

TECHNICAL SPECIFICATION FOR HIGH TENSILE WELDING ELECTRODES

<u>SNo</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	E69 4Mn 2Ni Cr Mo B 3 2 H3 asper NF EN 757
2.	Sizes	2.5, 3.15 & 4 mm
3.	Chemical Composition	As per NF EN 757 / NF EN ISO 6847 (Manganese values are ≥ 1.45 & ≤ 1.9 but shall be limited to 1.65)
4.	Mechanical Properties	As per NF EN 757 / NF EN 1597-1 Proof stress ≥ 700 MPa Tensile RM Values ≥ 780 MPa & ≤ 960 MPa Elongation $\geq 17\%$. Impact bending ≥ 47 Joules at -40°C
5.	Diffusible Hydrogen Content	As per NF EN 757 / NF EN ISO 3690 ≤ 0.03 ml/ gm of weld deposit @ 20°C & 40% RH
6.	Type of Coating	Basic as per NF EN 757
7.	Efficiency	As per NF 757/ NF EN 22401. Normal efficiency shall be $>105\%$ & $\leq 125\%$
8.	Current	Either Alternating current or Direct Current
9.	Welding Position	As per NF EN 757/ NF EN 1597-3. All position except Vertical position down
10.	Coating Moisture	As per NF A 81-301 Individual Moisture Content $\leq 0.12\%$ Mean Moisture Content $\leq 10\%$
11.	Dimensions	As per control panel & NF EN ISO 544
12.	Tolerances	As per NF EN ISO 544 Coating Concentricity $\leq 5\%$ of core diameter
13.	Consumable State	As per NF EN ISO 544
14.	Marking & Delivery	As per NF EN ISO 544

TECHNICAL SPECIFICATION FOR E 42 WELDING ELECTRODES

<u>SNo</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	E 42 4 B 3 2 H4 as per NF EN ISO 2560 A
2.	Sizes	2.5, 3.15 & 4 mm
3.	Chemical Composition	As per NF EN ISO 2560 A Manganese values ≥ 0.75 & ≤ 1.40
4.	Mechanical Properties	As per NF EN ISO 2560 Proof stress ≥ 420 MPa Tensile RM Values $500 \text{ MPa} \leq R_m \leq 640 \text{ MPa}$ Elongation $\geq 20\%$. Impact bending ≥ 47 Joules at -40°C
5.	Diffusible Hydrogen Content	As per NF EN ISO 2560 ≤ 0.04 ml/ gm of weld deposit @ 20°C & 40% RH
6.	Type of Coating	Basic as per NF EN ISO 2560
7.	Efficiency	As per NF EN ISO 2560 Normal efficiency shall be $> 105\%$ & $\leq 125\%$
8.	Current	Either Alternating current or Direct Current
9.	Welding Position	As per NF EN ISO 2560 All position except Vertical position down
10.	Coating Moisture	As per NF A 81-308 Individual Moisture Content $\leq 0.12\%$ Mean Moisture Content $\leq 0.10\%$
11.	Dimensions	As per NF EN ISO 544
12.	Tolerances	As per NF EN ISO 544. Coating Concentricity $\leq 5\%$ of core diameter
13.	Consumable State	As per NF EN ISO 544
14.	Marking & Delivery	As per NF EN ISO 544

TECHNICAL SPECIFICATION FOR E 42 WELDING ELECTRODES

<u>SNo</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	E 42 4 B 3 2 H5 as per NF EN ISO 2560-A
2.	Sizes	2.5, 3.15 & 4 mm
3.	Chemical Composition	As per EN ISO 2560-A Manganese value ≤ 2.0
4.	Mechanical Properties	As per NF EN ISO 2560-A Proof stress ≥ 420 MPa Tensile RM Values $500 \text{ MPa} \leq R_m \leq 640 \text{ MPa}$ Elongation $\geq 20\%$. Impact bending ≥ 47 Joules at -40°C
5.	Diffusible Hydrogen Content	As per NF EN ISO 2560-A ≤ 0.05 ml/ gm of weld deposit @ 20°C & 40% RH
6.	Type of Coating	Basic as per NF EN ISO 2560-A
7.	Efficiency	As per NF EN ISO 2560-A Normal efficiency shall be $> 105\%$ & $\leq 125\%$
8.	Current	Either Alternating current or Direct Current
9.	Welding Position	As per NF EN ISO 2560-A All position except Vertical position down
10.	Coating Moisture	As per NF A 81-308 Individual Moisture Content and Mean Moisture Content to be precised
11.	Dimensions	As per NF EN ISO 544
12.	Tolerances	As per NF EN ISO 544. Coating Concentricity $\leq 5\%$ of core diameter
13.	Consumable State	As per NF EN ISO 544
14.	Marking & Delivery	As per NF EN ISO 544

TECHNICAL SPECIFICATION FOR E 20 WELDING ELECTRODES

<u>SNo</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	E 20 10 3 B 4 2 (BH) As per NF EN 1600
2.	Sizes	2.5, 3.15 & 4 mm
3.	Chemical Composition	As per NF EN 1600 Manganese values ≥ 1.60 & ≤ 2.00
4.	Mechanical Properties	As per NF EN 1600 Proof stress Rp ≥ 450 MPa Tensile RM Values ≥ 620 MPa Elongation $\geq 29\%$. Impact bending ≥ 47 Joules at -40°C
5.	Diffusible Hydrogen Content	Not Applicable
6.	Type of Coating	Basic as per NF EN 1600
7.	Efficiency	As per NF EN 1600 Normal efficiency shall be $> 105\%$ & $\leq 125\%$
8.	Current	Direct Current
9.	Welding Position	As per NF EN 1600 All position except Vertical position down.
10.	Coating Moisture	As per NF A 81-308 Individual Moisture Content $\leq 0.20\%$ Mean Moisture Content $\leq 0.18\%$
11.	Dimensions	As per NF EN ISO 544
12.	Tolerances	As per NF EN ISO 544 Coating Concentricity $\leq 5\%$ of core diameter.
13.	Consumable State	As per NF EN ISO 544
14.	Marking & Delivery	As per NF EN ISO 544

TECHNICAL SPECIFICATION FOR TUBULAR CORED ELECTRODES FOR GAS-SHIELDED ARC WELDING OF HIGH STRENGTH STEELS

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	T 69 4 Mn2NiCrMo B M 3 H5 as per NF EN ISO 18276-A
2.	Size	1.6 mm
3.	Chemical Composition	As per NF EN ISO 18276-A (Manganese ≥ 1.3 & ≤ 1.7).
4.	Mechanical Properties	As per NF EN ISO 18276-A Proof stress ≥ 700 MPa Tensile RM Values ≥ 780 MPa & ≤ 940 MPa Elongation $\geq 17\%$. Impact bending ≥ 47 Joules at -40°C .
5.	Diffusible hydrogen content	As per NF EN ISO 18276-A ≤ 0.05 ml/ gm of weld deposit @ 20°C & 60% RH.
6.	Spatter rate	≤ 2.5 g/h
7.	Type of lining	Basic as per As per NF EN ISO 18276-A
8.	Welding positions	Flat butt weld, flat position fillet weld, horizontal vertical fillet weld. As per NF EN ISO 18276-A
9.	Dimensions	As per control panel & NF EN ISO 544
10.	Diameter tolerances & Consumables state	Compliant with the standard NF EN ISO 544
11.	Marking Coil and Packaging	Compliant with the standard NF EN ISO 544
12.	Condition` & Delivery	As per NF EN ISO 544

**TECHNICAL SPECIFICATION FOR SOLID BARE FILLER RODS FOR GAS-SHIELDED
ARC WELDING WITH NON-CONSUMABLE ELECTRODE OF HIGH STRENGTH
STEELS**

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	W 69 4 Mn3Ni1Mo As per EN 12534
2.	Size	2.4 mm
3.	Chemical Composition	As per EN 12534 (Manganese ≥ 1.3 & ≤ 1.7).
4.	Mechanical Properties	As per EN 12534 Proof stress ≥ 700 MPa Tensile RM Values ≥ 780 MPa & ≤ 940 MPa Elongation $\geq 17\%$. Impact bending ≥ 47 Joules at -40°C .
5.	Dimensions	As per control panel & EN 759
6.	Tolerances (Filler rod diameter & length)	Compliant with the standard EN 759
7.	Consumables state	Compliant with the standard EN 759
8.	Marking filler rod and Packaging	Compliant with the standard EN 759
9.	Conditioning & Delivery	As per EN 759

TECHNICAL SPECIFICATION FOR SOLID BARE RODS FOR GAS SHIELDED ARC WELDING OF HIGH STRENGTH STEEL WITH HEAT RESISTANCE ELECTRODE

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	W 46 4 W3Si1 As per NF EN 1668
2.	Size	2.4 mm
3.	Chemical Composition	As per NF EN 1668 (Manganese ≥ 1.4 & ≤ 1.6)
4.	Mechanical Properties	As per NF EN 1668 Proof stress ≥ 460 MPa Tensile RM Values ≥ 570 MPa & ≤ 680 MPa Elongation $\geq 20\%$. Impact bending ≥ 47 Joules at -40°C .
5.	Dimensions	According to purchase order & NF EN 759
6.	Tolerances (Rod diameter & length)	Compliant with the standard NF EN 759
7.	Consumables state	Compliant with the standard NF EN 759
8.	Marking rod and Packaging	Compliant with the standard NF EN 759
9.	Packaging & Delivery	As per NF EN 759

**TECHNICAL SPECIFICATION FOR WIRE ELECTRODES FOR GAS SHIELDED METAL
ARC WELDING OF NON ALLOY STEELS AND FINE GRAIN STEELS**

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	G 42 4 M G2Si as per EN 440
2.	Size	1.2 mm
3.	Chemical Composition	As per EN 440. (Manganese ≥ 0.9 & ≤ 1.3)
4.	Mechanical Properties	As per EN 440 Proof stress ≥ 420 MPa Tensile RM Values ≥ 500 MPa & ≤ 640 MPa Elongation $\geq 20\%$. Impact bending ≥ 47 Joules at -40°C .
5.	Dimensions	As per control panel & EN 759
6.	Diameter tolerances	Compliant with the standard EN 759
7.	Consumables state	Compliant with the standard EN 759
8.	Strength	Compliant with the standard A 81-311
9.	Residual diameter	Compliant with the standard A 81-311
10.	Coating adhesion	Compliant with the standard A 81-311
11.	Marking coil & packaging	Compliant with the standard EN 759
12.	Conditioning and delivery	Compliant with the standard EN 759

TECHNICAL SPECIFICATION FOR TUBULAR CORED ELECTRODES FOR GAS-SHIELDED ARC WELDING OF NON-ALLOY STEELS AND FINE GRAIN STEELS

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	T42 4 M M 2 H5 As per EN 758
2.	Size	1.2 mm
3.	Chemical Composition	As per EN 758 (Manganese ≤ 2.0)
4.	Mechanical Properties	As per EN 758 Proof stress ≥ 420 MPa Tensile RM Values ≥ 500 Mpa & ≤ 640 Mpa Elongation $\geq 20\%$. Impact bending ≥ 47 Joules at -40°C .
5.	Diffusible hydrogen content	As per EN 758 ≤ 0.05 ml/ gm of weld deposit
6.	Type of lining	Metal powder As per EN758
7.	Welding positions	All positions except vertical position down As per EN758
8.	Dimensions	As per control panel & EN 759
9.	Diameter tolerances	Compliant with the standard EN 759
10.	Consumables state	Compliant with the standard EN 759
11.	Marking coil & packaging	Compliant with the standard EN 759
12.	Conditioning and delivery	Compliant with the standard EN 759

TECHNICAL SPECIFICATION FOR TUBULAR CORED ELECTRODES FOR GAS-SHIELDED ARC WELDING OF NON-ALLOY STEELS AND FINE GRAIN STEELS

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	T 42 4 P M 1 H5 As per NF EN 758
2.	Size	1.2 mm
3.	Chemical Composition	As per NF EN 758 (Manganese ≥ 1.0 & ≤ 1.5)
4.	Mechanical Properties	As per NF EN 758 Proof stress ≥ 420 MPa Tensile RM Values ≥ 500 Mpa & ≤ 640 Mpa Elongation $\geq 20\%$. Impact bending ≥ 47 Joules at -40°C .
5.	Diffusible hydrogen content	As per NF EN 758 ≤ 0.05 ml/ gm of weld deposit at 20°C and 60% RH
6.	Type of lining	Rutile base ,rapid solidification slag as per NF EN758
7.	Welding positions	All positions As per NF EN 758
8.	Dimensions	As per control panel & NF EN ISO 544
9.	Diameter tolerances	Compliant with the standard NF EN ISO 544
10.	Consumables state	Compliant with the standard NF EN ISO 544
11.	Marking coil & packaging	Compliant with the standard NF EN ISO 544
12.	Conditioning and delivery	Compliant with the standard NF EN ISO 544

TECHNICAL SPECIFICATION FOR TUBULAR CORED ELECTRODES FOR GAS-SHIELDED ARC WELDING OF HIGH STRENGTH STEELS

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	T 55 4 1NiMo B M 3 H5 As per NF EN ISO 18276-A
2.	Size	1.6 mm
3.	Chemical Composition	As per NF EN ISO 18276-A (Manganese ≥ 1.1 & ≤ 1.6)
4.	Mechanical Properties	As per NF EN ISO 18276-A Proof stress ≥ 550 MPa Tensile RM Values ≥ 650 MPa & ≤ 820 MPa Elongation $\geq 20\%$. Impact bending ≥ 47 Joules at -40°C .
5.	Diffusible hydrogen content	As per NF EN ISO 18276-A ≤ 0.05 ml/ gm of weld deposit @ 20°C & 60% RH.
6.	Spatter rate	≤ 2.5 g/h
7.	Type of lining	Basic as per As per NF EN ISO 18276-A
8.	Welding positions	Flat butt weld, flat position fillet weld, horizontal vertical fillet weld. As per NF EN ISO 18276-A
9.	Dimensions	As per control panel & NF EN ISO 544
10.	Diameter tolerances	Compliant with the standard NF EN ISO 544
11.	Consumables state	Compliant with the standard NF EN ISO 544
12.	Marking Coil and Packaging	Compliant with the standard NF EN ISO 544
13.	Condition` & Delivery	As per NF EN ISO 544

TECHNICAL SPECIFICATION FOR SOLID BARE FILLER RODS FOR GAS SHIELDED ARC WELDING WITH NON-CONSUMABLE ELECTRODES OF NON-ALLOY STEELS AND FINE GRAIN STEELS

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	W 42 4 W3Si1 As per EN 1668
2.	Size	1.6 & 2.4 mm
3.	Chemical Composition	As per EN 1668 (Manganese ≥ 1.3 & ≤ 1.6)
4.	Mechanical Properties	As per EN 1668 Proof stress ≥ 420 MPa Tensile RM Values ≥ 500 MPa & ≤ 640 MPa Elongation $\geq 20\%$. Impact bending ≥ 47 Joules at -40°C .
5.	Dimensions	According to purchase order & EN 759
6.	Tolerances (Rod diameter & length)	Compliant with the standard EN 759
7.	Consumables state	Compliant with the standard EN 759
8.	Marking rod and Packaging	Compliant with the standard EN 759
9.	Packaging & Delivery	As per EN 759

**TECHNICAL SPECIFICATION FOR WIRE ELECTRODES & SOLID BARE FILLER
RODS FOR GAS SHIELDED ARC WELDING WITH STAINLESS AUSTENIC STEELS**

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	Rod : W 19 12 3 L Wire : G 19 12 3 L As per NF EN 12072
2.	Size	1.2, 1.6, 2 & 2.4 mm
3.	Chemical Composition	As per NF EN 12072 (Manganese ≥ 1.0 & ≤ 2.5)
4.	Mechanical Properties	As per NF EN 12072 Proof stress ≥ 320 MPa Tensile RM Values ≥ 510 MPa Elongation $\geq 25\%$.
5.	Dimensions	As per control panel & NF EN 759
6.	Tolerances (Rod diameter & length)	Compliant with the standard NF EN 759
7.	Consumables state	Compliant with the standard NF EN 759
8.	Strength	Compliant with the standard A 81-313
9.	Residual diameter	Compliant with the standard A 81-313
10.	Marking rod and Packaging	Compliant with the standard NF EN 759
11.	Packaging & Delivery	As per NF EN 759

**TECHNICAL SPECIFICATION FOR WIRE ELECTRODES & SOLID BARE FILLER
RODS FOR GAS SHIELDED METAL ARC WELDING WITH NON-COSUMABLE
ELECTRODES OF STAINLESS AUSTENIC STEELS**

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	Rod : W 19 9 L Wire : G 19 9 L As per NF EN 12072
2.	Size	1.2,1.6 & 2.0 mm
3.	Chemical Composition	As per NF EN 12072 (Manganese ≥ 1.0 & ≤ 2.5)
4.	Mechanical Properties	As per NF EN 12072 Proof stress ≥ 320 MPa Tensile RM Values ≥ 510 MPa Elongation $\geq 30\%$.
5.	Dimensions	As per control panel & NF EN 759
6.	Tolerances (Rod diameter & length)	Compliant with the standard NF EN 759
7.	Consumables state	Compliant with the standard NF EN 759
8.	Strength	Compliant with the standard A 81-313
9.	Risidual diameter	Compliant with the standard A 81-313
10.	Marking rod and Packaging	Compliant with the standard NF EN 759
11.	Packaging & Delivery	As per NF EN 759

**TECHNICAL SPECIFICATION FOR WIRE ELECTRODES & SOLID BARE FILLER
RODS FOR GAS SHIELDED ARC WELDING OF COPPER ALLOYS**

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	Rod : SG-CuAl8Ni2 Wire : SG-CuAl8Ni2 As per DIN 1733
2.	Size	2.0 mm
3.	Chemical Composition	As per DIN 1733 (Manganese ≥ 0.7 & ≤ 2.0)
4.	Mechanical Properties	Proof stress ≥ 290 MPa Tensile RM Values ≥ 600 MPa Elongation $\geq 18\%$.
5.	Dimensions	As per control panel & DIN 1733
6.	Tolerances (Rod diameter & length)	Compliant with the standard DIN 1733
7.	Consumables state	Compliant with the standard DIN 1733
8.	Strength	Not Involved
9.	Risidual diameter	Compliant with the standard DIN 1733
10.	Marking product and Packaging	As per DIN 1733
11.	Packaging & Delivery	As per DIN 1733

**TECHNICAL SPECIFICATION FOR WIRE ELECTRODES & SOLID BARE FILLER
RODS FOR GAS SHIELDED ARC WELDING OF COPPER ALLOYS**

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	SG-CuNi30Fe As per DIN 1733
2.	Size	1.6 & 2.0 mm
3.	Chemical Composition	As per DIN 1733 (Manganese ≥ 0.5 & ≤ 1.0)
4.	Mechanical Properties	Proof stress ≥ 130 MPa Tensile RM Values ≥ 360 MPa Elongation $\geq 30\%$.
5.	Dimensions	As per control panel & DIN 1733
6.	Tolerances (Rod diameter & length)	Compliant with the standard DIN 1733
7.	Consumables state	Compliant with the standard DIN 1733
8.	Strength	Not Involved
9.	Risidual diameter	Compliant with the standard DIN 1733
10.	Marking Rod and Packaging	As per DIN 1733
11.	Packaging & Delivery	As per DIN 1733

**TECHNICAL SPECIFICATION FOR BARE BRAZING ROD ASSOCIATED WITH
WELDING FLUX FOR COPPER/COPPER BRAZING FILLER METAL**

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Filler Metal description	B-Ag40ZnCdCu-595/630 As per NF EN 1044
2.	Size	1.0 mm
3.	Flux description	FH10 As per NF EN 1045
4.	Melting range	595-630 °C
5.	Chemical Composition	As per NF EN 1044
6.	Mechanical Properties	Tensile strength of the bond on butt joint at room temperature :Rm≥200 N/mm ² Instantaneous shear strength at room Temperature :Rm≥120 N/mm ²
7.	Dimensions	As per control panel & NF EN 1044
8.	Tolerances (Rod diameter & length)	Compliant with the standard As per NF EN 1044
9.	Surface state	Compliant with the standard As per NF EN 1044
10.	Delivery condition	As per control panel & NF EN 1045
11.	Marking Filler metal and Packaging	Compliant with the standard As per NF EN 1044
12.	Flux Packaging	Compliant with the standard As per NF EN 1045
13.	Filler metal conditioning & Delivery	Compliant with the standard As per NF EN 1044
14.	Flux conditioning & Delivery	Compliant with the standard As per NF EN 1045

**TECHNICAL SPECIFICATION FOR BARE BRAZING ROD ASSOCIATED WITH
WELDING FLUX FOR COPPER/COPPER-ALUMINIUM BRAZING FILLER METAL**

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Filler Metal description	B-Ag40ZnCdCu-595/630 As per NF EN 1044
2.	Size	2.0 mm
3.	Flux description	FH11 As per NF EN 1045
4.	Melting range	595-630 °C
5.	Chemical Composition	As per NF EN 1044
6.	Mechanical Properties	Tensile strength of the bond on butt joint at room temperature :Rm≥200 N/mm ² Instantaneous shear strength at room Temperature :Rm≥120 N/mm ²
7.	Dimensions	As per control panel & NF EN 1044
8.	Tolerances (Rod diameter & length)	Compliant with the standard As per NF EN 1044
9.	Surface state	Compliant with the standard As per NF EN 1044
10.	Delivery condition	As per control panel & NF EN 1045
11.	Marking Filler metal and Packaging	Compliant with the standard As per NF EN 1044
12.	Flux packaging	Compliant with the standard As per NF EN 1045
13.	Filler metal conditioning & Delivery	Compliant with the standard As per NF EN 1044
14.	Flux conditioning & Delivery	Compliant with the standard As per NF EN 1045

**TECHNICAL SPECIFICATION FOR WIRE ELECTRODES AND SOLID BARE FILLER
RODS FOR GAS-SHIELDED OF ALUMINIUM ALLOYS**

<u>SN.</u>	<u>Requirement</u>	<u>Standards / Remarks</u>
1.	Item	Rod : N-Al Mg5 Wire : M-Al Mg5 As per NFA 81-331
2.	Size	2 mm
3.	Melt run	Compliant with the standard As per NF A 81-331 Joint Class 1 As per NF A 89-220
4.	Compactness for electrode wire	Joint Class 1 As per NF A 89-220
5.	Chemical Composition	As per NF A 81-331
6.	Mechanical Properties	Tensile RM Values ≥ 250 MPa
8.	Dimensions	As per control panel & NF EN 759
9.	DiameterTolerances	Compliant with the standard NF A 81-331
10.	Consumables state	Compliant with the standard NF A 81-331
11.	Strength	Compliant with the standard NF A 81-331
12.	Risidual diameter	Compliant with the standard NF A 81-331
13.	Warped & Smoke test	Compliant with the standard NF A 81-331
14.	Marking Product and Packaging	Compliant with the standard NF A 81-331
15.	Conditioning & Delivery	Compliant with the standard NF A 81-331