed steel type overlays with ultimate frictional resistance.
- Excellent edge retention properties even at elevated temperature.

RECOMMENDATIONS:

Superb alloy which retains hardness at high temperatures combined with very low coefficient of friction. The deposits retain with edge in spite of high friction and abrasion due to the high alloyed electrode. Excellent for knife edges and machine tool parts subject to heavy frictional wear. Ideal for building composite blanking or punching dies.

PROCEDURE:

Clean weld area. Vee out cracks with Gouge and also gouge out the fatigued and worn damaged metal. Pre Heat die steel and high alloys to 350°-400°C. Use stringer beads deposition and also peen the deposits to relieve stresses. Chip slag in between passes and also maintain the temperature in the base metal while depositing on die steels & high carbon/ alloyed steels. Post heating will help in better performance. Use Super Stanalloy DS 34 as a cushion layers for best results.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	130-160
3.15	90-130
2.15	60-90

HARDNESS:

47-50 HRc

STARGOLD 600

Unique high hardness iron carbide alloy
with chrome, moly & vanadium carbides.

TECHNICAL DATA SHEET

TDS#SHO_22.08_01

- Deposit maintains a very sharp edge.
- Alloying elements include molybdenum and vanadium.
- Weld metal maintains many of the properties of H13 tool steel.

INTERNATIONAL SPECIFICATIONS	NONE
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Applications: For repair and reclamation of tools and dies subject to heat checking.

Microstructure: In the as-welded condition, the microstructure consists of partially tempered martensite with carbides and some retained austenite.

Alloy: C, Si, Mo, Mn, V, Cr.

Typical Mechanical Properties:

Undiluted Weld Metal	Maximum Value Up to:
Hardness (as welded)	Rockwell C 54-57.

Recommended Current: DC Reverse (+), Straight (-) or AC

Recommended Amperage Settings:

Diameter (mm)	3/32 (2.5)	1/8 (3.25)	5/32 (4.0)
Minimum Amperage	45	80	110
Maximum Amperage	60-90	80-120	125-175

Welding Positions: Flat, Horizontal, Vertical up

Welding Techniques: When welding on tool steel, preheat the part to 1100°F (600°C) and maintain this temperature during welding. Allow parts to slowly.

STARGOLD 601

Tough build-up alloy for steels offering superior compression and impact resistance.

TECHNICAL DATA SHEET

TDS#SH1_22.08_01

- Excellent operation on low voltage AC machines.
- Deposits easy to machine tough weldments.
- All position capabilities allows for cladding in position.
- Straight polarity (DC-) option doubles build-up speed.

INTERNATIONAL SPECIFICATIONS

NONE APPLICABLE TO THIS PROPRIETARY PRODUCT

Applications: Build-up and cladding of carbon and low alloy steels. Heavy thicknesses will not crack.

Microstructure: In the as-deposited condition, the microstructure consists of mar tensite with some carbides.

Alloy: C, Mn, Si, Cr, Mo, V, Fe.

Typical Mechanical Properties:

Undiluted Weld Metal

Hardness

Maximum Value Up to:

Rockwell C 54-57.

Brinell 310-350

Vickers 340-380

Recommended Current: DC Reverse (+), Straight (-) or AC

Recommended Amperage Settings:

Diameter (mm)	1/8 (3.25)	5/32 (4.0)	3/16 (5.0)
Minimum Amperage	90	120	160
Maximum Amperage	110	140	180

Welding Positions: Flat, Vertical up, Horizontal, Overhead

Deposition Rates:

Diameter (mm)	Length (mm)	Weldmetal/ Electrodes	Electrodes per lb (kg) of weld metal	Arc time of deposition min/lb (kg)	Amperage setting
1/8 (3.25)	14" (350)	0.59oz (17g)	27 (38)	21 (53)	115
5/32 (4.0)	14" (350)	1.1oz (30g)	15 (24)	18 (42)	175
3/16 (5.0)	14" (350)	1.8oz (50g)	09 (16)	13 (29)	220

Welding Techniques: Remove fatigued metal. Weld deposits can be made using stringer or weave technique. For very high build ups use DC straight polarity ().

STARGOLD 602

Impact resistant electrode for joining and surfacing steels.

TECHNICAL DATA SHEET

TDS#SH2_22.08_01

- Extra high strength welds.
- Welds do not spall.
- Outwears ordinary hardfacing alloys in Impact conditions as much as 10 to 1.

INTERNATIONAL SPECIFICATIONS	AWS/ASME A 54:E 307-26	EN 1600 E 188 Mn R73
	DIN 8556: E 18.8 Mn MPR 33 160	ISO 3581: E 18.8 Mn R 33
	NFA 81-343: EZ 18.8 MnR 160 33 X	

Applications: Build-up and cladding of carbon and low alloy steels. Heavy thicknesses will not crack.

Microstructure: In the as-deposited condition, the microstructure consists of martensite with some carbides.

Alloy: C, Mn, Si, Cr, Mo, Fe.

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile Strength	Maximum Value Up to: 119,000 psi (830 N/mm ²)
Yield Strength	72,000 psi (500 N/mm ²)
Elongation	41%
Hardness	Brinell 200. Rockwell C 10
Work Hardness	Brinell 520. Rockwell C 50

Recommended Current: DC Reverse (+), Straight (-) or AC

Recommended Amperage Settings:

Diameter (mm)	1/8 (3.25)	5/32 (4.0)	3/16 (5.0)
Minimum Amperage	90	120	165
Maximum Amperage	150	210	270

Welding Positions: Flat, Horizontal, Vertical up

Diameter (mm)	Length (mm)	Weldmetal/ Electrode metal	Electrodes per lb (kg) of weld	Are time of deposition min/lb (kg)	Amperage Setting	Recovery Rate
1/8 (3.25)	14" (350)	0.94oz (26g)	17(37)	22 (49)	115	160%
5/32 (4.0)	14" (350)	1.8oz (50g)	9 (19)	16 (35)	150	160%
3/16 (5.0)	14" (350)	2.7oz (75g)	6 (14)	11 (25)	210	160%

Welding Techniques: Do not pre-heat. Use the lowest amperage and move the electrode as quickly as feasible. Allow to cool slowly.

STARGOLD 30 MB

TECHNICAL DATA SHEET

TDS#SMB_22.08_01

- Very tough alloy for underlayments or medium hard tough overlays.
- Excellent machinability.
- Excels in vertical and horizontal position welding.

Description: Electrode with a semi-hard and machinable deposit for rebuilding and surfacing. The weld deposit is dense and resist deformation, compression and high Impact. Applied as cushion layer prior to hard facing, for buildup of worn parts like rails, drive sprockets, gear tooth, chains, and wheels.

Microstructures

Martensite with some carbides.

Flux Color:

Grey

Typical Mechanical Properties:

Undiluted Weld Metal

Maximum Value Up to:

Hardness

Rockwell C 25-27 Brinell 270

Recommended Current: DC Reverse (+) or AC

Recommended Amperage Settings:	Diameter(mm)	1/8 (3.25)	5/32 (4.0)	3/16 (5.0)
	Minimum Amperage	100	140	180
	Maximum Amperage	140	180	230

Welding Positions: Flat, Horizontal, Vertical up

Deposition Rates:

Diameter (mm)	Length (mm)	Weldmetal/ Electrode weld metal	Electrodes per lb (kg) of min/lb (kg)	Are time of deposition	Amperage Setting
1/8 (3.25)	18" (450)	0.77oz (22g)	20 (44)	21 (47)	120
5/32 (4.0)	18" (450)	1.33oz (39g)	12 (26)	18 (39)	160
3/16 (5.0)	18" (450)	2.34oz (65g)	7 (15)	13 (28)	205

Welding Techniques: Weld In a stringer or 3 x weave fashion. When welding vertically use the "whip" technique.

Applications: For underlayments on carbon and low alloy steels, also as a stand alone overlay for medium hard tough build-ups on rails, shafts, etc.

STARGOLD 60 CR

160% Recovery, High-Chrome Protection

TECHNICAL DATA SHEET

TDS#SCR_22.08_01

- 160% Recovery. Superior High-Chrome Protection.
- Quiet smooth welding with self-releasing slag.
- Short arc length-ultra low heat input.
- Forms shiny smooth deposit with excellent sliding wear resistance.
- Molten metal is viscous & easy to control. Allows for ease of use out of position.

Description: High recovery electrode (160%) for hard facing parts subject to mineral abrasion, compression and medium impact. The deposit is extremely smooth, dense and of outstanding appearance.

Recommended for mining and agricultural equipment, endless transportation screws, as final layer for dredger teeth and for crushers.

Microstructure: In the as-welded condition, the microstructure consists of an alloy matrix(bulk hardness RC57) and chromium/ complex carbides (hardness RA77)

Applications: For protecting most iron base surfaces against severe abrasive wear and moderate impact. For excavating and crushing equipment, surfacing of endless screws, mixer blades, pump bodies for abrasive materials, excavator teeth, crushing installations for minerals, concrete pumps, ores crushing, ploughshares, lumps break, screw presses for bricks Very useful on coal crushing hammers, fiberizers hammers, cane cutting knives, pump bodies, crushingmills, buckets dredgers, screw conveyors & mixer parts, concrete pumps, agitator areas & coke oven slides....

Hardness : HRC: 59-60

Mechanical properties Hardness of all-weld metal (typical values) : 59-60 HRc.

Current : =+/-50 V

Welding positions : Flat, Horizontal, Vertical up & Overhead

Rebaking : 1 h, 350 °C +/- 10 °C (Would not be required in most cases as products are vacuum packaged)

STARGOLD 606

Joining and cladding electrode
for manganese steel that can be flame cut.

TECHNICAL DATA SHEET

TDS#S606_22.08_01

- Tough overlay for manganese steels.
- Spray transfer allows for smooth uniform overlays.
- Work hardens easily in service.
- Rare alloy that can be flame cut.
- Withstands severe impact & shock loading, for long durations.
- Excellent cushion for hardfacing.
- Nickel fortified for superior non-cracking fusion to base alloys.

Microstructure: In the as deposited condition the microstructure consists of a soft manganese alloy austenite which rapidly work hardens under impact.

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile Strength

Elongation

Hardness (As Welded)

Maximum Value Up to:

116,000 psi (800 N/mm2)

38%

Brinell 170-220.

Rockwell B 87 -96 Vickers 180-230

Work Hardness

Brinell 380-550, Rockwell

C41-54, Vickers 400-580

Recommended Current: DC Reverse (+) or AC

Recommended Amperage Settings:

Diameter (mm)	1/8 (3.25)	5/32 (4.0)	3/16 (5.0)
Minimum Amperage	90	125	160
Minimum Amperage	125	170	225

Welding Positions: Flat, Horizontal, Vertical up

Deposition Rates:

Diameter (mm)	Length (mm)	Weldmetal/ Electrode of weld metal	Electrodes per lb (kg) min /lb (kg)	Arc time of deposition	Amperage Setting	Recover Rate
1/8 (3.15)	14" (350)	0.94oz (26g)	17(38)	24 (53)	110	120%
5/32 (4.0)	14" (350)	1.45oz (41g)	11(24)	19 (42)	150	120%
3/16 (5.0)	14" (350)	2.3oz (64g)	7(16)	13 (29)	195	120%

Welding Techniques: Clean metal of oils and fatigued sections. Most importantly, do not allow weld interpass temperature to exceed 320°F (160°C).

Applications: For repair of rail equipment and construction equipment manufactured of manganese steel-Hammers, Shovels, Excavators, Buckets, Frogs, Crushers, Sprockets, Teeth, Wear plates

STARGOLD 646

Impact resistant electrode for joining and surfacing steels.

TECHNICAL DATA SHEET

TDS#S606_22.08_01

- Extra high strength welds.
- Welds do not spall.
- Outwears ordinary hardfacing alloys in Impact conditions as much as 10 to 1.

Microstructure:Austenite Plus ferrite.

Flux color: Grey.

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile Strength

Yield Strength

Elongation

Hardness

Work Hardness

Maximum Value Up to:

119,000 psi (830 N/mm²)

72,000 psi (500 N/mm²)

41%

Brinell 200. Rockwell C 10

Brinell 520. Rockwell C 50

Recommended Current: DC Reverse (+) or AC

Recommended Amperage Settings:

Diameter (mm)	1/8 (3.25)	5/32 (4.0)	3/16 (5.0)
Minimum Amperage	90	120	165
Minimum Amperage	150	210	270

Welding Positions: Flat, Horizontal, Vertical up

Deposition Rates:

Diameter (mm)	Length (mm)	Weldmetal/ Electrode of weld metal	Electrodes per lb (kg) min /lb (kg)	Arc time of deposition	Amperage Setting	Recover Rate
1/8 (3.25)	14" (350)	0.94oz (26g)	17 (37)	22 (49)	115	160%
5/32 (4.0)	14" (350)	1.8oz (50g)	9 (19)	16 (35)	150	160%
3/16 (5.0)	14" (350)	2.7oz (75g)	6 (14)	11 (25)	210	160%

Welding Techniques: Do not pre-heat. Use the lowest amperage and move the electrode as quickly as feasible. Allow to cool slowly.

Application : For joining and repairing steel and manganese steel parts used throughout the railroad, construction, and related industries.

STARGOLD 700

For abrasion resistance and moderate impact resistance.

TECHNICAL DATA SHEET

TDS#S46_22.08_01

- Basic coated SMAW electrode for hard surfacing, hardness 60-67 HRC
- Good for severe abrasion and moderate impact resistance.
- Suitable up to 500° C.
- 120% Recovery.
- Low co-efficient of friction.
- Low-heat input smooth arc transfer.
- Excellent weldability.

Typical Mechanical Properties:

Undiluted Weld Metal

Structure
Hardness

Maximum Value Up to:

Martensitic cast iron
1st layer 60 HRC
2nd layer 62-64 HRC
3rd layer 65-67 HRC

Wear Coefficient
Machinability

2% (SiO₂ as abrasive)
Grinding only

Recommended Current: DC Straight (-), AC

Recommended Amperage Settings:

Diameter (mm)	1/8 (3.15)	5/32 (4.0)	3/16 (5.00)
Minimum Amperage)	85	115	150
Maximum Amperage)	120	150	190

Welding Positions: Flat, Horizontal, Half up

Welding techniques: Select the minimum required amperage and utilize a medium arc gap. For smooth flat welds use a 3 x weave. There is minimal slag which can be over welded without prior removal. Only 2 passes are required for development of the full benefits of this alloy. Cross crack stress relieving is normal.

Applications: For excavator parts, bucket edges & bucket teeth, drilling bits, coal planes, crusher jaws & cones, conveyor screws, mixer blades, pump and crusher parts, operation in sand, clay, cement, and coal.

STARGOLD 710 HC

High carbide density FeCrC hardfacing alloy.

TECHNICAL DATA SHEET

TDS#SCC_22.08_01

- Ideally suited to applications exposed to extreme "GRINDING" low stress abrasion. Excellent performance at high temperatures upto 500°C.

Stargold 710 HC is a heavy coated high efficiency hardfacing electrode with 170% recovery. Suitable for applications subject to strong abrasive wear by minerals, combined with moderate impact, medium shocks and compression as well as humidity or wetness.

The weld metal is nearly free of slag.

A buffer layer of Stargold 646 is recommended prior to surfacing on old claddings.

Typical applications: mainly used on pump bodies, mixer blades, agitator arms, concrete pumps, conveyor worms and coke-oven slides.

Hardness of all-weld metal (typical values) **Hrc**
ca. 63

Current = +/-50 V

Welding positions PA, PB

Rebaking 1 h, 130°C+/-10 °C (if required)

Welding Current

Article No.	Dia/Length mm	Amperage A
00.618.404	4,0/350	170-200

STARGOLD 710 HC

High carbide density FeCrC hardfacing alloy.

TECHNICAL DATA SHEET

TDS#SCC_22.08_01

Description: High recovery electrode (200%) for hard surfacing with a deposit which is extremely resistant against mineral abrasion combined with medium impact, corrosion and heat up to 650°C. (high% of hardness retention upto 860°C).

Applications: Agitator fingers, valves, mixer paddles, screw presses, coke crusher, ploughshares, ash plows, coke crusher segments, screw conveyers, valves, exhaust fans, agitator fingers, mill guides, mixer paddles, rake teeth in furnaces, tong bits, slag ladles, elevator bucket- tips etc. operation temperatures up to 650°C.

Excellent for the protecting of all iron based parts against severe fine particle abrasion as well as in applications at elevated temperatures.

Mechanical Properties:
Of all-Weld Metal
(typical values)

Hardness HRC
~65

Microstructure: in the as welded condition the microstructure consists at an austenitic alloy matrix (bulk hardness of RC 61-63) and a large proportion of chromium and complex alloy carbides (RA 78- 81).

Current = + -50 V

Welding positions



1G/PA

Welding current & instructions

Electrode	Current
3.2 x 350	110-144.0
4.0 x 5.0	140-190
5.0 x 450	190-250

Hold a short arc and the electrode almost vertical. Select lowest amperage possible to keep dilution low and weave only slightly.0

- Weld deposit distinguishes itself by its toughness and superior deformation resistance at high temperature. Controlled metallurgy with controlled chromium, results in hardness and toughness without loss of ductility.
- Nickel-Increases strength and toughness, increases hardenability, Improves grain growth and lessens distortion. Moly- increases strength and toughness, increases resistance to creep, in retaining hot hardness.
- Vanadium-Increases resistance to fatigue and high stresses.
- Cobalt-specially increases deformation and wear resistance at elevated temperatures.
- Controlled hardness ideal for Joining and build-ups on several layers.
- Excellent creep resistance and impact toughness.
- Excellent compatibility with die block steels.
- Fully machinable with tungsten carbide tools

Classification

DIN 855
E3-UM-40T5

Description : Electrode for repairs on hot working tools, forging dies, press jacks. Hot draw rings, hot cutting and up setting tools Furthermore, for surfacing on work harden surfaces and edges of tools from low and alloyed high tensile steels. Tough Chrome, Nickel, Moly, Vanadium, Cobalt alloy, all position, specially designed for surfacing of dies and tool in forging Industry. It is highly recommended for repairs and buildup on drop forging dies, punches etc.

Application : Joining, surfacing and build up on all drop & press forging dies, hammers, punches, inserts.

All Weld Metal Mechanical Properties :

Hardness HRC
38-42 (After welding)

1st Layer	34-36
3rd Layer	37-39
5th Layer	37-39
7th Layer	37-39

Welding recommendations : Re-drying: 300-350C/2h

Heat treatment : To avoid hot cracking pre-heating up to 400° C and slow cooling necessary. Welding with lowest heat Input recommended when material thicknesses are different, otherwise stresses and cracks possible.

Welding positions : Horizontal, Down hand

Welding Current :

Dia/Length	Amperage
3.15 x 350	90-130
4.0 x 350	140-18

STARCLAD 1

Wear, Abrasion, Impact & Compression Resistant.

TECHNICAL DATA SHEET

TDS#SD1_22.08_01

Description:

Basic coated all position hardfacing electrodes for application subject to impact, compression and abrasive wear. For anti wear application on carbon steels and manganese steels.

Applications:

Hardfacing and repairs of screw conveyors, bucket teeth, dipper teeth, cutting tools, crusher jaws, ploughshares, etc.

Weld metal Composition (%) (Typical)

C	Si	Mn	Cr	V	Mo	B
0.50	1.00	1.00	8.50	1.80	1.50	0.20

All Weld Metal Mechanical Properties: (Typical)

Hardness (HRC)
60 - 63 (Without treatment)

Welding Current :

3.15	4.00	5.00
90-120	140-170	180-210

Welding Instruction:

Redrying, if necessary, 2h/ 300°C. Guide electrode almost vertically with a short arc. On materials sensitive to cracks use a buffer- layer of ferrowork NiMnCr is recommended. Low alloyed, high carbon tool steels etc, have to be preheated to 200-400°C, depending on their composition and thickness. Slow cooling in still air after surfacing.0

STARCLAD 2

High carbon, chrome – moly – vanadiu, protection.

TECHNICAL DATA SHEET

TDS#SD2_22.08_01

Description: Basic coated electrode excellent for severe abrasion and moderate impact resistance. Alloy having carbides in hard martensitic matrix.

Applications: For bucket teeth, conveyors screws, mixer blades, jaw crushers, scrapers, crusher mantles, pulverizer hammers, fan blades etc.

Weld metal Composition (%) (Typical)

C	Si	Mn	Cr	Mo	V
4.00	1.00	0.50	8.50	2.00	0.50

All Weld Metal Mechanical Properties: (Typical)

Hardness (HRC)
58 - 62 (Without treatment)

Welding recommendations:

=+~

Re-drying: 300-350°C/2h

Welding position:



Welding Current :

3.15	4.00	5.00
90-130	120-161	60-200

STARCLAD 3

Complex Carbide Abrasion Resistant Alloy

TECHNICAL DATA SHEET

TDS#SD3_22.08_01

Description: Excellent resistance to Galling and Scratching abrasion and high stress grinding abrasion.

Applications: Buckets, scrapper blades, crushing hammers, chains, screw , coal, nozzles, coal burners, fan blades etc.

Weld metal Composition (%) (Typical)

C	Si	Mn	Cr	W
4.00	4.00	2.00	7.50	1.10

All Weld Metal Mechanical Properties: (Typical)

Hardness (HRC)
62 - 65 (Without treatment)

Welding recommendations: $\equiv + \sim$

Welding position:



Welding Current :

3.15	4.00	5.00
90-130	120-160	160-200

STARCLAD 4

Cavitation and erosion resistant.

TECHNICAL DATA SHEET

TDS#S46_22.08_01

- Excellent cavitation and Erosion resistant.
- Deposits are tough and resistant to abrasion and corrosion.
- Multiple layers build-ups on straight chrome steels.
- Excellent welding characteristics.
- Deposits are easily machinable.

Applications:

Especially suitable for pump housings, pump sleeves, valves, shafts, hydraulic turbine runners etc.

Microstructure: Martensitic

Alloys:

Cr, Ni, Mn, Si.

Typical Mechanical Properties:

Undiluted Weld Metal

Tensile strength (as welded)

Hardness

Maximum Value Up to:

1 20,000 psi (830 N/mm²)

34-38 Rc (as welded)

Recommended Current:

DC+; AC

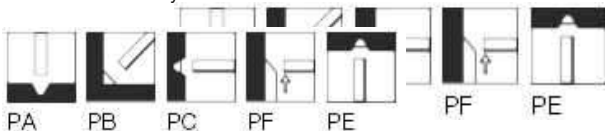
Recommended Amperage Settings:

Diameter (mm)	3.15	4.00
		100-130

Storage and redrying:

Keep dry and avoid condensation. Re-dry at 280-300°C for 1 hour.

Welding Position:



Welding Techniques:

Remove all rust, greases etc., clean weld area Tack thin parts and Preheat straight chrome steels (13% Cr) to 150 °C. Deposits with a short arc, keeping electrodes almost vertical. Clean slag between passes and whip back craters. Do not peen. For best mechanical properties carry out stress relieving at 760° C for one hour or 580 C for four hours and slow cool.

STARCLAD CR

160% Recovery, High-Chrome Protection.

TECHNICAL DATA SHEET

TDS#SFR_22.08_01

- Unmatched balance of abrasion resistance-impact resistance and cost effectiveness. Unmatched weldability on AC and low current settings. Eliminates unbonded islands and blowholes.
- Tough austenitic matrix resists both impact & abrasion.
- Superior weldability-positively non cracking.
- Ripple free surface doubles "grip resistance" to fine abrasive media.
- Can be deposited pass overpass without slag removal.
- Completely spatter proof.

Description: Universal hardfacing electrode, Superior quality 3C-33Cr chromium) carbide universal hardfacing alloy having excellent resistance to abrasion, Impact, corrosion, erosion surface formed is smooth & shiny & exhibits superior sliding wear resistance.) Deposit only in two layers, buffering with suitable product from Ferrowork Series or Ferrosteel LH." Uniquely replaces commonly used iron carbide based hardfacing alloys & provides 2-3 times longer wear life & protection.


Key repair applications: Buckets, shovels, scrapers, wear pads, screws, conveyors, paddles, hammers (fibrizer, mincer, coal crushing, cement mill). cane cutting knives, coal firing nozzles, drag line bucket pins & links, idlers, drums.

**All weld metal
mechanical properties:**

Hardness (HRC)
57 - 60 (Without treatment)

Welding recommendations: **==+ ~** Re-drying: 300-350°C/2h

Heat treatment: To avoid cracks pre-heating up to min. 500 °C, slow down cooling necessary.

Welding positions: 

STARCLAD IMPACT

Hardfacing electrode resistant to impact, compression and abrasion.

TECHNICAL DATA SHEET

TDS#SCT_22.08_01

Classification: DIN 8555: E6-UM-60-S

Description and Application:

Rutile-basic coated general purpose hardfacing electrode for applications subject to impact, compression and abrasive wear. For hardfacing on components made of C-steel, cast steel and Manganese steel. The deposit is tough-hard and crack-resistant.

Special applications are: Hardfacing of block presses, crusher jaws, wheel rims, rollers, caterpillar tracks, ploughshares, running surfaces, cutting edges etc.

**All Weld Metal:
Mechanical
Properties
(Typical)**

Hardness
58 - 60

**Weld metal
Composition
(%) (Typical)**

C	Si	Mn	Cr	V	Mo	Fe
0.40	1.00	1.00	9.00	1.00	1.00	Rem

Amperes (A)

3.15 mm	4.00 mm
90-130	120-160

Welding instruction Redrying generally not required, if necessary, 1h/100-130°C. Guide electrode almost vertically with a short arc. On materials sensitive to cracks use of buffer-layer of Starwork NMCr is recommended. Low alloyed, high carbon tool steels etc, have to be preheated to 200-400°C, depending on their composition and thickness. Slow cooling in still air after surfacing

Classification: Complex Fe- Cr- Nb- C chromium carbide, niobium carbide iron based hardfacing alloy.

E 10 UM 65 GR

Universal "Wet-High & Low stress abrasion" hardfacing electrode. Smooth deposits enriched with highest possible % of niobium & chromium carbides offer an excellent combination of wet & dry abrasion resistance & high temperature hardness retention of upto 650°C. Features a dense matrix impregnated with hard carbide to resist both "high stress" & "low stress" abrasion.

UNIQUE FEATURES

- Unmatched niobium carbides in a dense work hardening austenitic matrix to resist both high and low stress abrasion, especially wet abrasion.
- Unmatched wear resistance and high hardness 55-60 RC even at elevated temperatures. Problem solver for most applications.
- Unmatched weldability. Smooth pin hole free drop transfer deposits. Easy slag removal. High deposition rate 210% recovery.
- Ultra high % of carbide forming alloys.
- Excellent for "wet" & "dry" high temperature strong abrasion, friction, heat & corrosion.
- Ultra low wear co-efficient.

CHARACTERISTICS

Smooth deposits enriched with niobium carbides & chromium carbides offer the ultimate combination of abrasion, corrosion & high temperature hardness retention Starclad NbCr is a heavy coated high efficiency hardfacing electrode with 240% recovery.

The weld metal has a ledeburitic structure with an alloy containing carbides of different kinds.

Starclad NbCr is used for hardfacing of parts subject to strong abrasive wear, friction, heat and corrosion. Will perform well upto 550°C.

MICROSTRUCTURE

Austenitic alloy matrix (Bulk hardness of RC 61-63) & a large proportion of modular formed chromium & niobium alloy carbides (RA 78-81)

Tests carried out temperatures of upto 800°C confirm that addition of Nb in excess of 3-5 wt% significantly improves compressive yield strength, both at room & at high temperatures attributed to solid solution strengthening as well as precipitation hardening by the presence of fine & higher volume fractions of Niobium & Niobium carbide precipitates. During cooling niobium carbide dendrites are first to solidify, beading to formation of hard as well as tough modular Chromium Carbide- Niobium Carbide microstructure

FEATURES

- Smooth deposits enriched with primary chromium carbides & secondary niobium carbides in a dense austenitic matrix-ultimate combination of abrasion resistance, high temperature hardness retention & cost effectiveness- unique balance of hardness & toughness.
- Ideally suited for parts subjected to "Wet & Dry high abrasion, grinding friction, heat & corrosion.
- Uniquely resistant to both high stress & low-stress abrasion including erosion, scratching, grinding & gouging.
- Outwears conventional chromium & iron carbides by as much as 8:1.
- Fe-Cr-Nb-C system is designed for cladding components subjected to severe abrasive wear both low & high stress. Alloy offers many advantages over conventional hardfacing products such as, high quality multi layer deposits offer high hardness upto 61 HRC along with superior toughness, high temperature abrasion & corrosion resistance.... suitability for both extreme high stress & low stress abrasion.....
- Universal application- can be applied to carbon, low alloy or manganese steels.
- Tungsten carbide type wear resistance at 20% the cost.
- Average hardness equivalent to Rc 64-68
- High percentage of hardness retention upto 1600°F (860°C)
- Replaces stellite/ other complex carbides in many applications.
- Universal abrasion resistant alloy-The most versatile & cost effective hardfacing alloy for all low-medium impact hardfacing applications- PROBLEM SOLVER.

KEY REPAIR APPLICATION

- Sizing screens, rolling mill guides, pump impellers augers & feed screws handling wet abrasive sands& sludges, ash plows, screw conveyors, valves, agitator fingers, mill guides mixer paddles, rake teeth in furnaces, elevator bucket tips
- Ideal product for high abrasion low impact applications in the mining & cement industry.
- Superior to "chromium carbides" & even the more expensive "conventional Nb+ Mo+ Cr+ W type complex carbides" in specifically "wet" abrasion applications.
- Highly versatile alloy is possibly the best balance of cost & performance.
- Hardfacing on tools used in coal and ore mining as well as in the cement industry. High temperature abrasion "wer corrosive abrasion, severe fine particle abrasion...
- Excellently suited to extreme abrasive wear caused by dust, sand, gravel, ore, coal, chamotte, cement & slag upto 450°C. Smooth low co-efficient of friction deposits.

Anvil Knives

Augers

Paddles

Asphalt Paddles

Sand & Slurry Pumps

Drill augers

Scraper Blades

Screw Conveyors

Cultivator Shovels

Debarker Knives

Drag Line

Cement Die Rings

Conveyors Screws

Crusher cone shaft

Harrow Discs

Mud Pump Rotors

Paving Mach.

Buckets

Drag line chain

Grinding Blades

Guide plates

Teeth

All weld metal mechanical properties :

Hardness HRC
Ca. 64

Weld metal Analysis
(Typical, wt.%)

C	Si	Cr	Nb	Mo	Fe & Others
5.2	2.2	29	10.00	0.15	53.45

Welding recommendations = + / ~ 50v

Welding Position

Flat, Horizontal, Half-up.

Rebaking

1h, 150°C+/- 10°C (if required)

Dia/Length	Amperage (A)
2.5 x 350	80 - 110
3.2 x 350	100 - 140
4.0 x 450	130 - 180
5.0 x 450	170 - 240

STARBUILD 295

High build-up electrode depositing weldmetal that resists extreme compressive stresses.

TECHNICAL DATA SHEET

TDS#SNR_22.08_01

- Very tough alloy for underlayers or medium hard tough overlays.
- Excellent machinability.
- Excels in vertical and horizontal position welding.

INTERNATIONAL SPECIFICATIONS	AWS - None DIN 8555 E1 – UM-250
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Applications: Build-up and cladding of carbon and low alloy steels. Heavy thicknesses will not crack.

Microstructure: Martensite with some carbides.

Alloy: C, Mn, Si, Cr, Mo,

Typical Mechanical Properties:

Undiluted Weld Metal

Hardness

Maximum Value Up to:

Rockwell C 25-27 Brinell 270

Recommended Current: DC Reverse (+), or AC (70 ocv+)

Recommended Amperage Settings

Diameter (mm)	1/8 (3.25)	5/32 (4.0)	3/16 (5.0)
Minimum Amperage	100	140	180
Maximum Amperage	140	180	230

Welding Positions: Flat, Horizontal, Vertical up

Deposition Rates:

Diameter (mm)	Length (mm)	Weldmetal/ Electrode lb metal	Electrodes per (kg) of weld min/lb (kg)	Are time of deposition	Amperage Setting
1/8 (3.25)	18" (450)	0.77oz (22g)	20 (44)	21 (47)	120
5/32 (4.0)	18" (450)	1.33oz (39g)	12 (26)	18 (39)	160
3/16 (5.0)	18" (450)	2.34oz (65g)	07 (15)	13 (28)	205

Welding Techniques: Weld in a stringer or 3 x weave fashion. When welding vertically use the "whip" technique.

Description: Electrode for tough, hard and impact resistant surfacings, especially for medium manganese steels, (rail frog and crosspieces repair/ armoring of worn out parts on rails surfaces and flanks), wear resistant buildup and overlays. Highly suitable for wear - loaded machine members of unalloyed and low alloyed steels having dragged and crushing load. For example worms, toothed gears, and gear parts. The weld metal is machinable.

Applications: Rail frogs & crosspieces, hammers, wobblers, excavators, pinions, couplings, tail bars, key ways, gear teeth dozer sprockets... Carrier and track roller, idlers, crane wheels etc.

Weld metal Composition
(%) (Typical)

C	Si	Mn	Ni	Cr	Mo
0.20	0.40	0.95	0.30	2.10	1.00

All Weld Metal

Mechanical

Properties:

(Typical)

Hardness (HRC)

36 - 40 (Without treatment)

Welding recommendations: $\equiv + \sim$

Re-drying: 100°C /1hr

Heat treatment:

Pre-heating depending on base material, crack-sensitive materials up to min. 300 °C

Welding position:



Welding Current :

3.15	4.00	5.00
90-120	150-180	190-230

STARBUILD 325

ALL PURPOSE, MOLY – MANGANESE.

TECHNICAL DATA SHEET

TDS#SB2_22.08_01

Description: Electrode for tough, hard and impact resistant surfacings, especially for medium manganese steels, (rail frog and crosspieces repair/ armoring of worn out parts on rails surfaces and flanks), wear resistant buildup and overlays. Highly suitable for wear - loaded machine members of unalloyed and low alloyed steels having dragged and crushing load. For example worms, toothed gears, and gear parts. The weld metal is machinable. Resists sever impact.

Applications: Rail frogs & crosspieces, hammers, wobblers, excavators, pinions, couplings, tail bars, key ways, gear teeth dozer sprockets... use either as a buffer or as a final layer.

**Weld metal
Composition
(%) (Typical)**

C	Si	Mn	Mo	V
0.2%	0.4%	1.5%	0.6%	0.2%

**All Weld Metal
Mechanical
Properties:
(Typical)**

Hardness (HB)
275 - 325 (Without treatment)

**Welding :
recommendations
Heat treatment:**

 Re-drying: 300 - 350°C /2hr

Pre-heating depending on base material, crack-sensitive materials up to min. 300 °C

Welding position:



Welding Current :

Article No.	Dia./Length	Amperage	Kg/Pack	Appr. Pcs./pack
	mm	A		
.00.610.404	4,0/350	160-190	4,8	85

STARTRODE 60

ALL PURPOSE, MOLY – MANGANESE.

TECHNICAL DATA SHEET

TDS#SR6_22.08_01

Classification: *DIN 8555:* E6-UM-60-S

Description & Application: Electrode for tough, hard and impact resistant surfacings especially for medium manganese steels, (rail frog and crosspieces repair/ armouring of worn out parts on rails surfaces and flanks), wear resistant buildup and overlays. Highly suitable for wear - loaded machine members of unalloyed and low alloyed steels having dragged and crushing load. For example worms, toothed gears, and gear parts. The weld metal is machinable. Resists sever impact.

All Weld Metal Mechanical

Hardness (HB)

57-60 HRC

Properties: (Typical)

Obtained in pure weld Metal

Weld metal C Composition (%) (Typical)

C	Si	Mn	Cr	V	Mo	Fe
0.45	1.00	1.00	9.00	1.0.0	1.00	Rem

Amperes (A) 4,0 x 350

3.15 mm	4.00 mm
90-130	120-160

Welding instruction:

Redrying, if necessary, 1h/100-130°C. Guide electrode almost vertically with a short arc. On materials sensitive to cracks use a buffer-layer of Starwork Ultima is recommended. Low alloyed, high carbon tool steels etc, have to be preheated to 200-400°C, depending on their composition and thickness. Slow cooling in still air after surfacing.

STARTRODE 350

Hardfacing electrode resistant to Impact, compression and abrasion.

TECHNICAL DATA SHEET

TDS#SR6_22.08_01

Classification: *DIN 8555*: E1-UM-350

**Description
& Application**

Air hardening type good running electrode for depositing Chromium manganese alloy weld metal for resisting moderate abrasion and impact, Recommended for roller, tractor idler wheels, crane wheels, gears wobblers, shafts, plough Shears, brake shoes, drive sprockets tie. Weld deposit is machinable with good cutting tools.

**All Weld Metal
Mechanical**

Hardness (HB)
57-60 HRC

Obtained in pure weld Metal

**Weld metal C
Composition
(%) (Typical)**

C	Si	Mn	Cr	V	Mo	Fe
0.25	0.30	0.60	3.2	—	—	Rem

Welding Current

3.15 mm	4.00 mm	5.00 mm
90-120	140-170	180-220

STARTRODE 550 LH

Hardfacing electrode resistant to Impact, compression and abrasion.

TECHNICAL DATA SHEET

TDS#SRL_22.08_01

Classification: *DIN 8555:E6-UM-60P*

Description And Application: Hard surfacing electrode for tough - hard, impact tough and abrasive resistant surfacing on unalloyed and low Alloyed materials with higher tensile strength. Recommended For surfacing on machine parts, dredge teeth, beater bars, Scrapers, rock drills, drill bits, coal cutter blade, excavator teeth, conveyor worms, mill hammers, mixer arms, crusher jaws, vcones.

All Weld Metal Mechanical

Hardness (HB)
58-90 HRC

Obtained in pure weld Metal

Weld metal C Composition (%) (Typical)

C	Si	Mn	Cr	V	Mo	Fe
0.50	1.0	0.50	9.2	0.60	0.70	Rem

Welding Current

3.15 mm	4.00 mm	5.00 mm
90-120	140-180	180-240

Welding Instruction: Struction Redrying, if necessary, 2h/300°C. Guide electrode almost vertically with a short arc. On materials sensitive to cracks use a buffer-layer of 18/8Mn type is recommended. Low alloyed, high carbon tool steels etc, have to be preheated to 200-400°C, depending on their composition and thickness. Slow cooling in still air after surfacing.

STARTRODE 550

Hardfacing electrode resistant to Impact, compression and abrasion.

TECHNICAL DATA SHEET

TDS#SR5_22.08_01

Classification: *DIN 8555: E6-UM-60P*

Description
Application: Hard surfacing electrode for tough - hard, impact tough and abrasive **and** resistant surfacing on unalloyed and low Alloyed materials with higher tensile strength. Recommended For surfacing on machine parts, dredge teeth, beater bars, conveyor worms, mill hammers, mixer arms, crusher jaws, cones.

All Weld Metal
Mechanical

Hardness (HB)
57 – 59 HRC

Obtained in pure weld Metal

Weld metal C
Composition
(%) (Typical)

C	Si	Mn	Cr	V	Mo	Fe
0.50	0.50	0.60	7.00	0.60	0.60	Rem

Welding Current

3.15 mm	4.00 mm	5.00 mm
90-120	140-180	180-230

Welding Instruction: Guide electrode with a short arc. On materials sensitive to cracks use a buffer-layer of 18/8Mn type is recommended. Low alloyed, high carbon tool steels etc, have to be preheated to 200-400°C, depending on their composition and thickness. Slow cooling in still air after surfacing.

STARTRODE 650

Hardfacing electrode resistant to Impact, compression and abrasion.

TECHNICAL DATA SHEET

TDS#SR7_22.08_01

Classification: *DIN 8555:* E6-UM-60P

Description and Application: High alloyed air hardening type electrode depositing Non-CHINEABLE weld metal, the deposit is free from Cracks, porosities and slag inclusions. Recommended for rock drills, drill bits, coal cutter blades, bulldozer blades, excavator teeth, bucket lips. metal to metal wear.

**All Weld Metal
Mechanical**

Hardness (HB)

58 – 60 HRC

Obtained in pure weld Metal

**Weld metal C
Composition
(%) (Typical)**

C	Si	Mn	Cr	V	Mo	Fe
0.50	0.60	0.60	7.	–	–	Rem

Welding Current

3.15 mm	4.00 mm	5.00 mm
90-120	140-180	180-230

Welding Instruction: Guide electrode with a short arc. On materials sensitive to cracks use a buffer-layer of 18/8Mn type is recommended. Low alloyed, high carbon tool steels etc, have to be preheated to 200-400°C, depending on their composition and thickness. Slow cooling in still air after surfacing.

STARTWORK MN

Non- Magnetic Austenitic Deposit.

TECHNICAL DATA SHEET

TDS#SR7_22.08_01

Description: Heavy basic coated austenitic manganese-alloyed electrode for wear resistant, hardfacing on building machines grave mixers as well as for parts subject to impact and friction abrasion.

Applications: Cast manganese steel railway crossings, dredger buckets, crusher jaws, cement girder rings, austenitic manganese steel castings, limestone crusher hammers, crusher mantles, swing hammers, pulverizer hammers, wear plates etc.

All weld metal

Mechanical

Properties:

Hardness (BHN)

58-60HRC

Obtained in pure weld Metal

All weld metal

Mechanical properties:

(Typical)

Hardness (BHN)

As welded condition

180-220

Hardness (BHN)

Work hardening

400-450

Weld metal

Composition

(Typical)

C	Mn	Si	Cr	Ni
0.50	13.0	0.40	4.00	4.00

Welding recommendations: **=+~ (70)**

Re-drying: 300-350°C /2hr

Work position:



Welding Current

3.15	4..00	5.00
120-140	140-180	180-220

STARTWORK NM CR

Electrode highly Resistant to Impact.

TECHNICAL DATA SHEET

TDS#SNR_22.08_01

Classification: DIN 8555: E7-UM-250-KP AWS A5. 13: ~EFeMN-A

Description & Application: Rutile-basic coated electrode, designed to surface manganese & alloy steels subject to high impact. Frequently used as cushion layer before hardfacing in case of heavy reclaiming. Allows to build up and then the application of abrasion resistant final layers. The deposit is austenitic and is exceptionally resistant to impact and wear combined with impact. The hardness of the deposit is about 200-250HB as welded and 400-450HB after work hardening. The alloyed Ni and Cr increases the resistance against cracks and abrasion & provides long life under severe impact.

Special applications: Repairing of used pieces or preventive protection of new pieces used in railway applications (rails, switches, crossing, tongues) in quarries and mines (crusher jaws, excavator and grab teeth, mill hammers, rock crusher).

Base Materials: Austenitic steels with Mn:
DIN 17145 et 17155: X 110 Mn 14
AFNOR: Z 120 M 12

**All weld metal
Mechanical
properties:**

Hardness as welded	Hardness after work-hardening
200 – 250 HB	400-500 HB

**Weld metal
Composition
(Typical)**

C	Si	Mn	Cr	V	Mo	Fe
0.45	1.00	1.00	9.00	1.00	1.00	Rem

Welding instruction: Redrying, if necessary, 1h/300°C. Weld with a minimum heat input (low current, short beads) in order to respect an interpass temperature of 250°C maximum. Do not preheat the piece to weld! When surfacing other steels than 13% Mn types, apply a cushion layer with Ferrowork Ultima.

Amperes (A)	3.2	4.0	5.0
	120	160	200

IG/PA 2F/PB 2G/PC =+, - ~ 65

STARWEAR

Fe- 34 Cr- 4.5C Chromium carbide, Iron based
hardfacing alloy. E10-UM -65 GR

TECHNICAL DATA SHEET

TDS#SWR_22.08_01

- 170% recovery, ultra high -chrome carbide protection. High efficiency electrode for high abrasion resistant surfacings on machine parts, working under strong grinding conditions.
- Through high C and CR contents a high hardness and wearing property will be achieved.
- Excellent carbide grain structure for superior abrasion & erosion resistance.

UNIQUELY SUPERIOR ALLOY CHEMISTRY:

STARWEAR has higher alloy%. Alloy chemistry is superior & as a result of higher carbide density better suited for applications exposed to extreme "Grinding" low stress abrasion resistance, as well as abrasion at elevated temperature vis-a vis general chromium carbide alloys. The most important variable in determining low-stress abrasion resistance was found to be carbon content. Above about 4% carbon, numerous primary carbides are obtained and abrasion resistance is greatest. Hardness and chromium content (alloy content) have, at best, secondary effects on abrasion resistance.

MICROSTRUCTURE:

- a) The carbides, which have a Vickers hardness of 1200-1600HV, provide resistance to wear by coarse sand and hard minerals and the austenite matrix serves as a tough binder. The alloys are generally used at ambient temperature, but the high overall chromium content of the alloy imparts good corrosion and oxidation resistance to temperatures as high as 1000°C. Wear resistance would be maintained at high temperatures because, unlike tungsten carbide which readily decarburizes at temperatures greater than 500°C, the chromium carbide remains stable to beyond 1000°C. The overall hardness of the alloy is about 700HV.
- b) The microstructure and phase chemistry of a Fe, 34 Cr. 4.5 C wt% hardfacing alloy has been investigated using transmission electron microscopy and microanalytical techniques. The microstructure is found to consist of large primary M7C3 carbides in a eutectic mixture of austenite and more M7C3. The results indicate that the microstructure of the undiluted alloy becomes configurationally frozen at a temperature of about 1150°C during deposition by the manual metal arc welding technique. This allows the metastable austenite phase to contain large chromium concentration (16 wt%), thus imparting good corrosion resistance.
- c) Results indicate that the alloy only seems to undergo significant oxidation at temperatures around 1050°C. This resistance is probably a result of the high amount of carbon phase in the microstructure, containing some 55 wt% of Cr.
- d) In conclusion the Cr concentration of the austenite matrix of Fe, 34 Cr. 4.5 C wt% hardfacing alloy is sufficiently high to provide oxidation and corrosion resistance at high temperatures.
The microstructure of the alloy, as deposited by a manual metal arc welding technique, is that retained from a temperature just above 1150°C. The as-deposited M7C3+γ microstructure is thus metastable.

STARWEAR

Fe- 34 Cr- 4.5C Chromium carbide, Iron based hardfacing alloy. E10-UM -65 GR

TECHNICAL DATA SHEET

TDS#SWR_22.08_01

UNIQUE FEATURES:

- Highest carbide density in the chromium carbide class- best wear resistance.
- Ultra uniform hardness.
- Easy flow, self releasing slag.
- Excellent wear resistance even at elevated temperature vis-à-vis general chromium carbide type alloys.

KEY REPAIR APPLICATION:

Buckets, scrapper blades, crushing hammers, chains, screw pumps, coal chutes, fan blades, sand mullers medium impact high abrasion applications.

**Typical Weld metal
Composition (%)**

C	Si	Mn	Cr
5.00	1.00	0.50	35.00

**All Weld Metal
Mechanical
Properties**

Hardness HRC
60 – 62 (without treatment)

Welding recommendations: = + ~

Re-drying: 300-350°C /2hr

Welding position:



Welding Current:

Dia./Length	Amperage
Mm	A
3.15/350	120-150
4.00/350	170-200

Vibrating screen chute, drive rollers, guide bar holders, torsion guides, Sliding guide wear plates, water-cooled supports of continuous ovens, etc.

STARTWORK CR

High Chrome Manganese Deposit

TECHNICAL DATA SHEET

TDS#SKR_22.08_01

Austenitic hard manganese-chrome electrode for abrasion resistant surfacing especially on materials and machine parts made from hadfield steel, such as dredger teeth, beater bars, rail frogs and cross pieces....components as are mainly impact and shock loaded. The weld metal has in welding condition a hardness of 200 hb and cold-set by mechanical strain to 500 hb.

Applications: Rails, frogs & cross pieces, crossings & points, gantry tracks, drive sprocket wheels, conveyor rolls, crushers, hammers, bucket teeth, wear plates, shovel track pads, blow bars, impactors...for building-up or final layers on manganese steels, low alloy & low carbon steel.

**Weld metal
Composition**

C	Si	Mn	Cr
0.80%	16.0%	14.0%	14.0%

**All weld metal
Mechanical
properties:**

Hardness HB	Hardness HB
Welding condition: approx.. 200	Workhardened: approx. 500

**Welding
recommendations:**

=+ ~

Re-drying: 300-350°C /2hr

Heat treatment:
heat

Pre-heating only depending on base material. Welding with low

Input Required to avoid hard and brittle martensitic dilution zones.

Welding position:



Welding Current

Article No.	Dia./Length	Amperage
	Mm	A
00.626.404	4,0/350	150-180

STARWEAR ULTIMA

240% Recovery, Extreme Abrasion & Erosion
Resistance Chrome-Boron Alloy

TECHNICAL DATA SHEET

TDS#SWR_22.08_01

- Highest layer hardness-65 RC Plus, up to 70 RC
- Diamond hard boron carbides in a tough austenitic matrix.
- Ultra high density C-Cr Carbides support B4C carbides for unmatched wear & dry abrasion resistance.
- Performs well even at elevated temperature upto 800°C.
- Tungsten carbide like hardness at a fraction of the cost.

Classification: Chromium carbide, Boron carbide, Iron based hardfacing alloy. E 10-UM-70 GRZC

Description: Ultra high alloy %. Most suitable for severe abrasive low impact erosive wear especially at high temperatures, oscillating conveyors, grates, sinter crushers, worm segments, crusher jaws & cones Universal Dry Extreme abrasion hardfacing resistant boron Unmatched high hardness and wear carbide alloy-65RC plus hardness Unmatched wear life and as deposited hardness and alloying. Unmatched high recovery 240 %diamond hard alloy for the ultimate performance in "dry-Extreme" metal to earth abrasion applications under severe conditions. Excellent for surfacings and repairs in mining industry. cement works steel plants. Sugar mills.

MICROSTRUCTURE: The addition of boron to high-carbon chromium facing alloys promotes formation of hypereutectic structures, Increases the amount of the eutectic and changes its structure, alloys the basis phases and substantially increases their hardness, increases the structural and chemical heterogeneity of the facing metal and the zone of fusion due to formation of new phases and redistribution of alloying elements, and favors formation of martensite sections at the line of fusion.

**All Weld Metal
Mechanical
Properties:**

Hardness HRC	Hardness HRC at 600°C	Hardness HRC at 800°C
68-70	approx. 64	approx. 58

Welding recommendations: =+~ Re-drying: 300-350°C /2hr

Welding position:

Heat treatment: To avoid cracks pre-heating up to min. 500 °C, slow down cooling necessary.

KEY REPAIR APPLICATIONS:

Extreme abrasion & erosion applications. Unmatched wear resistance, In all parts subject to high abrasion, high temperature and low impact sintering planta, steel mills, coke oven plants, coal excavation, mining, over burden removal. road construction machinery crushers, conveyor screws

G

COBALT ALLOYS

STARHARD CO 906

Hardfacing & buildup electrode for Cobalt based
(Grade A) type components.

TECHNICAL DATA SHEET

TDS#SC6_22.08_01

TYPICAL APPLICATIONS:

Hydraulic turbine parts, hot working tools, chemical and high pressure steam valves, hot forming rolls, dies, augers, exhaust valves, etc.,

OUTSTANDING FEATURES:

- Controlled weld bead for easy edge buildups
- High resistance to impact, friction, abrasion & erosion at high temperatures
- Outstanding weldability with excellent deposit crack resistivity
- High resistance to thermal and mechanical shocks
- All position and self releasing slag design.

RECOMMENDATIONS:

For all steels including heat treatable types, also for overlay applications on cobalt alloys and special purpose steels. The deposits retains hardness at elevated temperature and also exhibits good corrosion and oxidation resistance at these high temperatures. The deposit incorporates cobalt-chrome-molybdenum alloy system which has extraordinary resistance high temperature, corrosion and oxidation. Deposits are machinable.

PROCEDURE:

Clean weld area. Remove all fatigued and cracked metal and previous overlays. Pre heat not normally required but beneficial when welding heavy sections or crack sensitive base metals. Maintain short arc and deposit stringer beads, back whip craters and remove slag between passes. For out of position, hold short arc and weave moderately.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-130
3.15	80-100

HARDNESS:

45 Hrc

STARHARD CO 912

Hardfacing & buildup electrode for Cobalt based
(Grade B) type components.

TECHNICAL DATA SHEET

TDS#SC1_22.08_01

TYPICAL APPLICATIONS:

Hot pressing dies, shear blades, hot cutting blades and hot forging dies..etc

OUTSTANDING FEATURES:

- Controlled weld bead for easy edge buildups
- Exceptional Resistance to heat and retaining hot hardness property
- Outstanding weldability with excellent deposit crack resistivity
- Superb resistance to impact and abrasion
- All position electrode
- Self releasing slag design.

RECOMMENDATIONS:

For all steels including heat treatable types, also for overlay applications on cobalt alloys and special purpose steels. The deposits retains hardness at elevated temperature and also exhibits good corrosion and oxidation resistance at these high temperatures. Excellent wear resistant deposits on carbon steels and overlays on alloy steels. Recommended for handling equipments combined with heat and abrasion.

PROCEDURE:

Clean weld area. Remove all fatigued and cracked metal and previous overlays. Pre heat not normally required but beneficial when welding heavy sections or crack sensitive base metals in carbon steels. It is recommended to use Staralloy DS 934 as a cushion layers for best performances. In case of Cast irons, a base layer of Super Staralloy FN 965 is recommended for best bonding. Remove slag by chipping, maintain short arc and deposit stringer beads, back whip craters and remove slag between passes. For out of position, hold short arc and weave moderately.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-130
3.15	80-100

HARDNESS:

50 HRc

STARHARD CO 921

Hardfacing & buildup electrode for Cobalt based
(Grade E) type components)

TECHNICAL DATA SHEET

TDS#SC1_22.08_01

TYPICAL APPLICATIONS:

Hydraulic turbine parts, hot cutting tools, chemical and high pressure steam valves, hot forming dies and exhaust valves

OUTSTANDING FEATURES:

- High resistance to impact, friction combined with abrasion, erosion at high temperatures
- Exceptional Resistance to heat and retaining hot hardness property
- Outstanding weldability with excellent deposit crack resistivity
- Exceptional resistance to oxidation and reducing environments up to 1200°C
- All position and self releasing slag design.

RECOMMENDATIONS:

For all steels including heat treatable types, also for overlay applications on cobalt alloys and special purpose steels. The deposits retains hardness at elevated temperature and also exhibits good corrosion and oxidation resistance at these high temperatures. Excellent wear resistant deposits on carbon steels and overlays on alloy steels. Recommended for handling equipments combined with heat and abrasion.

PROCEDURE:

Clean weld area. Remove all fatigued and cracked metal and previous overlays. Pre heat not normally required but beneficial when welding heavy sections or crack sensitive base metals in carbon steels. It is recommended to use Staralloy DS 934 as a cushion layers for best performances. In case of Cast irons, a base layer of Super Staralloy FN 965 is recommended for best bonding. Remove slag by chipping maintain short arc and deposit stringer beads, back whip craters and remove slag between passes. For out of position, hold short arc and weave moderately.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
4.0	100-130
3.15	80-100

HARDNESS:

45-50 HRc

STAR COBALT 6

Extremely smooth running Alloy 6 cobalt electrode.

TECHNICAL DATA SHEET

TDS#SH2_22.08_01

- Controlled weld bead allows for easy edge buildups.
- Slag is self releasing.
- Weld deposits are unusually fine rippled and uniform.
- Special technology also performs on AC current.
- High resistance to thermal & mechanical shocks.
- Good aptitude to polishing & machining

INTERNATIONAL: SPECIFICATIONS	AWS/ASME A 54.13 ECoCr-A DIN 8556: E 20-UM-45-CTZ
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Extremely smooth running satellite 6 cobalt electrodes. Excellent edge retention at elevated temperatures upto 800°C.

Applications: For moderate abrasion resistance combined with resistance to corrosion, erosion and thermal shock. Hardfacing of valves, valve seats, hot shear blades, hot pressing tools, beaters for Coal pulverisers, trimming & cutting dies, equipment for handling hot steel.

Microstructure: Cobalt based austenite with some carbides and other complex phases

All Weld Metal Analysis (Typical Weight %):

C	Mn	Si	Cr	Fe	Mo	Ni	W	Co
0.82	0.09	1.45	27.12	3.35	0.42	2.69	5.56	Bal.

Typical Mechanical Properties:

Undiluted Weld Metal

Maximum Value Up to:

Hardness

Room Temperature:

680F (200°)

Rockwell C 45

Work Hardened

Rockwell C 55

Elevated Temperatures:

7500F (400°C)

Rockwell C 32

11100F (600°C)

Rockwell C 28

14750F (800°C)

Rockwell C 22

16200F (900°C)

Rockwell C 20

Recommended Current:

AC or DC Reverse (+)

Recommended Amperage Settings:

Diameter (mm)	3/32 (2.5)	1/8 (3.15)	5/32 (4.0)
Minimum Amperage	65	80	100
Maximum Amperage	85	110	130

Welding Positions: Flat, Horizontal

Deposition Rates:

Diameter (mm)	Length (mm)	Weldmetal/ Electrode	Electrodes per lb (kg) of weld metal	Amperage Setting	Recovery Rate
3/32 (2.5)	14" (350)	80oz (22g)	19(42)	75	130%
1/8 (3.25)	14" (350)	1.2oz (33g)	14(31)	95	130%
5/32 (4.0)	14" (350)	1.56oz (44g)	11(24)	115	130%

Welding Techniques: Do not pre-heat. Use the lowest amperage and move the electrode as quickly as feasible. Allow to cool slowly.

STAR COBALT 12

Extremely smooth running Alloy 12 cobalt electrode.

TECHNICAL DATA SHEET

TDS#SF2_22.08_01

- Excellent resistance to metal and mineral abrasion.
- Slag is self releasing.
- Weld deposits are unusually fine rippled and uniform.
- Special technology also performs on AC current.

INTERNATIONAL SPECIFICATIONS : AWS/ASME A 5.13 ECoCr-B
DIN 8555: E 20-UM-50-CTZ

Applications: Hardfacing tools used for processing plastics, wood, and paper products including hot shear blades and extrusion screws.

Microstructure: Cobalt based austenite with some carbides and other complex phases.

Alloy: C, Mn, Si, Cr, Fe, Mo, Ni, W, Co.

Typical Mechanical Properties:

Undiluted Weld Metal

Maximum Value Up to:

Hardness

Room Temperature:

680F (20°C)

Rockwell C 50

Work Hardened

Rockwell C 58

Elevated Temperatures:

750°F (400°C)

Rockwell C 44

1110°F (600°C)

Rockwell C 40

1475°F (800°C)

Rockwell C 37

1620°F (900°C)

Rockwell C 35

Recommended Current:

AC or DC Reverse (+)

Recommended Amperage Settings

Diameter (mm)	3/32 (2.5)	1/8 (3.15)	5/32 (4.0)
Minimum Amperage	65	80	100
Maximum Amperage	85	110	130

Welding Positions:

Flat, Horizontal

Deposition Rates:

Diameter (mm)	Length (mm)	Weldmetal/ Electrode	Electrodes per lb (kg) of weld metal	Are time of deposition min/lb (kg)	Amperage Setting	Recovery Rate
3/32 (2.5)	14" (350)	80oz (22g)	20(44)	19 (42)	751	30%
1/8 (3.25)	14" (350)	1.2oz (33g)	13(29)	14 (31)	95	130%
5/32 (4.0)	14" (350)	1.56oz (44g)	10(22)	11 (24)	115	130%

Welding Techniques: Do not pre-heat. Use the lowest amperage and move the electrode as quickly as feasible. Allow to cool slowly.

STAR COBALT 21

Extremely smooth running Alloy 21 cobalt electrode.

TECHNICAL DATA SHEET

TDS#SF1_22.08_01

- Excellent resistance to metal and mineral abrasion.
- Slag is self releasing.
- Weld deposits are unusually fine rippled and uniform.
- Special technology also performs on AC current.
- Excellent Resistance to Oxidising & reducing environments upto 1200°C.

INTERNATIONAL AWS/ASME A 5.13 ECoCr-E

SPECIFICATIONS : DIN 8555

Applications: High- duty overlays of sealing faces and moving parts of valve seats and valves of combustion engines, for pumps and fitting for gas, water, steam and acids, gas turbines and hot working tools.

Microstructure: Cobalt based austenite with some carbides and other complex phases

Alloy: C, Mn, Si, Cr, Fe, Mo, Ni, W, Co.

All Weld Metal Analysis (Typical Weight %):

C	Mn	Si	Cr	Fe	Mo	Ni	W	Co
0.35	0.04	1.20	27.10	3.00	4.8	0300	-	Bal.

Typical Mechanical Properties:

Undiluted Weld Metal

Hardness

Room Temperature:

Work Hardened

Elevated Temperatures:

Maximum Value Up to:

680F (20°C)

750°F (400°C)

1110°F (600°C)

1475°F (800°C)

1620°F (900°C)

AC or DC Reverse (+)

Rockwell C 30-32

Rockwell C 45

Rockwell C 33

Rockwell C 30

Rockwell C 28

Rockwell C 26

Recommended Current:

Recommended Amperage Settings:

Diameter (mm)	3/32 (2.5)	1/8 (3.15)	5/32 (4.0)
Minimum Amperage	65	80	100
Maximum Amperage	85	110	130

Welding Positions: Flat, Horizontal

Deposition Rates:

Diameter (mm)	Length (mm)	Weldmetal/ Electrode	Electrodes per lb (kg) of weld metal	Are time of deposition min/lb (kg)	Amperage Setting	Recovery Rate
3/32 (2.5)	14" (350)	80oz (22g)	20(44)	19 (42)	75	130%
1/8 (3.25)	14" (350)	1.2oz (33g)	13(29)	14 (31)	95	130%
5/32 (4.0)	14" (350)	1.56oz (44g)	10(22)	11 (24)	115	130%

Welding Techniques: Do not pre-heat. Use the lowest amperage and move the electrode as quickly as feasible. Allow to cool slowly.

H

HRDFACING - TUBULAR

STARHARD CC 991

Tubular electrode for high Abrasion & Erosion Resistance.

TECHNICAL DATA SHEET

TDS#S91_22.08_01

TYPICAL APPLICATIONS:

Hydraulic turbine parts, hotcutting tools, chemical and high pressure steam valves, hot forming dies and exhaust valves.

OUTSTANDING FEATURES:

- Ultimate single layer hardness.
- Seamless steel tube construction for better arc characteristics.
- No flux dropping in the weld pool during welding.
- Complete electrode deposition without electrode overheating.
- Good control of weld pool during welding.
- Slagless deposit with high metal recovery.
- Minimal fumes, gases. Easy strike and restrike.

RECOMMENDATIONS:

A tubular product, with Chromium carbides and complex carbide rich deposits resists grinding abrasion along with erosion. The buildup can be done with ease with these alloys. Highly recommended for parts subjected to grinding abrasion combined with moderate heat and erosion. Complete electrode deposition is possible without the electrode getting red hot and leading to wastages. The productivity can be the best with these electrodes. Low temperature welding with good current density due to tubular design.

PROCEDURE:

Clean weld area. Vee out cracks with Star Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. In Mn steels use a base layer of Starhard NA975 & do not preheat. In carbon steels, If the build up is high it is recommended to use Staralloy CN954 as a cushion layers for best performances. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited with out the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. In case of Cast irons, a base layer of Staralloy FN 965 is recommended for best bonding. Remove slag by chipping.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
8.0	150-180
6.00	140-160

HARDNESS:

57-62 HRc

STARHARD CC 992

Tubular electrode for high Abrasion & Erosion Resistance
at temperatures up to 750°C.

TECHNICAL DATA SHEET

TDS#S92_22.08_01

TYPICAL APPLICATIONS:

Clinker crushers, Sinter breakers, burner buckets of power plants, ash conveying screws, Blow bars, Conveyor chutes etc.

OUTSTANDING FEATURES:

- High hardness retention at high temperature
- Seamless steel tube construction for better arc characteristic
- No flux dropping in the weld pool during welding
- Complete electrode deposition without electrode overheating
- Good control of weld pool during welding
- Slagless deposit with high metal recover
- Minimal fumes, gases. Easy Strike and restrike.

RECOMMENDATIONS:

A tubular product, with rich complex carbide rich deposits resists high temperature grinding abrasion along with erosion. The buildup can be done with ease with these alloys. Highly recommended for parts subjected to grinding abrasion combined with high heat and erosion. Temperature resistance up to 750°C. Complete electrode deposition is possible without the electrode getting red hot and leading to wastages. The productivity can be the best with these electrodes. Low temperature welding with good current density due to tubular design.

PROCEDURE:

Clean weld area. Vee out cracks with Star Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. In Mn steels use a base layer of Starhard NA975 & do not preheat. In carbon steels, If the build up is high it is recommended to use Staralloy CN954 as a cushion layers for best performances. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited with out the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. In case of Cast irons, a base layer of Staralloy FN 965 is recommended for best bonding. Remove slag by chipping.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
8.0	150-180
6.00	140-160

HARDNESS:

58-64 HRc

STARHARD CC 993

Tubular electrode resisting multiple wear factors at temperatures up to 900 C.

TECHNICAL DATA SHEET

TDS#S93_22.08_01

TYPICAL APPLICATIONS:

Sinter star crushers, clinker crushers, BLT chutes, Bell and Hopper, ash pumps, slurry pumps, Coal fired boiler burner buckets etc.,

OUTSTANDING FEATURES:

- Ultimate hardness combined with heat resistance up to 900°C.
- Low dilution leading to no hardness drop even on nickel steels.
- Seamless steel tube construction for better arc characteristics.
- No flux dropping in the weld pool during welding.
- Complete electrode deposition without electrode overheating.
- Good control of weld pool during welding.
- Minimal fumes, gases. Easy Strike and restrike.

RECOMMENDATIONS:

A tubular product, with rich complex carbide rich deposits resists high temperature grinding abrasion along with erosion. The buildup can be done with ease with these alloys. Highly recommended for parts subjected to grinding abrasion combined with high heat and erosion. Temperature resistance up to 900°C. Complete electrode deposition is possible without the electrode getting red hot and leading to wastages. The productivity can be the best with these electrodes. Low temperature welding with good density due to tubular design.

PROCEDURE:

Clean weld area. Vee out cracks with Star Gouge and also gouge out the fatigued and worn damaged metal. Pre heat heavy sections to about 200°C to 250°C. In Mn steels use a base layer of Starhard NA975 & do not preheat. In carbon steels, If the build up is high it is recommended to use Staralloy CN954 as a cushion layers for best performances. Use stringer beads or 2X weaving beads holding a short arc. The deposits can be deposited with out the danger of cracking. The stress relieving checks are hair line showing the tough matrix structure. In case of Cast irons, a base layer of Staralloy FN 965 is recommended for best bonding. Remove slag by chipping.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
8.0	150-180
6.00	120-150

HARDNESS:

60-65 HRc

Moisture Resistant Flux Coating: The Stargold flux coating is totally moisture resistant. The flux coating has an infinite storage life. There is absolutely no moisture pick-up which is a problem with so many other manual electrodes.

Metal Recovery:

The metal recovery from the Stargold antiwear hard facing electrodes is extremely high and with the 12mm diameter there are only four stub discards for each kg of electrodes.

Multilayers:

When multi layers are required no chipping of slag covering is needed, as little or no residual slag occurs. Easy to Apply & Re-Strike: Stargold antiwear hard facing electrodes are the easiest of hard facing electrodes to apply as no special skills are required to obtain first class results.

Arc Length:

Arc length is not crucial. Longer arc length, say 10 to 12mm, gives a soft spray type metal transfer with a smooth finish.

Heterogeneous Deposits:

Deposits are mostly heterogeneous; that is carbide particles in a tough, less hard matrix. This deposit combination gives alloys with the dual value of high abrasion resistance as well as a good impact resistance.

AC or DC:

These electrodes may be applied with either AC or DC (+) current.

DESCRIPTION

When compared to similar grades of small diameter alloy cored wires the Stargold electrodes due to lower dilution rates and extremely high alloy concentrations often give a service life improvement in excess of 300%. Comparative testing shows a swing back from smaller diameter wire to the Stargold antiwear electrodes. Big savings in labour and production result.

(A) Stargold 609T: Hi- Chrome Carbide Electrode- Iron Base

- Identification Light Blue EndTip.
- Composition-carbon, chromium, manganese, silicon.
- No buffer layers needed to hard face grey iron, austenitic manganese steels and low carbon steels. Gives good abrasion and moderate impact resistance.
- For application to dredge buckets, crusher rolls, ripper tyres, crusher hammer, muller pan tyres and pathways.
- AC-DC currents. Hardness single layer 55-60 Rc. Multi layer 58-64 Rc.

- 6mm good for out of position hard facing.

(B) Stargold 610T: Chromium Niobium Carbide Electrode- Iron Base

- Identification Red EndTip.
- Composition - carbon, chromium, niobium, molybdenum, vanadium.
- Modular formed carbides give both good impact and abrasion resistance to wear. Less relief checking than 609T. Ideal for rail ballast tampers, crusher hammers, dredger teeth, ripper teeth, grizzly bars, steel guides.
- AC-DC currents. Hardness single layer 55- 61RC&multi- layer 60- 66 RC.
- 6mm very good for out of position hard facing.

(C) Stargold 611T: Complex Carbide Electrode- Iron Base

- Identification White End Tip.
- Composition - carbon, chromium, niobium, molybdenum, vanadium, tungsten.
- Deposits are heat resisting to 850-900 C Applications include steelworks spike crusher rolls, grizzly bars, blast furnace bell chutes and other parts subject to high temperatures and high abrasion.
- AC or DC current Hardness 60-68Rc. Relief checks are normal.
- 6mm suitable for vertical and overhead deposition.

Usages – The higher the number the more suitable the grade for application

Application	609T	610T	611T
Impact	4	5	3
Dry Abrasion	5	6	7
Wet Abrasion	5	1	9
Hardness	5	7	8
Temperature	5	8	9

Amperages - AC or DC (+)

	609T	610T	611T
6mm	85-135	85-135	85-135
8mm	130-190	130-190	130-190
12mm	200-430	200-430	200-430

Moisture Resistant Flux Coating:

The Stargold flux coating is totally moisture resistant. The flux coating has an infinite storage life. There is absolutely no moisture pick-up which is a problem with so many other manual electrodes.

Metal Recovery:

The metal recovery from the Stargold antiwear hard facing electrodes is extremely high and with the 12mm diameter there are only four stub discards for each kg of electrodes.

Multilayers:

When multi layers are required no chipping of slag covering is needed, as little or no residual slag occurs. Easy to Apply & Re-Strike: Stargold antiwear hard facing electrodes are the easiest of hard facing electrodes to apply as no special skills are required to obtain first class results.

Arc Length:

Arc length is not crucial. Longer arc length, say 10 to 12mm, gives a soft spray type metal transfer with a smooth finish.

Heterogeneous Deposits:

Deposits are mostly heterogeneous; that is carbide particles in a tough, less hard matrix. This deposit combination gives alloys with the dual value of high abrasion resistance as well as a good impact resistance.

AC or DC:

These electrodes may be applied with either AC or DC (+) current.

DESCRIPTION:

When compared to similar grades of small diameter alloy cored wires the Stargold electrodes due to lower dilution rates and extremely high alloy concentrations often give a service life improvement in excess of 300%. Comparative testing shows a swing back from smaller diameter wire to the Stargold antiwear electrodes. Big savings in labour and production result.

(A) Stargold 609T: Hi-Chrome Carbide Electrode-Iron Base

- Identification Light Blue End Tip.
- Composition-carbon, chromium, manganese, silicon. No buffer layers needed to hard face grey iron, austenitic manganese steels and low carbon steels. Gives good abrasion and moderate impact resistance.
- For application to dredge buckets, crusher rolls, ripper tyres, crusher hammer, muller pan tyres and pathways.
- AC-DC currents. Hardness single layer 55-60 Rc. Multi layer 58-64 Rc.
- 6mm good for out of position hard facing.

STARGOLD 610 T

Antiwear Hardfacing Tubulars.

TECHNICAL DATA SHEET

TDS#ST0_22.08_01

(B) Stargold 610T: Chromium Niobium Carbide Electrode-Iron Base

- Identification Red EndTip.
- Composition-carbon, chromium, manganese, silicon, niobium, molybdenum, vanadium.
- Modular formed carbides give both good impact and abrasion resistance to wear. Less relief checking than 609T. Ideal for rail ballast tampers, crusher hammers, dredger teeth, ripper teeth, grizzly bars, steel guides.
- AC-DC currents. Hardness single layer 55-61RC&multi-layer 60-66 RC.
- 6mm very good for out of position hard facing.

(C) Stargold 611T: Complex Carbide Electrode - IronBase

- Complex Carbide Electrode-Iron Base Identification White End Tip.
- Composition-carbon, chromium, niobium, molybdenum, vanadium, tungsten.
- Deposits are heat resisting to 850-900 C Applications include steelworks spike crusher rolls, grizzly bars subject to high temperatures and high abrasion.
- AC or DC current Hardness 60-68Rc. Relief checks are normal.
- 6mm suitable for vertical and overhead deposition.

Usages – The higher the number the more suitable the grade for application

Application	609T	610T	611T
Impact	4	5	3
Dry Abrasion	5	6	7
Wet Abrasion	5	10	9
Hardness	5	7	8
Temperature	5	8	9

Amperages AC or DC (+)

	609T	610T	611T
6mm	85-135	85-135	85-135
8mm	130-190	130-190	130-190
12mm	200-430	200-430	200-430

Moisture Resistant Flux Coating:

The Stargold flux coating is totally moisture resistant. The flux coating has an infinite storage life. There is absolutely no moisture pick-up which is a problem with so many other manual electrodes.

Metal Recovery:

The metal recovery from the Stargold antiwear hard facing electrodes is extremely high and with the 12mm diameter there are only four stub discards for each kg of electrodes.

Multilayers:

When multi layers are required no chipping of slag covering is needed, as little or no residual slag occurs. Easy to Apply & Re-Strike: Stargold antiwear hard facing electrodes are the easiest of hard facing electrodes to apply as no special skills are required to obtain first class results.

Arc Length:

Arc length is not crucial. Longer arc length, say 10 to 12mm, gives a soft spray type metal transfer with a smooth finish.

Heterogeneous Deposits:

Deposits are mostly heterogeneous; that is carbide particles in a tough, less hard matrix. This deposit combination gives alloys with the dual value of high abrasion resistance as well as a good impact resistance.

AC or DC: These electrodes may be applied with either AC or DC (+) current.

DESCRIPTION:

When compared to similar grades of small diameter alloy cored wires the Stargold electrodes due to lower dilution rates and extremely high alloy concentrations often give a service life improvement in excess of 300%. Comparative testing shows a swing back from smaller diameter wire to the Stargold antiwear electrodes. Big savings in labour and production result.

(A) Stargold 609T: Hi-Chrome Carbide Electrode-Iron Base

- Identification Light Blue End Tip.
- Composition-carbon, chromium, manganese, silicon. No buffer layers needed to hard face grey iron, austenitic manganese steels and low carbon steels. Gives good abrasion and moderate impact resistance.
- For application to dredge buckets, crusher rolls, ripper tyres, crusher hammer, muller pan tyres and pathways.
- AC-DC currents. Hardness single layer 55-60 Rc. Multi layer 58-64 Rc.
- 6mm good for out of position hard facing.

STARGOLD 611 T

Antiwear Hardfacing Tubulars.

TECHNICAL DATA SHEET

TDS#ST1_22.08_01

(B) Stargold 610T: Chromium Niobium Carbide Electrode-Iron Base

- Identification Red EndTip.
- Composition-carbon, chromium, manganese, silicon, niobium, molybdenum, vanadium.
- Modular formed carbides give both good impact and abrasion resistance to wear. Less relief checking than 609T. Ideal for rail ballast tampers, crusher hammers, dredger teeth, ripper teeth, grizzly bars, steel guides.
- AC-DC currents. Hardness single layer 55-61 RC & multi-layer 60-66 RC.
- 6mm very good for out of position hard facing.

(C) Stargold 611T: Complex Carbide Electrode - Iron Base

- Complex Carbide Electrode-Iron Base Identification White End Tip.
- Composition-carbon, chromium, niobium, molybdenum, vanadium, tungsten.
- Deposits are heat resisting to 850-900 C Applications include steelworks spike crusher rolls, grizzly bars subject to high temperatures and high abrasion.
- AC or DC current Hardness 60-68Rc. Relief checks are normal.
- 6mm suitable for vertical and overhead deposition.

Usages-The higher the number the more suitable the grade for application

Usages – The higher the number the more suitable the grade for application

Application	609T	610T	611T
Impact	4	5	3
Dry Abrasion	5	6	7
Wet Abrasion	5	10	9
Hardness	5	7	8
Temperature	5	8	9

Amperages	AC or DC (+)		
	609T	610T	611T
6mm	85-135	85-135	85-135
8mm	130-190	130-190	130-190
12mm	200-430	200-430	200-430

DIES & MOULDS REPAIRING ALLOYS

STARHARD PD 988

Suitable for Hot & Cold Press Forging Die welding & cladding.

TECHNICAL DATA SHEET

TDS#S88_22.08_01

TYPICAL APPLICATIONS:

Ideal alloy specially designed for press forging dies of die steel or alloy steels.

OUTSTANDING FEATURES:

- Suited best for both Hot and Cold working dies.
- Excellent frictional wear properties.
- Self-releasing slag.
- Highly alloyed electrode for the said application.

RECOMMENDATIONS:

Specially designed electrode with best balanced alloy combination. Martensitic weld deposit for extra tough hot and cold work press forging application. The alloys can be welded without any preheating. The deposits exhibit good frictional resistance properties particularly for the press forging dies, both at cold and hot working conditions. The Chrome- Nickel- Moly-vanadium combination gives ideal protection for extra touch and cold work tooling dies.

PROCEDURE:

Clean weld area. Vee out cracks with Star Gouge and also gouge out the fatigued and worn damaged metal. Pre Heat die steel and high alloys to 350°-400°C. Use stringer beads deposition and also peen the deposits to relieve stresses. Chip slag in between passes and also maintain the temperature in the base metal while depositing on die steels & high carbon/ alloyed steels. Post heating will help in better performance. Use Staralloy DS 934 as a cushion layers for best results

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	200-240
4.00	140-180
3.15	90-130

HARDNESS:

50-55 HRc

STARGOLD PD (SPL)

Chrome-nickel-moly-vanadium-tungsten protection for extra tough hot and cold work tooling.

TECHNICAL DATA SHEET

TDS#SDS_22.08_01

Description: Specially designed electrode with best balanced alloy combination, martensitic weld deposit for extra tough hot and cold work tooling applications. Can be used as welded without any heat treatment.

Unique features:

- Chrome-nickel-moly-vanadium-tungsten protection.
- Excellent wear properties.
- Soft fusion, self releasing slag.
- Crack resistant deposits.

Applications: For repair and reclamation of dies, ideally suitable for press dies, screw press dies, impactor dies. Can also be used for cold forming applications like automotive trim section, blanking dies and forming dies.

Alloy base: C, Mn, Cr, Ni, Mo, V, W, Si

Typical Mechanical Properties	Hardness
	As welded 55-58 HRC

Tempered Hardness

At 580°C -	55-57 RC
At 600°C -	53-55 RC
At 610°C -	49-51 RC

Welding recommendations: DC (+) Re-drying: 250° - 300°C /1hr

Welding Current :	Dia./Length	Amperage
	mm	A
	4.0/450	180-210
	5.00/450	220-250
	6.30/450	260-300

Procedure: Remove all cracks, heat checks and all other defects. Clean weld area and make free from any rust scales, slag or drawing compounds. Preheat die blocks and other units upto 400°C where entire surface is to be welded. Pre-Heat and post heat on other alloy will be as per base - metal computation

Maintain temperature during welding use stringer bead and short arc technique peen the weld when forgeable to relieve stress. Cool in still air upto 150°C Post heat at 530°C-540°C for 1hr per inch thickness and cool in still air to room temperature.

STARGOLD PD 50

Tungstan fortified chrome – nickel moly – vanadium protection.

TECHNICAL DATA SHEET

TDS#SD5_22.08_01

Description: Basic coated specially designed electrode for repairs, surfacing and buildups of dies and tools forging industry, rolling mills.

Unique features:

- Excellent compatibility with forging die block base material.
- All position electrode.
- Chrome nickel-moly - vanadium - tungstan protection.
- Soft fusion, easy slag removal.
- Excellent wear and deformation resistant even at higher temperatures.

Applications: For repairs, surfacing and buildups of forging dies, trimming dies and tools.

Alloy base: Cr, Ni, Mn, Mo, W, Fe

Typical Mechanical Properties:

Hardness
47-50 HRC

Welding recommendations: DC (+) / AC

Welding Current :

Dia./Length	Amperage
mm	A
3.15x350	100-130
4.00x350	130-160
5.00x350	180-230

Procedure: Clean weld area, remove all cracked or fatigued material, pre-heat the job upto 300-400°C (As per thickness of base material) and maintain throughout the welding. Remove slag between passes. Use short arc and minimum amperage. Keep electrodes perpendicular to welding direction. Air cool to job to 200°C after completion of welding to develop uniform hardness.

*450mm length also available

STARGOLD PR 42

Tungsten fortified, chrome-nickel-manganese protection.

TECHNICAL DATA SHEET

TDS#SPR_22.08_01

Description: Specially designed electrode with superior alloy combination for joining and tools in forging industry, rolling mills, steel industries...

Unique features:

- Chrome-nickel-manganese-tungsten protection.
- Soft fusion. Self releasing slag. Uniform finely rippled weld bead.
- Controlled hardness between 38-42 HRC, ideal for joining filling impressions.
- Excellent wear and deformation resistance even at elevated temperatures.
- Fully machinable with tungsten-carbide tools.
- Crack resistant weld deposit.

Applications: For filling all types of die cavities, impressions, joining and build-ups on all drop forging tools, dies inserts, punches etc. Also suitable for repairing worn out profiles, rebuilding scrapped or undersized die blocks, pinch rolls....

Alloy base: Cr, Ni, Mn, W, Fe

Typical Mechanical Properties:	Hardness
	38-42HRC

Welding recommendations: DC (+) / AC

Welding Current :	Dia./Length	Amperage
	mm	A
	3.15x350	100-130
	4.00x350	120-160
	5.00x350	190-230

Procedure: Clean weld area and make free from any rust, scales, slag etc. Remove all cracks, fatigued layers, sharp edges and corners. Pre-heat the job upto 250-300°C and maintain same interpass temperature during welding. Remove slag between the passes. Post heat upto 450°C and cool slowly to room temperature, Duration of post-heat depends on thickness of job.

STARGOLD TD 50

Tungstan fortified chrome – nickel moly – vanadium protection.

TECHNICAL DATA SHEET

TDS#STD_22.08_01

Description: Basic coated specially designed electrode for repairs, surfacing and buildups of dies and tools in forging industry, rolling mills

Unique features:

- Excellent compatibility with forging die block base material.
- All position electrode.
- Chrome nickel-moly - vanadium - tungstan protection.
- Soft fusion, easy slag removal.
- Excellent wear and deformation resistant even at higher temperatures.

Applications: For repairs, surfacing and buildups of forging dies, trimming dies and tools.

Alloy base: Cr, Ni, Mn, Mo, W, Fe

Typical Mechanical Properties:	Hardness
	47-50 HRC

Welding recommendations: DC (+) /AC

Welding Current :	Dia./Length	Amperage
	mm	A
	3.15x350	100-130
	4.00x350	130-160
	5.00x350	180-230

Procedure: Clean weld area, remove all cracked or fatigued material, pre-heat the job upto 300-400°C (As per thickness of base material) and maintain throughout the welding. Remove slag between passes. Use short arc and minimum amperage. Keep electrodes perpendicular to welding direction. Air cool to job to 200°C after completion of welding to develop uniform hardness.

*450mm length also available;

STARTOOL HSS

Chrome-Moly – Tungsten – Vanadium protection.

TECHNICAL DATA SHEET

TDS#SHS_22.08_01

Description: Electrode for hard and abrasive resistant surfacing with high toughness. For armouring of cutting edges, on tools of low alloyed steels & for repairs on high speed steel tools. The weld metal is very resistant against abrasion, impact and shock. It exhibits excellent retention of cutting edges even at elevated temperatures.

Applications: HSS tools & dies, shears, punches

All Weld metal

Analysis

(typical weight %)

C	Si	Mn	Cr	Mo	W	V
0.60	0.40	0.40	4.6	08.0	01.6	01.00

Typical Mechanical Properties:

Hardness HRC	Hardness HRC	Hardness HRC
60-63	62-64	62-64
(after welding)	(after welding)	(after oil hardening)

Welding recommendations: **==+~**
3500C/1h

Re-drying: 300-

Heat treatment: Pre-heating only in dependence on the base material, at surfacing on crack-sensitive materials up to min. 350 °C.

Soft annealing: 850°C, 2-5 hours, furnace cooling

Hardening: 1,220°C, quenching in oil or compressed air

Tempering: 530°C, 2hours, air cooling

Welding positions: Flat, Horizontal, Vertical up, Vertical down, Overhead.

Welding Current :

Dia./Length mm	Amperage
	A
2.15x350	70-90
3.15x350	90-130
4.00x350	140-180

..

Martensitic steel deposit containing fine carbides of W, Cr & V. Excellent resistance to metal-metal wear and "Hot hardness" retention upto 550°C.

Electrode for repairs on hot working tools, forging dies, press jacks, hot draw rings, hot cutting and up setting tools. Further more for surfacings on tempered surfaces and edges of tools made from low and alloyed high tensile steels. Excellent heat & corrosion resistance.

UNIQUE FEATURES

- Chrome- tungsten-vanadium high temperature abrasion & impact protection.
- Soft fusion, no spatters, self releasing slag. Excellent balance of "Hot" wear resistance & machinability(especially when used either with Ferrosteel Plus as a buffer layer or in max 1-2 layers).
- Can be used in both metal forging & well as other tooling dies(cutting....)

KEY REPAIR APPLICATION

Hot forging dies & hammers cutting tools, hot working tools, trimming & blanking dies. shear blades, press dies & punches, hot shearing knives

Applications: Hot forging dies, cutting tools, hot working tools.

Weld metal

composition:

C	Si	Mn	Cr	W	V
0.25	0.30	0.50	2.50	4.50	0.60

Typical Mechanical

Properties:

Hardness HRC	Hardness HRC
Approx.. 47 (after welding)	Approx.. 50 (after tempering)

Welding recommendations: =+~

Re-drying: 300-3500C/2h

Heat treatment To avoid hot cracking pre-heating up to 400 °C and slow cooling necessary.

Welding with lowest heat input recommended when material thicknesses are different, otherwise stresses and cracks possible.

Soft annealing: 800-840°C, 2-4 hours, furnace cooling

Hardening: 1.060-1, 120°C, quenching in oil, salt-bath or compressed air

Tempering: 3 hours, temperature acc. to hardness

350°C approx. 48 HRC air cooling

450°C approx. 49 HRC air cooling

560°C approx. 52 HRC air cooling

Welding position:



Welding Current :

Article No.	Dia./Length	Amperage
00.611.253	2,5/350	60-90
00.611.323	3,2/350	90-130
00.611.403	4,0/350	130-160

Standards	Material No.	2.4883
	DIN 8555	E 23-UM-250-CKNPTZ

Typical Application: high alloyed nickel based AC electrode with 160% recovery. The Startool Cobalt type deposit has outstanding physical characteristics and is resistant to both, oxidation & reduction corrosion. It work hardens under impact and by machining to abt.400 HB-even at high temperature-without deforming the deposit.

Uniquely cobalt fortified, for the unmatched high temperature wear resistance. Thick layers should be buffered with Starsteel Plus.

Startool Cobalt is used in general for surfacing of all work-pieces subject to mechanical stresscombined with corrosion and/or to high temperatures upto 1000° C).

Operating Temperature: Room temperature upto 1000° C.

Base Materials: Main applications: Surfacing of hot working tools as hot shear punches, deburring tools, swages, dies, press tools, milling rolls and valves, etc.

Welding Instructions: To achieve a crack-free overlay, the base material should be preheated to 300-4000 C, depending on the alloy.

All weld metal	Yield strength Rp 0.2% N/mm ²	Tensile strength N/mm ²	Elongation	Hardness (Work-hardened) HB	Hardness (as welded) HB
	500	680	>10	Approx.400	Approx.200

Weld metal analysis
(typicall, wt.%)

C	Cr	Co	Mo	W	Fe	Ni
0,06	15	2	16	4,0	5	Bal.

Current: =+ / ~ 50 V
Welding PA, PB, PC, PD, PE, PF.
Rebaking positions 1h, 3000C +/- 100C (if required)

Dimensions Current intensity No. of piecesin et weights (typical values)

Dia./Length	Amperage
2,5 x 350	55-90
3,2 x 350	75-130
4,0 x 350	115-190
5,0 x 450	130-240

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METAL PREPARATION

STARALLOY CUT

High Speed Cutting & Piercing of all metals.

TECHNICAL DATA SHEET

TDS#SCT_22.08_01

TYPICAL APPLICATIONS:

Piercing, cutting of stainless steels and cast iron base metals. Cleaning castings of runners and risers, remover flash etc.

OUTSTANDING FEATURES:

- High arc force leading to easy cutting.
- No electrode overheating til the end.
- Exothermic coating and highly concentrated arc.
- Versatile-can be used for any metal.

RECOMMENDATIONS:

For highest speed, all position cutting and piercing of all metals using Standard electric arc equipment. Also for chamfering, gouging, cleaning out Defects, burning rivets, bevelling metal prior to welding. Ideal for cutting and Piercing mild carbon steel, stainless steel, cast iron, malleable iron, nickel And nickel alloys, aluminium, copper, bronze. No special skill, supplementary Equipment or oxygen tanks are required. Slow burn-off rate leaves little Residue, requiring comparably less finishing. Electrode does not overheat, can withstand high amperage.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	300-350
4.00	200-250
3.15	150-200

STAR FERRO CUT

TECHNICAL DATA SHEET

TDS#SFT_22.08_01

Electrode for cutting of all kinds of metals-alloyed & unalloyed steels, non-ferrous metals, cast iron & cast steels.

Applications: Metal Cutting, piercing holes

Welding = _ ~

Recommendations: A light reciprocating movement will help to drive the molten metal out of the kerf. The easiest way by horizontal pieces is to be held on an angle of 45° in cutting direction. At vertical pieces an angle of 60°, downwards is recommend. Moistured electrodes should be re-dried up to 70 °C for about 30 minutes.

Welding Current:

Article no.	Dia./Length	Amperage
	mm	
.00.990.404	4,0/450	300-400
.00.990.504	5,2/450	350-450

STARALLOY GOUGE

High Arc Force Gouging & Chamfering application for all metals.

TECHNICAL DATA SHEET

TDS#SGE_22.08_01

TYPICAL APPLICATIONS:

Gouging and chamfering, cast irons and other ferrous metals. Removal of studs, bolts, nuts and rivets from the structures.,

OUTSTANDING FEATURES:

- High arc force leading to easy gouging
- White smoke leading to easy crack spotting while gouging
- Delayed arcing for preplacement of electrode
- Superb U groove preparation.
- Minimal cleaning after groove preparation.
- Fast metal removal and low electrode consumption.

RECOMMENDATIONS:

A heavy coated electrode, ideally designed for groove preparation and metal removal. The electrode produces high arc force which has exothermic properties to melt and throw away the gouged metal. The whitish smoke facilitates the welder to spot the crack easily during welding. Also the delayed arcing of the electrode allows the welder to correctly place the electrode before gouging. The base metals required only chipping or minimal cleaning after gouging. The consumption of the electrode is very low facilitating higher productivity and low consumption.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	300-350
4.00	200-250
3.15	150-200

STAR FERRO GOUGE

TECHNICAL DATA SHEET

TDS#SFG_22.08_01

Description/Properties: Special covered electrode for chamfering of all metallic materials including stainless steel, cast iron, copper, bronze and aluminum. Ferro gouge strikes easily and generates a high gas pressure, enabling a clean gouge to be achieved

Welding recommendations: =_~

The electrode should be set to base material as horizontal at possible. The working speed is increased by slight pushing movements in the direction of working.

Welding Current:

Dia./Length	Amperage
mm	A
3.15/350	150-200
4.00/350	200-300
5.00/350	300-400

STARTRODE FORCE CUT

TECHNICAL DATA SHEET
TDS#SFT_22.08_01

Electrode for cutting of all kinds of metals-alloyed & unalloyed steels, non-ferrous metals, cast iron & cast steels.

Applications: Metal Cutting, piercing holes.....

Welding recommendations: =_~

A light reciprocating movement will help to drive the molten metal out of the kerf. The easiest way by horizontal pieces is to held on an angle of 45° in cutting direction. At vertical pieces an angle of 60°, downwards is recommend. Moistured electrodes should be re-dried up to 70 °C for about 30 minutes.

Welding Current:	Article no.	Dia./Length mm	Amperage
	.00.990.404	4,0/450	300-400
	.00.990.504	5,2/450	350-450

STARTRODE FORCE GOUGE

TECHNICAL DATA SHEET
TDS#SFE_22.08_01

TYPICAL APPLICATIONS:

Gouging and chamfering, cast irons and other ferrous metals. Removal of studs, bolts, nuts and rivets from the structures

OUTSTANDING FEATURES:

- High arc force leading to easy gouging.
- White smoke leading to easy crack spotting while gouging.
- Delayed arcing for preplacement of electrode.
- Superb U groove preparation.
- Minimal cleaning after groove preparation.
- Fast metal removal and low electrode consumption.

RECOMMENDATIONS:

A heavy coated electrode, ideally designed for groove preparation and metal removal. The electrode produces high arc force which has exothermic properties to melt and throw away the gouged metal. The whitish smoke facilitates the welder to spot the crack easily during welding. Also the delayed arcing of the electrode allows the welder to correctly place the electrode before gouging. The base metals required only chipping or minimal deaning after gouging. The consumption of the electrode is very low facilitating higher productivity and low consumption.

RECOMMENDED AMPERAGES:

SIZE (mm)	RANGE
5.0	300-350
4.00	200-250
3.15	150-200

COMMON MODES OF INDUSTRIAL WEAR



Metal-Metal Friction

Metal surfaces in relative motion forced into contact with or without lubricant. Degradation by the formation of micro-welds between the contacting surfaces.



Mechanical fatigue

Fatigue and formation of cracks in surface regions due to tribological stress cycles that result in the separation of material.



Thermal fatigue

Cyclic exposure to high temperatures leading to permanent deformation by alternate expansion and contraction. Alteration of the structure and properties of the material.



Cavitation

Tearing out of grains from the metal surface by the formation and implosion of bubbles in a liquid in rapid motion.



Mineral Abrasion

Wear by relative movement of mineral particles of suitable hardness, shape and texture to remove material from the metal surface.



Hot Abrasion

Mineral abrasion in a high-temperature environment, leading generally to softening of the metal or its constituents.



Hot oxidation

Creation of a poorly adhering oxide layer that reforms constantly. Degradation by loss of material thickness.



Corrosion

Degradation of the material by chemical reaction with its environment. Complex phenomenon involving numerous parameters.



Impact

Impact between two materials, one of which provokes deformation or rupture of the surface of the other. This phenomenon is controlled by the toughness or ductility of the two materials



Abrasion under pressure

Wear by relative movement under pressure of mineral particles of suitable hardness, shape and texture to remove material from the metal surface, leaving superficial deformation



Erosion

Repeated high-speed impacts between mineral particles and a material surface. Local destruction by tearing out of metallic grains.

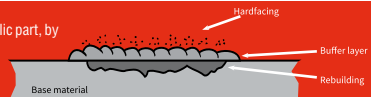
Hardfacing

Hardfacing is the deposition of a special alloy material on a metallic part, by various welding processes, to obtain more desirable wear properties and/or dimensions. The property usually sought is greater resistance to wear from abrasion, impact, adhesion (metal-to-metal), heat, corrosion or any combination of these factors.

A wide range of surfacing alloys is available to fit the need of practically any metal part. Some alloys are very hard, while others are softer with hard abrasion resistant particles dispersed throughout. Certain alloys are designed to build a part up to a required dimension, while others are designed to be a final overlay that protects the work surface. Because of the large number of these materials it is convenient to classify them into groups (e.g. DIN EN 14700).

Rebuilding worn metal parts to usable dimensions.

This is accomplished with build-up or with buildup and overlay. In both cases, the rebuilt part is usually superior to the original part. Worn parts that remain basically sound can be surfaced again and again provided that correct weld procedures are used.



Protecting new metal parts against the loss of metal

Hardfacing overlay is used on both new and/or original equipment where the part is most susceptible to wear. The higher alloy overlay offers much better wear resistance than that of the original base material. This usually increases the work life of the component multiple times that of a part which is not surfaced. Although the added hardfacing material may add to the price of the equipment, usually a less expensive base material may be used.

FACTORS OTHER THAN THE WELDING PROCESS THAT INFLUENCE DILUTION:

Dilution

A feature of weld-deposited coatings is the strong bond with the substrate, and temperatures required to achieve this always result in some melting of the substrate.

Dilution is defined as the change in chemical composition of a welding filler metal caused by the admixture of the base metal or previous weld metal in the weld bead. It is measured as the ratio between the base metal to the filler metal in the weld deposit. That means the dilution percentage is the amount of base metal (or previous weld metal) that ends up in weld deposit.

During surfacing operations, dilution should be limited to optimise deposit characteristics, whilst ensuring a good fusion with the substrate.

Weld Process Dilution Factors

1. Oxy-Acetylene	0-5%	4. TIG	5-15%
2. Covered Electrode	20-45%	5. Submerged Arc	25-50%
3. Flux-cored Wire	20-45%	6. Plasma Transferred Arc	5-10%

Factors other than the welding process that influence dilution:

Preheat temperatures

Higher preheats give higher deposit dilution. Keep preheat temperatures within recommended ranges

Welding speed

The slower the welding speed, the higher the dilution rate.

Welding current

The higher the current, the higher the dilution

Welding position

In order of decreasing dilution: vertical-up (highest dilution), horizontal, uphill, flat, downhill (lowest)

Welding technique

Greater width of electrode oscillation increases dilution. Stringer beads give minimum dilution. Greater overlap of previous bead also reduces dilution.

Number of layers

As more layers are deposited, the dilution decreases.

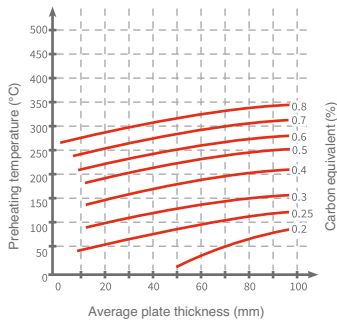
Electrode stick-out (wires)

Longer electrode extension decreases dilution (for wire processes).

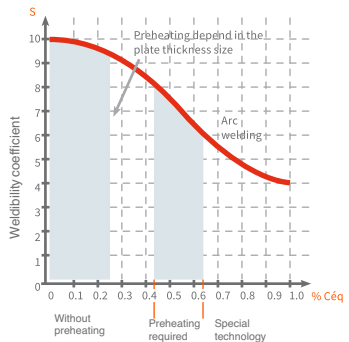
Type of welding current and polarity

Greatest dilution is encountered using DC positive (DC+); AC has an intermediate effect and DC negative (DC-) gives lowest dilution.

Preheat and interpass temperature



Séférian Model for Preheating Temperature Calculation



Séférian Model for Weldability

HARDNESS CHART OF COMMON ABRASIVES & MINERAL PHASES

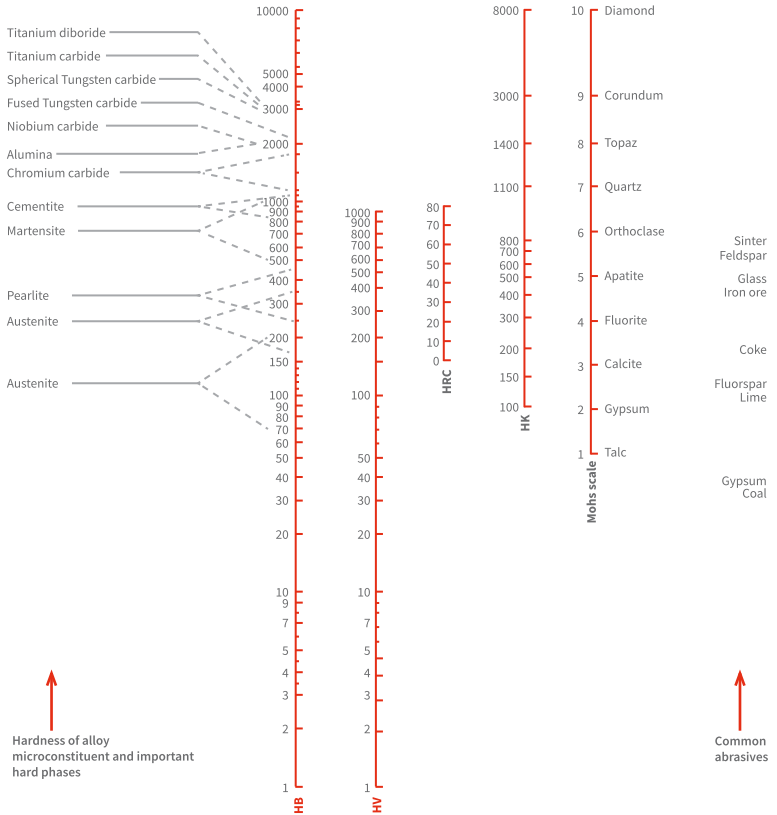


Chart for understanding various hardness scales and hardness of important minerals.

Note the limited range of most scales. Because of many factors involved, these conversions are approximate



StarBlaze India

(A Division of Stellaris Specialities India Ltd.)

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