# Shield Arc® HYP+

## High strength cellulosic electrode



### Classification

AWS A5.5 : E 7010-P1
ISO 2560-A : E 42 2 Mo C 25*

### General description

**Cellulosic electrode for vertical do wn pipe welding**
**Suitable for pipe with strengths X52 trough X65**
**Cleaner weld puddle**
**Very low tendency to peel or flake off under high electrode pressure in tight joints**
**Low susceptibility to wagon tracks, windows and pinholes**
**Very low spatter and smoother arc action**

### Welding positions

ISO/ASME PG/5Gdown

### Current type

DC +

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | Mo | V |
|---|---|---|---|---|
| 0.12 | 0.40 | 0.15 | 0.50 | 0.01 |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -20°C | Impact ISO-V(J) -29°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | | min. 415 | min. 480 | min. 22 | | 27 |
| ISO 2560-A | | min. 420 | 500-640 | min. 20 | min. 47 | |
| Typical values | AW | 450 | 540 | 24 | 65 | 45 |

### Packaging and available sizes

| | | | | |
|---|---|---|---|---|
| | Diameter (mm) | 3.2 | 4.0 | 4.8 |
| | Length (mm) | 350 | 350 | 350 |
| Unit: Metal can | Pieces / unit | 210 | 135 | 89 |
| | Net weight/unit (kg) | 5.4 | 5.4 | 5.1 |

**Identification** Imprint: 7010-G Tip Color: none

## Materials to be welded

| Steel grades/Code | Type |
|---|---|
| **Pipe material** | |
| EN 10208-2 | L360, L415, L445 |
| EN 10216-1 / 10217-1 | P 355 |
| API 5LX | X52, X56, X60, X65 |
| Gaz de France | X52, X63 |



## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 3.2x350 | 75-130 | DC+ | | | | 25.8 | | |
| 4.0x350 | 90-185 | DC+ | | | | 39.5 | | |
| 4.8x350 | 140-185 | DC+ | | | | 57.1 | | |

## Welding parameters, optimum fill passes

| Welding positions | PG/5G down |
|---|---|
| Diameter (mm) | |
| 3.2 | 110A |
| 4.0 | 150A |
| 4.8 | 165A |

## Remarks/ Application advice

Preheating pipe material from L380 to L450 (X56 to X65) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans
Use Fleetweld 5P+ for lower hardness in the root pass

# Shield Arc® 70+

## High strength cellulosic electrode



### Classification

AWS A5.5 : E8010-G
ISO 2560-A : E 46 4 1Ni C 25

### General description

**Cellulosic coated electrode for vertical down pipe welding**
**Suitable for pipe with strengths in the range of X56 - X70**
**Can be used for root, fill and capping passes**
**Low susceptibility to wagon tracks, windows and pinholes**
**Good impact values**
**Can be used for silicon-killed steels**

### Welding positions

ISO/ASME PG/5Gdown

### Current type

DC +

### Approvals

TÜV
+

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | Ni | Cr | V | P | S |
|---|---|---|---|---|---|---|---|
| 0.12 | 0.90 | 0.20 | 0.85 | 0.10 | 0.03 | 0.012 | 0.013 |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -20°C | Impact ISO-V(J) -40°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | | min. 460 | min. 550 | min. 19 | not required | |
| ISO 2560-A | | min. 460 | 530-680 | min. 20 | | min. 47 |
| Typical values | AW | 510 | 570 | 24 | 75 | |

### Packaging and available sizes

| | | | | |
|---|---|---|---|---|
| | Diameter (mm) | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 |
| Unit: Metal can | Pieces / unit | 320 | 195 | 125 |
| | Net weight/unit (kg) | 8.3 | 7.7 | 7.8 |

**Identification** Imprint: 8010-G SA70+ Tip Color: none





LINCOLN® ELECTRIC

## Materials to be welded

| Steel grades/Code | Type |
|---|---|
| **Pipe material** | |
| EN 10208-2 | L 360, L 415, L 445, L 480 |
| EN 10216-1 / 10217-1 | P 355 |
| API 5LX | X 56, X60, X65, X70 |
| Gaz de France | X52, X63 |



## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 3.2 x 350 | 75 - 130 | DC+ | | | | 25.8 | | |
| 4.0 x 350 | 90 - 185 | DC+ | | | | 39.5 | | |
| 5.0 x 350 | 140 - 225 | DC+ | | | | 62.3 | | |

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PG/5G down |
|---|---|
| 3.2 | 110A |
| 4.0 | 150A |
| 5.0 | 165A |

## Remarks/ Application advice

Preheating pipe material from L360 to L480 (X56 to X70) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans
Use Fleetweld 5P+ for lower hardness in the root pass

# Shield Arc® 90

## High strength cellulosic electrode



### Classification

AWS A5.5 : E 9010-G
ISO 2560-A : E 50 4 1NiMo C 25

### General description

**Cellulosic electrode, 0.5% Mo and Ni-alloyed, for vertical down welding in pipes**
**Suitable for pipe material API 5LX-70 and X-80, EN 10208-2, or L480 and L550**
**Applicable for root, filling- and capping pass**
**Not sensitive for wagon tracks, windows and pinholes**

### Welding positions

ISO/ASME PG/5Gdown

### Current type

DC +
DC- (root)

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | Ni | Mo |
|---|---|---|---|---|
| 0.13 | 0.60 | 0.15 | 0.7 | 0.6 |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -40°C | Impact ISO-V(J) -46°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | | min. 530 | min. 620 | min. 17 | not required | |
| ISO 2560-A | | min. 500 | 560-720 | min. 18 | min. 47 | |
| Typical values | AW | 550 | 640 | 22 | 50 | 45 |

### Packaging and available sizes

| | | | | |
|---|---|---|---|---|
| | Diameter (mm) | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 |
| Unit: Metal can | Pieces / unit | 300 | 185 | 125 |
| | Net weight/unit (kg) | 7.7 | 7.3 | 7.9 |

**Identification** Imprint: 9010-G Tip Color: none

**Shield Arc® 90: rev. EN 21**

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Pipe material** | |
| EN 10208-2 | L 480 , L 550 |
| API 5LX | X70, X80 |



## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 3.2 x 350 | 75-130 | DC+ | | | | 26.3 | | |
| 4.0 x 350 | 80-185 | DC+ | | | | 40.8 | | |
| 5.0 x 350 | 140-225 | DC+ | | | | 63.6 | | |

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PG/5G down |
|---|---|
| 3.2 | 120A |
| 4.0 | 170A |
| 5.0 | 180A |

## Remarks/ Application advice

Preheating pipe material required (acc. EN 1011-1)
Rootlayer preferable to weld with lower yield electrodes (Fleetweld 5P+ or Shield Arc 70+.)
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans

# Cellulosic electrode



## Classification

AWS A5.1 : E6010
ISO 2560-A : E 42 3 C 25

## General description

**Cellulosic electrode for pipe welding**
**Smooth arc**
**Soft and ductile root welds**
**Suitable for root, fill and cap passes up to X52 grades**

## Welding positions


ISO/ASME PF/5Gup PG/5Gdown

## Current type

DC + / -

## Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S |
|---|---|---|---|---|
| 0.11 | 0.55 | 0.18 | 0.009 | 0.009 |

## Mechanical properties, typical, all weld metal

| | Condition | Yield strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -29°C | Impact ISO-V(J) -30°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.1 | | min. 331 | min. 414 | min. 22 | 27 | |
| ISO 2560-A | | min. 420 | 500-640 | min. 20 | | 47 |
| Typical values | AW | 420-524 | 503-594 | 24-33 | 51-85 | |

## Packaging and available sizes

| | | | |
|---|---|---|---|
| | Diameter (mm) | 3.2 | 4.0 |
| | Length (mm) | 350 | 350 |
| Unit: metal can | Pieces / unit | 205 | 130 |
| | Net weight/unit (kg) | 5.2 | 5.1 |

**Identification** Imprint: 6010 Shield Arc 6P+ Tip Color: none

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Pipe material** | |
| API 5LX | X42, X46, X52 |



## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 3.2x350 | 65-130 | DC+/- | 46 | | | 25.3 | | |
| 4.0x350 | 90-175 | DC+/- | 52 | | | 39.2 | | |

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | 5G up | 5G down |
|---|---|---|
| 3.2 | 90A | 110A |
| 4.0 | 130A | 150A |

## Remarks/ Application advice

Preheating pipe material L360 (X52) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans

# Shield Arc® 7P+

## High strength Cellulosic electrode



### Classification

| | |
|---|---|
| AWS A5.5 | E7010-P1/E7010-G |
| ISO 2560-A | : E 42 3 Z C 25 |

### General description

**Cellulosic electrode for pipe welding**
**Suitable for root, fill and cap passes up to X65 grades**
**High resistance to porosity**
**Easy welding puddle control**
**High stacking efficiency: fill joints in fewer passes**
**Micro-alloyed to ensure consistent mechanical properties**

### Welding positions

ISO/ASME PG/5Gdown

### Current type

DC + (Also DC- for dia.4mm)

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | Ni | Mo | P | S |
|---|---|---|---|---|---|---|
| 0.12-0.23 | 0.5-0.9 | 0.14-0.32 | 0.62-0.95 | 0.12-0.3 | 0.015 | 0.015 |

### Mechanical properties, typical, all weld metal

| | Condition | Yield strength ($N/mm^2$) | Tensile strength ($N/mm^2$) | Elongation (%) | Impact ISO-V(J) -20°C | -29°C | -40°C |
|---|---|---|---|---|---|---|---|
| Required: AWS A5.1 | | min.414 | min480 | min. 22 | | min.27 | |
| ISO 2560-A | | min. 420 | 500-640 | min. 20 | 47 | | |
| Typical values | AW | 427-520 | 496-635 | 23-30 | 34-102 | | 27-85 |

### Packaging and available sizes

| | | | |
|---|---|---|---|
| | Diameter (mm) | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 |
| Unit: metal can | Pieces / unit | 120 | 80 |
| | Net weight/unit (kg) | 4.7 | 5.0 |

| **Identification** | Imprint: 7010-P1 Shield Arc 7P+ | Tip Color: none | **Shield Arc® 7P+: rev. EN 02** |
|---|---|---|---|

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Pipe material** | |
| API 5LX | X42, X46, X52, X56, X60, X65 |



## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 4.0x350 | 90-175 | DC+/- | | | | 39.1 | | |
| 5.0x350 | 130-210 | DC+ | | | | 62.5 | | |

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | 5G down |
|---|---|
| 4.0 | 150A |
| 5.0 | 165A |

## Remarks/ Application advice

Preheating pipe material from L360 to L450 (X52 to X65) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans

# Shield Arc® 8P+

## High strength cellulosic electrode



### Classification

| | |
|---|---|
| AWS A5.5 | E8010-P1 |
| ISO 2560-A | : E 46 4 1Ni C 25 |

### General description

**Cellulosic electrode for pipe welding**
**Suitable for root, fill and cap passes up to X70 grades**
**High resistance to porosity**
**Easy welding puddle control**
**High stacking efficiency: fill joints in fewer passes**
**Micro-alloyed to ensure consistent mechanical properties**

### Welding positions

ISO/ASME PG/5Gdown

### Current type

DC + (Also DC- for dia.4mm)

### Approvals

| DNV | TÜV |
|---|---|
| + | + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | Ni | Cr | Mo | P | S |
|---|---|---|---|---|---|---|---|
| 0.17 | 0.7 | 0.25 | 0.8 | 0.2 | 0.2 | 0.01 | 0.01 |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -29°C | -40°C | -46°C |
|---|---|---|---|---|---|---|---|
| Required: AWS A5.5 | | min. 460 | min. 550 | min. 19 | 27 | | |
| ISO 2560-A | | min. 460 | 530-680 | min. 20 | | min. 40 | |
| Typical values | AW | 460-559 | 550-676 | 20-27 | 62-99 | | 46-84 |

### Packaging and available sizes

| | | | |
|---|---|---|---|
| | Diameter (mm) | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 |
| Unit: metal can | Pieces / unit | 120 | 80 |
| | Net weight/unit (kg) | 4.7 | 5.0 |

| **Identification** | Imprint: 8010-P1 Shield Arc 8P+ | Tip Color: none | **Shield Arc® 8P+: rev. EN 02** |
|---|---|---|---|

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Pipe material** | |
| API 5LX | X56, X60, X65, X70 |



## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 4.0 x 350 | 90 - 185 | DC+/- | | | | 39.1 | | |
| 5.0 x 350 | 140 - 225 | DC+ | | | | 62.5 | | |

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | 5G down |
|---|---|
| 4.0 | 150A |
| 5.0 | 165A |

## Remarks/ Application advice

Preheating pipe material from L360 to L480 (X56 to X70) required (acc. EN 1011-1).
Pipeclamps to be removed after finishing root pass, start welding hot pass (within 5 min) after root pass
Use electrodes directly from metal cans
Use PIPELINER 6P+ for lower hardness in the root pass when required

# Conarc® 55CT

## Basic electrode for weathering resistant steel



### Classification

AWS A5.5 : E8018-W2-H4R [1)]
ISO 2560-A : E 46 5 Mn1Ni B 32 H5
[1)] Deviation, see remarks

### General description

**Basic extremely low hydrogen electrode**
**All position electrode for welding weather resistant steel**
**Very suitable for off- and on-shore constructions, high resistance to corrosion caused by seawater or combinations of oil, gas and seawater**
**Excellent mechanical properties (impact at -50°C)**
**Also available in vacuum sealed Sahara ReadyPack® (SRP): $H_{DM}$ < 3 ml/100g**

### Welding positions

| ISO/ASME | PA/1G | PB/2F | PC/2G | PF/3Gup | PE/4G | PF/5Gup |
|---|---|---|---|---|---|---|

### Current type

AC / DC + / -

### Approvals

| LR |
|---|
| 4Y42H5 |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | Cu | $H_{DM}$ |
|---|---|---|---|---|---|---|---|
| 0.05 | 1.5 | 0.4 | 0.010 | 0.015 | 0.9 | 0.4 | 3ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -18°C | -20°C | -40°C | -50°C |
|---|---|---|---|---|---|---|---|---|
| Required: AWS A5.5 | | min. 460 | min. 550 | min. 19 | min. 27 | | | |
| ISO 2560-A | | min. 460 | 530-680 | min. 20 | | | | min. 47 |
| Typical values | AW | 540 | 610 | 25 | | 115 | 100 | 60 |

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 |
| Unit: Box | Pieces / unit | 216 | 113 | 84 | 55 |
| | Net weight/unit (kg) | 4.2 | 4.2 | 4.4 | 5.5 |
| Unit: SRP | Pieces / unit | 69 | 50 | 27 | 23 |
| | Net weight/unit (kg) | 1.4 | 1.9 | 1,5 | 2.5 |

**Identification** Imprint: CONARC 55CT Tip Color: black

# Conarc® 55CT



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Weather resisting steels** | |
| EN 10155 | S235 J0W |
| | S235 J2W |
| | S355 J0W |
| | S355 J2W |
| | S355 K2G1W |

Weather resistant steels like Cor-Ten®, Patinax®-F, Patinax®-37 and similar Ni- and Cu-alloyed steels

## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 55 - 85 | DC+ | 53 | 81 | 0.77 | 19.7 | 88 | 1.74 |
| 3.2 x 350 | 80 - 145 | DC+ | 70 | 223 | 1.2 | 36.9 | 43 | 1.60 |
| 4.0 x 350 | 120 - 185 | DC+ | 77 | 355 | 1.6 | 54.1 | 29 | 1.59 |
| 5.0 x 450 | 180 - 270 | DC+ | 104 | 784 | 2.4 | 105.2 | 15 | 1.53 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 110A | 110A | 115A | 110A | 105A | 110A |
| 3.2 | 140A | 120A | 145A | 120A | 120A | 120A |
| 4.0 | 150A | 140A | 150A | 140A | 135A | 140A |
| 5.0 | 220A | 210A | 210A | 170A | | |

## Remarks/ Application advice

Deviations: chemical composition:

| | |
|---|---|
| Mn = 1.4 - 1.9% | AWS: Mn = 0.50 - 1.30% |
| Si = 0.15 - 0.60% | AWS: Si = 0.35 - 0.80% |
| Cr = 0.1% | AWS: Cr = 0.45 - 0.70% |
| Ni = 0.7 - 1.0% | AWS: Ni = 0.40 - 0.80% |
| Cu = 0.3 - 0.5% | EN: Cu max. 0.3% |

# Conarc® 60G

## High strength basic electrode



### Classification

AWS A5.5 : E9018M-H4
EN 757 : E 55 4 Z B 32 H5

### General description

**Basic all position extremely low hydrogen electrode**
**For welding high strength steel grades (UTS 540-640 N/mm²)**
**Good impact values at -51°C**
**DC welding preferred**
**115 - 120% recovery**
**Also available in vacuum sealed Sahara ReadyPack® (SRP): HDM < 3 ml/100g**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Approvals

| ABS | BV | DNV | GL | LR | TÜV |
|---|---|---|---|---|---|
| 3Y | 4Y50 | 4Y50H5 | 4YH10 | + | + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | Mo | HDM |
|---|---|---|---|---|---|---|---|
| 0.06 | 1.0 | 0.4 | 0.015 | 0.010 | 1.6 | 0.3 | 2 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -20°C | -40°C | -51°C |
|---|---|---|---|---|---|---|---|
| Required: AWSA5.5 | | 540-620* | min. 620 | min. 24 | | | min. 27 |
| EN 757 | | min. 550 | 610-780 | min. 18 | | min. 47 | |
| Typical values | AW | 600 | 670 | 25 | | 98 | |
| | SR: 1h/620°C | 550 | 640 | 24 | 90 | | 40 |

* Dia. 2.5 mm max 655 N/mm²

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 |
| Unit: Box | Pieces / unit | 110 | 120 | 85 | 55 |
| | Net weight/unit (kg) | 2.5 | 4.6 | 4.6 | 5.8 |
| Unit: SRP | Pieces / unit | 65 | 50 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 2.0 | 1.5 | 2.6 |

**Identification** Imprint: 9018-M / CONARC 60G Tip Color: red

**Conarc® 60G: rev. EN 22**

# Conarc® 60G



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **General structural steel** | |
| EN 10025 | S355 |
| **Pipe material** | |
| EN 10208-2 | L360, L415, L445, L480 |
| API 5 LX | X52, X56, X60, X65, X70 |
| **Fine grained steel** | |
| EN 10025 part 4 | S420 M (L), S460 M (L), S420 N (L), S460 N (L) |
| EN 10025 part 6 | S460, S500 |
| **Weather resisting steels** | |
| EN 10155 | S235 J0W<br>S235 J2W<br>S355 J0W<br>S355 J2W<br>S 355 K2G1W |

## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy - per electrode at max. current - E(kJ) | Dep.rate - per electrode at max. current - H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 100 | DC+ | 63 | 114 | 0.7 | 23.5 | 77 | 1.80 |
| 3.2 x 350 | 80 - 130 | DC+ | 69 | 231 | 1.3 | 38.3 | 40 | 1.52 |
| 4.0 x 350 | 120 - 180 | DC+ | 72 | 324 | 1.7 | 55.8 | 30 | 1.66 |
| 5.0 x 450 | 160 - 240 | DC+ | 119 | 760 | 2.2 | 105.2 | 14 | 1.43 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 75A | 80A | 85A | 75A | 75A |
| 3.2 | 130A | 120A | 135A | 120A | 115A | 120A |
| 4.0 | 155A | 145A | 160A | 145A | 140A | 140A |
| 5.0 | 225A | 220A | 210A | | | |

## Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# Conarc® 70G

## High strength basic electrode



### Classification

AWS A5.5 : E9018-G-H4R
EN 757 : E 55 4 1NiMo B 32 H5

### General description

**Basic all position extremely low hydrogen electrode**
**For high strength steel grades (UTS 640-735 N/mm²), root passes in HY 100 steel**
**Good impact values at -40°C**
**DC welding preferred**
**115 - 120% recovery**
**Also available in vacuum sealed Sahara ReadyPack® (SRP): HDM < 3 ml/100g**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Approvals

| DNV | TÜV |
|---|---|
| 4Y50H5 | + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | Mo | HDM |
|---|---|---|---|---|---|---|---|
| 0.06 | 1.2 | 0.4 | 0.014 | 0.009 | 1.0 | 0.4 | 2 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -20°C | -40°C | -46°C |
|---|---|---|---|---|---|---|---|
| Required: AWS A5.5 | | min. 530 | min. 620 | min. 17 | not required | | |
| EN 757 | | min. 550 | 610-780 | min. 18 | | min. 47 | |
| Typical values | AW | 600 | 655 | 24 | | 90 | 60 |
| | SR: 15h/580°C | 550 | 640 | 24 | 90 | | 50 |

### Packaging and available sizes

| | | | | | | |
|---|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 | 450 |
| Unit: Box | Pieces / unit | 110 | 120 | 85 | - | 55 |
| | Net weight/unit (kg) | 2.5 | 4.6 | 4.6 | - | 5.8 |
| Unit: SRP | Pieces / unit | 64 | 50 | 28 | 28 | 23 |
| | Net weight/unit (kg) | 1.5 | 2.0 | 1.5 | 2.0 | 2.4 |

**Identification** Imprint: 9018-G / CONARC 70G Tip Color: light green

**Conarc® 70G: rev. EN 22**

# Conarc® 70G



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Boiler & pressure vessel steel (Reactor steels incl. Q & T steels)** | |
| DIN | 20MnMoNi5-5, 22NiMoCr3-7,<br>15NiCuMoNb5-6-4<br>GS-18NiMoCr3-7 |
| ASTM | A508CL2, A508CL3,<br>A533CL.1Gr.B / C,<br>A533CL.2Gr.B / C |
| **Creep resistant steels** | |
| | 15NiCuMoN6-5 (WB36),<br>17MnMoVL6-4(WB35) |
| **Pipe material** | |
| API 5LX | X65, X70 (X80 root run) |
| EN 10208-2 | L480, L550 |
| **Fine grained steel** | |
| EN 10025 part 6 | S460, S500, S550<br>Root runs and fillet welds in S620 and S690 |

## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy - per electrode at max. current - E(kJ) | Dep.rate - per electrode at max. current - H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 100 | DC+ | 67 | 121 | 0.7 | 19.5 | 75 | 1.47 |
| 3.2 x 350 | 80 - 130 | DC+ | 70 | 234 | 1.3 | 37.5 | 41 | 1.56 |
| 4.0 x 350 | 120 - 180 | DC+ | 74 | 343 | 1.7 | 55.4 | 29 | 1.59 |
| 5.0 x 450 | 160 - 240 | DC+ | 106 | 573 | 2.5 | 106.4 | 14 | 1.43 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 75A | 80A | 85A | 75A | 75A |
| 3.2 | 130A | 120A | 135A | 120A | 115A | 120A |
| 4.0 | 155A | 145A | 160A | 145A | 140A | 140A |
| 5.0 | 225A | 220A | 210A | | | |

## Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# Conarc® 74

## Low temperature basic electrode



### Classification

AWS A5.5 : E8018-G-H4R
ISO 2560-A : E 50 6 Mn1Ni B 32 H5

### General description

**The basic all position pipeline and offshore electrode with max. 1% Ni**
**Excellent mechanical properties (impact at -60°C)**
**Extremely low hydrogen content**
**110 - 120% recovery**
**Weldable on AC and DC**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Approvals

NAKS
Pending

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | $H_{DM}$ |
|---|---|---|---|---|---|---|
| 0.05 | 1.5 | 0.5 | 0.01 | 0.005 | 0.95 | 2 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength ($N/mm^2$) | Tensile strength ($N/mm^2$) | Elongation (%) | Impact ISO-V(J) -40°C | Impact ISO-V(J) -60°C |
|---|---|---|---|---|---|---|
| Required: AWS5.5 | | min. 460 | min. 550 | min. 19 | not required | |
| ISO 2560-A | | min. 500 | 560-720 | min. 18 | | min. 47 |
| Typical values | AW | 550 | 640 | 24 | 140 | 80 |

CTOD value at -10°C > 0.25 mm

### Packaging and available sizes

| | | | | | | |
|---|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 | 450 |
| Unit: Box | Pieces / unit | 135 | 120 | 85 | 85 | 23 |
| | Net weight/unit (kg) | 2.7 | 4.7 | 4.4 | 5.9 | 2.4 |

**Identification** Imprint: 8018-G / CONARC 74 Tip Color: white

**Conarc® 74: rev. EN 01**

# Conarc® 74



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **General structural steel** | |
| EN 10025 | S275, S355 |
| **Ship plates** | |
| ASTM A131 | Grade A, B, D, AH32 to EH40 |
| **Cast steel** | |
| EN 10213-2 | GP 240R |
| **Pipe material** | |
| EN 10208-1 | L290 GA, L360 GA |
| EN 10208-2 | L290, L360, L415, L445 |
| API 5LX | X42, X46, X52, X60, X65 |
| EN 10216-1 | P275 T1 |
| EN 10217-1 | P275 T2, P355 N |
| **Fine grained steel** | |
| EN 10025 part 3 | S275, S355, S420, S460 |
| EN 10025 part 4 | S275, S355, S420, S460 |
| EN 10025 part 6 | S460 |

## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy - per electrode at max. current - E(kJ) | Dep.rate - per electrode at max. current - H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 55 - 80 | DC+ | 59 | 85 | 0.72 | 19.3 | 86 | 1.65 |
| 3.2 x 350 | 80 - 145 | DC+ | 66 | 220 | 1.2 | 37.7 | 48 | 1.79 |
| 4.0 x 350 | 120 - 185 | DC+ | 77 | 355 | 1.6 | 54.1 | 29 | 1.59 |
| 4.0 x 450 | 120 - 185 | DC+ | 90 | 450 | 1.8 | 68.4 | 23 | 1.56 |
| 5.0 x 450 | 180 - 240 | DC+ | 104 | 784 | 2.4 | 105.2 | 15 | 1.53 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 80A | 80A | 80A | 80A | 80A |
| 3.2 | 140A | 120A | 145A | 120A | 120A | 120A |
| 4.0 | 150A | 140A | 150A | 140A | 135A | 140A |

## Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# Conarc® 80

## High strength basic electrode



### Classification

AWS A5.5 : E11018M-H4
EN 757 : E 69 5 Z B 32 H5

### General description

**Basic all position extremely low hydrogen electrode**
**Weldable on AC and DC**
**110 - 115% recovery**
**Good impact values at -51°C**
**Meets the requirements of military specifications**
**Suitable for welding submarines high strength steels (UTS up to 800 N/mm²)**
**Also available in vacuum sealed Sahara ReadyPack® (SRP): $H_{DM}$ < 3 ml/100g**

### Welding positions

| ISO/ASME | PA/1G | PB/2F | PC/2G | PF/3Gup | PE/4G | PF/5Gup |
|---|---|---|---|---|---|---|

### Current type

AC / DC + / -

### Approvals

| ABS | LR |
|---|---|
| + | 4Y69H5 |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | Mo | $H_{DM}$ |
|---|---|---|---|---|---|---|---|
| 0.06 | 1.5 | 0.4 | 0.015 | 0.01 | 2.2 | 0.4 | 2 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -40°C | -50°C | -51°C |
|---|---|---|---|---|---|---|---|
| Required: AWSA5.5 | | 680-760* | min. 760 | min. 20 | | | min. 27 |
| EN 757 | | min. 690 | 760-960 | min. 17 | | min. 47 | |
| Typical values | AW | 750 | 785 | 22 | 100 | 80 | 80 |

* Diam. 2.5 max. 795 N/mm²

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 |
| Unit: Box | Pieces / unit | 225 | 120 | 90 | 60 |
| | Net weight/unit (kg) | 4.4 | 4.5 | 5.0 | 6.3 |
| Unit: SRP | Pieces / unit | 70 | 50 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 1.9 | 1.5 | 2.5 |

**Identification** Imprint: 11018-M / CONARC 80 Tip Color: gold

**Conarc® 80: rev. EN 22**

# Conarc® 80



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Pipe material** | |
| API-5LX | X70, X75 |
| **Fine grained steel** | |
| EN 10025 part 6 | S620, S690<br>root runs and fillet welds in S890 |

## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 80 | DC+ | 55 | 99 | 0.8 | 19.5 | 82 | 1.61 |
| 3.2 x 350 | 80 - 130 | DC+ | 78 | 261 | 1.1 | 36.5 | 43 | 1.55 |
| 4.0 x 350 | 120 - 180 | DC+ | 75 | 356 | 1.6 | 53.2 | 30 | 1.59 |
| 5.0 x 450 | 160 - 240 | DC+ | 116 | 627 | 2.3 | 105.1 | 14 | 1.45 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 75A | 75A | 75A | 80A | 75A | 80A |
| 3.2 | 130A | 120A | 135A | 120A | 115A | 120A |
| 4.0 | 145A | 145A | 155A | 140A | 140A | 140A |
| 5.0 | 225A | 230A | 210A | | | |

## Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# Conarc® 85

## High strength basic electrode



### Classification

AWS A5.5 : E12018-G-H4R
EN 757 : E 69 5 Mn2NiCrMo B 32 H5

### General description

**Basic all position extremely low hydrogen electrode**
**For steels with a tensile strength UTS of max. 835 N/mm²**
**For high strength steels such as T1, HY 100, Naxtra 70, HRS 650, Dillimax. 690**
**Good impact values down to -50°C**
**Only available in vacuum sealed Sahara ReadyPack® (SRP): $H_{DM}$ < 3 ml/100g**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Approvals

| ABS | DNV |
|---|---|
| + | 4Y69H5 |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Cr | Ni | Mo | $H_{DM}$ |
|---|---|---|---|---|---|---|---|---|
| 0.06 | 1.4 | 0.3 | 0.01 | 0.01 | 0.4 | 2.0 | 0.4 | 2 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -40°C | Impact ISO-V(J) -50°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | | min. 740 | min. 830 | min. 14 | not required | |
| EN 757 | | min. 690 | 760-960 | min. 17 | | min. 47 |
| Typical values | AW | 840 | 890 | 21 | 80 | 60 |
| | SR: 1h/620°C | 780 | 840 | 20 | 75 | 60 |

### Packaging and available sizes

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 3.2 | 4.0 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 450 | 350 | 450 | 450 |
| Unit: SRP | Pieces / unit | 68 | 50 | 50 | 28 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 1.9 | 2.4 | 1.5 | 1.9 | 2.5 |

**Identification** Imprint: 12018-G / CONARC 85 Tip Color: light blue

**Conarc® 85: rev. EN 22**

# Conarc® 85



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Pipe material** | |
| API-5LX | X70, X75, X80 |
| **Fine grained steel** | |
| EN 10025 part 6 | S690<br>root runs and fillet welds in S890 |

## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 3.2 x 350 | 80 - 130 | DC+ | 69 | 219 | 1.0 | 37.5 | 50 | 1.89 |
| 4.0 x 350 | 120 - 180 | DC+ | 68 | 321 | 1.5 | 53.2 | 35 | 1.87 |
| 5.0 x 450 | 160 - 240 | DC+ | 106 | 632 | 2.0 | 106.7 | 17 | 1.81 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 3.2 | 135A | 130A | 140A | 120A | 120A | 120A |
| 4.0 | 155A | 145A | 155A | 140A | 140A | 140A |
| 5.0 | 225A | 220A | 215A | | | |

# Kryo® 1

## Low temperature basic electrode



### Classification

AWS A5.5 : E7018-G-H4R [1)]
ISO 2560-A : E 50 6 Mn1Ni B 32 H5
[1)] meet also AWS A5.5: E8018-G-H4R

### General description

**The basic all position offshore electrode with max. 1% Ni**
**Excellent mechanical properties (impact at -60°C)**
**Good CTOD at -10°C**
**Extremely low hydrogen content**
**110 - 120% recovery**
**Weldable on AC and DC**
**Vacuum sealed Sahara ReadyPack®: HDM < 3 ml/100g**
**Also available in carton boxes**

### Welding positions

| ISO/ASME | PA/1G | PB/2F | PC/2G | PF/3Gup | PE/4G | PF/5Gup |
|---|---|---|---|---|---|---|

### Current type

AC / DC + / -

### Approvals

| ABS | BV | DNV | GL | LR | RINA | RMRS | TÜV |
|---|---|---|---|---|---|---|---|
| 3Y | UP | 5Y46H5 | 6Y46H10 | 5Y40H5 | 4YH5 | 3-3YH5 | + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | HDM |
|---|---|---|---|---|---|---|
| 0.05 | 1.5 | 0.4 | 0.01 | 0.01 | 0.9 | 2 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -20°C | Impact ISO-V(J) -60°C |
|---|---|---|---|---|---|---|
| Required: AWS5.5 | | min. 390 | min. 480 | min. 25 | not required | |
| ISO 2560-A | | min. 500 | 560-720 | min. 18 | | min. 47 |
| Typical values | AW | 550 | 640 | 24 | 150 | 90 |

CTOD value at -10°C > 0.25 mm

### Packaging and available sizes

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.0 | 3.2 | 3.2 | 4.0 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 | 350 | 450 | 450 |
| Unit: Box | Pieces / unit | 135 | 90 | 130 | 120 | 85 | 85 | 55 |
| | Net weight/unit (kg) | 2.7 | 2.8 | 4.7 | 5.8 | 4.4 | 5.9 | 5.7 |
| Unit: SRP | Pieces / unit | 70 | 54 | 50 | 50 | 28 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 1.5 | 1.9 | 2.4 | 1.5 | 2.0 | 2.5 |

**Identification** Imprint: 7018-G / KRYO 1 Tip Color: purple

**Kryo® 1: rev. EN 22**

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **General structural steel** | |
| EN 10025 | S275, S355 |
| **Ship plates** | |
| ASTM A131 | Grade A, B, D, AH32 to EH40 |
| **Cast steel** | |
| EN 10213-2 | GP 240R |
| **Pipe material** | |
| EN 10208-1 | L290 GA, L360 GA |
| EN 10208-2 | L290, L360, L415, L445 |
| API 5LX | X42, X46, X52, X60, X65, X70 |
| EN 10216-1 | P275 T1 |
| EN 10217-1 | P275 T2, P355 N |
| **Fine grained steel** | |
| EN 10025 part 3 | S275, S355, S420, S460 |
| EN 10025 part 4 | S275, S355, S420, S460 |
| EN 10025 part 6 | S460 |



## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 55 - 80 | DC+ | 59 | 85 | 0.72 | 19.3 | 86 | 1.65 |
| 3.0 x 350 | 70 - 110 | DC+ | 74 | 256 | 0.93 | 30.2 | 52 | 1.58 |
| 3.2 x 350 | 80 - 140 | DC+ | 66 | 220 | 1.2 | 37.7 | 48 | 1.79 |
| 3.2 x 450 | 80 - 140 | DC+ | 78 | 259 | 1.3 | 48.7 | 35 | 1.72 |
| 4.0 x 350 | 120 - 170 | DC+ | 77 | 355 | 1.6 | 54.1 | 29 | 1.59 |
| 4.0 x 450 | 120 - 170 | DC+ | 90 | 450 | 1.8 | 68.4 | 23 | 1.56 |
| 5.0 x 450 | 180 - 240 | DC+ | 104 | 784 | 2.4 | 105.2 | 15 | 1.53 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 80A | 80A | 80A | 80A | 80A |
| 3.0 | 110A | 110A | 115A | 110A | 105A | 110A |
| 3.2 | 140A | 120A | 145A | 120A | 120A | 120A |
| 4.0 | 150A | 140A | 150A | 140A | 135A | 140A |
| 5.0 | 220A | 210A | 210A | 170A | | |

## Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# Kryo® 1N

## Low temperature basic electrode



### Classification

AWS A5.5 : E8016-G-H4R
ISO 2560-A : E 50 6 Mn1Ni B 12 H5

### General description

**The basic all position offshore electrode with max. 1% Ni**
**Thin coated electrode, easy weld pool control**
**Excellent mechanical properties (impact at -60°C)**
**Good CTOD at -10°C**
**Extremely low hydrogen content**
**Weldable on AC and DC**
**Only available in vacuum sealed Sahara ReadyPack® (SRP): $H_{DM}$ < 3 ml/100g**

### Welding positions

| ISO/ASME | PA/1G | PB/2F | PC/2G | PF/3Gup | PE/4G | PF/5Gup |
|---|---|---|---|---|---|---|

### Current type

AC / DC + / -

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | $H_{DM}$ |
|---|---|---|---|---|---|---|
| 0.07 | 1.7 | 0.5 | 0.02 | 0.005 | 0.9 | 2 ml/100 g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -40°C | Impact ISO-V(J) -60°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | | min. 460 | min. 550 | min. 19 | not required | |
| ISO 2560-A | | min. 500 | 560-720 | min. 18 | | min. 47 |
| Typical values | AW | 570 | 650 | 24 | 95 | 60 |

CTOD value at -10°C > 0.25 mm

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 450 | 450 | 450 |
| Unit: SRP | Pieces / unit | 45 | 56 | 30 | 23 |
| | Net weight/unit (kg) | 0.9 | 2.3 | 1.9 | 2.3 |

**Identification** Imprint: 8016-G / KRYO 1N Tip Color: red

**Kryo® 1N: rev. EN 22**

# Kryo® 1N



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **General structural steel** | |
| EN 10025 | S275, S355 |
| **Ship plates** | |
| ASTM A131 | Grade A, B, D, AH32 to EH40 |
| **Cast steel** | |
| EN 10213-2 | GP 240R |
| **Pipe material** | |
| EN 10208-1 | L290 GA, L360 GA |
| EN 10208-2 | L290, L360, L415, L445 |
| API 5LX | X42, X46, X52, X60, X65, X70 |
| EN 10216-1 | P275 T1 |
| EN 10217-1 | P275 T2, P355 N |
| **Fine grained steel** | |
| EN 10025 part 3 | S275, S355, S420, S460 |
| EN 10025 part 4 | S275, S355, S420, S460 |
| EN 10025 part 6 | S460 |

## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 95 | DC+ | 50 | 106 | 0.82 | 19.2 | 90 | 1.71 |
| 3.2 x 450 | 80 - 145 | DC+ | 68 | 256 | 1.2 | 40.1 | 43 | 1.73 |
| 4.0 x 450 | 120 - 190 | DC+ | 82 | 436 | 1.7 | 63.6 | 26 | 1.65 |
| 5.0 x 450 | 175 - 230 | | | | | | | |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 75A | 70A | 75A | 70A | 75A | 80A |
| 3.0 | 100A | 110A | 100A | 100A | 100A | 110A |
| 4.0 | 150A | 140A | 130A | 125A | 125A | 120A |

## Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# Kryo® 1P

## Low temperature basic electrode



### Classification

AWS A5.5 : E 8018-G-H4R
ISO 2560-A : E 50 6 Mn1Ni B 32 H5

### General description

**The basic all position offshore electrode with max. 1% Ni**
**Excellent mechanical properties (impact at -60°C)**
**Good CTOD at -10°C**
**Extremely low hydrogen content**
**110 - 120% recovery**
**Weldable on AC and DC**
**Vacuum sealed Sahara ReadyPack®: HDM < 3 ml/100g**
**Also available in carton boxes**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | HDM |
|---|---|---|---|---|---|---|
| 0.05 | 1.5 | 0.5 | 0.010 | 0.005 | 0.95 | 2 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -40°C | Impact ISO-V(J) -60°C |
|---|---|---|---|---|---|---|
| Required: AWSA5.5 | | min. 460 | min. 550 | min. 19 | not required | |
| ISO 2560-A | | min. 500 | 560-720 | min. 18 | | min. 47 |
| Typical values | AW | 550 | 640 | 24 | 140 | 80 |
| | SR: 580°C/15h | 460 | 550 | 24 | 150 | 90 |

CTOD value at -10°C > 0.25 mm

### Packaging and available sizes

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 3.2 | 4.0 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 450 | 350 | 450 | 450 |
| Unit: Box | Pieces / unit | 135 | 120 | 120 | 85 | 85 | 55 |
| | Net weight/unit (kg) | 2.7 | 4.7 | 5.8 | 4.4 | 5.9 | 5.7 |
| Unit: SRP | Pieces / unit | 70 | 50 | 50 | 28 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 1.9 | 2.4 | 1.5 | 2.0 | 2.5 |

**Identification** Imprint: 8018-G / KRYO 1P Tip Color: purple

**Kryo® 1P: rev. EN 22**



LINCOLN® ELECTRIC

# Kryo® 1P



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **General structural steel** | |
| EN 10025 | S275, S355 |
| **Ship plates** | |
| ASTM A131 | Grade A, B, D, E, AH 32 to EH 40 |
| **Cast steel** | |
| EN 10213-2 | GP 240R |
| **Pipe material** | |
| EN 10208-1 | L290 GA, L360 GA |
| EN 10208-2 | L290, L360, L415, L445 |
| API 5LX | X42, X46, X52, X60, X65, X70 |
| EN 10216-1 | P275 T1 |
| EN 10217-1 | P275 T2, P355 N |
| **Fine grained steel** | |
| EN 10025 part 3 | S275, S355, S420, S460 |
| EN 10025 part 4 | S275, S355, S420, S460 |
| EN 10025 part 6 | S460 |

## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy - per electrode at max. current - E(kJ) | Dep.rate - per electrode at max. current - H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 55 - 85 | DC+ | 59 | 85 | 0.72 | 19.3 | 86 | 1.65 |
| 3.2 x 350 | 80 - 145 | DC+ | 66 | 220 | 1.2 | 37.7 | 48 | 1.79 |
| 3.2 x 450 | 80 - 145 | DC+ | 78 | 259 | 1.3 | 48.7 | 35 | 1.72 |
| 4.0 x 350 | 120 - 185 | DC+ | 77 | 355 | 1.6 | 54.1 | 29 | 1.59 |
| 4.0 x 450 | 120 - 185 | DC+ | 90 | 450 | 1.8 | 68.4 | 23 | 1.56 |
| 5.0 x 450 | 180 - 270 | DC+ | 104 | 784 | 2.4 | 105.2 | 15 | 1.53 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 80A | 80A | 80A | 80A | 80A |
| 3.2 | 140A | 120A | 145A | 120A | 120A | 120A |
| 4.0 | 150A | 140A | 150A | 140A | 135A | 140A |
| 5.0 | 220A | 210A | 210A | 170A | | |

## Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# Kryo® 1-180

## Low temperature basic electrode



### Classification

AWS A5.5 : E 8018-G-H4R
ISO 2560-A : E 50 5 1Ni B 73 H5

### General description

**Basic electrode with max. 1%Ni**
**Extremely low hydrogen content**
**Approx. 175% recovery, easy slag release, weldable on AC and DC**
**Filling horizontal V- and X-grooves**
**Excellent X-ray quality**
**Also available in vacuum sealed Sahara ReadyPack® (SRP): $H_{DM}$ < 3 ml/100g**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G

### Current type

AC / DC + / -

### Approvals

| DNV | LR |
|---|---|
| 4Y46H5 | 4YH5 |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | $H_{DM}$ |
|---|---|---|---|---|---|---|
| 0.07 | 1.2 | 0.3 | 0.020 | 0.010 | 0.9 | 2 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -40°C | Impact ISO-V(J) -50°C |
|---|---|---|---|---|---|---|
| Required: AWSA5.5 | | min. 460 | min. 550 | min. 19 | not required | |
| ISO 2560-A | | min. 500 | 560-720 | min. 18 | | min. 47 |
| Typical values | AW | 550 | 640 | 26 | 90 | 60 |
| | SR: 600°C/4h | 540 | 620 | 24 | 100 | 85 |

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 3.2 | 4.0 | 5.0 | 6.3 |
| | Length (mm) | 450 | 450 | 450 | 450 |
| Unit: SRP | Pieces / unit | 27 | 23 | 19 | 8 |
| | Net weight/unit (kg) | 2.0 | 2.4 | 2.8 | 1.9 |

**Identification** Imprint: 8018-G / KRYO 1-180 Tip Color: pink

**Kryo® 1-180: rev. EN 23**

# Kryo® 1-180



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **General structural steel** | |
| EN 10025 | S275, S355 |
| **Ship plates** | |
| ASTM A131 | Grade A, B, D, AH32 to EH40 |
| **Cast steel** | |
| EN 10213-2 | GP 240R |
| **Pipe material** | |
| EN 10208-1 | L290 GA, L360 GA |
| EN 10208-2 | L290, L360, L415, L445 |
| API 5 LX | X42, X46, X52, X60, X65, X70 |
| EN 10216-1 | P275 T1 |
| EN 10217-1 | P275 T2, P355 N |
| **Fine grained steel** | |
| EN 10025 part 3 | S275, S355, S420, S460 |
| EN 10025 part 4 | S275, S355, S420, S460 |
| EN 10025 part 6 | S460, S500 |

## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 3.2 x 450 | 130 - 160 | | | | | | | |
| 4.0 x 450 | 170 - 240 | AC | 73 | 537 | 3.5 | 102.0 | 14 | 1.43 |
| 5.0 x 450 | 250 - 300 | AC | 78 | 772 | 5.0 | 156.7 | 9 | 1.45 |
| 6.3 x 450 | 280 - 390 | AC | 84 | 1171 | 6.9 | 234.6 | 6 | 1.45 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G |
|---|---|---|---|
| 4.0 | 230A | 190A | 190A |
| 5.0 | 300A | 230A | 230A |
| 6.3 | 390A | 280A | |

## Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# Kryo® 2

## Low temperature basic electrode



### Classification

AWS A5.5 : E9018-G-H4R
EN 757 : E 55 6 Z B 32 H5

### General description

**Basic all position offshore electrode for high strength steels**
**110 - 120% recovery**
**Extremely low hydrogen content**
**Excellent impact toughness at -60°C**
**Good CTOD at -15°C**
**Vacuum sealed Sahara ReadyPack®: $H_{DM}$ < 3 ml/100g**
**Also available in carton boxes**

### Welding positions

| ISO/ASME | PA/1G | PB/2F | PC/2G | PF/3Gup | PE/4G | PF/5Gup |
|---|---|---|---|---|---|---|

### Current type

AC / DC + / -

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | $H_{DM}$ |
|---|---|---|---|---|---|---|
| 0.05 | 1.6 | 0.3 | 0.015 | 0.01 | 1.5 | 2 ml/100 g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -40°C | -50°C | -60°C |
|---|---|---|---|---|---|---|---|
| Required: AWS A5.5 | | min. 530 | min.620 | min. 17 | not required | | |
| EN 757 | | min. 550 | 610-780 | min. 18 | | | min. 47 |
| Typical values | AW | 570 | 650 | 22 | 140 | 110 | 60 |

CTOD-value at -15°C > 0.30mm

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 450 | 450 | 450 |
| Unit: Box | Pieces / unit | 135 | 120 | 85 | 55 |
| | Net weight/unit (kg) | 2.7 | 5.8 | 5.9 | 5.7 |
| Unit: SRP | Pieces / unit | 70 | 50 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 2.4 | 2.0 | 2.5 |

**Identification** Imprint: 9018-G / KRYO 2 Tip Color: green

**Kryo® 2: rev. EN 22**

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **General structural steel** | |
| EN 10025 | S355 |
| **Cast steel** | |
| EN 10213-2 | GP 240R |
| **Pipe material** | |
| EN 10208-1 | L290 GA, L360 GA |
| EN 10208-2 | L290, L360, L415, L445, L480 |
| API 5 LX | X42, X46, X52, X60, X65, X70 |
| EN 10216-1 | P275 T1 |
| EN 10217-1 | P275 T2, P355 N |
| **Fine grained steel** | |
| EN 10025 part 3 | S275, S355, S420, S460 |
| EN 10025 part 4 | S275, S355, S420, S460 |
| EN 10025 part 6 | S460, S500 |
| **Low temperature steels** | |
| EN 10028-4 | 11 MnNi 5-3, 13 MnNi 6-3, 15 NiMn 6 |
| EN 10222-3 | 13 MnNi 6-3, 15 NiMn 6 |



## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 55 - 85 | DC+ | 59 | 85 | 0.72 | 19.4 | 86 | 1.65 |
| 3.2 x 450 | 80 - 140 | DC+ | 80 | 268 | 1.2 | 46.8 | 36 | 1.70 |
| 4.0 x 450 | 120 - 170 | DC+ | 89 | 445 | 1.8 | 70.0 | 22 | 1.52 |
| 5.0 x 450 | 180 - 240 | DC+ | 96 | 598 | 2.6 | 103.8 | 14 | 1.51 |

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 80A | 80A | 85A | 80A | 80A |
| 3.2 | 140A | 120A | 145A | 120A | 120A | 120A |
| 4.0 | 150A | 140A | 150A | 140A | 135A | 140A |
| 5.0 | 220A | 210A | 210A | 170A | | |

## Remarks/ Application advice

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# Kryo® 3

## Low temperature basic electrode



### Classification

AWS A5.5 : E8018-C1-H4
ISO 2560-A : E 46 8 3Ni B 32 H5

### General description

**The basic all position offshore electrode with approx. 2.5% Ni**
**115 - 120% recovery**
**Excellent impact toughness at -80°C**
**Good CTOD at -10°C**
**Extremely low hydrogen content**
**Also available in vacuum sealed Sahara ReadyPack® (SRP): $H_{DM}$ < 3 ml/100g**

### Welding positions

| ISO/ASME | PA/1G | PB/2F | PC/2G | PF/3Gup | PE/4G | PF/5Gup |
|---|---|---|---|---|---|---|

### Current type

AC / DC + / -

### Approvals

| ABS | BV | DNV | GL | LR | RINA | TÜV |
|---|---|---|---|---|---|---|
| + | UP | 5YH10 | 6Y42H10 | 5Y40H | 5YH5 | + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | $H_{DM}$ |
|---|---|---|---|---|---|---|
| 0.05 | 0.7 | 0.3 | 0.015 | 0.010 | 2.5 | 2 ml/100 g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -60°C | Impact ISO-V(J) -80°C |
|---|---|---|---|---|---|---|
| Required: AWSA5.5 | SR[1)] | min. 460 | min. 550 | min. 19 | min. 47 | |
| ISO 2560-A | | min. 460 | 530-680 | min. 20 | | min. 47 |
| Typical values | AW | 520 | 600 | 26 | 120 | 60 |
| | SR: 610°C/2h | 500 | 590 | 29 | 90 | |

CTOD value at -10°C > 0.25 mm
Stress relieved: SR[1)] = 605±14°C/1h

### Packaging and available sizes

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 3.2 | 4.0 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 450 | 350 | 450 | 450 |
| Unit: Box | Pieces / unit | 135 | 120 | 120 | 85 | 85 | 55 |
| | Net weight/unit (kg) | 2.7 | 4.2 | 5.8 | 4.4 | 5.9 | 5.7 |
| Unit: SRP | Pieces / unit | 70 | 50 | 50 | 28 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 1.9 | 2.4 | 1.5 | 2.0 | 2.5 |

**Identification** Imprint: 8018-C1 / KRYO 3 Tip Color: silver

**Kryo® 3: rev. EN 22**

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **General structural steel** | |
| EN 10025 | S355 |
| **Pipe material** | |
| EN 10208-2 | L360, L415, L445 |
| API 5 LX | X52, X56, X60, X65 |
| **Fine grained steel** | |
| EN 10025 part 3 | S355, S420, S460 |
| EN 10025 part 4 | S355, S420, S460 |
| **Low temperature steels** | |
| EN 10028-4 | 11 MnNi 5-3, 13 MnNi 6-3, 15 NiMn 6 (12 Ni 14 G 1, G 2) |
| EN 10222-3 | 13 MnNi 6-3, 15 NiMn 6 |



## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 55 - 80 | DC+ | 57 | 103 | 0.72 | 19.5 | 88 | 1.71 |
| 3.2 x 350 | 80 - 140 | DC+ | 65 | 218 | 1.3 | 37.4 | 44 | 1.64 |
| 3.2 x 450 | 80 - 140 | DC+ | 79 | 263 | 1.4 | 48.5 | 33 | 1.59 |
| 4.0 x 350 | 120 - 170 | DC+ | 74 | 344 | 1.6 | 52.7 | 30 | 1.57 |
| 4.0 x 450 | 120 - 170 | DC+ | 100 | 463 | 1.7 | 69.8 | 21 | 1.45 |
| 5.0 x 450 | 180 - 240 | DC+ | 103 | 723 | 2.5 | 104.8 | 14 | 1.48 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 80A | 80A | 85A | 80A | 80A |
| 3.2 | 140A | 120A | 145A | 120A | 120A | 120A |
| 4.0 | 150A | 140A | 150A | 140A | 135A | 140A |
| 5.0 | 220A | 210A | 210A | 170A | | |

## Remarks/ Application advice

Deviations: chemical composition:

Ni = 2.25 - 2.75% EN: Ni = 2.6 - 3.8%

# Kryo® 4

## Low temperature basic electrode



### Classification

AWS A5.5 : E7016-C2L-H4R
ISO 2560-A : E 38 8 3Ni B 32 H5

### General description

**The basic all position offshore electrode with approx. 3.5% Ni**
**Excellent impact toughness at -80°C in as welded condition and -100°C after PWHT**
**Extremely low hydrogen content**
**Only available in vacuum sealed Sahara ReadyPack® (SRP)**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Ni | $H_{DM}$ |
|---|---|---|---|---|---|---|
| 0.03 | 0.6 | 0.4 | 0.010 | 0.005 | 3.6 | 2 ml/100 g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) -80°C | Impact ISO-V(J) -101°C |
|---|---|---|---|---|---|---|
| Required: AWSA5.5 | SR[1)] | min. 390 | min. 480 | min. 25 | | min. 27 |
| Typical values | AW | 450 | 520 | 26 | 80 | |
| Typical values | SR[2)] | 430 | 510 | 26 | 120 | 80 |

Stress relieved: SR[1)] = 605±14°C/1h
Stress relieved: SR[2)]= 605±14°C/1h

### Packaging and available sizes

| | | | |
|---|---|---|---|
| | Diameter (mm) | 3.2 | 4.0 |
| | Length (mm) | 350 | 350 |
| Unit: SRP | Pieces / unit | 58 | 30 |
| | Net weight/unit (kg) | 1.8 | 1.4 |
| | Consult Lincoln for availability | | |

**Identification** Imprint: 7016-C2 / KRYO 4 Tip Color: silver

**Kryo® 4: rev. EN 22**

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **General structural steel** | |
| EN 10025 | S355 |
| **Pipe material** | |
| EN 10208-2 | L360, L415, L445 |
| API 5 LX | X52, X56, X60, X65 |
| **Fine grained steel** | |
| EN 10025 part 3 | S355, S420 |
| EN 10025 part 4 | S355, S420 |
| **Low temperature steels** | |
| EN 10028-4 | 11 MnNi 5-3, 13 MnNi 6-3, 15 NiMn 6 (12 Ni 14 G 1, G 2) |
| EN 10222-3 | 13 MnNi 6-3, 15 NiMn 6 |
| ASTM A203 | Grade A, B |
| ASTM A333 | Grade 3 |
| ASTM A334 | Grade 3 |
| ASTM A350 | Grade LF3, CL1 & 2 |
| ASTM A480 | Grade WPC3 |



## Calculation data

| Sizes Diam. x length (mm) | Current range A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 3.2 x 350 | 80 - 140 | DC+ | 72 | 207 | 1.1 | 30.8 | 48 | 1.45 |
| 4.0 x 350 | 120 - 165 | DC+ | 72 | 309 | 1.6 | 46.1 | 32 | 1.48 |

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 3.2 | 110A | 120A | 110A | 100A | 100A | 100A |
| 4.0 | 150A | 140A | 150A | 140A | 135A | 140A |

# SL®12G

## Creep resistant basic electrode



### Classification

AWS A5.5 : E7018-A1-H4R
EN 1599 : E Mo B 32 H5

### General description

**Basic very low hydrogen all position electrode ($H_{DM}$ < 5 ml/100g)**
**For welding creep resisting and fine grained steels**
**Service temperature from -40 up to 500°C**
**DC-welding preferred**
**115 - 120% recovery**
**Also available in vacuum sealed Sahara ReadyPack® (SRP)**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Approvals

| DB | DNV | TÜV |
|---|---|---|
| x | 0,3 Mo PT.2 | + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Mo | $H_{DM}$ |
|---|---|---|---|---|---|---|
| 0.05 | 0.8 | 0.6 | 0.02 | 0.01 | 0.55 | 2 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) +20°C | Impact ISO-V(J) -20°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | SR[1)] | min. 390 | min. 480 | min. 25 | not required | |
| EN 1599 | SR[2)] | min. 355 | min. 510 | min. 22 | min. 47 | |
| Typical values | SR[3)] | 560 | 620 | 25 | 140 | 50 |
| | AW | 550 | 610 | 25 | 160 | 70 |

Stress relieved: SR[1)] = 620±14°C/1h, SR[2)] = 570-620°C/1h, SR[3)] = 620°C/1h

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 |
| Unit: Box | Pieces / unit | 110 | 120 | 85 | 55 |
| | Net weight/unit (kg) | 2.5 | 4.5 | 4.7 | 6.0 |
| Unit: SRP | Pieces / unit | 67 | 50 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 2.0 | 1.5 | 2.6 |

**Identification** Imprint: 7018-A1 / SL 12 G Tip Color: blue

**SL®12G: rev. EN 22**

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Creep resistant steels** | |
| EN 10028-2 | P295 G H, P355 G H, 16 Mo 3 |
| EN 10222-2 | 17 Mo 3, 14 Mo 6 |
| **Fine grained steel** | |
| EN 10025 part 3 | S275, S355, S420 |
| EN 10025 part 4 | S275, S355, S420 |



## Creep data

| Test temperature | (°C) | 400 | 450 | 500 | 550 |
|---|---|---|---|---|---|
| Yield strength Rp-0,2% | ($N/mm^2$) | 420 | 380 | 330 | |
| Creep strength Rm/1000 | ($N/mm^2$) | | 360 | 300 | (200) |
| Creep strength Rm/10.000 | ($N/mm^2$) | | 320 | 180 | (80) |
| Creep resistance Rp1%/10.000 | ($N/mm^2$) | | 230 | 150 | (65) |

## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 90 | DC+ | 65 | 118 | 0.7 | 22.8 | 84 | 1.92 |
| 3.2 x 350 | 80 - 130 | DC+ | 69 | 230 | 1.3 | 37.9 | 42 | 1.59 |
| 4.0 x 350 | 120 - 180 | DC+ | 81 | 373 | 1.6 | 54.8 | 28 | 1.56 |
| 5.0 x 450 | 160 - 240 | DC+ | 106 | 799 | 2.4 | 107.4 | 14 | 1.52 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 85A | 80A | 85A | 80A | 80A |
| 3.2 | 130A | 120A | 130A | 120A | 120A | 120A |
| 4.0 | 150A | 145A | 140A | 140A | 140A | 140A |
| 5.0 | 225A | 225A | 210A | | | |

## Remarks/ Application advice

Recommended tempering heat treatment range: 580 - 630°C (time depends on material thickness)
Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# SL®19G

## Creep resistant basic electrode



### Classification

AWS A5.5 : E8018-B2-H4
EN 1599 : E CrMo1 B 32 H5

### General description

**Basic very low hydrogen all position electrode ($H_{DM}$ < 5 ml/100g)**
**For welding creep and hydrogen resistant CrMo-steels**
**Maximum service temperature 550°C**
**DC-welding preferred**
**115 - 120% recovery**
**Also available in vacuum sealed Sahara ReadyPack® (SRP)**

### Welding positions

| ISO/ASME | PA/1G | PB/2F | PC/2G | PF/3Gup | PE/4G | PF/5Gup |
|---|---|---|---|---|---|---|

### Current type

AC / DC + / -

### Approvals

| BV | DNV | RINA | TÜV |
|---|---|---|---|
| C1M | 1Cr0,5Mo | C1M | + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Cr | Mo | $H_{DM}$ |
|---|---|---|---|---|---|---|---|
| 0.06 | 0.75 | 0.6 | 0.015 | 0.01 | 1.1 | 0.5 | 3 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) +20°C | Impact ISO-V(J) -20°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | SR[1)] | min. 460 | min. 550 | min. 19 | not required | |
| EN 1599 | SR[2)] | min. 355 | min. 510 | min. 20 | min. 47 | |
| Typical values | SR[3)] | 570 | 640 | 24 | 180 | 100 |

Stress relieved: SR[1)] = 690±14°C/1h, SR[2)] = 660-700°C/1h, SR[3)] = 700°C/1h

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 |
| Unit: Box | Pieces / unit | 120 | 120 | 85 | 55 |
| | Net weight/unit (kg) | 2.6 | 4.6 | 4.7 | 6.1 |
| Unit: SRP | Pieces / unit | 67 | 50 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 2.0 | 1.5 | 2.6 |

**Identification** Imprint: 8018-B2 / SL 19 G Tip Color: red

**SL®19G: rev. EN 21**

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Creep resistant steels** | |
| EN 10028-2 | 13 CrMo 4-5 |
| EN 10083-1 | 25 CrMo 4 |
| EN 10222-2 | 14 CrMo 4-5 |
| **Tool steel** | |
| DIN 17210 | 16 MnCr 5 |



## Creep data

| Test temperature | (°C) | 400 | 450 | 500 | 550 | 600 |
|---|---|---|---|---|---|---|
| Yield strength Rp-0,2% | ($N/mm^2$) | 460 | 440 | 430 | | |
| Creep strength Rm/1000 | ($N/mm^2$) | | | 300 | 140 | (80) |
| Creep strength Rm/10.000 | ($N/mm^2$) | | 350 | 240 | 110 | (50) |
| Creep resistance Rp1%/10.000 | ($N/mm^2$) | | 250 | 170 | 80 | (35) |

## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 90 | DC+ | 63 | 114 | 0.71 | 21.0 | 80 | 1.67 |
| 3.2 x 350 | 80 - 130 | DC+ | 68 | 227 | 1.3 | 37.9 | 41 | 1.56 |
| 4.0 x 350 | 120 - 180 | DC+ | 79 | 367 | 1.6 | 54.9 | 29 | 1.59 |
| 5.0 x 450 | 160 - 240 | DC+ | 103 | 777 | 2.5 | 106.9 | 14 | 1.52 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 85A | 80A | 85A | 80A | 80A |
| 3.2 | 130A | 120A | 130A | 120A | 120A | 120A |
| 4.0 | 150A | 145A | 140A | 140A | 140A | 140A |
| 5.0 | 225A | 225A | 210A | | | |

## Remarks/ Application advice

Recommended preheat temperature: 200 - 250°C

Recommended tempering heat treatment range: 660 - 700°C (time depends on material thickness)

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# SL®19G(STC)

## Creep resistant basic electrode



### Classification

AWS A5.5 : E8018-B2-H4
EN 1599 : E CrMo1 B 32 H5

### General description

**Basic very low hydrogen all position electrode ($H_{DM}$ < 5 ml/100g)**
**For welding creep and hydrogen resistant CrMo-steels**
**Excellent weldability for welding pipe and plate on site**
**Reliable X-ray properties**
**Good mechanical properties in the as welded and stress relieved condition**
**Applicable for service temperature from -20 to 500°C**
**SL19G(STC) meets the actual "step cool" requirements including the Bruscato factor of X < 15**
**Only available in vacuum sealed Sahara ReadyPack® (SRP)**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Cr | Mo | Bruscato | $H_{DM}$ |
|---|---|---|---|---|---|---|---|---|
| 0.06 | 0.7 | 0.35 | 0.010 | 0.010 | 1.2 | 0.55 | max. 15 ppm | 3 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) +20°C | Impact ISO-V(J) -20°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | SR[1)] | min. 460 | min. 550 | min. 19 | not required | |
| EN 1599 | SR[2)] | min. 355 | min. 510 | min. 20 | min. 47 | |
| Typical values | SR[3)] | 570 | 640 | 24 | 180 | 100 |

Stress relieved: SR[1)] = 690±14°C/1h, SR[2)] = 660-700°C/1h, SR[3)] = 700°C/1h
Shifting CVN at 55 J(DeltaT55): +10°C after "STC" (step cool treatment)

### Packaging and available sizes

| | | | | |
|---|---|---|---|---|
| | Length (mm) | 350 | 350 | 350 |
| | Diameter (mm) | 2.5 | 3.2 | 4.0 |
| Unit: SRP | Pieces / unit | 69 | 50 | 28 |
| | Net weight/unit (kg) | 1.4 | 2.0 | 1.5 |

**Identification** Imprint: 8018-B2 / SL 19 G (STC) Tip Color: red

**SL®19G(STC): rev. EN 22**

# SL®19G(STC)



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Creep resistant steels** | |
| EN 10028-2 | 13 CrMo 4-5 |
| EN 10083-1 | 25 CrMo 4 |
| EN 10222-2 | 14 CrMo 4-5 |
| **Tool steel** | |
| DIN 17210 | 16 MnCr 5 |

## Creep data

| Test temperature | (°C) | 400 | 450 | 500 | 550 | 600 |
|---|---|---|---|---|---|---|
| Yield strength Rp-0,2% | ($N/mm^2$) | 460 | 440 | 430 | | |
| Creep strength Rm/1000 | ($N/mm^2$) | | | 300 | 140 | (80) |
| Creep strength Rm/10.000 | ($N/mm^2$) | | 350 | 240 | 110 | (50) |
| Creep resistance Rp1%/10.000 | ($N/mm^2$) | | 250 | 170 | 80 | (35) |

## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy - per electrode at max. current - E(kJ) | Dep.rate - per electrode at max. current - H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 90 | | | | | | | |
| 3.2 x 350 | 80 - 145 | DC+ | 68 | 227 | 1.3 | 37.9 | 41 | 1.56 |
| 4.0 x 350 | 120 - 185 | DC+ | 79 | 367 | 1.6 | 54.9 | 29 | 1.59 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 85A | 80A | 85A | 80A | 80A |
| 3.2 | 130A | 120A | 130A | 120A | 120A | 120A |
| 4.0 | 150A | 145A | 140A | 140A | 140A | 140A |

## Remarks/ Application advice

Recommended preheat/interpass temperature: 200 - 250°C

Recommended tempering heat treatment range: 660 - 700°C (time depends on material thickness)

Stepcooling requirements: Bruscato factor X = (10 P + 5 Sb +4 Sn + As)/100 ≤ 15 ppm and Mn + Si < 1.1

# SL®20G

## Creep resistant basic electrode



### Classification

AWS A5.5 : E9018-B3-H4
EN 1599 : E CrMo2 B 32 H5

### General description

**Basic very low hydrogen all position electrode ($H_{DM}$ < 5 ml/100g)**
**For welding creep and hydrogen resistant CrMo-steels**
**Maximum service temperature 600°C**
**DC-welding preferred**
**115 - 120% recovery**
**Also available in vacuum sealed Sahara ReadyPack® (SRP)**

### Welding positions

| ISO/ASME | PA/1G | PB/2F | PC/2G | PF/3Gup | PE/4G | PF/5Gup |
|---|---|---|---|---|---|---|

### Current type

AC / DC + / -

### Approvals

| RINA | TÜV |
|---|---|
| C2M1 | + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Cr | Mo | $H_{DM}$ |
|---|---|---|---|---|---|---|---|
| 0.06 | 0.8 | 0.6 | 0.015 | 0.01 | 2.3 | 1.0 | 3 ml/100 g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) +20°C | Impact ISO-V(J) -10°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | SR[1)] | min. 530 | min. 620 | min. 17 | not required | |
| EN 1599 | SR[2)] | min. 400 | min. 500 | min. 18 | min. 47 | |
| Typical values : | SR[3)] | 530 | 650 | 22 | 150 | 90 |

Stress relieved: SR[1)] = 690±14°C/1h, SR[2)] = 690-750°C/1h, SR[3)] = 695°C/1h

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 |
| Unit: Box | Pieces / unit | 110 | 120 | 85 | 55 |
| | Net weight/unit (kg) | 2.6 | 4.7 | 4.8 | 6.2 |
| Unit: SRP | Pieces / unit | 67 | 50 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 2.0 | 1.5 | 2.6 |

**Identification** Imprint: 9018-B3 / SL 20 G Tip Color: white

**SL®20G: rev. EN 22**

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Creep and hydrogen resistant steels** | |
| EN 10028-2 | 10 CrMo 9-10 |
| EN 10222-2 | 12 CrMo 9-10 |

## Creep data

| Test temperature | (°C) | 400 | 450 | 500 | 550 | 600 |
|---|---|---|---|---|---|---|
| Yield strength Rp-0,2% | ($N/mm^2$) | 480 | 460 | 430 | | |
| Creep strength Rm/1000 | ($N/mm^2$) | | | 240 | 160 | (100) |
| Creep strength Rm/10.000 | ($N/mm^2$) | | | 210 | 110 | (60) |
| Creep resistance Rp1%/10.000 | ($N/mm^2$) | | | 160 | 85 | (45) |

## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 90 | DC+ | 63 | 114 | 0.72 | 21.0 | 79 | 1.67 |
| 3.2 x 350 | 80 - 130 | DC+ | 70 | 233 | 1.3 | 37.6 | 40 | 1.49 |
| 4.0 x 350 | 120 - 180 | DC+ | 75 | 348 | 1.7 | 56.7 | 28 | 1.56 |
| 5.0 x 450 | 160 - 240 | DC+ | 100 | 754 | 2.6 | 107.6 | 14 | 1.47 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 85A | 80A | 85A | 80A | 80A |
| 3.2 | 130A | 120A | 130A | 120A | 120A | 120A |
| 4.0 | 150A | 145A | 140A | 140A | 140A | 140A |
| 5.0 | 225A | 225A | 210A | | | |

## Remarks/ Application advice

Recommended preheat/interpass temperature: 200 - 300°C

Recommended tempering heat treatment range: 690 - 750°C (time depends on material thickness)

Electrodes after removal from cardboard boxes redry 2-4h 350 ± 25°C

# SL®20G(STC)

## Creep resistant basic electrode



### Classification

AWS A5.5 : E9018-B3-H4
EN 1599 : E CrMo2 B 32 H 5

### General description

**Basic very low hydrogen all position electrode ($H_{DM}$ < 5 ml/100g)**
**For welding 2.25% Cr 1% Mo-creep and hydrogen resistant steels**
**Excellent weldability for pipe and site welding**
**Reliable X-ray properties**
**Good mechanical properties in the as welded and stress relieved condition**
**Applicable for service temperature from -20 to 600°C**
**SL 20G (STC) meets the actual "step cool" requirements including the Bruscato factor X < 15**
**Only available in vacuum sealed Sahara ReadyPack® (SRP)**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Cr | Mo | Bruscato | $H_{DM}$ |
|---|---|---|---|---|---|---|---|---|
| 0.10 | 0.6 | 0.35 | 0.01 | 0.01 | 2.3 | 1.0 | max. 15 ppm | 3 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) +20°C | Impact ISO-V(J) -20°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | SR[1)] | min. 530 | min. 620 | min. 17 | not required | |
| EN 1599 | SR[2)] | min. 400 | min. 500 | min. 18 | min. 47 | |
| Typical values | SR[3)] | 540 | 640 | 20 | 160 | 80 |

Stress relieved: SR[1)] = 690±14°C/1h, SR[2)] = 690-750°C/1h, SR[3)] = 695°C/1h
Shifting CVN at 55 J(DeltaT55): +10°C after "STC" (step cool treatment)

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 |
| Unit: SRP | Pieces / unit | 67 | 51 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 2.0 | 1.5 | 1.6 |

**Identification** Imprint: 9018-B3 / SL 20 G (STC) Tip Color: White

**SL®20G(STC): rev. EN 22**

# SL®20G(STC)



## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Creep and hydrogen resistant steels** | |
| EN 10028-2 | 10 CrMo 9-10 |
| EN 10222-2 | 12 CrMo 9-10 |

## Creep data

| Test temperature | (°C) | 400 | 450 | 500 | 550 | 600 |
|---|---|---|---|---|---|---|
| Yield strength Rp-0,2% | ($N/mm^2$) | 480 | 460 | 430 | | |
| Creep strength Rm/1000 | ($N/mm^2$) | | | 240 | 160 | (100) |
| Creep strength Rm/10.000 | ($N/mm^2$) | | | 210 | 110 | (60) |
| Creep resistance Rp1%/10.000 | ($N/mm^2$) | | | 160 | 85 | (45) |

## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 95 | DC+ | 63 | 114 | 0.72 | 21.0 | 79 | 1.67 |
| 3.2 x 350 | 80 - 145 | DC+ | 70 | 233 | 1.3 | 37.6 | 40 | 1.49 |
| 4.0 x 350 | 120 - 185 | DC+ | 75 | 348 | 1.7 | 56.7 | 28 | 1.56 |
| 5.0 x 450 | 160 - 260 | DC+ | 100 | 754 | 2.6 | 107.6 | 14 | 1.47 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 85A | 80A | 85A | 80A | 80A |
| 3.2 | 130A | 120A | 130A | 120A | 120A | 120A |
| 4.0 | 150A | 145A | 140A | 140A | 140A | 140A |
| 5.0 | 225A | 225A | 210A | | | |

## Remarks/ Application advice

Recommended preheat/interpass temperature: 200 - 300°C

Recommended tempering heat treatment range: 680 - 750°C (time depends on material thickness)

Stepcooling requirements: Bruscato factor X = (10 P + 5 Sb +4 Sn + As)/100 ≤ 15 ppm and Mn + Si < 1.1

# SL®22G

## Creep resistant basic electrode



### Classification

AWS A5.5 : E8018-B1-H4
EN 1599 : E Z B 32 H5

### General description

**Basic very low hydrogen all position electrode ($H_{DM}$ < 5 ml/100g)**
**For welding creep resistant CrMoV-steels**
**Maximum service temperature 550°C**
**DC-welding preferred**
**115 - 120% recovery**
**Only available in vacuum sealed Sahara ReadyPack® (SRP)**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Approvals

| TÜV |
|---|
| + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Cr | Mo | V | $H_{DM}$ |
|---|---|---|---|---|---|---|---|---|
| 0.06 | 0.8 | 0.6 | 0.02 | 0.01 | 0.5 | 0.5 | 0.3 | 3 ml/100 g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) +20°C | Impact ISO-V(J) -10°C |
|---|---|---|---|---|---|---|
| Required: AWS A5.5 | SR[1)] | min. 460 | min. 550 | min. 19 | not required | |
| Typical values | SR[2)] | 570 | 640 | 24 | 180 | 110 |

Stress relieved: SR[1)] = 690±14°C/1h, SR[2)] = 730°C/1h

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 |
| Unit: SRP | Pieces / unit | 67 | 50 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 2.0 | 1.5 | 2.6 |

| **Identification** | Imprint: 8018-B1 / SL 22 G | Tip Color: orange | **SL®22G: rev. EN 22** |
|---|---|---|---|

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Creep resistant steels** | |
| DIN | 14MoV63 |
| | 17MnMoV64 |
| | 10CrSiMoV7 |
| | 24CrMoV5-5 |



## Creep data

| Test temperature | (°C) | 400 | 450 | 500 | 550 | 575 |
|---|---|---|---|---|---|---|
| Yield strength Rp-0,2% | (N/mm²) | 480 | 470 | 450 | | |
| Creep strength Rm/1000 | (N/mm²) | | | 270 | 170 | 150 |
| Creep strength Rm/10.000 | (N/mm²) | | | 250 | 150 | 130 |
| Creep resistance Rp1%/10.000 | (N/mm²) | | | 210 | 130 | 110 |

## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy - per electrode at max. current - E(kJ) | Dep.rate - per electrode at max. current - H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 90 | DC+ | 64 | 115 | 0.70 | 21.0 | 82 | 1.69 |
| 3.2 x 350 | 80 - 130 | DC+ | 71 | 238 | 1.2 | 37.5 | 41 | 1.54 |
| 4.0 x 350 | 120 - 180 | DC+ | 76 | 353 | 1.6 | 55.8 | 30 | 1.64 |
| 5.0 x 450 | 160 - 220 | DC+ | 101 | 762 | 2.6 | 106.6 | 14 | 1.49 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 85A | 80A | 85A | 80A | 80A |
| 3.2 | 130A | 120A | 130A | 120A | 120A | 120A |
| 4.0 | 150A | 145A | 140A | 140A | 140A | 140A |
| 5.0 | 225A | 225A | 210A | | | |

## Remarks/ Application advice

Recommended preheat/interpass temperature: 200 - 300°C

Recommended tempering heat treatment range: 700 - 720°C (time depends on material thickness)

# SL®502

## Creep resistant basic electrode



### Classification

AWS A5.5 : E8018-B6-H4R
EN 1599 : E CrMo5 B 32 H5

### General description

**Basic very low hydrogen all position electrode ($H_{DM}$ < 5 ml/100g)**
**For welding creep and hydrogen resistant 5% Cr-0.5% Mo-steels**
**Maximum service temperature 550°C**
**Developed for the petrochemical industry**
**Only available in vacuum sealed Sahara ReadyPack® (SRP)**

### Welding positions

| ISO/ASME | PA/1G | PB/2F | PC/2G | PF/3Gup | PE/4G | PF/5Gup |
|---|---|---|---|---|---|---|

### Current type

AC / DC + / -

### Approvals

| TÜV |
|---|
| + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Cr | Mo | $H_{DM}$ |
|---|---|---|---|---|---|---|---|
| 0.07 | 0.8 | 0.6 | 0.020 | 0.010 | 5.3 | 0.6 | 3 ml/100g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) +20°C |
|---|---|---|---|---|---|
| Required: AWS A5.5 | SR[1)] | min. 460 | min. 550 | min. 19 | not required |
| EN 1599 | SR[2)] | min. 400 | min. 590 | min. 17 | min. 47 |
| Typical values | SR[3)] | 580 | 680 | 22 | 110 |

Stress relieved: SR[1)] = 740 ±14°C/1h, SR[2)] = 730-760°C/1h, SR[3)] = 750°C/2h

### Packaging and available sizes

| | | | | |
|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 |
| | Length (mm) | 350 | 350 | 350 |
| Unit: SRP | Pieces / unit | 67 | 52 | 29 |
| | Net weight/unit (kg) | 1.4 | 1.9 | 1.6 |

**Identification** Imprint: 8018-B6 / SL 502 Tip Color: brown

**SL®502: rev. EN 22**

## Materials to be welded

| Steel grades/Standard | Type |
|---|---|
| **Creep and hydrogen resistant steels** | |
| DIN | 12CrMo19.5 and equivalent grades |
| ASTM | A182 F5 |
| | A213 T5 |
| | A335 P5 |
| | A336 F5 |
| | A369 FP5 |
| | A387 Grade 5 |



## Creep data

| Test temperature | (°C) | 400 | 450 | 500 | 550 | 600 |
|---|---|---|---|---|---|---|
| Yield strength Rp-0,2% | ($N/mm^2$) | 480 | 440 | 380 | | |
| Creep strength Rm/1000 | ($N/mm^2$) | | | 160 | 140 | (80) |
| Creep strength Rm/10.000 | ($N/mm^2$) | | | 130 | 90 | (60) |
| Creep resistance Rp1%/10.000 | ($N/mm^2$) | | | 100 | 50 | (30) |

## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy - per electrode at max. current - E(kJ) | Dep.rate - per electrode at max. current - H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 90 | DC+ | 55 | 95 | 0.82 | 20.8 | 80 | 1.67 |
| 3.2 x 350 | 85 - 130 | DC+ | 66 | 237 | 1.1 | 35.4 | 50 | 1.79 |
| 4.0 x 350 | 130 - 180 | DC+ | 76 | 331 | 1.5 | 51.8 | 32 | 1.64 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 80A | 75A | 70A | 70A | 70A |
| 3.2 | 130A | 130A | 125A | 120A | 120A | 120A |
| 4.0 | 140A | 140A | 135A | 135A | 135A | 135A |

## Remarks/ Application advice

Recommended preheat and interpass temperature 200 - 300°C

Postweld heat treatment 730 - 760°C (time depends on material thickness)

# SL®9Cr(P91)

## Creep resistant basic electrode



### Classification

AWS A5.5 : E9016-B9-H4
EN 1599 : E CrMo91 B 32 H5

### General description

**Basic very low hydrogen all position electrode ($H_{DM}$ < 5 ml/100g)**
**For welding creep and hydrogen resistant 9% Cr-1% Mo steels**
**Maximum service temperature 650°C**
**Developed for power plants and the petrochemical industry**
**Only available in vacuum sealed Sahara ReadyPack® (SRP)**

### Welding positions

ISO/ASME PA/1G PB/2F PC/2G PF/3Gup PE/4G PF/5Gup

### Current type

AC / DC + / -

### Approvals

| TÜV |
|---|
| + |

### Chemical composition (w%), typical, all weld metal

| C | Mn | Si | P | S | Cr | Ni | Mo | Nb | V | N | $H_{DM}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.09 | 0.6 | 0.2 | 0.010 | 0.010 | 9.0 | 0.6 | 1.0 | 0.04 | 0.2 | 0.04 | 3 ml/100 g |

### Mechanical properties, typical, all weld metal

| | Condition | 0.2% Proof strength (N/mm²) | Tensile strength (N/mm²) | Elongation (%) | Impact ISO-V(J) +20°C |
|---|---|---|---|---|---|
| Required: AWS A5.5 | SR[1)] | min. 530 | min. 620 | min. 17 | not required |
| EN 1599 | SR[2)] | min. 415 | min. 585 | min. 17 | min. 47 |
| Typical values | SR[3)] | 650 | 800 | 20 | 50 |

Stress relieved: SR[1)] = 740±14°C/1h, SR[2)] = 750-770°C/2h, SR[3)] = 750-754°C/2h

### Packaging and available sizes

| | | | | | |
|---|---|---|---|---|---|
| | Diameter (mm) | 2.5 | 3.2 | 4.0 | 5.0 |
| | Length (mm) | 350 | 350 | 350 | 450 |
| Unit: SRP | Pieces / unit | 66 | 50 | 28 | 23 |
| | Net weight/unit (kg) | 1.4 | 1.8 | 1.5 | 2,4 |

**Identification** Imprint: 9016-B9 / SL 9 Cr(P91) Tip Color: dark green

**SL®9Cr(P91): rev. EN 22**

# SL®9Cr(P91)



## Materials to be welded

| Steel grades/Standard | Type | Code | Type |
|---|---|---|---|
| **Creep and hydrogen resistant steels** | | | |
| EN 10222-2 | X10CrMoV 9-1 | | |
| ASTM | A199 Grade T91 | ASME | SA 182-F91 |
| | A200 Grade T91 | | |
| | A213 Grade T91 | | SA 213-T91 |
| | A335 Grade P91 | | SA 335-P91 |
| | A336 Grade F91 | | SA 336-F91 |
| | | | SA 369-FP91 |
| | | | SA 387-Grade 91 |

## Calculation data

| Sizes Diam. x length (mm) | Current range (A) | Current type | Arc time - per electrode at max. current - (s)* | Energy E(kJ) | Dep.rate H(kg/h) | Weight/ 1000 pcs. (kg) | Electrodes/ kg weldmetal B | kg Electrodes/ kg weldmetal 1/N |
|---|---|---|---|---|---|---|---|---|
| 2.5 x 350 | 60 - 90 | DC+ | 57 | 88 | 0.7 | 19.3 | 92 | 1.78 |
| 3.2 x 350 | 85 - 140 | DC+ | 65 | 172 | 1.0 | 34.8 | 59 | 2.04 |
| 4.0 x 350 | 130 - 175 | DC+ | 66 | 263 | 1.5 | 50.8 | 36 | 1.81 |

* stub end 35 mm

## Welding parameters, optimum fill passes

| Welding positions Diameter (mm) | PA/1G | PB/2F | PC/2G | PF/3G up | PE/4G | PF/5G up |
|---|---|---|---|---|---|---|
| 2.5 | 80A | 80A | 75A | 70A | 70A | 70A |
| 3.2 | 130A | 130A | 125A | 120A | 120A | 120A |
| 4.0 | 140A | 140A | 135A | 135A | 135A | 135A |

## Remarks/ Application advice

Recommended preheat and interpass temperature: 250 - 300°C

Recommended tempering heat treatment range: 740 - 780°C (time depends on material thickness)