



MIG (GMAW) wires · TIG (GTAW) rods · SAW wires · Gas welding rods

Production program



FLIESS
SINCE 1915

The Fliess company was founded by Hermann Fliess in Duisburg in 1915. Within just a few years, the company became established as a significant manufacturer of covered stick electrodes and gas welding rods. As early as the middle of the twenties, Fliess exported quality products all over the world. The development and production of wire electrodes for submerged-arc welding began in the thirties and for gas-shielded metal-arc welding in the fifties. Fliess applied for a large number of patents and invested in modern production processes.

Today, Fliess is an internationally operating manufacturer of welding filler materials which follows three simple basic principles: highest quality, speed and uncompromising fulfilment of customer wishes.

Fliess owes this enduring development to the fact that the company concentrates not only on the products but also on the responsibility to the employees, the environment and the society.

Therefore Fliess declares its unambiguous support for the production location of Germany!



History

- 1915** Foundation of HERMANN FLIESS & CO.
- 1917** Manufacturing of covered electrodes
- 1925** Patent to FLIESS for welding wire with a copper-plated surface
- 1937** Development and manufacturing of submerged arc welding wire
- 1955** Start of MIG (GMAW) wire production
- 1959** Patent to FLIESS for welding wire with a bronze-plated surface
- 1967** Patent to FLIESS for precision layer wound spooling
- 1988** Commissioning of a new production hall
- 1990** Capacity expansion with focus on quality, environment, health and safety
- 2002** Introduction of ISO 9001
- 2010** Enlargement by 3000 m² and commissioning of the new drawing shop
- 2012** Installation of two new fully automatic spooling lines
- 2013** Installation of further spooling and cutting lines
- 2015** 100th anniversary
- 2018** Acquisition of the company PITEC Deutschland GmbH
- 2019** New building for shipping
- 2022** Commissioning of new fine drawing machines and fully automatic spooling lines

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Product	DIN EN ISO	AWS	Page
MIG (GMAW) wires			
ED-SG 1	14341-A G 42 2 C1 2Si	A5.18 ER70S-3	1
ED-SG 1A	14341-A G 46 A M21 2Ti	A5.18 ER70S-2	2
ED-SG 2	14341-A G 42 5 M21 3Si1	A5.18 ER70S-6	3
ED-SG 3	14341-A G 46 5 M21 4Si1, 14341-A G 46 5 M32 4Si1, 14341-A G 46 4 C1 4Si1	A5.18 ER70S-6	4
ED-SG NiCu	14341-A G 42 2 M21 Z2NiCu	A5.28 ER80S-G	5
ED-ER100S-1	16834-A G 62 5 M21 Mn3Ni1,5Mo	A5.28 ER100S-1	6
ED-ER110S-1	-	A5.28 ER110S-1	7
ED-ER120S-1	-	A5.28 ER120S-1	8
ED-A 31 (G4Mo)	14341-A G 50 7 M21 4Mo, 14341-B S4M31	A5.28 ER80S-D2, A5.28 ER90S-D2	9
ED-FK620	16834-A G 62 6 M21 Mn3Ni1Mo	A5.28 ER100S-G	10
ED-FK1	16834-A G 69 4 M21 Mn3Ni1CrMo	A5.28 ER100S-G, A5.28 ER110S-G	11
ED-FK800	16834-A G 69 6 M21 Mn4Ni1,5CrMo	A5.28 ER110S-G, A5.28 ER100S-1	12
ED-FK850	16834-A G 79 5 M21 Mn4Ni1,5CrMo	A5.28 ER110S-G	13
ED-FK1000	16834-A G 89 6 M21 Mn4Ni2CrMo	A5.28 ER120S-G	14
ED-FK1100	16834-A G 89 5 M21 Mn4Ni2,5CrMo	A5.28 ER120S-G	15
ED-FK1150	16834-A GZ 96 4 M21 Mn4Ni2,5CrMo	A5.28 ER120S-G	16
ED-SG Mo	14341-A G 42 2 C1 2Mo, 14341-A G 46 6 M21 2Mo, 21952-A G MoSi	A5.28 ER70S-A1, A5.28 ER80S-G	17
ED-SG CrMo1	21952-A G CrMo1Si	A5.28 ER80S-G	18
ED-ER70S-B2L	21952-B G 1CML	A5.28 ER70S-B2L	19
ED-ER80S-B2	21952-B G 1CM	A5.28 ER80S-B2	20
ED-SG CrMo2	21952-A G CrMo2Si	A5.28 ER90S-G	21
ED-ER80S-B3L	21952-B G 2C1ML	A5.28 ER80S-B3L	22

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MIG (GMAW) wires			
ED-ER90S-B3	21952-B G 2C1M	A5.28 ER90S-B3	23
ED-SG CrMo5	21952-A G CrMo5Si	A5.28 ER80S-B6	24
ED-ER80S-B8	21952-A G CrMo9	A5.28 ER80S-B8	25
ED-SG P91	21952-A G CrMo91	A5.28 ER90S-B91	26
ED-SG P92	21952-A G ZCrMoWVNb9 0,5 1,5	A5.28 ER90S-B92	27
ED-ER80S-Ni1	14341-A G 50 6 M21 3Ni1	A5.28 ER80S-Ni1	28
ED-SG Ni2,5	14341-A G 46 7 M21 2Ni2	A5.28 ER80S-Ni2	29
ED-A 350	14700 S Fe1, (DIN 8555 MSG 5-GZ-350)	-	30
ED-A 35	14700 S Fe2	-	31
ED-A 60	14700 S Fe8	-	32

Product	DIN EN ISO	AWS	Page
TIG welding rods			
WSG 1	636-A W 42 4 2Si	A5.18 ER70S-3	33
WSG 1A	636-A W 46 2 2Ti	A5.18 ER70S-2	34
WSG 2	636-A W 46 5 3Si1	A5.18 ER70S-6	35
WSG 3	636-A W 50 5 4Si1	A5.18 ER70S-6	36
WSG NiCu	636-A W 42 4 Z2NiCu	A5.28 ER80S-G	37
WSG ER100S-1	16834-A G 62 5 M21 Mn3Ni1,5Mo	A5.28 ER100S-1	38
WSG ER110S-1	-	A5.28 ER110S-1	39
WSG ER120S-1	-	A5.28 ER120S-1	40
WSG A 31	21952-A W Z4Mo, 636-B W 57A 4 W4M31	A5.28 ER80S-D2, A5.28 ER90S-D2	41
WSG FK1	16834-A W 69 4 I1 Mn3Ni1CrMo	A5.28 ER100S-G, A5.28 ER110S-G	42
WSG FK620	16834-A W 62 6 I1 Mn3Ni1Mo	A5.28 ER100S-G	43
WSG S3NiMo1	16834-A W 69 5 I1 ZMn3Ni1Mo	A5.28 ER90S-G	44

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TIG welding rods			
WSG FK1000	16834-A W 89 5 I1 Mn4Ni2CrMo	A5.28 ER120S-G	45
WSG Mo	636-A W 46 4 2Mo, 21952-A W MoSi	A5.28 ER70S-A1, A5.28 ER80S-G	46
WSG CrMo1	21952-A W CrMo1Si	A5.28 ER80S-G	47
WSG ER70S-B2L	21952-B W 1CML	A5.28 ER70S-B2L	48
WSG ER80S-B2	21952-B W 1CM	A5.28 ER80S-B2	49
WSG CrMo2	21952-A W CrMo2Si	A5.28 ER90S-G	50
WSG ER80S-B3L	21952-B W 2C1ML	A5.28 ER80S-B3L	51
WSG ER90S-B3	21952-B W 2C1M	A5.28 ER90S-B3	52
WSG P24	21952-A W ZCrMo2VNB	A5.28 R90S-B24	53
WSG CrMo5	21952-A W CrMo5Si	A5.28 ER80S-B6	54
WSG ER80S-B8	21952-A W CrMo9	A5.28 ER80S-B8	55
WSG P91	21952-A W CrMo91	A5.28 ER90S-B91	56
WSG P92	21952-A W ZCrMoWVNb 9 0,5 1,5	A5.28 ER90S-B92	57
WSG ER80S-Ni1	636-A W 46 6 3Ni1	A5.28 ER80S-Ni1	58
WSG Ni2,5	636-A W 42 9 2Ni2	A5.28 ER80S-Ni2	59

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SAW (submerged arc welding) wires			
UP-99 (S1)	14171-A S1	A5.17 ~EL12, A5.23 ~EL12	60
UP-100 (S2)	14171-A S2	A5.17 EM12, A5.23 EM12	61
UP-100 Si (S2Si)	14171-A S2Si	A5.17 EM12K, A5.23 EM12K	62
UP-101 (S3)	14171-A S3	A5.17 EH10K, A5.23 EH10K	63
UP-101 Spezial (S3Si)	14171-A S3Si	A5.17 EH12K, A5.23 EH12K	64
UP-100 Mo (S2Mo)	14171-A S2Mo, 24598-A S S Mo	A5.23 EA2	65
UP-101 Mo (S3Mo)	14171-A S3Mo, 24598-A S S MnMo	A5.23 EA4	66
UP-EM13K	14171-A S2Si2	A5.17 EM13K, A5.23 EM13K	67
UP-EM14K	-	A5.17 EM14K, A5.23 EM14K	68
UP-EH11K	-	A5.17 EH11K, A5.23 EH11K	69
UP-101 1Ni $\frac{1}{4}$ Mo (S3 1Ni $\frac{1}{4}$ Mo)	26304-A SZ 3Ni1Mo0,2, 14171-A S3Ni1Mo0,2	A5.23 ENi5 / ENi6, CE	70
UP-101 NiMo1 (S3NiMo1)	14171-A S3Ni1Mo, 26304-A S3Ni1Mo	A5.23 EF3, A5.23 EF3N	71
UP-100 CrNiMo1 (S2CrNiMo1)	26304-A SZ 2Cr1Ni1Mo	A5.23 EG	72
UP-101 NiCrMo2,5 (S3NiCrMo2,5)	26304-A S3Ni2,5CrMo	A5.23 ~EM4	73
UP-EM2	26304-B SUN4M2	A5.23 EM2	74
UP-EM4	26304-A SZ S3Ni2,5CrMo	A5.23 EM4	75
UP-100 CrMo1 (S2CrMo1)	24598-A-S S CrMo1	A5.23 EB2R	76
UP-99 CrMo2 (S1CrMo2)	24598-A-S S CrMo2	A5.23 EB3R	77
UP-P24	24598-A-S S Z CrMo2VNb	A5.23 EB24	78
UP-99 CrMo5 (S1CrMo5)	24598-A-S S CrMo5	A5.23 EB6	79
UP-EB8	24598-A-S S CrMo9	A5.23 EB8	80
UP-P91 (S1CrMo91)	24598-A-S S CrMo91	A5.23 EB91	81

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SAW (submerged arc welding) wires			
UP-P92	24598-A-S S Z CrMoWVNb 9 0,5 1,5	A5.23 EG	82
UP-100 Ni1 (S2Ni1)	14171-A S2Ni1	A5.23 ENi1	83
UP-ENi1K	26304-A SZ 2Ni1Si, 14171-B SUN21	A5.23 ENi1K	84
UP-100 Ni2 (S2Ni2)	14171-A S2Ni2	A5.23 ENi2	85
UP-100 Ni3 (S2Ni3)	14171-A S2Ni3	A5.23 ENi3	86
UP-100 NiCu1 (S2NiCu1)	14171-A S2Ni1Cu	A5.23 EG	87
UP-S3 TiB	14171-A SZ3TiB	A5.23 EG	88
UP-S3 ½MoTiB	14171-A SZMoTiB	A5.23 EG	89
UP-S2 MoTiB	14171-A S2MoTiB	A5.23 EA2TiB	90
UP-S3 MoTiB	14171-A S2MoTiB	A5.23 EA2TiB	91

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Gas welding rods			
U 39 (G I)	20378 - O I	A5.2 ~R45	92
U 40 (G II)	20378 - O II	A5.2 R60	93
U 40 Ni (G III)	20378 - O III	A5.2 ~R60	94
U 47 Mo (G IV)	20378 - O IV	A5.2 ~R60	95
U 49 CrMo (G V)	20378 - O V	A5.2 ~R65	96
U 50 CrMo (G VI)	20378 - O VI	A5.2 ~R65	97

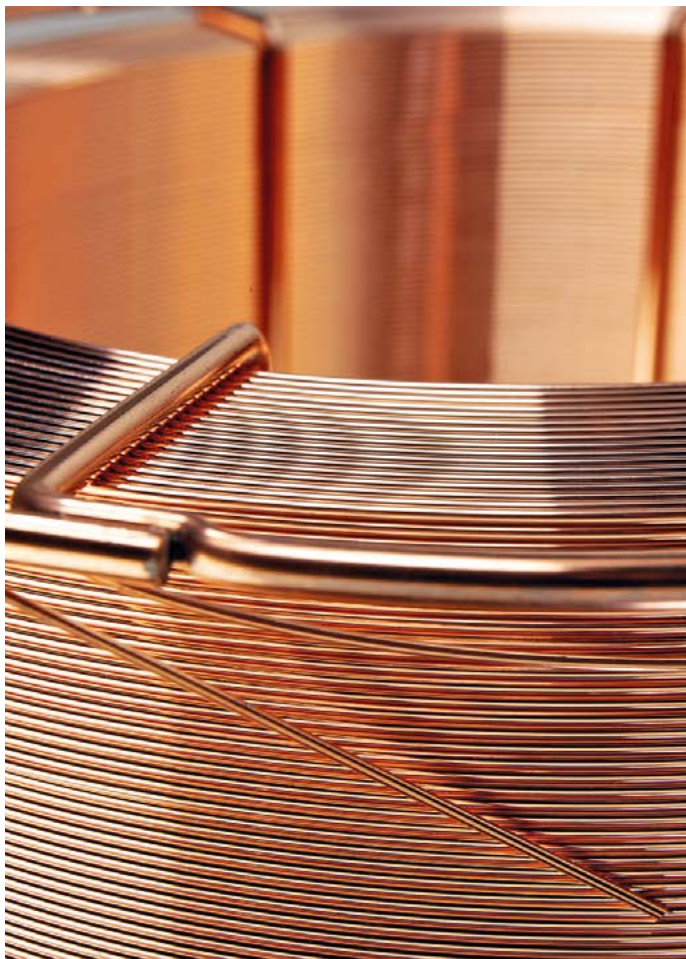


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-	ED-ER110S-1	A5.28 ER110S-1	7
-	WSG ER120S-1	A5.28 ER120S-1	40
-	ED-ER120S-1	A5.28 ER120S-1	8
-	UP-EH11K	A5.17 EH11K, A5.23 EH11K	69
-	UP-EM14K	A5.17 EM14K, A5.23 EM14K	68
-	WSG ER110S-1	A5.28 ER110S-1	39
636-A W 42 4 2Si	WSG 1	A5.18 ER70S-3	33
636-A W 42 4 Z2NiCu	WSG NiCu	A5.28 ER80S-G	37
636-A W 42 9 2Ni2	WSG Ni2,5	A5.28 ER80S-Ni2	59
636-A W 46 2 2Ti	WSG 1A	A5.18 ER70S-2	34
636-A W 46 4 2Mo, 21952-A W MoSi	WSG Mo	A5.28 ER70S-A1, A5.28 ER80S-G	46
636-A W 46 5 3Si1	WSG 2	A5.18 ER70S-6	35
636-A W 46 6 3Ni1	WSG ER80S-Ni1	A5.28 ER80S-Ni1	58
636-A W 50 5 4Si1	WSG 3	A5.18 ER70S-6	36
14171-A S1	UP-99 (S1)	A5.17 ~EL12, A5.23 ~EL12	60
14171-A S2	UP-100 (S2)	A5.17 EM12, A5.23 EM12	61
14171-A S2Mo, 24598-A S S Mo	UP-100 Mo (S2Mo)	A5.23 EA2	65
14171-A S2MoTiB	UP-S2 MoTiB	A5.23 EA2TiB	90
14171-A S2MoTiB	UP-S3 MoTiB	A5.23 EA2TiB	91
14171-A S2Ni1	UP-100 Ni1 (S2Ni1)	A5.23 ENi1	83
14171-A S2Ni1Cu	UP-100 NiCu1 (S2NiCu1)	A5.23 EG	87
14171-A S2Ni2	UP-100 Ni2 (S2Ni2)	A5.23 ENi2	85
14171-A S2Ni3	UP-100 Ni3 (S2Ni3)	A5.23 ENi3	86
14171-A S2Si	UP-100 Si (S2Si)	A5.17 EM12K, A5.23 EM12K	62
14171-A S2Si2	UP-EM13K	A5.17 EM13K, A5.23 EM13K	67

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14171-A S3	UP-101 (S3)	A5.17 EH10K, A5.23 EH10K	63
14171-A S3Mo, 24598-A S S MnMo	UP-101 Mo (S3Mo)	A5.23 EA4	66
14171-A S3Ni1Mo, 26304-A S3Ni1Mo	UP-101 NiMo1 (S3NiMo1)	A5.23 EF3, A5.23 EF3N	71
14171-A S3Si	UP-101 Spezial (S3Si)	A5.17 EH12K, A5.23 EH12K	64
14171-A SZ3TiB	UP-S3 TiB	A5.23 EG	88
14171-A SZMoTiB	UP-S3 ½MoTiB	A5.23 EG	89
14341-A G 42 2 C1 2Mo, 14341-A G 46 6 M21 2Mo, 21952-A G MoSi	ED-SG Mo	A5.28 ER70S-A1, A5.28 ER80S-G	17
14341-A G 42 2 C1 2Si	ED-SG 1	A5.18 ER70S-3	1
14341-A G 42 2 M21 Z2NiCu	ED-SG NiCu	A5.28 ER80S-G	5
14341-A G 42 5 M21 3Si1	ED-SG 2	A5.18 ER70S-6	3
14341-A G 46 5 M21 4Si1, 14341-A G 46 5 M32 4Si1, 14341-A G 46 4 C1 4Si1	ED-SG 3	A5.18 ER70S-6	4
14341-A G 46 7 M21 2Ni2	ED-SG Ni2,5	A5.28 ER80S-Ni2	29
14341-A G 46 A M21 2Ti	ED-SG 1A	A5.18 ER70S-2	2
14341-A G 50 6 M21 3Ni1	ED-ER80S-Ni1	A5.28 ER80S-Ni1	28
14341-A G 50 7 M21 4Mo, 14341-B S4M31	ED-A 31 (G4Mo)	A5.28 ER80S-D2, A5.28 ER90S-D2	9
14700 S Fe1, (DIN 8555 MSG 5-GZ-350)	ED-A 350	-	30
14700 S Fe2	ED-A 35	-	31
14700 S Fe8	ED-A 60	-	32
16834-A G 62 5 M21 Mn3Ni1,5Mo	ED-ER100S-1	A5.28 ER100S-1	6
16834-A G 62 5 M21 Mn3Ni1,5Mo	WSG ER100S-1	A5.28 ER100S-1	38
16834-A W 69 5 I1 ZMn3Ni1Mo	WSG S3NiMo1	A5.28 ER90S-G	44
16834-A G 62 6 M21 Mn3Ni1Mo	ED-FK620	A5.28 ER100S-G	10

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16834-A G 69 4 M21 Mn3Ni1CrMo	ED-FK1	A5.28 ER100S-G, A5.28 ER110S-G	11
16834-A G 69 6 M21 Mn4Ni1,5CrMo	ED-FK800	A5.28 ER110S-G, A5.28 ER100S-1	12
16834-A G 79 5 M21 Mn4Ni1,5CrMo	ED-FK850	A5.28 ER110S-G	13
16834-A G 89 5 M21 Mn4Ni2,5CrMo	ED-FK1100	A5.28 ER120S-G	15
16834-A G 89 6 M21 Mn4Ni2CrMo	ED-FK1000	A5.28 ER120S-G	14
16834-A GZ 96 4 M21 Mn4Ni2,5CrMo	ED-FK1150	A5.28 ER120S-G	16
16834-A W 62 6 I1 Mn3Ni1Mo	WSG FK620	A5.28 ER100S-G	43
16834-A W 69 4 I1 Mn3Ni1CrMo	WSG FK1	A5.28 ER100S-G, A5.28 ER110S-G	42
16834-A W 89 5 I1 Mn4Ni2CrMo	WSG FK1000	A5.28 ER120S-G	45
20378 - O I	U 39 (G I)	A5.2 -R45	92
20378 - O II	U 40 (G II)	A5.2 R60	93
20378 - O III	U 40 Ni (G III)	A5.2 -R60	94
20378 - O IV	U 47 Mo (G IV)	A5.2 -R60	95
20378 - O V	U 49 CrMo (G V)	A5.2 -R65	96
20378 - O VI	U 50 CrMo (G VI)	A5.2 -R65	97
21952-A G CrMo1Si	ED-SG CrMo1	A5.28 ER80S-G	18
21952-A G CrMo2Si	ED-SG CrMo2	A5.28 ER90S-G	21
21952-A G CrMo5Si	ED-SG CrMo5	A5.28 ER80S-B6	24
21952-A G CrMo9	ED-ER80S-B8	A5.28 ER80S-B8	25
21952-A G CrMo91	ED-SG P91	A5.28 ER90S-B91	26
21952-A W CrMo1Si	WSG CrMo1	A5.28 ER80S-G	47
21952-A W CrMo2Si	WSG CrMo2	A5.28 ER90S-G	50
21952-A W CrMo5Si	WSG CrMo5	A5.28 ER80S-B6	54
21952-A W CrMo9	WSG ER80S-B8	A5.28 ER80S-B8	55
21952-A W CrMo91	WSG P91	A5.28 ER90S-B91	56

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21952-A W Z4Mo, 636-B W 57A 4 W4M31	WSG A 31	A5.28 ER80S-D2, A5.28 ER90S-D2	41
21952-A W ZCrMo2VNB	WSG P24	A5.28 R90S-B24	53
21952-A W ZCrMoWVNb 9 0,5 1,5	WSG P92	A5.28 ER90S-B92	57
21952-A G ZCrMoWVNb9 0,5 1,5	ED-SG P92	A5.28 ER90S-B92	27
21952-B G 1CM	ED-ER80S-B2	A5.28 ER80S-B2	20
21952-B G 1CML	ED-ER70S-B2L	A5.28 ER70S-B2L	19
21952-B G 2C1M	ED-ER90S-B3	A5.28 ER90S-B3	23
21952-B G 2C1ML	ED-ER80S-B3L	A5.28 ER80S-B3L	22
21952-B W 1CM	WSG ER80S-B2	A5.28 ER80S-B2	49
21952-B W 1CML	WSG ER70S-B2L	A5.28 ER70S-B2L	48
21952-B W 2C1M	WSG ER90S-B3	A5.28 ER90S-B3	52
21952-B W 2C1ML	WSG ER80S-B3L	A5.28 ER80S-B3L	51
24598-A-S S CrMo1	UP-100 CrMo1 (S2CrMo1)	A5.23 EB2R	76
24598-A-S S CrMo2	UP-99 CrMo2 (S1CrMo2)	A5.23 EB3R	77
24598-A-S S CrMo5	UP-99 CrMo5 (S1CrMo5)	A5.23 EB6	79
24598-A-S S CrMo9	UP-EB8	A5.23 EB8	80
24598-A-S S CrMo91	UP-P91 (S1CrMo91)	A5.23 EB91	81
24598-A-S S Z CrMo2VNB	UP-P24	A5.23 EB24	78
24598-A-S S Z CrMoWVNb 9 0,5 1,5	UP-P92	A5.23 EG	82
26304-A S3Ni2,5CrMo	UP-101 NiCrMo2,5 (S3NiCrMo2,5)	A5.23 ~EM4	73
26304-A SZ 2Cr1Ni1Mo	UP-100 CrNiMo1 (S2CrNiMo1)	A5.23 EG	72
26304-A SZ 2Ni1Si, 14171-B SUN21	UP-ENi1K	A5.23 ENi1K	84
26304-A SZ 3Ni1Mo0,2, 14171-A S3Ni1Mo0,2	UP-101 1Ni¼Mo (S3 1Ni¼Mo)	A5.23 ENi5 / ENi6, CE	70
26304-A SZ S3Ni2,5CrMo	UP-EM4	A5.23 EM4	75
26304-B SUN4M2	UP-EM2	A5.23 EM2	74



AWS	Product	DIN EN ISO	Page
-	ED-A 60	14700 S Fe8	32
-	ED-A 35	14700 S Fe2	31
-	ED-A 350	14700 S Fe1, (DIN 8555 MSG 5-GZ-350)	30
A5.2 R60	U 40 (G II)	20378 - 0 II	93
A5.2 ~R45	U 39 (G I)	20378 - 0 I	92
A5.2 ~R60	U 47 Mo (G IV)	20378 - 0 IV	95
A5.2 ~R60	U 40 Ni (G III)	20378 - 0 III	94
A5.2 ~R65	U 49 CrMo (G V)	20378 - 0 V	96
A5.2 ~R65	U 50 CrMo (G VI)	20378 - 0 VI	97
A5.17 EH10K, A5.23 EH10K	UP-101 (S3)	14171-A S3	63
A5.17 EH11K, A5.23 EH11K	UP-EH11K	-	69
A5.17 EH12K, A5.23 EH12K	UP-101 Spezial (S3Si)	14171-A S3Si	64
A5.17 EM12, A5.23 EM12	UP-100 (S2)	14171-A S2	61
A5.17 EM12K, A5.23 EM12K	UP-100 Si (S2Si)	14171-A S2Si	62
A5.17 EM13K, A5.23 EM13K	UP-EM13K	14171-A S2Si2	67
A5.17 EM14K, A5.23 EM14K	UP-EM14K	-	68
A5.17 ~EL12, A5.23 ~EL12	UP-99 (S1)	14171-A S1	60
A5.18 ER70S-2	WSG 1A	636-A W 46 2 2Ti	34
A5.18 ER70S-2	ED-SG 1A	14341-A G 46 A M21 2Ti	2
A5.18 ER70S-3	ED-SG 1	14341-A G 42 2 C1 2Si	1
A5.18 ER70S-3	WSG 1	636-A W 42 4 2Si	33
A5.18 ER70S-6	WSG 2	636-A W 46 5 3Si1	35
A5.18 ER70S-6	ED-SG 2	14341-A G 42 5 M21 3Si1	3

AWS	Product	DIN EN ISO	Page
A5.18 ER70S-6	ED-SG 3	14341-A G 46 5 M21 4Si1, 14341-A G 46 5 M32 4Si1, 14341-A G 46 4 C1 4Si1	4
A5.18 ER70S-6	WSG 3	636-A W 50 5 4Si1	36
A5.23 EA2	UP-100 Mo (S2Mo)	14171-A S2Mo, 24598-A S S Mo	65
A5.23 EA2TiB	UP-S2 MoTiB	14171-A S2MoTiB	90
A5.23 EA2TiB	UP-S3 MoTiB	14171-A S2MoTiB	91
A5.23 EA4	UP-101 Mo (S3Mo)	14171-A S3Mo, 24598-A S S MnMo	66
A5.23 EB2R	UP-100 CrMo1 (S2CrMo1)	24598-A-S S CrMo1	76
A5.23 EB3R	UP-99 CrMo2 (S1CrMo2)	24598-A-S S CrMo2	77
A5.23 EB6	UP-99 CrMo5 (S1CrMo5)	24598-A-S S CrMo5	79
A5.23 EB8	UP-EB8	24598-A-S S CrMo9	80
A5.23 EB24	UP-P24	24598-A-S S Z CrMo2VNb	78
A5.23 EB91	UP-P91 (S1CrMo91)	24598-A-S S CrMo91	81
A5.23 EF3, A5.23 EF3N	UP-101 NiMo1 (S3NiMo1)	14171-A S3Ni1Mo, 26304-A S3Ni1Mo	71
A5.23 EG	UP-P92	24598-A-S S Z CrMoWVNb 9 0,5 1,5	82
A5.23 EG	UP-100 CrNiMo1 (S2CrNiMo1)	26304-A SZ 2Cr1Ni1Mo	72
A5.23 EG	UP-100 NiCu1 (S2NiCu1)	14171-A S2Ni1Cu	87
A5.23 EG	UP-S3 ½MoTiB	14171-A SZMoTiB	89
A5.23 EG	UP-S3 TiB	14171-A SZ3TiB	88
A5.23 EM2	UP-EM2	26304-B SUN4M2	74
A5.23 EM4	UP-EM4	26304-A SZ S3Ni2,5CrMo	75
A5.23 ENi1	UP-100 Ni1 (S2Ni1)	14171-A S2Ni1	83

AWS	Product	DIN EN ISO	Page
A5.23 ENi1K	UP-ENi1K	26304-A SZ 2Ni1Si, 14171-B SUN21	84
A5.23 ENi2	UP-100 Ni2 (S2Ni2)	14171-A S2Ni2	85
A5.23 ENi3	UP-100 Ni3 (S2Ni3)	14171-A S2Ni3	86
A5.23 ENi5 / ENi6, CE	UP-101 1Ni¼Mo (S3 1Ni¼Mo)	26304-A SZ 3Ni1Mo0,2, 14171- A S3Ni1Mo0,2	70
A5.23 -EM4	UP-101 NiCrMo2,5 (S3NiCrMo2,5)	26304-A S3Ni2,5CrMo	73
A5.28 ER70S-A1, A5.28 ER80S-G	WSG Mo	636-A W 46 4 2Mo, 21952-A W MoSi	46
A5.28 ER70S-A1, A5.28 ER80S-G	ED-SG Mo	14341-A G 42 2 C1 2Mo, 14341-A G 46 6 M21 2Mo, 21952-A G MoSi	17
A5.28 ER70S-B2L	WSG ER70S-B2L	21952-B W 1CML	48
A5.28 ER70S-B2L	ED-ER70S-B2L	21952-B G 1CML	19
A5.28 ER80S-B2	WSG ER80S-B2	21952-B W 1CM	49
A5.28 ER80S-B2	ED-ER80S-B2	21952-B G 1CM	20
A5.28 ER80S-B3L	WSG ER80S-B3L	21952-B W 2C1ML	51
A5.28 ER80S-B3L	ED-ER80S-B3L	21952-B G 2C1ML	22
A5.28 ER80S-B6	WSG CrMo5	21952-A W CrMo5Si	54
A5.28 ER80S-B6	ED-SG CrMo5	21952-A G CrMo5Si	24
A5.28 ER80S-B8	ED-ER80S-B8	21952-A G CrMo9	25
A5.28 ER80S-B8	WSG ER80S-B8	21952-A W CrMo9	55
A5.28 ER80S-D2, A5.28 ER90S-D2	ED-A 31 (G4Mo)	14341-A G 50 7 M21 4Mo, 14341-B S4M31	9
A5.28 ER80S-D2, A5.28 ER90S-D2	WSG A 31	21952-A W Z4Mo, 636-B W 57A 4 W4M31	41
A5.28 ER80S-G	ED-SG CrMo1	21952-A G CrMo1Si	18

AWS	Product	DIN EN ISO	Page
A5.28 ER80S-G	ED-SG NiCu	14341-A G 42 2 M21 Z2NiCu	5
A5.28 ER80S-G	WSG CrMo1	21952-A W CrMo1Si	47
A5.28 ER80S-G	WSG NiCu	636-A W 42 4 Z2NiCu	37
A5.28 ER80S-Ni1	WSG ER80S-Ni1	636-A W 46 6 3Ni1	58
A5.28 ER80S-Ni1	ED-ER80S-Ni1	14341-A G 50 6 M21 3Ni1	28
A5.28 ER80S-Ni2	WSG Ni2,5	636-A W 42 9 2Ni2	59
A5.28 ER80S-Ni2	ED-SG Ni2,5	14341-A G 46 7 M21 2Ni2	29
A5.28 ER90S-B3	ED-ER90S-B3	21952-B G 2C1M	23
A5.28 ER90S-B3	WSG ER90S-B3	21952-B W 2C1M	52
A5.28 ER90S-B91	WSG P91	21952-A W CrMo91	56
A5.28 ER90S-B91	ED-SG P91	21952-A G CrMo91	26
A5.28 ER90S-B92	WSG P92	21952-A W ZCrMoWVNb 9 0,5 1,5	57
A5.28 ER90S-B92	ED-SG P92	21952-A G ZCrMoWVNb9 0,5 1,5	27
A5.28 ER90S-G	ED-SG CrMo2	21952-A G CrMo2Si	21
A5.28 ER90S-G	WSG S3NiMo1	16834-A W 69 5 I1 ZMn3Ni1Mo	44
A5.28 ER90S-G	WSG CrMo2	21952-A W CrMo2Si	50
A5.28 ER100S-1	WSG ER100S-1	16834-A G 62 5 M21 Mn3Ni1,5Mo	38
A5.28 ER100S-1	ED-ER100S-1	16834-A G 62 5 M21 Mn3Ni1,5Mo	6
A5.28 ER100S-G	ED-FK620	16834-A G 62 6 M21 Mn3Ni1Mo	10
A5.28 ER100S-G	WSG FK620	16834-A W 62 6 I1 Mn3Ni1Mo	43

AWS	Product	DIN EN ISO	Page
A5.28 ER100S-G, A5.28 ER110S-G	ED-FK1	16834-A G 69 4 M21 Mn3Ni1CrMo	11
A5.28 ER100S-G, A5.28 ER110S-G	WSG FK1	16834-A W 69 4 I1 Mn3Ni1CrMo	42
A5.28 ER110S-1	ED-ER110S-1	-	7
A5.28 ER110S-1	WSG ER110S-1	-	39
A5.28 ER110S-G	ED-FK850	16834-A G 79 5 M21 Mn4Ni1,5CrMo	13
A5.28 ER110S-G, A5.28 ER100S-1	ED-FK800	16834-A G 69 6 M21 Mn4Ni1,5CrMo	12
A5.28 ER120S-1	WSG ER120S-1	-	40
A5.28 ER120S-1	ED-ER120S-1	-	8
A5.28 ER120S-G	ED-FK1150	16834-A GZ 96 4 M21 Mn4Ni2,5CrMo	16
A5.28 ER120S-G	ED-FK1000	16834-A G 89 6 M21 Mn4Ni2CrMo	14
A5.28 ER120S-G	ED-FK1100	16834-A G 89 5 M21 Mn4Ni2,5CrMo	15
A5.28 ER120S-G	WSG FK1000	16834-A W 89 5 I1 Mn4Ni2CrMo	45
A5.28 R90S-B24	WSG P24	21952-A W ZCrMo2VNB	53



MIG (GMAW) wires
for unalloyed and weathering steels

Product	C	Si	Mn	Cr	Ni	Mo	Other
ED-SG 1	0,09	0,60	1,15				
ED-SG 1A	0,04	0,55	1,20				Ti=0,10 Zr=0,07 Al=0,10
ED-SG 2	0,09	0,87	1,47				
ED-SG 3	0,09	0,95	1,67				
ED-SG NiCu	0,08	0,80	1,40		0,80		Cu=0,40

MIG (GMAW) wires
for high strength fine grain structural steels

Product	C	Si	Mn	Cr	Ni	Mo	Other
ED-ER100S-1	0,06	0,45	1,50	0,10	1,65	0,40	
ED-ER110S-1	0,09	0,50	1,70	0,20	2,00	0,45	
ED-ER120S-1	0,09	0,35	1,55	0,35	2,50	0,55	
ED-A 31 (G4Mo)	0,09	0,70	1,95			0,50	
ED-FK620	0,08	0,60	1,70		0,95	0,38	Ti=0,08
ED-FK1	0,09	0,52	1,57	0,30	1,40	0,25	V=0,09
ED-FK800	0,09	0,55	1,67	0,25	1,60	0,50	Ti=0,07
ED-FK850	0,09	0,74	1,73	0,30	1,82	0,55	Ti=0,07
ED-FK1000	0,09	0,80	1,80	0,30	2,25	0,55	
ED-FK1100	0,10	0,80	1,90	0,45	2,40	0,60	
ED-FK1150	0,1	0,5	1,4	0,5	2,7	0,5	

All values in percent by weight

MIG (GMAW) wires
for creep resisting steels

Product	C	Si	Mn	Cr	Ni	Mo	Other
ED-SG Mo	0,10	0,60	1,15			0,52	
ED-SG CrMo1	0,10	0,60	1,00	1,20		0,52	
ED-ER70S-B2L	0,05	0,55	0,55	1,35		0,50	
ED-ER80S-B2	0,09	0,55	0,55	1,35		0,50	
ED-SG CrMo2	0,08	0,60	0,92	2,45		1,00	
ED-ER80S-B3L	0,05	0,55	0,55	2,50		1,05	
ED-ER90S-B3	0,09	0,55	0,55	2,50		1,05	
ED-SG CrMo5	0,08	0,35	0,55	6,00		0,65	
ED-ER80S-B8	0,08	0,40	0,60	8,90	0,20	1,00	
ED-SG P91	0,10	0,32	0,50	9,20	0,45	0,95	V=0,20 Nb=0,05
ED-SG P92	0,10	0,30	0,65	9,00	0,50	0,40	V=0,15 W=1,60 Nb=0,05

MIG (GMAW) wires
for low temperature service

Product	C	Si	Mn	Cr	Ni	Mo	Other
ED-ER80S-Ni1	0,09	0,50	1,05		0,90		
ED-SG Ni2,5	0,09	0,52	1,10		2,45		

MIG (GMAW) wires
for hardfacing

Product	C	Si	Mn	Cr	Ni	Mo	Other
ED-A 350	0,1	0,5	0,6	5,5		0,6	
ED-A 35	0,7		2,0	1,0			
ED-A 60	0,45	3,00	0,40	9,50			

All values in percent by weight

**TIG welding rods
for unalloyed and weather resisting steels**

Product	C	Si	Mn	Cr	Ni	Mo	Other
WSG 1	0,09	0,60	1,15				
WSG 1A	0,03	0,55	1,20				Ti=0,10 Zr=0,07 Al=0,10
WSG 2	0,09	0,87	1,47				
WSG 3	0,09	0,95	1,67				
WSG NiCu	0,08	0,80	1,40		0,80		Cu=0,40

**TIG welding rods
for high strength fine grain structural steels**

Product	C	Si	Mn	Cr	Ni	Mo	Other
WSG ER100S-1	0,06	0,45	1,50	0,10	1,65	0,40	
WSG ER110S-1	0,09	0,50	1,70	0,20	2,00	0,45	
WSG ER120S-1	0,09	0,35	1,55	0,35	2,50	0,55	
WSG A 31	0,09	0,70	1,95			0,50	
WSG FK1	0,09	0,52	1,57	0,30	1,40	0,25	V=0,09
WSG FK620	0,08	0,60	1,70		0,95	0,38	Ti=0,08
WSG S3NiMo1	0,12	0,20	1,75		0,90	0,55	
WSG FK1000	0,09	0,80	1,80	0,31	2,20	0,55	Ti=0,06

All values in percent by weight

Product	C	Si	Mn	Cr	Ni	Mo	Other
WSG Mo	0,10	0,60	1,15			0,52	
WSG CrMo1	0,10	0,60	1,00	1,20		0,52	
WSG ER70S-B2L	0,03	0,54	0,53	1,39		0,50	
WSG ER80S-B2	0,09	0,55	0,55	1,35		0,50	
WSG CrMo2	0,08	0,60	0,92	2,45		1,00	
WSG ER80S-B3L	0,04	0,52	0,58	2,48		0,96	
WSG ER90S-B3	0,09	0,55	0,55	2,50		1,05	
WSG P24	0,10	0,25	0,90	2,30		1,00	V=0,30 Nb=0,02
WSG CrMo5	0,08	0,35	0,55	6,00		0,65	
WSG ER80S-B8	0,08	0,40	0,60	8,90	0,20	1,00	
WSG P91	0,10	0,32	0,50	9,20	0,45	0,95	V=0,20 Nb=0,05
WSG P92	0,10	0,35	0,44	8,80	0,50	0,40	V=0,20 W=1,60 Nb=0,05

**TIG welding rods
for low temperature service**

Product	C	Si	Mn	Cr	Ni	Mo	Other
WSG ER80S-Ni1	0,09	0,50	1,05		0,90		
WSG Ni2,5	0,09	0,52	1,10		2,45		

**SAW (submerged arc welding) wires
for mild and low alloyed steel**

Product	C	Si	Mn	Cr	Ni	Mo	Other
UP-99 (S1)	0,08	0,10	0,50				
UP-100 (S2)	0,09	0,12	1,05				
UP-100 Si (S2Si)	0,11	0,28	1,00				
UP-101 (S3)	0,12	0,08	1,55				
UP-101 Spezial (S3Si)	0,11	0,30	1,72				
UP-100 Mo (S2Mo)	0,09	0,15	1,05			0,52	
UP-101 Mo (S3Mo)	0,12	0,15	1,52			0,52	
UP-EM13K	0,09	0,55	1,15				
UP-EM14K	0,08	0,55	1,20				P=0,010 S=0,015 Ti=0,10 N=0,0040
UP-EH11K	0,09	0,95	1,67				

**SAW (submerged arc welding) wires
for high strength fine grain structural steels**

Product	C	Si	Mn	Cr	Ni	Mo	Other
UP-101 1Ni ¹ / ₄ Mo (S3 1Ni ¹ / ₄ Mo)	0,10	0,22	1,45		0,90	0,25	
UP-101 NiMo1 (S3NiMo1)	0,12	0,20	1,75		0,90	0,55	
UP-100 CrNiMo1 (S2CrNiMo1)	0,10	0,25	1,10	1,00	0,95	0,55	
UP-101 NiCrMo2,5 (S3NiCrMo2,5)	0,11	0,17	1,40	0,70	2,40	0,55	
UP-EM2	0,08	0,35	1,50	0,25	1,90	0,45	
UP-EM4	0,09	0,35	1,55	0,35	2,50	0,55	P=0,006 S=0,008

All values in percent by weight

**SAW (submerged arc welding) wires
for creep resisting steels**

Product	C	Si	Mn	Cr	Ni	Mo	Other
UP-100 CrMo1 (S2CrMo1)	0,10	0,17	0,95	1,20		0,52	
UP-99 CrMo2 (S1CrMo2)	0,11	0,15	0,55	2,40		1,00	
UP-P24	0,09	0,25	0,55	2,35		1,00	V=0,26 Nb=0,04
UP-99 CrMo5 (S1CrMo5)	0,08	0,30	0,50	6,00		0,60	
UP-EB8	0,08	0,40	0,60	8,60	0,20	1,00	
UP-P91 (S1CrMo91)	0,10	0,32	0,50	9,20	0,45	0,95	V=0,20 Nb=0,05
UP-P92	0,10	0,30	0,50	9,00	0,50	0,40	V=0,15 W=1,60 Nb=0,05

**SAW (submerged arc welding) wires
for low temperature service**

Product	C	Si	Mn	Cr	Ni	Mo	Other
UP-100 Ni1 (S2Ni1)	0,10	0,10	1,00		0,90		
UP-ENi1K	0,09	0,65	1,05		0,90		
UP-100 Ni2 (S2Ni2)	0,08	0,12	1,05		2,25		
UP-100 Ni3 (S2Ni3)	0,09	0,17	1,05		3,20		

**SAW (submerged arc welding) wires
for weathering steels**

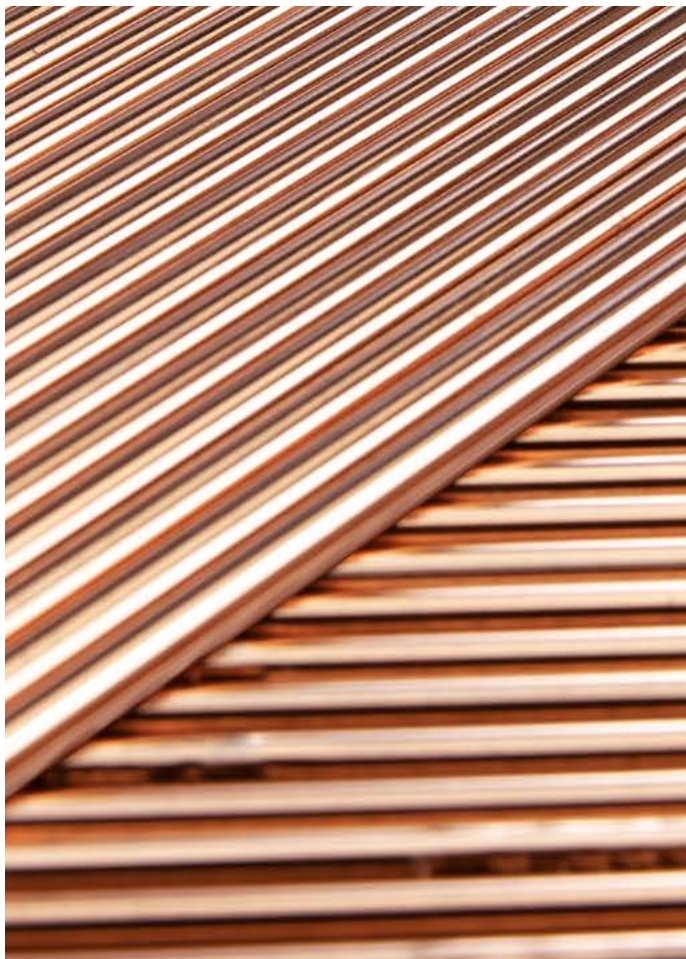
Product	C	Si	Mn	Cr	Ni	Mo	Other
UP-100 NiCu1 (S2NiCu1)	0,10	0,25	1,00		0,85		Cu=0,47

All values in percent by weight

Product	C	Si	Mn	Cr	Ni	Mo	Other
UP-S3 TiB	0,08	0,25	1,55				Ti=0,15 B=0,0012
UP-S3 ½MoTiB	0,11	0,08	1,25			0,35	Ti=0,05 B=0,005
UP-S2 MoTiB	0,08	0,25	1,15			0,52	Ti=0,14 B=0,011
UP-S3 MoTiB	0,08	0,25	1,25			0,52	Ti=0,14 B=0,011

Gas welding rods
for mild and low alloyed steel

Product	C	Si	Mn	Cr	Ni	Mo	Other
U 39 (G I)	0,08	0,10	0,50				
U 40 (G II)	0,09	0,15	1,10				
U 40 Ni (G III)	0,08	0,10	1,10		0,40		
U 47 Mo (G IV)	0,10	0,15	1,05			0,50	
U 49 CrMo (G V)	0,12	0,15	0,95	1,15		0,50	
U 50 CrMo (G VI)	0,08	0,15	0,55	2,10		1,00	



MIG



ED-SG 1

MIG (GMAW) wires for mild steels

FLIESS
SINCE 1915

Classification DIN EN ISO

14341-A G 42 2 C1 2Si

Material No.

1.5112

Classification AWS

A5.18 ER70S-3

Approvals

CE

Characteristics and application

MIG/GMAW wire for welding standard CMn structural steels. Typical applications would include shipbuilding, pressure vessels and construction.

Base materials

For steels up to a yield strength of 420MPa (60ksi).
S185-E360, S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S420N, S275M-S420M, P235GH-P355GH, P275N-P355N, P355M-P420M, P355Q
ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1
API: 5L grades X42-X60

Typical analysis in %

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

Yield strength in Mpa

≥ 420

Tensile strength in Mpa

≥ 500

Elongation in %

4d/5d: ≥22/20

Charpy-V-Value (ISO-V) in J

RT ≥ 100
-20°C ≥ 47

Typical heat treatment

Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si)
MIG/GMAW: ED-SG 1A, ED-SG 2, ED-SG 3
TIG/GTAW: WSG 1, WSG 1 A, WSG 2, WSG 3
Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO

14341-A G 46 A M21 2Ti

Material No.

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Classification AWS

A5.18 ER70S-2

Approvals

CE

Characteristics and application

MIG/GMAW wire for welding standard CMN structural steels. Typical applications would include shipbuilding, pressure vessels and construction.

Base materials

For steels up to a yield strength of 460MPa (65ksi).
 S185-E360, S235JR-S355JR, S235J0-S450J0, S235J2-S355J2, S275N-S460N, S275M-S460M, S460Q, P235GH-P355GH, P275N-P460N, P355M-P460M, P355Q-P460Q
 ASTM: A27, A36, A106 grades A/B/C, A139, A210 grades A1/C, A214, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1
 API: 5L grades X42-X60

Typical analysis in %

C: 0,04
 Si: 0,55
 Mn: 1,20
 Ti: 0,10
 Zr: 0,07
 Al: 0,10

Yield strength in Mpa

≥ 460

Tensile strength in Mpa

≥ 560

Elongation in %

4d/5d: ≥22/20

Charpy-V-Value (ISO-V) in J

RT ≥ 100
 -30°C: ≥ 27

Typical heat treatment

Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si)
 MIG/GMAW: ED-SG 1A, ED-SG 2, ED-SG 3
 TIG/GTAW: WSG 1, WSG 1 A, WSG 2, WSG 3
 Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO

14341-A G 42 5 M21 3Si1

Material No.

1.5125

Classification AWS

A5.18 ER70S-6

Approvals

TÜV 02413, CE, DB 42.045.02

Characteristics and application

MIG/GMAW wire for welding standard CMN structural steels. Typical applications would include shipbuilding, pressure vessels and construction.

Base materials

For steels up to a yield strength of 420MPa (60ksi).

S185-E360, S235JR-S355JR, S235J0-S355J0, S235J2-S355J2, S275N-S420N, S275NL-S420NL, S275M-S420M, S275ML-S420ML, P235GH-P355GH, P275N-P355N, P275NL1-P355NL1, P275NL2-P355NL2, P355M-P420M, P355ML1-P420ML1, P355ML2-P420ML2, P355Q, P355QL1, P355QL2

ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1

API: 5L grades X42-X60

Typical analysis in %

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

Yield strength in Mpa

≥ 420

Tensile strength in Mpa

≥ 500

Elongation in %

4d/5d: ≥22/20

Charpy-V-Value (ISO-V) in J

RT ≥ 100
 -50°C ≥ 47

Typical heat treatment

Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si)
 MIG/GMAW: ED-SG 1A, ED-SG 2, ED-SG 3
 TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3
 Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO

14341-A G 46 5 M21 4Si1, 14341-A G 46 5 M32 4Si1, 14341-A G 46 4 C1 4Si1

Material No.

1.5130

Classification AWS

A5.18 ER70S-6

Approvals

TÜV 02332, CE, DB 42.045.03, VG 95132

Characteristics and application

MIG/GMAW wire for welding standard CMn structural steels. Typical applications would include shipbuilding, pressure vessels and construction.

Base materials

For steels up to a yield strength of 460MPa (65ksi).

S185-E360, S235JR-S355JR, S235J0-S450J0, S235J2-S355J2, S275N-S460N, S275M-S460M, S460Q, S460QL, P235GH-P355GH, P275N-P460N, P275NL1-P460NL1, P355M-P460M, P355ML1-P460ML1, P355Q-P460Q, P355QL1-P460QL1

ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1

API: 5L grades X42-X60

Typical analysis in %

C: 0,09
Si: 0,95
Mn: 1,67

Yield strength in Mpa

≥ 460

Tensile strength in Mpa

≥ 530

Elongation in %

4d/5d: ≥ 20

Charpy-V-Value (ISO-V) in J

RT ≥ 100
-50°C ≥ 47

Typical heat treatment

Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si)
MIG/GMAW: ED-SG 1A, ED-SG 2, ED-SG 3
TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3
Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO

14341-A G 42 2 M21 Z2NiCu

Material No.

-

Classification AWS

A5.28 ER80S-G

Approvals

CE, DB 42.045.10

Characteristics and application

MIG/GMAW wire for weathering steels like Corten and Patinax. Weathering steels with controlled additions of Cu provide improved corrosion resistance compared to CMn steels. The improved resistance to atmospheric corrosion means these steels find use for architectural applications and also for welding CMn steels to prevent preferential corrosion of the weld.

Base materials

For weather resistant construction steels, commonly referred to as weathering steels. S235J0W-S355J0W, S235J2W-S355J2W, S355J0WP, S355J2WP, S355K2W
 ASTM: A242 grades 1/2, A588 grades A/B/C/K, A606, A709 grade 50W
 Corten, Patinax

Typical analysis in %

C: 0,08
 Si: 0,80
 Mn: 1,40
 Ni: 0,80
 Cu: 0,40

Yield strength in Mpa

≥ 450

Tensile strength in Mpa

≥ 550

Elongation in %

4d/5d: ≥22

Charpy-V-Value (ISO-V) in J

RT ≥ 80
 -20°C ≥ 47

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-100 NiCu1 (S2NiCu1)
 TIG/GTAW: WSG NiCu

Classification DIN EN ISO

16834-A G 62 5 M21 Mn3Ni1,5Mo

Material No.

-

Classification AWS

A5.28 ER100S-1

Approvals

CE

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -50°C. Typical applications can be found in crane construction, mining, shipbuilding, automotive and pressure vessel industries.

Base materials

For high strength fine-grained structural steels up to yield strength 690MPa (100ksi). S500Q-S690Q, S500QL-S690QL, S500QLN-S690QLN, P500Q-P690Q, P500QL1-P690QL1, P500QL2-P690QL2, S770QL
ASTM A514 Steel Grades
EH62, EH69

Typical analysis in %

C: 0,06
Si: 0,45
Mn: 1,50
Cr: 0,10
Ni: 1,65
Mo: 0,40

Yield strength in Mpa

≥ 610

Tensile strength in Mpa

≥ 690

Elongation in %

4d/5d: ≥18

Charpy-V-Value (ISO-V) in J

RT ≥ 100
-50°C ≥ 68

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK800
TIG/GTAW: WSG FK1

Classification DIN EN ISO

-

Material No.

-

Classification AWS

A5.28 ER110S-1

Approvals

CE

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -50°C. Typical applications can be found in crane construction, mining, shipbuilding and pressure vessel industries.

Base materials

For high strength fine-grained structural steels up to yield strength 690MPa (100ksi). S500Q-S690Q, S500QL-S690QL, S500QLN-S690QLN, P500Q-P690Q, P500QL1-P690QL1, P500QL2-P690QL2, S770QL
 ASTM A514 Steel Grades
 HY 100

Typical analysis in %

C: 0,09
 Si: 0,50
 Mn: 1,70
 Cr: 0,20
 Ni: 2,00
 Mo: 0,45

Yield strength in Mpa

≥ 660

Tensile strength in Mpa

≥ 760

Elongation in %

4d/5d: ≥17

Charpy-V-Value (ISO-V) in J

RT ≥ 100
 -50°C ≥ 68

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW ED-FK800
 TIG/GTAW: WSG FK100S-1
 SAW: UP-EM2

Classification DIN EN ISO
-
Material No.
-
Classification AWS
A5.28 ER120S-1
Approvals
CE
Characteristics and application
MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -60°C. Typical applications are mining, mobile cranes, shipbuilding, concrete pumps and pressure vessel industries.
Base materials
For high strength fine-grained structural steels up to tensile strength 830MPa (120ksi). S690Q-S890Q, S690QL-S890QL, S690QLN-S890QLN, HY 100

Typical analysis in %
C: 0,09 Si: 0,35 Mn: 1,55 Cr: 0,35 Ni: 2,50 Mo: 0,55
Yield strength in Mpa
≥ 730
Tensile strength in Mpa
≥ 830
Elongation in %
4d/5d: ≥14
Charpy-V-Value (ISO-V) in J
RT ≥ 70 -50°C ≥ 68
Typical heat treatment
Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.
Other products
MIG/GMAW: ED-FK1000, ED-FK1100 TIG/GTAW: WSG FK1000

ED-A 31 (G4Mo)

MIG (GMAW) wires for high strength structural steels (MnMo)

FLIESS
SINCE 1915

Classification DIN EN ISO

14341-A G 50 7 M21 4Mo, 14341-B S4M31

Material No.

-

Classification AWS

A5.28 ER80S-D2, A5.28 ER90S-D2

Approvals

CE

Characteristics and application

MIG/GMAW wire for welding of high strength steels, used predominantly after stress relieving. Predominantly used for welding high strength steels, providing a good combination of strength and toughness. May find use for joining creep resistance steels up to about 500°C.

Base materials

For a wide range of engineering steels with a yield strength up to 540MPa (78ksi) and tensile strength up to 620MPa (90ksi). S355NL-S460NL, S355ML-S460ML, S460QL-S550QL, P235GH-P355GH, 16Mo3, 15NiCuMoNb5-6-4
ASTM: A182 grade F36, A213 grade T36, A335 grade P36, A487 grades 2A/B/C
AISI: 4130

Typical analysis in %

C: 0,09
Si: 0,70
Mn: 1,95
Mo: 0,50

Yield strength in Mpa

≥ 560

Tensile strength in Mpa

≥ 620

Elongation in %

4d/5d: ≥18

Charpy-V-Value (ISO-V) in J

RT ≥ 160
-70°C ≥ 47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-SG Mo
TIG/GTAW: WSG A 31 (G4Mo)

Classification DIN EN ISO

16834-A G 62 6 M21 Mn3Ni1Mo

Material No.

-

Classification AWS

A5.28 ER100S-G

Approvals

TÜV 18992, VG 95132, DB 42.045.23, CE

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for many structural and construction applications including: mobile cranes, concrete pumps, pipelines, mining equipment, tankers and containers.

Base materials

For high strength fine-grained structural steels up to yield strength 620MPa. S500Q-S620Q, S500QL-S620QL, P500Q-P620Q, P500QL1-P620QL1 Alform Plate 620 M, NAXTRA 620, Strenx 600

Typical analysis in %

C: 0,08
Si: 0,60
Mn: 1,70
Ni: 0,95
Mo: 0,38
Ti: 0,08

Yield strength in Mpa

≥ 620

Tensile strength in Mpa

≥ 760

Elongation in %

4d/5d: ≥18

Charpy-V-Value (ISO-V) in J

RT ≥ 100
-60°C ≥ 47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

TIG/GTAW: WSG FK620

Classification DIN EN ISO

16834-A G 69 4 M21 Mn3Ni1CrMo

Material No.

-

Classification AWS

A5.28 ER100S-G, A5.28 ER110S-G

Approvals

TÜV 03691, CE, DB 42.045.04

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for many structural and construction applications including: mobile cranes, concrete pumps, pipelines, mining equipment, tankers and containers.

Base materials

For high strength fine-grained steels with yield strength up to 690MPa (100ksi). S500Q-S690Q, S500QL-S690QL, P500Q-P690Q, P500QL1-P690QL1
 Alform plate 700 M, NAXTRA 700, Strenx 700, Dillimax 690
 ASTM: A514, HY80, HY100, Q1(N)

Typical analysis in %

C: 0,09
 Si: 0,52
 Mn: 1,57
 Cr: 0,30
 Ni: 1,40
 Mo: 0,25
 V: 0,09

Yield strength in Mpa

≥ 690

Tensile strength in Mpa

≥ 790

Elongation in %

4d/5d: ≥ 16

Charpy-V-Value (ISO-V) in J

RT ≥ 80
 -40°C ≥ 47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK800, ED-FK850
 TIG/GTAW: WSG FK1

Classification DIN EN ISO

16834-A G 69 6 M21 Mn4Ni1,5CrMo

Material No.

-

Classification AWS

A5.28 ER110S-G, ~A5.28 ER100S-1

Approvals

TÜV 10268, DB 42.045.18, ABS, BV, LR, RINA, RS, DNV, CE, VG 95132

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -60°C. Typical applications can be found in crane construction, mining, shipbuilding, automotive and pressure vessel industries.

Base materials

For high strength fine-grained structural steels up to yield strength 690MPa (100ksi). S500Q-S690Q, S500QL-S690QL, S500QLN-S690QLN, P500Q-P690Q, P500QL1-P690QL1, P500QL2-P690QL2, S770QL
ASTM A514 Steel Grades
EH62, EH69

Typical analysis in %

C: 0,09
Si: 0,55
Mn: 1,67
Cr: 0,25
Ni: 1,60
Mo: 0,50
Ti: 0,07

Yield strength in Mpa

≥ 720

Tensile strength in Mpa

≥ 790

Elongation in %

4d/5d: ≥ 17

Charpy-V-Value (ISO-V) in J

RT ≥ 100
-60°C ≥ 47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK 850, ED-FK1
TIG/GTAW: WSG FK1

Classification DIN EN ISO

16834-A G 79 5 M21 Mn4Ni1,5CrMo

Material No.

-

Classification AWS

A5.28 ER110S-G

Approvals

CE

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -60°C. Typical applications can be found in crane construction, mining, shipbuilding, automotive and pressure vessel industries.

Base materials

For high strength fine-grained structural steels up to yield strength 770 MPa (100ksi). S500Q-S690Q, S500QL-S690QL, S500QLN-S690QLN, P500Q-P690Q, P500QL1-P690QL1, P500QL2-P690QL2, S770QL
ASTM A514 Steel Grades
EH62, EH69

Typical analysis in %

C: 0,09
Si: 0,74
Mn: 1,73
Cr: 0,30
Ni: 1,82
Mo: 0,55
Ti: 0,07

Yield strength in Mpa

≥ 790

Tensile strength in Mpa

≥ 880

Elongation in %

4d/5d: ≥16

Charpy-V-Value (ISO-V) in J

RT ≥ 90
-50°C ≥ 47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK 800, ED-FK1000
TIG/GTAW: WSG FK1000

Classification DIN EN ISO

16834-A G 89 6 M21 Mn4Ni2CrMo

Material No.

-

Classification AWS

A5.28 ER120S-G

Approvals

TÜV 04015, CE, DB 42.045.09, DNV

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -60°C.

Typical applications are mining, mobile cranes, shipbuilding, concrete pumps, automotive and pressure vessel industries.

Base materials

For high strength fine-grained structural steels up to yield strength 890MPa (129ksi). S690Q-S890Q, S690QL-S890QL, S690QLN-S890QLN, S960QL, S1100QL, S1300QL

Typical analysis in %

C: 0,09
Si: 0,80
Mn: 1,80
Cr: 0,30
Ni: 2,25
Mo: 0,55

Yield strength in Mpa

≥ 890

Tensile strength in Mpa

≥ 940

Elongation in %

4d/5d: ≥15

Charpy-V-Value (ISO-V) in J

RT ≥ 70
-60°C ≥ 47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK1100
TIG/GTAW: WSG FK1000

Classification DIN EN ISO

16834-A G 89 5 M21 Mn4Ni2,5CrMo

Material No.

-

Classification AWS

A5.28 ER120S-G

Approvals

TÜV 20059, CE, DB 42.045.24

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications.

Typical applications are mobile cranes, concrete pumps and automotive applications.

Base materials

For welding of high strength quenched and tempered or thermomechanically rolled fine-grained structural steels.

S890QL, S890MC, S960QL, S960 MC, S1100QL, S1300QL

Typical analysis in %

C: 0,10
Si: 0,80
Mn: 1,90
Cr: 0,45
Ni: 2,40
Mo: 0,60

Yield strength in Mpa ≥ 960 **Tensile strength in Mpa** ≥ 1050 **Elongation in %**4d/5d: ≥ 15 **Charpy-V-Value (ISO-V) in J**

RT ≥ 60
-50°C ≥ 47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK1000, ED-FK1150
TIG/GTAW: WSG FK1000

Classification DIN EN ISO
16834-A GZ 96 4 M21 Mn4Ni2,5CrMo
Material No.
-
Classification AWS
A5.28 ER120S-G
Approvals
CE
Characteristics and application
MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications. Typical applications are mobile cranes.
Base materials
For welding of high strength quenched and tempered or thermomechanically rolled fine-grained structural steels. S890QL, S890MC, S960QL, S960 MC, S1100QL, S1300QL

Typical analysis in %
C: 0,1 Si: 0,5 Mn: 1,4 Cr: 0,5 Ni: 2,7 Mo: 0,5
Yield strength in Mpa
≥ 1000
Tensile strength in Mpa
≥ 1150
Elongation in %
4d/5d: ≥14
Charpy-V-Value (ISO-V) in J
RT ≥ 90 -20°C ≥ 50
Typical heat treatment
Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.
Other products
MIG/GMAW: FK1100 TIG/GTAW: WSG FK1000

Classification DIN EN ISO

14341-A G 42 2 C1 2Mo, 14341-A G 46 6
M21 2Mo, 21952-A G MoSi

Material No.

1.5424

Classification AWS

A5.28 ER70S-A1, A5.28 ER80S-G

Approvals

TÜV 03465, CE, DB 42.045.07

Characteristics and application

MIG/GMAW wire for 0.5%Mo steels, which are used at service temperatures up to 500°C and for some sub-zero structural applications. The 0.5% alloying improves creep performance compared to CMn steels and sees the alloy being used for boiler, pressure vessel and piping construction as well as in general structural engineering.

Base materials

For similar alloyed high temperature steels and cast steels, ageing resistant and steels resistant to caustic cracking.
S355, P235G1TH-P255G1TH, P310GH, L320, L360NB-L415NB, 16Mo3
ASTM: A182/A336 grade F1, A204 grades A/B/C, A209/A250 grade T1, A217 grade WC1, A335 grade P1, A352 grade LC1

Typical analysis in %

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

Yield strength in Mpa

≥ 460

Tensile strength in Mpa

≥ 560

Elongation in %

4d/5d: ≥22

Charpy-V-Value (ISO-V) in J

RT ≥ 100
-40°C ≥ 47

Typical heat treatment

Preheat temperature: Dependent on material thickness
Interpass temperature: max. 250°C
PWHT: AW or 650°C

Other products

SAW: UP-100 Mo (S2Mo), UP-101 Mo (S3Mo)
TIG/GTAW: WSG Mo
Gas welding: U 47 Mo (G IV)

Classification DIN EN ISO
21952-A G CrMo1Si
Material No.
1.7339
Classification AWS
A5.28 ER80S-G
Approvals
TÜV 04292, CE, DB 42.045.12
Characteristics and application
MIG/GMAW wire for high temperature creep resistant 1.25%Cr-0.5%Mo ferritic steels, i.e. P11/P12. These steels are used for creep resisting applications up to ~550°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor (X < 10 ppm) for temper embrittlement resistant applications.
Base materials
For matching 1.25%Cr-0.5%Mo creep resisting ferritic steels. 13CrMo 4-4, 13CrMo 4-5, 16CrMo 4-4, G-17CrMo 5-5 ASTM: A182 grades F11/F12, A199/A200 grade T11, A217 grades WC6/WC11, A234 grades WP11/WP12, A335 grades P11/P12, A387 grades 11/12

Typical analysis in %
C: 0,10 Si: 0,60 Mn: 1,00 Cr: 1,20 Mo: 0,52
Yield strength in Mpa
≥ 355
Tensile strength in Mpa
≥ 510
Elongation in %
4d/5d: ≥20
Charpy-V-Value (ISO-V) in J
RT ≥ 100 -10°C ≥ 47
Typical heat treatment
Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 620°C - 690°C
Other products
SAW: UP-100 CrMo1 MIG/GMAW: ED-ER80S-B2, ED-ER70S-B2L TIG/GTAW: WSG CrMo1, WSG ER80S-B2, WSG ER70S-B2L Gas welding: U 49 CrMo (G V)

Classification DIN EN ISO

21952-B G 1CML

Material No.

-

Classification AWS

A5.28 ER70S-B2L

Approvals

CE

Characteristics and application

MIG/GMAW wire for high temperature creep resistant 1.25%Cr-0.5%Mo ferritic steels, i.e. P11/P12. These steels are used for creep resisting applications up to ~550°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor ($X < 10$ ppm) for temper embrittlement resistant applications.

Base materials

For matching 1.25%Cr-0.5%Mo creep resisting ferritic steels.
 13CrMo 4-4, 13CrMo 4-5, 16CrMo 4-4, GS-17CrMo 5-5
 ASTM: A182 grades F11/F12, A199/A200 grade T11, A217 grades WC6/WC11, A234 grades WP11/WP12, A335 grades P11/P12, A387 grades 11/12

Typical analysis in %

C: 0,05
 Si: 0,55
 Mn: 0,55
 Cr: 1,35
 Mo: 0,50

Yield strength in Mpa

≥ 470

Tensile strength in Mpa

≥ 550

Elongation in %

4d/5d: ≥19

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Preheat temperature: 200°C
 Interpass temperature: max. 300°C
 PWHT: 620°C - 690°C

Other products

SAW: UP-100 CrMo 1
 MIG/GMAW: ED-SG CrMo 1
 TIG/GTAW: WSG CrMo 1 or WSG ER80S-B2
 Gas welding: U 49 CrMo

Classification DIN EN ISO
21952-B G 1CM
Material No.
-
Classification AWS
A5.28 ER80S-B2
Approvals
CE
Characteristics and application
MIG/GMAW wire for high temperature creep resistant 1.25%Cr-0.5%Mo ferritic steels, i.e. P11/P12. These steels are used for creep resisting applications up to ~550°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor (X < 10 ppm) for temper embrittlement resistant applications.
Base materials
For matching 1.25%Cr-0.5%Mo creep resisting ferritic steels. 13CrMo 4-4, 13CrMo 4-5, 16CrMo 4-4, GS-17CrMo 5-5 ASTM: A182 grades F11/F12, A199/A200 grade T11, A217 grades WC6/WC11, A234 grades WP11/WP12, A335 grades P11/P12, A387 grades 11/12

Typical analysis in %
C: 0,09 Si: 0,55 Mn: 0,55 Cr: 1,35 Mo: 0,50
Yield strength in Mpa
≥ 470
Tensile strength in Mpa
≥ 550
Elongation in %
4d/5d: ≥19
Charpy-V-Value (ISO-V) in J
-
Typical heat treatment
Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 620°C - 690°C
Other products
SAW: UP-100 CrMo1 (S2CrMo1) MIG/GMAW: ED-SG CrMo1 TIG/GTAW: WSG CrMo1 Gas welding: U 49 CrMo (G V)

Classification DIN EN ISO

21952-A G CrMo2Si

Material No.

1.7384

Classification AWS

A5.28 ER90S-G

Approvals

TÜV 10966, CE, DB 42.045.20

Characteristics and application

MIG/GMAW wire for high temperature creep resistant 2.25%Cr-1%Mo ferritic steels, i.e. P21/P22. These steels are used for creep resisting applications up to ~600°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor (X < 10 ppm) for temper embrittlement resistant applications.

Base materials

For matching 2.5%Cr-1%Mo creep resisting ferritic steels.

10CrMo 9-10, G-17CrMo 9-10

ASTM: A182 grade F22, A199/A200 grades T21/T22, A213 grade T22, A217 grade WC9, A234 grade WP22, A335 grade P22, A387 grades 21/22

Typical analysis in %

C: 0,08
Si: 0,60
Mn: 0,92
Cr: 2,45
Mo: 1,00

Yield strength in Mpa

≥ 400

Tensile strength in Mpa

≥ 520

Elongation in %

4d/5d: ≥20

Charpy-V-Value (ISO-V) in J

RT ≥ 80

Typical heat treatment

Preheat temperature: 200°C
Interpass temperature: max. 300°C
PWHT: 690°C

Other products

SAW: UP-99 CrMo2 (S1CrMo2)
MIG/GMAW: ED-ER90S-B3, ED-ER80S-B3L
TIG/GTAW: WSG CrMo2, WSG ER90S-B3
Gas welding: U 50 CrMo (G VI)

Classification DIN EN ISO
21952-B G 2C1ML
Material No.
-
Classification AWS
A5.28 ER80S-B3L
Approvals
CE
Characteristics and application
MIG/GMAW wire for high temperature creep resistant 2.25%Cr-1%Mo ferritic steels, i.e. P21/P22. These steels are used for creep resisting applications up to ~600°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Bruscato Factor (X < 10 ppm) for temper embrittlement resistant applications.
Base materials
For matching 2.5%Cr-1%Mo creep resisting ferritic steels. 10CrMo 9-10, G-17CrMo 9-10 ASTM: A182 grade F22, A199/A200 grades T21/T22, A213 grade T22, A217 grade WC9, A234 grade WP22, A335 grade P22, A387 grades 21/22

Typical analysis in %
C: 0,05 Si: 0,55 Mn: 0,55 Cr: 2,50 Mo: 1,05
Yield strength in Mpa
≥ 540
Tensile strength in Mpa
≥ 620
Elongation in %
4d/5d: ≥17
Charpy-V-Value (ISO-V) in J
-
Typical heat treatment
Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 690°C
Other products
SAW: UP-99 CrMo2 (S1CrMo2), UP-100 CrMo2 (S2CrMo2) MIG/GMAW: ED-SG CrMo2 TIG/GTAW: WSG CrMo2 or WSG ER90S-B3 Gas welding: U 50 CrMo (G VI)

Classification DIN EN ISO

21952-B G 2C1M

Material No.

-

Classification AWS

A5.28 ER90S-B3

Approvals

CE

Characteristics and application

MIG/GMAW wire for high temperature creep resistant 2.25%Cr-1%Mo ferritic steels, i.e. P21/P22. These steels are used for creep resisting applications up to ~600°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor (X < 10 ppm) for temper embrittlement resistant applications.

Base materials

For matching 2.5%Cr-1%Mo creep resisting ferritic steels.

10CrMo 9-10, G-17CrMo 9-10

ASTM: A182 grade F22, A199/A200 grades T21/T22, A213 grade T22, A217 grade WC9, A234 grade WP22, A335 grade P22, A387 grades 21/22

Typical analysis in %

C: 0,09

Si: 0,55

Mn: 0,55

Cr: 2,50

Mo: 1,05

Yield strength in Mpa

≥ 540

Tensile strength in Mpa

≥ 620

Elongation in %

4d/5d: ≥17

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Preheat temperature: 200°C

Interpass temperature: max. 300°C

PWHT: 690°C

Other products

SAW: UP-99 CrMo2 (S1CrMo2)

MIG/GMAW: ED-SG CrMo2

TIG/GTAW: WSG CrMo2

Gas welding: U 50 CrMo (G VI)

Classification DIN EN ISO	Typical analysis in %
21952-A G CrMo5Si	C: 0,08 Si: 0,35 Mn: 0,55 Cr: 6,00 Mo: 0,65
Material No.	Yield strength in Mpa
1.7373	≥ 450
Classification AWS	Tensile strength in Mpa
A5.28 ER80S-B6	≥ 570
Approvals	Elongation in %
CE	4d/5d: ≥17
Characteristics and application	Charpy-V-Value (ISO-V) in J
MIG/GMAW wire for high temperature creep resistant 5%Cr0.5%Mo ferritic steels, i.e. P5. The 5%Cr-0.5%Mo creep resistant alloy is used for service up to ~600°C particularly in environments involving hot hydrogen gas. Typical applications are found in oil refineries.	RT ≥ 100
Base materials	Typical heat treatment
For matching 5%Cr-0.5%Mo creep resisting ferritic steels. X12CrMo5, GX12CrMo5 ASTM: A182/A336 grade F5, A199/A213 grade T5, A217 grade C5, A234 grade WP5, A335 grade P5, A387 grade 5	Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 745°C
	Other products
	SAW: UP-99 CrMo5 (S1CrMo5) TIG/GTAW: WSG CrMo5

ED-ER80S-B8

MIG (GMAW) wires for creep resisting steels

FLIESS
SINCE 1915

Classification DIN EN ISO

21952-A G CrMo9

Material No.

-

Classification AWS

A5.28 ER80S-B8

Approvals

CE

Characteristics and application

MIG/GMAW wire for high temperature creep resistant 9%Cr-1%Mo martensitic steels, i.e. P9. The 9%Cr-1%Mo creep resistant alloy is used for service up to ~600°C particularly in environments involving hot hydrogen gas. Typical applications are found in oil refineries.

Base materials

For matching 9%Cr-1%Mo creep resisting martensitic steels.
ASTM: A182/A336 F9, A199/A213 T9, A217 C12, A234 WP9, A335 P9, A387 9
X12CrMo 9 1, GX12CrMo 10 1
1.7386, 1.7688, 1.7389

Typical analysis in %

C: 0,08
Si: 0,40
Mn: 0,60
Cr: 8,90
Ni: 0,20
Mo: 1,00

Yield strength in Mpa

≥ 470

Tensile strength in Mpa

≥ 590

Elongation in %

4d/5d: ≥18

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Preheat temperature: 200°C
Interpass temperature: 300°C
PWHT: 745°C

Other products

TIG/GTAW: WSG ER80S-B8

Classification DIN EN ISO
21952-A G CrMo91
Material No.
1.4903
Classification AWS
A5.28 ER90S-B91
Approvals
CE
Characteristics and application
<p>MIG/GMAW wire for high temperature, creep resistant, modified 9%Cr1%Mo martensitic steels (T91/P91). T91 / P91 steel is commonly used at service temperatures up to 600°C. V, Nb and N additions provide this 'creep strength enhanced ferritic' (CSEF) alloy with improved high temperature creep resistance compared to standard CrMo creep resistant alloys. Alloy T91/P91 is widely used in the power generating industry for fossil fuel ultra-super-critical (USC) power plant boilers and turbines; the alloy is also finding applications in the chemical and oil and gas industries.</p> <p>Ni+Mn<1,0%, different Ni-contents on request. X-Factor <10ppm.</p>
Base materials
<p>For matching P91, 9%Cr1%Mo modified, creep resisting martensitic steels.</p> <p>X10CrMoVNB 9-1</p> <p>ASTM: A182/A336 grade F91, A213 grade T91, A217 grade C12A, A234 grade WP91, A335 grade P91, A387 grade 91</p>

Typical analysis in %
<p>C: 0,10 Si: 0,32 Mn: 0,50 Cr: 9,20 Ni: 0,45 Mo: 0,95 V: 0,20 Nb: 0,05</p>
Yield strength in Mpa
≥ 520
Tensile strength in Mpa
≥ 620
Elongation in %
4d/5d: ≥16
Charpy-V-Value (ISO-V) in J
RT ≥ 47
Typical heat treatment
<p>Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 760°C</p>
Other products
<p>SAW: UP-P91 (S1CrMo91) TIG/GTAW: WSG P91</p>

Classification DIN EN ISO

21952-A G ZCrMoWVNb9 0,5 1,5

Material No.

-

Classification AWS

A5.28 ER90S-B92

Approvals

CE

Characteristics and application

MIG/GMAW wire for high temperature, creep resistant, modified 9%Cr-1,7%W-0,5%Mo martensitic steels (T9/P92). T92/P92 steel is commonly used at service temperatures up to 620°C. W,V,Nb and N additions provide this 'creep strength enhanced ferritic' (CSEF) alloy with improved high temperature creep resistance compared to standard CrMo creep resistant alloys. Alloy T92/P92 is widely used in the power generating industry for fossil fuel ultra-super-critical (USC) power plant boilers and turbines; the alloy is also finding applications in the chemical and oil and gas industries.

Base materials

For matching P92, 9%Cr-1,7%W-0,5%Mo, creep resisting martensitic steels.
 X10CrWMoVNB 9-2
 ASTM: A182 grade F92, A213 grade T92, A235 grade P92, A387 grade 92

Typical analysis in %

C: 0,10
 Si: 0,30
 Mn: 0,65
 Cr: 9,00
 Ni: 0,50
 Mo: 0,40
 V: 0,15
 W: 1,60
 Nb: 0,05

Yield strength in Mpa

≥ 540

Tensile strength in Mpa

≥ 620

Elongation in %

4d/5d: ≥17

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Preheat temperature: 200°C
 Interpass temperature: max. 300°C
 PWHT: 760°C

Other products

SAW: UP-P92
 TIG/GTAW: WSG P92

Classification DIN EN ISO
14341-A G 50 6 M21 3Ni1
Material No.
-
Classification AWS
A5.28 ER80S-Ni1
Approvals
TÜV 10106, CE, DB 42.045.17
Characteristics and application
MIG/GMAW wire for steels where impact properties are required at -60°C. Applications include structural, oil and gas and offshore steelwork.
Base materials
For cryogenic construction steels and Ni bearing low temperature steels. 11MnNi5-3, 13MnNi6-3, S275NL-S460NL, S275ML-S460ML, P275NL2-P460NL2, P355ML2-P460ML2 ASTM: A333/A334 grades 1/6, A350 grades LF2/LF6, A352 grades LCB/LCC API: 5L X65

Typical analysis in %
C: 0,09 Si: 0,50 Mn: 1,05 Ni: 0,90
Yield strength in Mpa
≥ 500
Tensile strength in Mpa
≥ 560
Elongation in %
4d/5d: ≥18
Charpy-V-Value (ISO-V) in J
RT ≥ 80 -60°C ≥47
Typical heat treatment
Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.
Other products
SAW: UP-100 Ni1 (S2Ni1), UP-ENi1K TIG/GTAW: WSG ER80S-Ni1

Classification DIN EN ISO

14341-A G 46 7 M21 2Ni2

Material No.

-

Classification AWS

A5.28 ER80S-Ni2

Approvals

TÜV 06008, CE, DB 42.045.14, DNV

Characteristics and application

MIG/GMAW wire for steels where impact properties are required at -60°C (PWHT). Applications include structural, oil and gas and offshore steelwork.

Base materials

For cryogenic construction steels and Ni bearing low temperature steels.
 11MnNi5-3, 13MnNi6-3, S275NL-S460NL, S275ML-S460ML, P275NL2-P460NL2, P355ML2-P460ML2
 ASTM: A203 grade A/B, A333/A334 grades 1/6/7, A350 grade LF2/LF5/LF6, A352 grade LC1/LC2

Typical analysis in %

C: 0,09
 Si: 0,52
 Mn: 1,10
 Ni: 2,45

Yield strength in Mpa

≥ 470

Tensile strength in Mpa

≥ 570

Elongation in %

4d/5d: ≥24/20

Charpy-V-Value (ISO-V) in J

RT ≥ 100
 -70°C ≥ 47

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-100 Ni2 (S2Ni2)
 TIG/GTAW: WSG Ni2.5

Classification DIN EN ISO
14700 S Fe1, (DIN 8555 MSG 5-GZ-350)
Material No.
~1.7363
Classification AWS
-
Approvals
-
Characteristics and application
MIG/GMAW wire for hardfacing. The wire is used for applications requiring excellent impact resistance, or as a buffer layer prior to higher hardness deposits (eg. ED-A 60). The weld deposit has a nominal hardness of 350HB depending on welding parameters, base materials, shielding gas, preheat temperature and the applied welding technique.
Hardness
325-375 HB

Typical analysis in %
C: 0,1 Si: 0,5 Mn: 0,6 Cr: 5,5 Mo: 0,6
Charpy-V-Value (ISO-V) in J
-
Typical heat treatment
Weld procedure requirements dependent on material being surfaced.

ED-A 35

MIG (GMAW) wire for hardfacing

FLIESS
SINCE 1915

Classification DIN EN ISO

14700 S Fe2

Material No.

1.8405

Classification AWS

-

Approvals

-

Characteristics and application

MIG/GMAW wire for hardfacing. The wire is used for applications requiring excellent impact resistance, or as a buffer layer prior to higher hardness deposits (eg. ED-A 60). The weld deposit has a nominal hardness of 350HB and can be machined using most standard milling, turning and cutting techniques.

Hardness

325-375 HB

Typical analysis in %

C: 0,7
Mn: 2,0
Cr: 1,0

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Weld procedure requirements dependent on material being surfaced.

Classification DIN EN ISO

14700 S Fe8

Material No.

1.4718

Classification AWS

-

Approvals

-

Characteristics and application

MIG/GMAW wire for hardfacing. The wire is predominantly used for applications requiring good abrasion resistance such as mixers, crushers and earth moving equipment but deposits will withstand moderate impact. With final deposit hardness being nominally 60HRC the weld metal can only be ground. If very thick build-ups are required it is suggested that lower hardness wires (eg. ED-A 35) be used as a buffer layer.

Hardness

57 - 62 HRC

Typical analysis in %

C: 0,45
Si: 3,00
Mn: 0,40
Cr: 9,50

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Weld procedure requirements dependent on material being surfaced.

TIG



Classification DIN EN ISO

636-A W 42 4 2Si

Material No.

1.5112

Classification AWS

A5.18 ER70S-3

Approvals

TÜV 07253, CE

Characteristics and application

TIG/GTAW rod for welding standard CMn structural steels. Typical applications would include shipbuilding, pressure vessels and construction.

Base materials

For steels up to a yield strength of 420MPa (60ksi).

S185-E360, S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S420N, S275M-S420M, P235GH-P355GH, P275N-P355N, P355M-P420M, P355Q
 ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A214, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1
 API: 5L grades X42-X60

Typical analysis in %

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

Yield strength in Mpa

≥ 420

Tensile strength in Mpa

≥ 510

Elongation in %

4d/5d: ≥22/20

Charpy-V-Value (ISO-V) in J

RT ≥ 100
 -46°C ≥ 200

Typical heat treatment

Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si)
 MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 3
 TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3
 Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO
636-A W 46 2 2Ti
Material No.
-
Classification AWS
A5.18 ER70S-2
Approvals
TÜV 07299, CE
Characteristics and application
TIG/GTAW rod for welding standard CMn structural steels. Typical applications would include shipbuilding, pressure vessels and construction.
Base materials
Particularly for root pass welding of steels up to a yield strength of 460MPa (65ksi). S185-E360, S235JR-S355JR, S235JO-S450JO, S235J2-S355J2, S275N-S460N, S275M-S460M, S460Q, P235GH-P355GH, P275N-P460N, P355M-P460M, P355Q-P460Q ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A214, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1 API: 5L grades X42-X60

Typical analysis in %
C: 0,03 Si: 0,55 Mn: 1,20 Ti: 0,10 Zr: 0,07 Al: 0,10
Yield strength in Mpa
≥ 460
Tensile strength in Mpa
≥ 560
Elongation in %
4d/5d: ≥22/20
Charpy-V-Value (ISO-V) in J
RT ≥ 100 -20°C ≥ 47 -30°C ≥ 27
Typical heat treatment
Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.
Other products
SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si) MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 3 TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3 Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO

636-A W 46 5 3Si1

Material No.

1.5125

Classification AWS

A5.18 ER70S-6

Approvals

TÜV 02414, CE, DB 42.045.06

Characteristics and application

TIG/GTAW rod for welding standard CMn structural steels. Typical applications would include shipbuilding, pressure vessels and construction.

Base materials

For steels up to a yield strength of 420MPa (60ksi).
 S185-E360, S235JR-S355JR, S235J0-S355J0, S235J2-S355J2, S275N-S420N, S275NL-S420NL, S275M-S420M, S275ML-S420ML, P275N-P355N, P275NL1-P355NL1, P275NL2-P355NL2, P355M-P420M, P355ML2-P420ML2, P355Q, P355QL1
 ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A214, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1
 API: 5L grades X42-X60

Typical analysis in %

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

Yield strength in Mpa

≥ 460

Tensile strength in Mpa

≥ 560

Elongation in %

4d/5d: ≥22/20

Charpy-V-Value (ISO-V) in J

RT ≥ 100
 -50°C ≥ 47

Typical heat treatment

Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si)
 MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 3
 TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3
 Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO
636-A W 50 5 4Si1
Material No.
1.5130
Classification AWS
A5.18 ER70S-6
Approvals
CE
Characteristics and application
TIG/GTAW rod for welding standard CMn structural steels. Typical applications would include shipbuilding, pressure vessels and construction.
Base materials
For steels up to a yield strength of 460MPa (65ksi). S185-E360, S235JR-S355JR, S235JO-S450JO, S235J2-S355J2, S275N-S460N, S275M-S460M, S460Q, S460QL, P275N-P460N, P275NL1-P460NL1, P355M-P460M, P355ML1-P460ML1, P355Q-P460Q, P355QL1-P460QL1 ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A214, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1 API: 5L grades X42-X60

Typical analysis in %
C: 0,09 Si: 0,95 Mn: 1,67
Yield strength in Mpa
≥ 500
Tensile strength in Mpa
≥ 560
Elongation in %
4d/5d: ≥18
Charpy-V-Value (ISO-V) in J
RT ≥ 100 -50°C ≥ 80
Typical heat treatment
Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.
Other products
SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si) MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 3 TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3 Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO

636-A W 42 4 Z2NiCu

Material No.

-

Classification AWS

A5.28 ER80S-G

Approvals

CE, DB 42.045.19

Characteristics and application

TIG/GTAW rod for weathering steels. Weathering steels, with controlled additions of Cu, provide improved corrosion resistance compared to CMn steels. The improved resistance to atmospheric corrosion means these steels find use for architectural applications and also for welding CMn steels to prevent preferential corrosion of the weld.

Base materials

For weather resistant construction steels, commonly referred to as weathering steels. S235J0W-S355J0W, S235J2W-S355J2W, S355J0WP, S355J2WP, S355K2W3
ASTM: A242 grades 1/2, A588 grades A/B/C/K, A606, A709 grade 50W

Typical analysis in %

C: 0,08
Si: 0,80
Mn: 1,40
Ni: 0,80
Cu: 0,40

Yield strength in Mpa

≥ 450

Tensile strength in Mpa

≥ 550

Elongation in %

4d/5d: ≥22/20

Charpy-V-Value (ISO-V) in J

RT ≥ 80
-40°C ≥ 47

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-100 NiCu1 (S2NiCu1)
MIG/GMAW: ED-SG NiCu

Classification DIN EN ISO

16834-A G 62 5 M21 Mn3Ni1,5Mo

Material No.

-

Classification AWS

A5.28 ER100S-1

Approvals

CE

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -50°C. Typical applications can be found in crane construction, mining, shipbuilding, automotive and pressure vessel industries.

Base materials

For high strength fine-grained structural steels up to yield strength 690MPa (100ksi). S500Q-S690Q, S500QL-S690QL, S500QLN-S690QLN, P500Q-P690Q, P500QL1-P690QL1, P500QL2-P690QL2, S770QL
 ASTM A514 Steel Grades
 EH62, EH69

Typical analysis in %

C: 0,06
 Si: 0,45
 Mn: 1,50
 Cr: 0,10
 Ni: 1,65
 Mo: 0,40

Yield strength in Mpa

≥ 610

Tensile strength in Mpa

≥ 690

Elongation in %

4d/5d: ≥18

Charpy-V-Value (ISO-V) in J

RT ≥ 100
 -50°C ≥ 68

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK800, ED-ER100S-1, FK1
 TIG/GTAW: WSG FK1

Classification DIN EN ISO

-

Material No.

-

Classification AWS

A5.28 ER110S-1

Approvals

CE

Characteristics and application

MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -50°C. Typical applications can be found in crane construction, mining, shipbuilding and pressure vessel industries.

Base materials

For high strength fine-grained structural steels up to yield strength 690MPa (100ksi). S500Q-S690Q, S500QL-S690QL, S500QLN-S690QLN, P500Q-P690Q, P500QL1-P690QL1, P500QL2-P690QL2, S770QL
 ASTM A514 Steel Grades
 HY 100

Typical analysis in %

C: 0,09
 Si: 0,50
 Mn: 1,70
 Cr: 0,20
 Ni: 2,00
 Mo: 0,45

Yield strength in Mpa

≥ 660

Tensile strength in Mpa

≥ 760

Elongation in %

4d/5d: ≥17

Charpy-V-Value (ISO-V) in J

RT ≥ 100
 -50°C ≥ 68

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW ED-FK800,FK1, ED-ER110S-1
 TIG/GTAW: WSG FK800
 SAW: UP-EM2, UP-EM4

Classification DIN EN ISO
-
Material No.
-
Classification AWS
A5.28 ER120S-1
Approvals
CE
Characteristics and application
MIG/GMAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -60°C. Typical applications are mining, mobile cranes, shipbuilding, concrete pumps and pressure vessel industries.
Base materials
For high strength fine-grained structural steels up to tensile strength 830MPa (120ksi). S690Q-S890Q, S690QL-S890QL, S690QLN-S890QLN, HY 100

Typical analysis in %
C: 0,09 Si: 0,35 Mn: 1,55 Cr: 0,35 Ni: 2,50 Mo: 0,55
Yield strength in Mpa
≥ 730
Tensile strength in Mpa
≥ 830
Elongation in %
4d/5d: ≥14
Charpy-V-Value (ISO-V) in J
RT ≥ 70 -50°C ≥ 68
Typical heat treatment
Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.
Other products
MIG/GMAW: ED-FK1000, ED-FK1100, ED-ER120S-1 TIG/GTAW: WSG FK1000

Classification DIN EN ISO

21952-A W Z4Mo, 636-B W 57A 4 W4M31

Material No.

-

Classification AWS

A5.28 ER80S-D2, A5.28 ER90S-D2

Approvals

CE

Characteristics and application

TIG/GTAW rod for welding of high strength steels, used predominantly after stress relieving. Predominantly used for welding high strength steels, providing a good combination of strength and toughness. May find use for joining creep resistance steels up to -500°C but the WSG Mo wire would be the more usual choice.

Base materials

For a wide range of engineering steels with a yield strength up to 540MPa (78ksi) and UTS up to 620MPa (90ksi).
 S355NL-S460NL, S55ML-S460ML, S460QL-S550QL, P235GH-P355GH, 16Mo3
 ASTM: A487 grades 2A/B/C
 AISI: 4130

Typical analysis in %

C: 0,09
 Si: 0,70
 Mn: 1,95
 Mo: 0,50

Yield strength in Mpa
 ≥ 540
Tensile strength in Mpa
 ≥ 620
Elongation in %
 $4d/5d: \geq 17$
Charpy-V-Value (ISO-V) in J

RT ≥ 100
 $-40^{\circ}\text{C} \geq 47$

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-A 31
 TIG/GTAW: WSG Mo

Classification DIN EN ISO

16834-A W 69 4 I1 Mn3Ni1CrMo

Material No.

-

Classification AWS

A5.28 ER100S-G, A5.28 ER110S-G

Approvals

CE

Characteristics and application

TIG/GTAW wire for welding high strength low alloy steels. Used for many structural and construction applications including: mobile cranes, cement pumps, pipelines, tankers and containers.

Base materials

For high strength fine-grained steels with yield strength up to 690MPa (100ksi).
 S500Q-S690Q, S500QL-S690QL, P500Q-P690Q, P500QL1-P690QL1
 ASTM: A514, HY80, HY100, Q1(N)

Typical analysis in %

C: 0,09
 Si: 0,52
 Mn: 1,57
 Cr: 0,30
 Ni: 1,40
 Mo: 0,25
 V: 0,09

Yield strength in Mpa

≥ 690

Tensile strength in Mpa

≥ 790

Elongation in %

4d/5d: ≥17

Charpy-V-Value (ISO-V) in J

-40°C ≥47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK1, ED-ER110S-1, ED-FK800
 TIG/GTAW: WSG ER100S-1, WSG ER110S-1
 SAW: UP-EM2, UP-EM4, UP-101 S3NiCr-Mo2,5

Classification DIN EN ISO

16834-A W 62 6 11 Mn3Ni1Mo

Material No.

-

Classification AWS

A5.28 ER100S-G

Approvals

CE

Characteristics and application

TIG/GTAW rod for welding high strength low alloy steels. Used for many structural and construction applications including: pipelines, tankers and containers.

Base materials

For high strength fine-grained structural steels up to yield strength 620MPa. S500Q-S620Q, S500QL-S620QL, P500Q-P620Q, P500QL1-P620QL1

Typical analysis in %

C: 0,08
 Si: 0,60
 Mn: 1,70
 Ni: 0,95
 Mo: 0,38
 Ti: 0,08

Yield strength in Mpa

≥ 620

Tensile strength in Mpa

≥ 760

Elongation in %

4d/5d: ≥18

Charpy-V-Value (ISO-V) in J

-60°C ≥47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK620, ED-ER100S-1
 TIG/GTAW: WSG ER100S-1

Classification DIN EN ISO

16834-A W 69 5 11 ZMn3Ni1Mo

Material No.

-

Classification AWS

A5.28 ER90S-G

Approvals

CE

Characteristics and application

TIG rod for high strength structural steels.

Base materials

For high strength low alloy fine-grained steels with yield strengths up to ~550MPa (80ksi).

P460NL1, P460ML1, S460Q-S550Q, S460QL-S550QL, P460Q-P500Q, P460QL1-500QL1. 15NiCuMoNb5-6-4 (1.6368)
ASTM: A182 grade F36, A335 grade P36, A533, A537

Typical analysis in %

C: 0,12
Si: 0,20
Mn: 1,75
Ni: 0,90
Mo: 0,55

Yield strength in Mpa

≥ 640

Tensile strength in Mpa

≥ 740

Elongation in %

4d/5d: ≥20

Charpy-V-Value (ISO-V) in J

RT ≥ 100
-50°C ≥ 100

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

Other products

SAW: UP-101 NiMo1 (S3NiMo1)
MIG/GMAW: ED-A 31, ED-FK620
TIG/GTAW: WSG A 31, WSG FK620

Classification DIN EN ISO

16834-A W 89 5 11 Mn4Ni2CrMo

Material No.

-

Classification AWS

A5.28 ER120S-G

Approvals

CE

Characteristics and application

TIG/GTAW wire for welding high strength low alloy steels. Used for welding high strength steels in many high stress, critical applications; also exhibiting excellent toughness down to -60°C. Typical applications can be found in the mining, mobile cranes, cement pumps shipbuilding, automotive and pressure vessel industries.

Base materials

For high strength fine-grained structural steels up to yield strength 890MPa (129ksi). S690Q-S890Q, S690QL-S890QL, S690QLN-S890QLN, S960QL, S1100QL, S1300QL
ASTM: HY80, Q1(N), HY100, Q2(N)

Typical analysis in %

C: 0,09
Si: 0,80
Mn: 1,80
Cr: 0,31
Ni: 2,20
Mo: 0,55
Ti: 0,06

Yield strength in Mpa

≥ 890

Tensile strength in Mpa

≥ 940

Elongation in %

4d/5d: ≥15

Charpy-V-Value (ISO-V) in J

-60°C ≥47

Typical heat treatment

Welding procedure, including preheat temperature, interpass temperature and PWHT, will be dependent on the base material being welded and any applicable design codes.

Other products

MIG/GMAW: ED-FK1000, ED-FK1100
TIG/GTAW: WSG ER120S-1

Classification DIN EN ISO

636-A W 46 4 2Mo, 21952-A W MoSi

Material No.

1.5424

Classification AWS

A5.28 ER70S-A1, A5.28 ER80S-G

Approvals

TÜV 03466, CE, DB 42.045.08

Characteristics and application

TIG/GTAW rod for 0.5%Mo steels. These steels are commonly used at service temperatures up to 500°C and for some sub-zero structural applications. The 0.5% alloying improves creep performance compared to CMn steels and sees the alloy being used for boiler, pressure vessel and piping construction. The good general mechanical properties also ensures use in general structural engineering applications.

Base materials

For similar alloyed high temperature steels and cast steels, ageing resistant and steels resistant to caustic cracking.
 P235G1TH-P255G1TH, P310GH, L320, L360NB-L415NB, 16Mo3
 ASTM: A182/A336 F1, A204 grades A/B/C, A209/A250 T1, A217 WC1, A335 P1, A352 LC1

Typical analysis in %

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

Yield strength in Mpa

≥ 460

Tensile strength in Mpa

≥ 560

Elongation in %

4d/5d: ≥ 22

Charpy-V-Value (ISO-V) in J

RT ≥ 60
 -40°C ≥ 47

Typical heat treatment

Preheat temperature: Dependent on material thickness
 Interpass temperature: max. 250°C
 PWHT: AW or 650°C

Other products

SAW: UP-100 Mo (S2Mo), UP-101 Mo (S3Mo)
 MIG/GMAW: ED-SG Mo
 Gas welding: U 47 Mo (G IV)

Classification DIN EN ISO

21952-A W CrMo1Si

Material No.

1.7339

Classification AWS

A5.28 ER80S-G

Approvals

TÜV 04293, CE, DB 42.045.13

Characteristics and application

TIG/GTAW rod for high temperature creep resistant 1.25%Cr0.5%Mo ferritic steel, i.e. P11/P12. These steels are used for creep resisting applications up to ~550°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor (X < 10 ppm) for temper embrittlement resistant applications.

Base materials

For matching 1.25%Cr0.5%Mo creep resisting ferritic steels.
13CrMo 4-4, 13CrMo 4-5, 16CrMo 4-4, GS-17CrMo 5-5
ASTM: A182 grades F11/F12, A199/A200 T11, A217 grades WC6/WC11, A234 grades WP11/WP12, A335 grades P11/P12, A387 grades 11/12

Typical analysis in %

C: 0,10
Si: 0,60
Mn: 1,00
Cr: 1,20
Mo: 0,52

Yield strength in Mpa

≥ 355

Tensile strength in Mpa

≥ 510

Elongation in %

4d/5d: ≥20

Charpy-V-Value (ISO-V) in J

RT ≥ 100
-40°C ≥ 47

Typical heat treatment

Preheat temperature: 200°C
Interpass temperature: max. 300°C
PWHT: 620-690°C

Other products

SAW: UP-100 CrMo1 (S2CrMo1)
MIG/GMAW: ED-SG CrMo1, ED-ER80S-B2, ED-ER70S-B2L
TIG/GTAW: WSG ER80S-B2, ED-ER70S-B2L
Gas welding: U 49 CrMo (G V)

Classification DIN EN ISO

21952-B W 1CML

Material No.

-

Classification AWS

A5.28 ER70S-B2L

Approvals

CE

Characteristics and application

TIG/GTAW rod for high temperature creep resistant 1.25%Cr-0.5%Mo ferritic steel, i.e. P11/P12. These steels are used for creep resisting applications up to ~550°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Bruscato Factor ($X < 10$ ppm) for temper embrittlement resistant applications.

This type is identical to ER 80S-B2 except the lower Carbon content. Strength and Hardness of the weld metal may be lowered leading to a higher resistance to cracking which is beneficial when the weldments are left in the as welded condition.

Base materials

For matching 1.25%Cr-0.5%Mo creep resisting ferritic steels.
13CrMo 4-5, 16CrMo 4-4, GS-17CrMo 5-5
ASTM: A182 grades F11/F12, A199/A200
T11, A217 grades WC6/WC11, A234 grades WP11/WP12, A335 grades P11/P12, A387 grades 11/12

Typical analysis in %

C: 0,03
Si: 0,54
Mn: 0,53
Cr: 1,39
Mo: 0,50

Yield strength in Mpa

≥ 400

Tensile strength in Mpa

≥ 520

Elongation in %

4d/5d: ≥19

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Preheat temperature: approx. 200°C
Interpass temperature: max. 300°C
PWHT: approx. 620°C - 690°C

Other products

SAW: UP-100 CrMo1 (S2CrMo1)
MIG/GMAW: ED-SG CrMo1, ED-ER80S-B2,
ED-ER70S-B2L
TIG/GTAW: WSG CrMo1, WSG ER80S-B2
Gas welding: U 49 CrMo (G V)

Classification DIN EN ISO

21952-B W 1CM

Material No.

-

Classification AWS

A5.28 ER80S-B2

Approvals

CE

Characteristics and application

TIG/GTAW rod for high temperature creep resistant 1.25%Cr-0.5%Mo ferritic steel, i.e. P11/P12. These steels are used for creep resisting applications up to ~550°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor (X < 10 ppm) for temper embrittlement resistant applications.

Base materials

For matching 1.25%Cr-0.5%Mo creep resisting ferritic steels.
 13CrMo 4-5, 16CrMo 4-4, GS-17CrMo 5-5
 ASTM: A182 grades F11/F12, A199/A200
 T11, A217 grades WC6/WC11, A234 grades
 WP11/WP12, A335 grades P11/P12, A387
 grades 11/12

Typical analysis in %

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

Yield strength in Mpa

≥ 470

Tensile strength in Mpa

≥ 550

Elongation in %

4d/5d: ≥19

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Preheat temperature: 200°C
 Interpass temperature: max. 300°C
 PWHT: 620°C - 690°C

Other products

SAW: UP-100 CrMo1 (S2CrMo1)
 MIG/GMAW: ED-SG CrMo1, ED-ER80S-B2,
 ED-ER70S-B2L
 TIG/GTAW: WSG CrMo1, WSG ER70S-B2L
 Gas welding: U 49 CrMo (G V)

Classification DIN EN ISO
21952-A W CrMo2Si
Material No.
1.7384
Classification AWS
A5.28 ER90S-G
Approvals
TÜV 07300, CE
Characteristics and application
TIG/GTAW rod for high temperature creep resistant 2.25%Cr-1%Mo ferritic steel, i.e. P21/P22. These steels are used for creep resisting applications up to ~600°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Bruscato Factor (X < 10 ppm) for temper embrittlement resistant applications.
Base materials
For matching 2.5%Cr-1%Mo creep resisting ferritic steels. 10CrMo 9-10, G-17CrMo 9-10 ASTM: A182 F22, A199/A200 grades T21/T22, A213 T22, A217 WC9, A234 WP22, A335 P22, A387 grades 21/22

Typical analysis in %
C: 0,08 Si: 0,60 Mn: 0,92 Cr: 2,45 Mo: 1,00
Yield strength in Mpa
≥ 400
Tensile strength in Mpa
≥ 520
Elongation in %
4d/5d: ≥ 18
Charpy-V-Value (ISO-V) in J
RT ≥ 100 -40°C ≥ 47
Typical heat treatment
Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 690°C
Other products
SAW: UP-99 CrMo2 (S1CrMo2) MIG/GMAW: ED-SG CrMo2, ED-ER90S-B3, ED-ER80S-B3L TIG/GTAW: WSG ER90S-B3, ED-ER80S-B3L Gas welding: U 50 CrMo (G VI)

Classification DIN EN ISO

21952-B W 2C1ML

Material No.

-

Classification AWS

A5.28 ER80S-B3L

Approvals

CE

Characteristics and application

TIG/GTAW rod for high temperature creep resistant 2.25%Cr-1%Mo ferritic steel, i.e. P21/P22. These steels are used for creep resisting applications up to ~600°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor ($X < 10$ ppm) for temper embrittlement resistant applications.

This type is identical to WSG ER 90S-B3 except the lower Carbon content. Strength and Hardness of the weld metal may be lowered leading to a higher resistance to cracking which is beneficial when the weldments are left in the as welded condition.

Base materials

For matching 2.5%Cr-1%Mo creep resisting ferritic steels.

10CrMo 9-10, G-17CrMo 9-10
ASTM: A182 F22, A199/A200 grades T21/
T22, A213 T22, A217 WC9, A234 WP22,
A335 P22, A387 grades 21/22

Typical analysis in %

C: 0,04
Si: 0,52
Mn: 0,58
Cr: 2,48
Mo: 0,96

Yield strength in Mpa

≥ 470

Tensile strength in Mpa

≥ 550

Elongation in %

4d/5d: ≥17

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Preheat temperature: approx. 200°C
Interpass temperature: max. 300°C
PWHT: approx. 690°C

Other products

SAW: UP-99 CrMo2 (S1CrMo2)
MIG/GMAW: ED-SG CrMo2, ED-ER90S-B3,
ED-ER80S-B3L
TIG/GTAW: WSG CrMo2, WSG ER90S-B3
Gas welding: U 50 CrMo (G VI)

Classification DIN EN ISO
21952-B W 2C1M
Material No.
-
Classification AWS
A5.28 ER90S-B3
Approvals
CE
Characteristics and application
TIG/GTAW rod for high temperature creep resistant 2.25%Cr-1%Mo ferritic steel, i.e. P21/P22. These steels are used for creep resisting applications up to ~600°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Bruscato Factor (X < 10 ppm) for temper embrittlement resistant applications.
Base materials
For matching 2.5%Cr-1%Mo creep resisting ferritic steels. 10CrMo 9-10, G-17CrMo 9-10 ASTM: A182 F22, A199/A200 grades T21/T22, A213 T22, A217 WC9, A234 WP22, A335 P22, A387 grades 21/22

Typical analysis in %
C: 0,09 Si: 0,55 Mn: 0,55 Cr: 2,50 Mo: 1,05
Yield strength in Mpa
≥ 540
Tensile strength in Mpa
≥ 620
Elongation in %
4d/5d: ≥17
Charpy-V-Value (ISO-V) in J
RT ≥ 100 -40°C ≥ 47
Typical heat treatment
Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 690°C
Other products
SAW: UP-99 CrMo2 (S1CrMo2) MIG/GMAW: ED-SG CrMo2, ED-ER90S-B3, ED-ER80S-B3L TIG/GTAW: WSG CrMo2, WSG ER80S-B3L Gas welding: U 50 CrMo (G VI)

Classification DIN EN ISO

21952-A W ZCrMo2VNb

Material No.

-

Classification AWS

A5.28 R90S-B24

Approvals

TÜV 11949, CE

Characteristics and application

TIG/GTAW rod for T24 creep resistant steel. The T24 alloy is a modified 2.25%Cr1%Mo alloy with additions of Nb and V to improve high temperature creep performance. The alloy finds use for waterwalls in ultra-super-critical (USC) boilers in the power generating industry.

Base materials

For matching alloy 24, 2.5%Cr1%Mo modified, creep resisting ferritic steels.
 X7CrMoVTiB 10-10
 ASTM: A213 T24

Typical analysis in %

C: 0,10
 Si: 0,25
 Mn: 0,90
 Cr: 2,30
 Mo: 1,00
 V: 0,30
 Nb: 0,02

Yield strength in Mpa

≥ 600

Tensile strength in Mpa

≥ 700

Elongation in %

4d/5d: ≥15

Charpy-V-Value (ISO-V) in J

RT ≥ 47

Typical heat treatment

Preheat temperature: Dependent on application either none or 150-200°C
 Interpass temperature: max. 300°C
 PWHT: Dependent on application either AW or 730°C - 760°C

Other products

SAW: UP-P24

Classification DIN EN ISO
21952-A W CrMo5Si
Material No.
1.7373
Classification AWS
A5.28 ER80S-B6
Approvals
CE
Characteristics and application
TIG/GTAW rod for high temperature creep resistant 5%Cr-0.5%Mo ferritic steel, i.e. P5. The 5%Cr-0.5%Mo creep resistant alloy is used for service up to ~600°C particularly in environments involving hot hydrogen gas. Typical applications are found in oil refineries.
Base materials
For matching 5%Cr-0.5%Mo creep resisting ferritic steels. X12CrMo5, GX12CrMo5 ASTM: A182/A336 F5, A199/A213 T5, A217 C5, A234 WP5, A335 P5, A387 5

Typical analysis in %
C: 0,08 Si: 0,35 Mn: 0,55 Cr: 6,00 Mo: 0,65
Yield strength in Mpa
≥ 450
Tensile strength in Mpa
≥ 550
Elongation in %
4d/5d: ≥ 18
Charpy-V-Value (ISO-V) in J
RT ≥ 100
Typical heat treatment
Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 745°C.
Other products
SAW: UP-99 CrMo5 (S1CrMo5) MIG/GMAW: ED-SG CrMo5

Classification DIN EN ISO

21952-A W CrMo9

Material No.

-

Classification AWS

A5.28 ER80S-B8

Approvals

CE

Characteristics and application

TIG/GTAW rod for high temperature creep resistant 9%Cr-1%Mo ferritic steel, i.e. P9. The 9%Cr-1%Mo creep resistant alloy is used for service up to ~600°C particularly in environments involving hot hydrogen gas. Typical applications are found in oil refineries.

Base materials

For matching 9%Cr-1%Mo creep resisting ferritic steels.
 ASTM: A182/A336 F9, A199/A213 T9, A217 C12, A234 WP9, A335 P9, A387 9
 X12CrMo 9 1, GX12CrMo 10 1
 1.7386, 1.7688, 1.7389

Typical analysis in %

C: 0,08
 Si: 0,40
 Mn: 0,60
 Cr: 8,90
 Ni: 0,20
 Mo: 1,00

Yield strength in Mpa

≥ 470

Tensile strength in Mpa

≥ 590

Elongation in %

4d/5d: ≥ 18

Charpy-V-Value (ISO-V) in J

-

Typical heat treatment

Preheat temperature: 200°C
 Interpass temperature: 300°C
 PWHT: 745°C

Other products

SAW: UP-EB8
 MIG/GMAW: ED-ER80S-B8

Classification DIN EN ISO
21952-A W CrMo91
Material No.
1.4903
Classification AWS
A5.28 ER90S-B91
Approvals
TÜV 11950, CE
Characteristics and application
TIG/GTAW rod for high temperature, creep resistant, modified 9%Cr-1%Mo martensitic steel (T91/P91). T91/P91 steel is commonly used at service temperatures up to 600°C. V, Nb and N additions provide this 'creep strength enhanced ferritic' (CSEF) alloy with improved high temperature creep resistance compared to standard CrMo creep resistant alloys. Alloy T91/P91 is widely used in the power generating industry for fossil fuel ultra-super-critical (USC) power plant boilers and turbines; the alloy is also finding applications in the chemical and oil and gas industries.
Base materials
For matching P91, 9%Cr-1%Mo modified, creep resisting martensitic steels. X10CrMoVNB 9 1 ASTM: A182/A336 F91, A213 T91, A217 C12A, A234 WP91, A335 P91, A387 91

Typical analysis in %
C: 0,10 Si: 0,32 Mn: 0,50 Cr: 9,20 Ni: 0,45 Mo: 0,95 V: 0,20 Nb: 0,05
Yield strength in Mpa
≥ 520
Tensile strength in Mpa
≥ 620
Elongation in %
4d/5d: ≥16
Charpy-V-Value (ISO-V) in J
RT ≥ 47
Typical heat treatment
Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 760°C
Other products
SAW: UP-P91 (S1CrMo91) MIG/GMAW: ED-SG P91

Classification DIN EN ISO

21952-A W ZCrMoWVNb 9 0,5 1,5

Material No.

-

Classification AWS

A5.28 ER90S-G

Approvals

CE

Characteristics and application

TIG/GTAW wire for high temperature, creep resistant, modified 9%Cr-1%Mo martensitic steel (T92/P92). T92/P92 steel is commonly used at service temperatures up to 620°C. V, Nb and N additions provide this 'creep strength enhanced ferritic' (CSEF) alloy with improved high temperature creep resistance compared to standard CrMo creep resistant alloys. Alloy T92/P92 is widely used in the power generating industry for fossil fuel ultra-super-critical (USC) power plant boilers and turbines; the alloy is also finding applications in the chemical and oil and gas industries.

Base materials

For matching P92, 9%Cr-1.7%W-0.5%Mo, creep resisting martensitic steels.
 X10CrWMoVNb 9 2
 ASTM: A182 grade F92, A213 grade T92, A335 grade P92, A387 grade 92

Typical analysis in %

C: 0,10
 Si: 0,35
 Mn: 0,44
 Cr: 8,80
 Ni: 0,50
 Mo: 0,40
 V: 0,20
 W: 1,60
 Nb: 0,05

Yield strength in Mpa

≥ 540

Tensile strength in Mpa

≥ 620

Elongation in %

4d/5d: ≥17

Charpy-V-Value (ISO-V) in J

RT ≥ 47

Typical heat treatment

Preheat temperature: 200°C
 Interpass temperature: max. 300°C
 PWHT: 760°C

Other products

SAW: UP-P92
 MIG/GMAW: ED-SG P92

Classification DIN EN ISO
636-A W 46 6 3Ni1
Material No.
-
Classification AWS
A5.28 ER80S-Ni1
Approvals
TÜV 10107, CE, DB 42.045.16, DNV
Characteristics and application
TIG/GTAW rod for steels where impact properties are required at -60°C. Applications include structural, oil and gas and offshore steelwork.
Base materials
For cryogenic construction steels and Ni bearing low temperature steels. 11MnNi5-3, 13MnNi6-3, S275NL-S460NL, S275ML-S460ML, P275NL2-P460NL2, P355ML2-P460ML2 ASTM: A333/A334 grades 1/6, A350 grades LF2/LF6, A352 grades LCB/LCC API: 5L X65

Typical analysis in %
C: 0,09 Si: 0,50 Mn: 1,05 Ni: 0,90
Yield strength in Mpa
≥ 470
Tensile strength in Mpa
≥ 550
Elongation in %
4d/5d: ≥24/20
Charpy-V-Value (ISO-V) in J
RT ≥ 100 -60°C ≥ 47
Typical heat treatment
Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.
Other products
SAW: UP-100 Ni1 (S2Ni1) MIG/GMAW: ED-ER80S-Ni1

Classification DIN EN ISO

636-A W 42 9 2Ni2

Material No.

-

Classification AWS

A5.28 ER80S-Ni2

Approvals

TÜV 06009, CE, DB 42.045.15

Characteristics and application

TIG/GTAW rod for steels where impact properties are required at -90°C. Applications include structural, oil and gas and offshore steelwork.

Base materials

For cryogenic construction steels and Ni bearing low temperature steels.
 11MnNi5-3, 13MnNi6-3, 15NiMn6,
 S275NL-S460NL, S275ML-S460ML,
 P275NL2-P460NL2, P355ML2-P460ML2
 ASTM: A203 grade A/B, A333/A334 grades
 1/6/7, A350 grade LF2/LF5/LF6, A352 grade
 LC1/LC2

Typical analysis in %

C: 0,09
 Si: 0,52
 Mn: 1,10
 Ni: 2,45

Yield strength in Mpa

≥ 470

Tensile strength in Mpa

≥ 550

Elongation in %

4d/5d: ≥24/20

Charpy-V-Value (ISO-V) in J

RT ≥ 200
 -90°C ≥ 47

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-100 Ni2 (S2Ni2)
 MIG/GMAW: ED-SG Ni2.5

SAW



UP-99 (S1)

SAW (submerged arc welding) wires for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A S1

Material No.

1.0351

Classification AWS

A5.17 ~EL12, A5.23 ~EL12

Approvals

TÜV 03275, CE, DB 52.045.01

Characteristics and application

Submerged arc welding wire for standard CMn structural steels. Typical applications include shipbuilding, pressure vessels and general construction.

Base materials

For CMn and mild steels with yield strength up to ~360MPa (52ksi).
S185-E360, S235JR-S355JR, S235J0-S355J0, S235J2-S355J2, S275N-S355N, S275M-S355M, P235GH-P355GH, P275N-P355N, P355M, P355Q, Pipeline steels L210-360, Shipbuilding grades A-E, AH36, DH36
ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A266 grades 1/2/4, A283 grades A/B/C/D, A285 grades A/B/C, A299 grades A/B, A515 grades 60/65/70, A516 grades 55-70, A656 grade 50
API: 5L grades X42-X52

Typical analysis in %

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

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

Other products

SAW: UP-100 (S2), UP-101 (S3), UP-100Si (S2Si)
MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2, ED-SG 3
TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3
Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO

14171-A S2

Material No.

1.0494

Classification AWS

A5.17 EM12, A5.23 EM12

Approvals

TÜV 03275, CE, DB 52.045.02

Characteristics and application

Submerged arc welding wire for standard CMn structural steels. Typical applications include shipbuilding, pressure vessels and general construction.

Base materials

For CMn and mild steels with yield strength up to ~380MPa (56ksi).
S185-E360, S235JR-S355JR, S235J0-S355J0, S235J2-S355J2, S275N-S355N, S275M-S355M, P235GH-P355GH, P275N-P355N, P355M, P355Q, Pipeline steels L210-360, Shipbuilding grades A-E, AH36, DH36
ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A266 grades 1/2/4, A283 grades A/B/C/D, A285 grades A/B/C, A299 grades A/B, A515 grades 60, A516 grades 55, A656 grade 50
API: 5L grades X42-X56

Typical analysis in %

C: 0,09
Si: 0,12
Mn: 1,05

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

Other products

SAW: UP-99 (S1), UP-101 (S3),
UP-100Si (S2Si)
MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2,
ED-SG 3
TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3
Gas welding: U 39 (G I), U 40 (G II),
U 40 Ni (G III)

UP-100 Si (S2Si)

SAW (submerged arc welding) wires for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A S2Si

Material No.

1.0492

Classification AWS

A5.17 EM12K, A5.23 EM12K

Approvals

TÜV 03275, CE, DB 52.045.06

Characteristics and application

Submerged arc welding wire for standard CMn structural steels. Typical applications include shipbuilding, pressure vessels and general construction.

Base materials

For CMn and mild steels with yield strength up to ~420MPa (60ksi).

S185-E360, S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S420N, S275M-S420M, P235GH-P355GH, P275N-P355N, P355M-P420M, P355Q, Pipeline steels L210-360, Shipbuilding grades A-E, AH40-EH40

ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A266 grades 1/2/4, A283 grades A/B/C/D, A285 grades A/B/C, A299 grades A/B, A515 grades 60/65/70, A516 grades 55-70, A656 grade 50/60
API: 5L grades X42-X60

Typical analysis in %

C: 0,11
Si: 0,28
Mn: 1,00

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3)
MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2, ED-SG 3
TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3
Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

Classification DIN EN ISO

14171-A S3

Material No.

1.0496

Classification AWS

A5.17 EH10K, A5.23 EH10K

Approvals

TÜV 03275, CE, DB 52.045.03

Characteristics and application

Submerged arc welding wire for standard CMn structural steels. Typical applications include shipbuilding, pressure vessels and general construction.

Base materials

For CMn and mild steels with yield strength up to ~420MPa (60ksi).

S185-E360, S235JR-S355JR, S235JO-S355JO, S235J2-S355J2, S275N-S420N, S275M-S420M, P235GH-P355GH, P275N-P355N, P355M-P420M, P355Q, Pipeline steels L210-360, Shipbuilding grades A-E, AH40, DH40

ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A266 grades 1/2/4, A283 grades A/B/C/D, A285 grades A/B/C, A299 grades A/B, A515 grades 60/65/70, A516 grades 55-70, A656 grade 50/60

API: 5L grades X42-X60

Typical analysis in %

C: 0,12
Si: 0,08
Mn: 1,55

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-100Si (S2Si)
MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2, ED-SG 3
TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3
Gas welding: U 39 (G I), U 40 (G II), U 40 Ni (G III)

UP-101 Spezial (S3Si)

SAW (submerged arc welding) wires for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A S3Si

Material No.

~1.0479

Classification AWS

A5.17 EH12K, A5.23 EH12K

Approvals

TÜV 03275, CE, DNV

Characteristics and application

Submerged arc welding wire for fine grain structural steels. Typical applications include offshore construction.

Base materials

For CMn and mild steels with yield strength up to ~460MPa (65ksi).
S355J0, S355J2, S355N-S460N, S355NL-S460NL, S355M-S460M, S355ML-S460ML, S460Q, S460QL, P355GH, P355N-P460N, P355NL2-P460NL2, P355M-P460M, P355ML2-P460ML2, P355Q-P460Q, Pipeline steels L210-450, Shipbuilding grades AH40-FH40
ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A266 grades 1/2/4, A283 grades A/B/C/D, A285 grades A/B/C, A299 grades A/B, A515 grades 60/65/70, A516 grades 55-70, A656 grade 50/60
API: 5L grades X42-X65

Typical analysis in %

C: 0,11
Si: 0,30
Mn: 1,72

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

Other products

SAW: UP-100 Mo (S2Mo),
UP-101 Mo (S3Mo)
MIG/GMAW: ED-SG 3, ED-A 31
TIG/GTAW: WSG 3, WSG A 31
Gas welding: U 47 Mo (GI V)

UP-100 Mo (S2Mo)

SAW (submerged arc welding) wires for mild and low alloyed steels

FLIESS
SINCE 1915

Classification DIN EN ISO

14171-A S2Mo, 24598-A S S Mo

Material No.

1.5425

Classification AWS

A5.23 EA2

Approvals

TÜV 03275, CE, DB 52.045.07

Characteristics and application

Submerged arc welding wire for 0.5%Mo steels, i.e. P1. These steels are commonly used at service temperatures up to 500°C and for some sub-zero structural applications. The 0.5% alloying improves creep performance compared to CMn steels and sees the alloy being used for boiler, pressure vessel and piping construction. The good general mechanical properties also ensures use in general structural engineering applications.

Base materials

For similar alloyed high temperature steels and cast steels, ageing resistant and steels resistant to caustic cracking.
S355J0, E335, P285NH, P310GH, S355J0Cu, 16Mo3, P315N - S420N, P315NH - P420NH, fine grain structural steels up to S460N/ P460N, large-diameter pipes up to L485MB
ASTM: A182/A336 grade F1, A204 grades A/B/C, A209/A250 grade T1, A217 grade WC1, A335 grade P1, A352 grade LC1

Typical analysis in %

C: 0,09
Si: 0,15
Mn: 1,05
Mo: 0,52

Yield strength in Mpa

≥470

Tensile strength in Mpa

≥550

Elongation in %

4d/5d: ≥20/22

Typical heat treatment

Preheat temperature: Dependent on material thickness
Interpass temperature: max. 250°C
PWHT: AW or 650°C

Other products

SAW: UP-101 Mo (S3Mo),
UP-101 Spezial (S3Si)
MIG/GMAW: ED-SG Mo
TIG/GTAW: WSG Mo
Gas welding: U 47 Mo (G IV)

UP-101 Mo (S3Mo)

SAW (submerged arc welding) wires for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A S3Mo, 24598-A S S MnMo

Material No.

1.5426

Classification AWS

A5.23 EA4

Approvals

TÜV 03275, CE, DB 52.045.08

Characteristics and application

Submerged arc welding wire for 0.5%Mo steels, i.e. P1. These steels are commonly used at service temperatures up to 500°C and for some sub-zero structural applications. The 0.5% alloying improves creep performance compared to CMn steels and sees the alloy being used for boiler, pressure vessel and piping construction. The good general mechanical properties also ensures use in general structural engineering applications.

Base materials

For similar alloyed high temperature steels and cast steels, ageing resistant and steels resistant to caustic cracking.

S550GD, S355J0, E335, P285NH, P310GH, S355J0Cu, P355N-P460N, P355NH-P460NH, 16Mo3

ASTM: A182/A336 grade F1, A204 grades A/B/C, A209/A250 grade T1, A217 grade WC1, A335 grade P1, A352 grade LC1

Typical analysis in %

C: 0,12
Si: 0,15
Mn: 1,52
Mo: 0,52

Yield strength in Mpa

≥470

Tensile strength in Mpa

≥550

Elongation in %

4d/5d: ≥20/22

Typical heat treatment

Preheat temperature: Dependent on material thickness
Interpass temperature: max. 250°C
PWHT: AW or 650°C

Other products

SAW: UP-100 Mo (S2Mo)
MIG/GMAW: ED-SG Mo
TIG/GTAW: WSG Mo
Gas welding: U 47 Mo (G IV)

Classification DIN EN ISO
14171-A S2Si2
Material No.
1.5112
Classification AWS
A5.17 EM13K, A5.23 EM13K
Approvals
CE
Characteristics and application
SAW wire for welding CMn structural steels. Typical applications would include shipbuilding, pressure vessels and construction.
Base materials
For steels up to a yield strength of 420MPa (60ksi). S185-E360, S235JR-S355JR, S235J0-S355J0, S235J2-S355J2, S275N-S420N, S275M-S420M, P235GH-P355GH, P275N-P355N, P355M-P420M, P355Q ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1 API: 5L grades X42-X60

Typical analysis in %
C: 0,09 Si: 0,55 Mn: 1,15
Yield strength in Mpa
≥ 420
Tensile strength in Mpa
≥ 500
Elongation in %
4d/5d: ≥22/20
Other products
UP: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si) MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2, ED-SG 3 TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3 Gas: U39 (G I), U40 (G II)

Classification DIN EN ISO

-

Material No.

-

Classification AWS

A5.17 EM14K, A5.23 EM14K

Approvals

CE

Characteristics and application

SAW wire for welding standard CMn structural steels. Typical applications would include pressure vessels and construction.

Base materials

For steels up to a yield strength of 460MPa (65ksi).
 S185-E360, S235JR-S355JR, S235J0-S450J0, S235J2-S355J2, S275N-S460N, S275M-S460M, S460Q, P235GH-P355GH, P275N-P460N, P355M-P460M, P355Q-P460Q
 ASTM: A27, A36, A106 grades A/B/C, A139, A210 grades A1/C, A214, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1
 API: 5L grades X42-X60

Typical analysis in %

C: 0,08
 Si: 0,55
 Mn: 1,20
 P: 0,010
 S: 0,015
 Ti: 0,10
 N: 0,0040

Charpy-V-Value (ISO-V) in J

-

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3)
 MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2, ED-SG 3
 TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3

Classification DIN EN ISO
-
Material No.
-
Classification AWS
A5.17 EH11K, A5.23 EH11K
Approvals
CE
Characteristics and application
SAW wire for welding standard CMn structural steels. Typical applications would include shipbuilding, pressure vessels and construction.
Base materials
For steels up to a yield strength of 460MPa (65ksi). S185-E360, S235JR-S355JR, S235J0-S450J0, S235J2-S355J2, S275N-S460N, S275M-S460M, S460Q, S460QL, P235GH-P355GH, P275N-P460N, P275NL1-P460NL1, P355M-P460M, P355ML1-P460ML1, P355Q-P460Q, P355QL1-P460QL1 ASTM: A36, A106 grades A/B/C, A139, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB, A334 grade 1 API 5L grades X42-X60

Typical analysis in %
C: 0,09 Si: 0,95 Mn: 1,67
Charpy-V-Value (ISO-V) in J
-
Other products
SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si) MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2, ED-SG3 TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3

UP-101 1Ni¹/₄Mo (S3 1Ni¹/₄Mo)

SAW (submerged arc welding) wires for high strength structural steels

FLIESS
SINCE 1915

Classification DIN EN ISO

26304-A SZ 3Ni1Mo0,2, 14171-A S3Ni-1Mo0,2

Material No.

-

Classification AWS

A5.23 ENi5 / ENi6

Approvals

DNV, CE

Characteristics and application

Submerged arc welding wire for high strength quenched and tempered structural steels. Applications will be found in the off-shore industry, pipe production, shipbuilding and general structural fabrication.

Base materials

For high strength low alloy fine-grained steels with yield strengths up to ~500MPa (72ksi).

S450J2, S460N, P460QL1-P500QL1, P460QL2-P500QL2, S460QL-S500QL, S460QLN-S500QLN, P460QL1-P500QL1, P460QL2-P500QL2
API: 5L grades X60-X70

Typical analysis in %

C: 0,10
Si: 0,22
Mn: 1,45
Ni: 0,90
Mo: 0,25

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

UP-101 NiMo1 (S3NiMo1)

SAW (submerged arc welding) wires for high strength structural steels

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A S3Ni1Mo, 26304-A S3Ni1Mo

Material No.

-

Classification AWS

A5.23 EF3, A5.23 EF3N

Approvals

TÜV 03275, CE

Characteristics and application

Submerged arc welding wire for high strength structural steels.

Base materials

For high strength low alloy fine-grained steels with yield strengths up to ~550MPa (80ksi).

P460NL1, P460ML1, S460Q-S550Q,
S460QL-S550QL, P460Q-P500Q, P460QL1-
500QL1. 15NiCuMoNb5-6-4 (1.6368)
ASTM: A182 grade F36, A335 grade P36,
A533, A537

Typical analysis in %

C: 0,12
Si: 0,20
Mn: 1,75
Ni: 0,90
Mo: 0,55

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

Other products

MIG/GMAW: ED-A 31
TIG/GTAW: WSG A 31

MIG

TIG

SAW

Gas

UP-100 CrNiMo1 (S2CrNiMo1)

SAW (submerged arc welding) wires for high strength structural steels

FLIESS
SINCE 1916

Classification DIN EN ISO

26304-A SZ 2Cr1Ni1Mo

Material No.

-

Classification AWS

A5.23 EG

Approvals

CE

Characteristics and application

Submerged arc welding wire for high strength quenched and tempered steels. Applications will be found in the offshore industry, shipbuilding, pressure vessels, earthmoving equipment, cranes and general structural fabrication.

Base materials

For high strength low alloy steels with yield strength up to 690MPa (100ksi).
S500Q-S690Q, S500QL-S690QL, P500Q-P690Q, P500QL1-P690QL1
ASTM: A514, A517, HY80, HY100, Q1(N)

Typical analysis in %

C: 0,10
Si: 0,25
Mn: 1,10
Cr: 1,00
Ni: 0,95
Mo: 0,55

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

Other products

MIG/GMAW: ED-FK1, ED-FK800
TIG/GTAW: WSG FK1

Classification DIN EN ISO

26304-A S3Ni2,5CrMo

Material No.

-

Classification AWS

A5.23 ~EM4

Approvals

TÜV 03275, CE

Characteristics and application

Submerged arc welding wire for high strength quenched and tempered steels. Applications will be found in the offshore industry, shipbuilding, pressure vessels, earthmoving equipment, cranes and general structural fabrication.

Base materials

For high strength low alloy steels with yield strength up to 690MPa (100ksi).
S500Q-S690Q, S500QL-S690QL, P500Q-P690Q, P500QL1-P690QL1
ASTM: A514, A517. HY80, HY100, Q1(N)

Typical analysis in %

C: 0,11
Si: 0,17
Mn: 1,40
Cr: 0,70
Ni: 2,40
Mo: 0,55

Typical heat treatment

Welding procedure (including preheat temperature, interpass temperature and PWHT) will be dependent on the base material being welded, including its thickness, and any applicable design codes.

Other products

SAW: UP-EM4
MIG/GMAW: ED-FK1, ED-FK800
TIG/GTAW: WSG FK1

Classification DIN EN ISO

26304-B SUN4M2

Material No.

-

Classification AWS

A5.23 EM2

Approvals

CE

Characteristics and application

Submerged arc welding wire for high strength quenched and tempered steels. Applications will be found in the offshore industry, shipbuilding, pressure vessels, earthmoving equipment, cranes and general structural fabrication.

Base materials

For high strength low alloy steels with yield strength up to 690MPa (100ksi).
EN: S500Q-S690Q, S500QL-S690QL,
P500Q-P690Q, P500QL1-P690QL1
RQT 701, N-A-XTRA 700, USS-T1
ASTM: A514, A517. HY80, HY100, Q1(N)

Typical analysis in %

C: 0,08
Si: 0,35
Mn: 1,50
Cr: 0,25
Ni: 1,90
Mo: 0,45

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

UP: UP-101 NiCrMo2,5 (S3NiCrMo2,5),
UP-EM4
MIG/GMAW: ED-FK1, ED-FK800, ED-
ER110S-1
TIG/GTAW: WSG FK1

Classification DIN EN ISO
26304-A SZ S3Ni2,5CrMo
Material No.
-
Classification AWS
A5.23 EM4
Approvals
CE
Characteristics and application
Submerged arc welding wire for high strength quenched and tempered steels. Applications will be found in the offshore industry, shipbuilding, pressure vessels, earthmoving equipment, cranes and general structural fabrication.
Base materials
For high strength low alloy steels with yield strength up to 690MPa (100ksi). S500Q-S690Q, S500QL-S690QL, P500Q-P690Q, P500QL1-P690QL1 ASTM: A514, A517. HY80, HY100, Q1(N)

Typical analysis in %
C: 0,09 Si: 0,35 Mn: 1,55 Cr: 0,35 Ni: 2,50 Mo: 0,55 P: 0,006 S: 0,008
Yield strength in Mpa
≥ 730
Tensile strength in Mpa
≥ 830
Elongation in %
4d/5d: ≥14
Charpy-V-Value (ISO-V) in J
RT ≥ 70 -50°C ≥ 68
Other products
MIG/GMAW: ED-FK1, ED-FK800, ED-ER100S-1, ED-ER110S-1 TIG/GTAW: WSG ER120S-1, WSG FK1, WSG ER100S-1, WSG ER110S-1 SAW: UP-101 NiCrMo2,5 (S3NiCrMo2,5)

UP-100 CrMo1 (S2CrMo1)

SAW (submerged arc welding) wires for creep resisting steels

FLIESS
SINCE 1916

Classification DIN EN ISO

24598-A-S S CrMo1

Material No.

1.7346

Classification AWS

A5.23 EB2R

Approvals

TÜV 03274, CE, DB 52.045.12

Characteristics and application

Submerged arc welding wire for high temperature creep resistant 1.25%Cr-0.5%Mo ferritic steel, i.e. P11/P12. These steels are used for creep resisting applications up to ~550°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petrochemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor ($X < 10$ ppm) for temper embrittlement resistant applications.

Base materials

For matching 1.25%Cr-0.5%Mo creep resisting ferritic steels.
13CrMo 4-5, 16CrMo 4-4, G-17CrMo 5-5, 24CrMo5, 25CrMo4
ASTM: A182 grades F11/F12, A199/A200 grade T11, A217 grades WC6/WC11, A234 grades WP11/WP12, A335 grades P11/P12, A387 grades 11/12

Typical analysis in %

C: 0,10
Si: 0,17
Mn: 0,95
Cr: 1,20
Mo: 0,52

Yield strength in Mpa

≥470

Tensile strength in Mpa

≥550

Elongation in %

4d/5d: ≥20

Typical heat treatment

Preheat temperature: 200°C
Interpass temperature: max. 300°C
PWHT: 620-690°C

Other products

MIG/GMAW: ED-SG CrMo1, ED-ER80S-B2, ED-ER70S-B2L
TIG/GTAW: WSG CrMo1, WSG ER80S-B2, WSG ER70S-B2L
Gas welding: U 49 CrMo (G V)

UP-99 CrMo2 (S1CrMo2)

SAW (submerged arc welding) wires for creep resisting steels

FLIESS
SINCE 1916

Classification DIN EN ISO	Typical analysis in %
24598-A-S S CrMo2	C: 0,11 Si: 0,15 Mn: 0,55 Cr: 2,40 Mo: 1,00
Material No.	Yield strength in Mpa
-	≥470
Classification AWS	Tensile strength in Mpa
A5.23 EB3R	≥550
Approvals	Elongation in %
TÜV 03274, CE	4d/5d: ≥20/18
Characteristics and application	Typical heat treatment
Submerged arc welding wire for high temperature creep resistant 2.25%Cr-1%Mo ferritic steel. These steels are used for creep resisting applications up to ~600°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries. The wire has low levels of tramp elements (eg. Sn, As, Sb and P) providing a low Brucato Factor (X < 10 ppm) for temper embrittlement resistant applications.	Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 690°C-750°C
Base materials	Other products
For matching 2.25%Cr-1%Mo creep resisting ferritic steels 10CrMo 9-10, 12CrMo 9-10, G-17CrMo 9 10 ASTM: A182 grade F22, A199/A200 grades T21/T22, A213 grade grade T22, A217 grade WC9, A234 grade WP22, A335 grade P22, A387 grades 21/22	MIG/GMAW: ED-SG CrMo2, ED-ER90S-B3, ED-ER80S-B2L TIG/GTAW: WSG CrMo2, WSG ER90S-B3, WSG ER80S-B2L

Classification DIN EN ISO

24598-A-S S Z CrMo2VNb

Material No.

-

Classification AWS

A5.23 EB24

Approvals

TÜV 03274, CE

Characteristics and application

Submerged arc welding wire for T24 creep resistant steel. The T24 alloy is a modified 2.25%Cr-1%Mo alloy with additions of Nb and V to improve high temperature creep performance. The alloy finds use for water-walls in ultra-super-critical (USC) boilers in the power generating industry.

Base materials

For matching alloy 24, 2.25%Cr-1%Mo modified, creep resisting ferritic steels.
X7CrMoVTiB 10-10
ASTM: A213 grade T24

Typical analysis in %

C: 0,09
Si: 0,25
Mn: 0,55
Cr: 2,35
Mo: 1,00
V: 0,26
Nb: 0,04

Yield strength in Mpa

≥470

Tensile strength in Mpa

≥550

Elongation in %

4d/5d: ≥20/18

Typical heat treatment

Preheat temperature: Dependent on application either none or 150-200°C
Interpass temperature: max. 300°C
PWHT: Dependent on application either AW or 730-760°C

Other products

TIG/GTAW: WSG P24

UP-99 CrMo5 (S1CrMo5)

SAW (submerged arc welding) wires for creep resisting steels

FLIESS
SINCE 1916

Classification DIN EN ISO
24598-A-S S CrMo5
Material No.
1.7374
Classification AWS
A5.23 EB6
Approvals
TÜV 03274.06, CE
Characteristics and application
Submerged arc welding wire for high temperature creep resistant 5%Cr-0.5%Mo ferritic steel. The 5%Cr-0.5%Mo creep resistant alloy is used for service up to ~600°C particularly in environments involving hot hydrogen gas. Typical applications are found in oil refineries.
Base materials
For matching 5%Cr-0.5%Mo creep resisting ferritic steels. X12CrMo5, GX12CrMo5 ASTM: A182/A336 grade F5, A199/A213 grade T5, A217 grade C5, A234 grade WP5, A335 grade P5, A387 grade 5

Typical analysis in %
C: 0,08 Si: 0,30 Mn: 0,50 Cr: 6,00 Mo: 0,60
Yield strength in Mpa
≥470
Tensile strength in Mpa
≥590
Elongation in %
4d/5d: ≥20/17
Typical heat treatment
Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 745°C.
Other products
MIG/GMAW: ED-SG CrMo5 TIG/GTAW: WSG CrMo5

MIG

TIG

SAW

Gas

Classification DIN EN ISO

24598-A-S S CrMo9

Material No.

-

Classification AWS

A5.23 EB8

Approvals

CE

Characteristics and application

Submerged arc welding wire for high temperature creep resistant 9%Cr-1%Mo ferritic steel, i.e. P9.

The 9%Cr-1%Mo creep resistant alloy is used for service up to ~600°C particularly in environments involving hot hydrogen gas. Typical applications are found in oil refineries.

Base materials

For matching 9%Cr-1%Mo creep resisting ferritic steels.

ASTM: A182/A336 F9, A199/A213 T9, A217 C12, A234 WP9, A335 P9, A387 9
X12CrMo 9 1, GX12CrMo 10 1
1.7386, 1.7688, 1.7389

Typical analysis in %

C: 0,08
Si: 0,40
Mn: 0,60
Cr: 8,60
Ni: 0,20
Mo: 1,00

Yield strength in Mpa

≥470

Tensile strength in Mpa

≥550

Elongation in %

4d/5d: ≥20

Typical heat treatment

Preheat temperature: 200°C
Interpass temperature: max. 300°C
PWHT: 745°C

Other products

MIG/GMAW: ED-ER80S-B8
TIG/GTAW: WSG ER80S-B8

UP-P91 (S1CrMo91)

SAW (submerged arc welding) wires for creep resisting steels

FLIESS
SINCE 1916

Classification DIN EN ISO

24598-A-S S CrMo91

Material No.

-

Classification AWS

A5.23 EB91

Approvals

TÜV 03274, CE

Characteristics and application

Submerged arc welding wire for high temperature, creep resisting, modified 9%Cr-1%Mo martensitic steels (T91/P91). T91/P91 steel is commonly used at service temperatures up to 620°C and the UP-P91 wire has approval for long term service up to 650°C. V, Nb and N additions provide this 'creep strength enhanced ferritic' (CSEF) alloy with improved high temperature creep resistance compared to standard CrMo creep resistant alloys. Alloy T91/P91 is widely used in the power generating industry for fossil fuel ultra-super-critical (USC) power plant boilers and turbines; the alloy is also finding applications in the chemical and oil and gas industries.

Base materials

For matching P91, 9%Cr-1%Mo modified, creep resisting martensitic steels.
X10CrMoVNb 9 1
ASTM: A182/A336 grade F91, A213 grade T91, A217 grade C12A, A234 grade WP91, A335 grade P91, A387 grade 91

Typical analysis in %

C: 0,10
Si: 0,32
Mn: 0,50
Cr: 9,20
Ni: 0,45
Mo: 0,95
V: 0,20
Nb: 0,05

Yield strength in Mpa

≥540

Tensile strength in Mpa

≥620

Elongation in %

4d/5d: ≥17

Typical heat treatment

Preheat temperature: 200°C
Interpass temperature: max. 300°C
PWHT: 760°C

Other products

MIG/GMAW: ED-SG P91
TIG/GTAW: WSG P91

Classification DIN EN ISO

24598-A-S S Z CrMoWVNb 9 0,5 1,5

Material No.

-

Classification AWS

A5.23 EG

Approvals

TÜV 03274, CE

Characteristics and application

Submerged arc welding wire for high temperature, creep resistant, modified 9%Cr-1.7%W-0.5%Mo martensitic steel (T92/P92). T92/P92 steel is commonly used at service temperatures up to 620°C. V, Nb and N additions provide this 'creep strength enhanced ferritic' (CSEF) alloy with improved high temperature creep resistance compared to standard CrMo creep resistant alloys. Alloy T92/P92 is widely used in the power generating industry for fossil fuel ultra-super-critical (USC) power plant boilers and turbines; the alloy is also finding applications in the chemical and oil and gas industries.

Base materials

For matching P92, 9%Cr-1.7%W-0.5%Mo, creep resisting martensitic steels.
X10CrWMoVNb 9 2
ASTM: A182 grade F92, A213 grade T92,
A335 grade P92, A387 grade 92

Typical analysis in %

C: 0,10
Si: 0,30
Mn: 0,50
Cr: 9,00
Ni: 0,50
Mo: 0,40
V: 0,15
W: 1,60
Nb: 0,05

Yield strength in Mpa

≥540

Tensile strength in Mpa

≥620

Elongation in %

4d/5d: ≥17

Typical heat treatment

Preheat temperature: 200°C
Interpass temperature: max. 300°C
PWHT: 760°C

Other products

MIG/GMAW: ED-SG P92
TIG/GTAW: WSG P92

UP-100 Ni1 (S2Ni1)

SAW (submerged arc welding) wires for low temperature service

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A S2Ni1

Material No.

1.6222

Classification AWS

A5.23 ENi1

Approvals

TÜV 03275, CE, DB 52.045.10

Characteristics and application

Submerged arc welding wire for steels where impact properties are required at -60°C. Applications include structural, oil and gas and offshore steelwork.

Base materials

For cryogenic construction steels and Ni bearing steels.
11MnNi5-3, 13MnNi6-3, S275NL-S460NL, S275ML-S460ML, P275NL2-P460NL2, P355ML2-P460ML2
ASTM: A333/A334 grades 1/6, A350 grades LF2/LF6, A352 grades LCB/LCC
API: 5L X65

Typical analysis in %

C: 0,10
Si: 0,10
Mn: 1,00
Ni: 0,90

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

MIG/GMAW: ED-ER80S-Ni1
TIG/GTAW: WSG ER80S-Ni1

MIG

TIG

SAW

Gas

Classification DIN EN ISO

26304-A SZ 2Ni1Si, 14171-B SUN21

Material No.

-

Classification AWS

A5.23 ENi1K

Approvals

CE

Characteristics and application

Submerged arc welding wire for steels where impact properties are required at -60°C. Applications include structural, oil and gas and offshore steelwork.

Base materials

For cryogenic construction steels and Ni bearing steels.
 11MnNi5-3, 13MnNi6-3, S275NL-S460NL, S275ML-S460ML, P275NL2-P460NL2, P355ML2-P460ML2
 ASTM: A333/A334 grades 1/6, A350 grades LF2/LF6, A352 grades LCB/LCC
 API: 5L X65

Typical analysis in %

C: 0,09
 Si: 0,65
 Mn: 1,05
 Ni: 0,90

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-100 Ni 1 (S2Ni1)
 MIG/GMAW: ED-SG ER80S-Ni1
 TIG/GTAW: WSG ER80S-Ni1

UP-100 Ni2 (S2Ni2)

SAW (submerged arc welding) wires for low temperature service

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A S2Ni2

Material No.

1.6223

Classification AWS

A5.23 ENi2

Approvals

TÜV 03275, CE, DB 52.045.11

Characteristics and application

Submerged arc welding wire for steels where impact properties are required at -75°C. Applications include structural, oil and gas and offshore steelwork.

Base materials

For cryogenic construction steels and Ni bearing low temperature steels.
11MnNi5-3, 13MnNi6-3, S275NL-S460NL, S275ML-S460ML, P275NL2-P460NL2, P355ML2-P460ML2
ASTM: A203 grade A/B, A333/A334 grades 1/6/7, A350 grade LF2/LF5/LF6, A352 grade LC1/LC2

Typical analysis in %

C: 0,08
Si: 0,12
Mn: 1,05
Ni: 2,25

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

MIG/GMAW ED-SG Ni2.5
TIG/GTAW WSG Ni2.5

MIG

TIG

SAW

Gas

UP-100 Ni3 (S2Ni3)

SAW (submerged arc welding) wires for low temperature service

FLIESS
SINCE 1915

Classification DIN EN ISO

14171-A S2Ni3

Material No.

-

Classification AWS

A5.23 ENi3

Approvals

TÜV 03275, CE

Characteristics and application

Submerged arc welding of fine grain structural steel where high impact values are required.

Base materials

For cryogenic construction steels and Ni bearing low temperature steels.

12Ni14

ASTM: A203 grades D/E/F, A333/A334 grades 3/7, A350 grade LF3/LF5, A352 grade LC3

Typical analysis in %

C: 0,09

Si: 0,17

Mn: 1,05

Ni: 3,20

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

UP-100 NiCu1 (S2NiCu1)

SAW (submerged arc welding) wires for weathering steels

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A S2Ni1Cu

Material No.

-

Classification AWS

A5.23 EG

Approvals

TÜV 03275, CE

Characteristics and application

Submerged arc welding wire for weathering steels. Weathering steels, with controlled additions of Cu, provide improved corrosion resistance compared to CMn steels. The improved resistance to atmospheric corrosion means these steels find use for architectural applications and also for welding CMn steels to prevent preferential corrosion of the weld.

Base materials

For weather resistant construction steels, commonly referred to as weathering steels. S235J0W-S355J0W, S235J2W-S355J2W, S355J0WP, S355J2WP, S355K2W
ASTM: A242 grades 1/2, A588 grades A/B/C/K, A606, A709 grade 50W

Typical analysis in %

C: 0,10
Si: 0,25
Mn: 1,00
Ni: 0,85
Cu: 0,47

Typical heat treatment

Preheat and PWHT are often not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

MIG/GMAW: ED-SG NiCu
TIG/GTAW: WSG NiCu

MIG

TIG

SAW

Gas

UP-S3 TiB

SAW (submerged arc welding) wires for pipeline steels

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A SZ3TiB

Material No.

-

Classification AWS

A5.23 EG

Approvals

TÜV 03275, CE

Characteristics and application

Submerged arc welding of pipeline steel. Optimised for multi arc welding using DSAW (two-run) technique. For applications in sour gas service.

Base materials

Low alloy wire with Ti and B additions optimised for multi-arc welding using a two run technique.
EN 10208-2: L360-L555
API: 5L grades X52-X80

Typical analysis in %

C: 0,08
Si: 0,25
Mn: 1,55
Ti: 0,15
B: 0,0012

Typical heat treatment

Preheat and interpass temperature requirements will be dependent on specific process, procedure and code requirements. Ti-B micro-alloyed weld deposits are left in the as-welded condition.

Other products

SAW: UP-S2 MoTiB, UP-S3 MoTiB

Classification DIN EN ISO

14171-A SZMoTiB

Material No.

-

Classification AWS

A5.23 EG

Approvals

CE

Characteristics and application

Submerged arc welding of pipeline steel. Optimised for multi arc welding using DSAW (two-run) technique. For applications with high toughness requirements.

Base materials

Low alloy wire with Ti and B additions optimised for multi-arc welding using a two run technique.
EN 10208-2: L360-L485
API: 5L grades X52-X70

Typical analysis in %

C: 0,11
Si: 0,08
Mn: 1,25
Mo: 0,35
Ti: 0,05
B: 0,005

Typical heat treatment

Preheat and interpass temperature requirements will be dependent on specific process, procedure and code requirements. Ti-B micro-alloyed weld deposits are left in the as-welded condition.

Other products

SAW: UP-S2 MoTiB, UP-S3 MoTiB

UP-S2 MoTiB

SAW (submerged arc welding) wires for pipeline steels

FLIESS
SINCE 1916

Classification DIN EN ISO

14171-A S2MoTiB

Material No.

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Classification AWS

A5.23 EA2TiB

Approvals

CE

Characteristics and application

Submerged arc welding of pipeline steel. Optimised for multi arc welding using DSAW (two-run) technique. For applications with high toughness requirements.

Base materials

Low alloy wire with Ti and B additions optimised for multi-arc welding using a two run technique.
EN 10208-2: L360-L555
API: 5L grades X52-X80

Typical analysis in %

C: 0,08
Si: 0,25
Mn: 1,15
Mo: 0,52
Ti: 0,14
B: 0,011

Typical heat treatment

Preheat and interpass temperature requirements will be dependent on specific process, procedure and code requirements. Ti-B micro-alloyed weld deposits are left in the as-welded condition.

Other products

SAW: UP-S3 TiB, UP-S3 MoTiB

Classification DIN EN ISO

14171-A S2MoTiB

Material No.

-

Classification AWS

A5.23 EA2TiB

Approvals

TÜV 03275, CE

Characteristics and application

Submerged arc welding of pipeline steel. Optimised for multi arc welding using DSAW (two-run) technique. For applications with high toughness requirements.

Base materials

Low alloy wire with Ti and B additions optimised for multi-arc welding using a two run technique.
EN 10208-2: L360-L555
API: 5L grades X52-X80

Typical analysis in %

C: 0,08
Si: 0,25
Mn: 1,25
Mo: 0,52
Ti: 0,14
B: 0,011

Typical heat treatment

Preheat and interpass temperature requirements will be dependent on specific process, procedure and code requirements. Ti-B micro-alloyed weld deposits are left in the as-welded condition.

Other products

SAW: UP-S2 MoTiB

Gas



U 39 (G I)

Gas welding rods for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO

20378 - 0 I

Material No.

1.0324

Classification AWS

A5.2 ~R45

Approvals

TÜV 06258.01, CE, DB 70.045.06

Characteristics and application

Rod for gas welding suitable for joining tubes and plates. Highly fluid weld metal.

Base materials

Steels up to a yield strength of 235MPa (34 ksi).
S185, S235JR
ASTM: A36, A106 grades A/B, A139 grade A, A216 grades WCA/WCB/WCC, A234 grade WPB

Typical analysis in %

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

Yield strength in Mpa

≥ 260

Tensile strength in Mpa

≥ 360

Elongation in %

4d/5d: ≥ 20

Charpy-V-Value (ISO-V) in J

RT ≥ 30

Typical heat treatment

Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW:UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si)
MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2, ED-SG 3
TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3
Gas welding: U 40 (G II), U 40 Ni (G III)

U 40 (G II)

Gas welding rods for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO
20378 - 0 II
Material No.
1.0494
Classification AWS
A5.2 R60
Approvals
CE, DB 70.045.04
Characteristics and application
Rod for gas welding. For joint welding in pipe and tank construction. Tough deposit.
Base materials
Steels up to a yield strength of 275MPa (40 ksi). S185, S235JR-S275JR ASTM: A36, A106 grades A/B/C, A139 grade A, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB

Typical analysis in %
C: 0,09 Si: 0,15 Mn: 1,10
Yield strength in Mpa
≥ 300
Tensile strength in Mpa
≥ 400
Elongation in %
4d/5d: ≥ 20
Charpy-V-Value (ISO-V) in J
RT ≥ 47
Typical heat treatment
Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.
Other products
SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si) MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2, ED-SG 3 TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3 Gas welding: U 39 (G I), U 40 Ni (G II)

MIG

TIG

SAW

Gas

U 40 Ni (G III)

Gas welding rods for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO

20378 - 0 III

Material No.

1.6215

Classification AWS

A5.2 ~R60

Approvals

TÜV 02333.04, CE, DB 70.045.07

Characteristics and application

Well suited for weldments with special requirements. Viscous melting bath and excellent fusion.

Base materials

Steels up to a yield strength of 275MPa (40 ksi).

S185-E295, S235JR-S275JR

ASTM: A36, A106 grades A/B/C, A139 grade A, A210 grades A1/C, A216 grades WCA/WCB/WCC, A234 grade WPB

Typical analysis in %

C: 0,08

Si: 0,10

Mn: 1,10

Ni: 0,40

Yield strength in Mpa

≥ 310

Tensile strength in Mpa

≥ 400

Elongation in %

4d/5d: ≥22

Charpy-V-Value (ISO-V) in J

RT ≥ 47

Typical heat treatment

Preheat and PWHT are generally not necessary but actual requirements will depend on the grade and thickness of material being welded and any design codes that apply.

Other products

SAW: UP-99 (S1), UP-100 (S2), UP-101 (S3), UP-100Si (S2Si)

MIG/GMAW: ED-SG 1, ED-SG 1A, ED-SG 2, ED-SG 3

TIG/GTAW: WSG 1, WSG 1A, WSG 2, WSG 3

Gas welding: U 39 (G I), U 40 Ni (G II)

U 47 Mo (G IV)

Gas welding rods for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO
20378 - 0 IV
Material No.
1.5425
Classification AWS
A5.2 ~R60
Approvals
TÜV 02412.05, CE, DB 70.045.05
Characteristics and application
Rod for gas welding of 0.5%Mo steels, i.e. P1. These steels are commonly used at service temperatures up to 500°C and for some sub-zero structural applications. The 0.5% alloying improves creep performance compared to CMn steels and sees the alloy being used for boiler, pressure vessel and piping construction. The good general mechanical properties also ensures use in general structural engineering applications. Viscous melting bath. Extremely useful when the exact analysis of the boiler plate is unknown.
Base materials
S550GD, S355J0, E335, P285NH, P310GH, S355J0Cu, P355N-P460N, P355NH-P460NH, 16Mo3 ASTM: A182/A336 grade F1, A204 grades A/B/C, A209/A250 grade T1, A217 grade WC1, A335 grade P1, A352 grade LC1

Typical analysis in %
C: 0,10 Si: 0,15 Mn: 1,05 Mo: 0,50
Yield strength in Mpa
≥ 260
Tensile strength in Mpa
≥ 440
Elongation in %
4d/5d: ≥22
Charpy-V-Value (ISO-V) in J
RT ≥ 60
Typical heat treatment
Preheat temperature: Dependent on material thickness Interpass temperature: max. 250°C PWHT: AW or 650°C
Other products
SAW:UP-100 Mo (S2Mo), UP-101 Mo (S3Mo) MIG/GMAW: ED-SG Mo TIG/GTAW: WSG Mo

MIG

TIG

SAW

Gas

U 49 CrMo (G V)

Gas welding rods for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO

20378 - 0 V

Material No.

1.7346

Classification AWS

A5.2 ~R65

Approvals

-

Characteristics and application

Rod for gas welding of high temperature creep resistant 1.25%Cr-0.5%Mo ferritic steels, i.e. P11/P12. These steels are used for creep resisting applications up to ~550°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries.

Base materials

For matching 1.25%Cr-0.5%Mo creep resisting ferritic steels.
13CrMo 4-5, 16CrMo 4-4, G-17CrMo 5-5, 24CrMo5, 25CrMo4
ASTM: A182 grades F11/F12, A199/A200 grade T11, A217 grades WC6/WC11, A234 grades WP11/WP12, A335 grades P11/P12, A387 grades 11/12

Typical analysis in %

C: 0,12
Si: 0,15
Mn: 0,95
Cr: 1,15
Mo: 0,50

Yield strength in Mpa

≥ 320

Tensile strength in Mpa

≥ 510

Elongation in %

4d/5d: ≥20

Charpy-V-Value (ISO-V) in J

RT ≥ 70

Typical heat treatment

Preheat temperature: 200°C
Interpass temperature: max. 300°C
PWHT: 620-690°C

Other products

SAW: UP-100 CrMo1 (S2CrMo1)
MIG/GMAW: ED-SG CrMo1, ED-ER80S-B2
TIG/GTAW: WSG CrMo1, WSG ER80S-B2

U 50 CrMo (G VI)

Gas welding rods for mild and low alloyed steels

FLIESS
SINCE 1916

Classification DIN EN ISO
20378 - 0 VI
Material No.
1.7305
Classification AWS
A5.2 ~R65
Approvals
-
Characteristics and application
Rod for gas welding of high temperature creep resistant 2.25%Cr-1%Mo ferritic steels, i.e. P21/P22. These steels are used for creep resisting applications up to ~600°C. Typical applications in power generation plant include steam piping, turbines and boilers; the alloy also finds applications in the chemical and petro-chemical industries.
Base materials
For matching 2.5%Cr-1%Mo creep resisting ferritic steels. 10CrMo 9-10, 12CrMo 9-10, G-17CrMo 9 10 ASTM: A182 grade F22, A199/A200 grades T21/T22, A213 grade grade T22, A217 grade WC9, A234 grade WP22, A335 grade P22, A387 grades 21/22

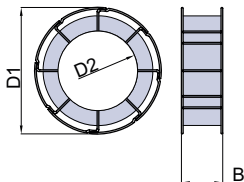
Typical analysis in %
C: 0,08 Si: 0,15 Mn: 0,55 Cr: 2,10 Mo: 1,00
Yield strength in Mpa
≥ 340
Tensile strength in Mpa
≥ 520
Elongation in %
4d/5d: ≥18
Charpy-V-Value (ISO-V) in J
RT ≥ 60
Typical heat treatment
Preheat temperature: 200°C Interpass temperature: max. 300°C PWHT: 690°C
Other products
SAW: UP-99 CrMo2 (S1CrMo2) MIG/GMAW: ED-SG CrMo2, ED-ER90S-B3 TIG/GTAW: WSG CrMo2, WSG ER90S-B3

Basket rim B 300, Basket spool BS 300

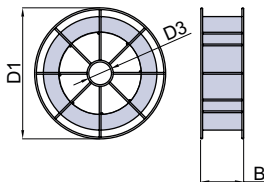
Packaging units, coil types

FLIESS
SINCE 1915

Basket rim (B)



Basket spool (BS)



DIN EN ISO 544

B 300, BS 300

Type

Basket rim (B), Basket spool (BS)

Outer diameter D1 mm

B 300: 300 (-5)
BS 300: 300 (±5)

Inner diameter D2 mm

B 300: 180 (±2)
BS 300: 189 (±0,5)

Outer width B mm

B 300: 100 (±3)
BS 300: 103 (-3)

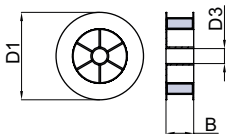
Bore diameter D3 mm

B 300: -
BS 300: 50,5 (+2.5)

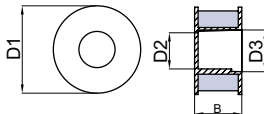
Weight

12,5-20 kg

Spool (S)



Spool (S)



DIN EN ISO 544

S 100 / 40: : S 100
 S 100 / 53,5: -

Type

Reel/spool (S)

Outer diameter D1 mm

S 100 / 40: : 100 (±2)
 S 100 / 53,5: 100

Inner diameter D2 mm

S 100 / 40: : -
 S 100 / 53,5: 41,4

Inner diameter D3 mm

S 100 / 40: : -
 S 100 / 53,5: 47,8

Outer width B mm

S 100 / 40: : 45 (-2)
 S 100 / 53,5: 54

Bore diameter D3 mm

S 100 / 40: : 16,5 (+1)
 S 100 / 53,5: -

Diameter driver pin hole

S 100 / 40:
 D4 mm: -
 D5 mm: -

S 100 / 53,5:
 D4 mm: -
 D5 mm: -

Distance from axis

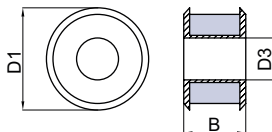
S 100 / 40:
 e1 mm: -
 e2 mm: -

S 100 / 53,5:
 e1 mm: -
 e2 mm: -

Weight

S 100 / 40: 0,5-1,0kg
 S 100 / 53,5: 1,5kg

Spool (S)



DIN EN ISO 544

S 117

Type

Reel/spool (S)

Outer diameter D1 mm

117 (± 1)

Inner diameter D2 mm

-

Outer width B mm

71 (-2)

Bore diameter D3 mm

48 (+0,6)

Diameter driver pin hole

D4 mm: -
D5 mm: -

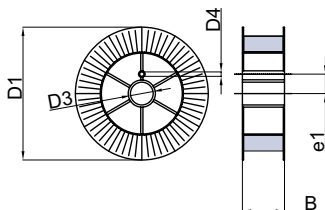
Distance from axis

e1 mm: -
e2 mm: -

Weight

max. 2,7 kg

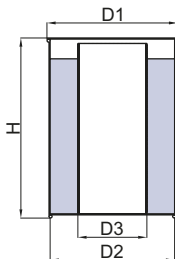
Spool (S)



DIN EN ISO 544
S 200, S 300
Type
Reel/spool (S)
Outer diameter D1 mm
S 200: 200 (±3) S 300: 300 (±5)
Inner diameter D2 mm
-
Outer width B mm
S 200: 55 (-3) S 300: 103 (-3)
Bore diameter D3 mm
S 200: 50,5 (+2,5) S 300: 50,5 (+2,5)

Diameter driver pin hole
S 200: D4 mm: 10 (+1) D5 mm: -
S 300: D4 mm: 10 (+1) D5 mm: -
Distance from axis
S 200: e1 mm: 44,5 (±0,5) e2 mm: -
S 300: e1 mm: 44,5 (±0,5) e2 mm: -
Weight
S 200: 5 kg S 300: 12,5 - 20 kg

Pay-Off-Pack /Drum (MIG)



Outer diameter D1 mm

MIG-Drum 520: 520
 MIG-Drum 575: 575
 MIG-Drum 670: 670

Inner diameter D2 mm

MIG-Drum 520: 500
 MIG-Drum 575: 555
 MIG-Drum 670: 650

Inner tube /inner core* D3 mm

MIG-Drum 520: 300
 MIG-Drum 575: 300
 MIG-Drum 670: 300

*Inner core on request

Height H mm

MIG-Drum 520: 900
 MIG-Drum 575: 940
 MIG-Drum 670: 875

Weight

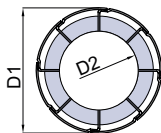
MIG-Drum 520: 300 kg
 MIG-Drum 575: 450 kg
 MIG-Drum 670: 500 kg

Basket rim B 450, Basket rim B 450oc

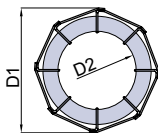
Packaging units, coil types

FLIESS
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Basket rim (B)



Basket rim (B)



DIN EN ISO 544

Basket rim: B 450
Basket rim: ~ B 450

Type

Basket rim (B)

Outer diameter D1 mm

B450: 415
B450oc: 415

Inner diameter D2 mm

B 450: 300 (±5)
B 450oc: 300 (±5)

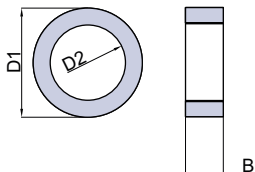
Outer width B mm

B 450: 100 (±3)
B 450oc: 100 (±3)

Weight

B 450: 25 kg
B 450oc: 25 kg

Coil (C)



DIN EN ISO 544
C 450
Type
Coil (C)
Outer diameter D1 mm
380
Inner diameter D2 mm
300 (+15/-5)
Outer width B mm
100 (+10/-5)
Bore diameter D3 mm
-
Diameter driver pin hole
D4 mm = -
D5 mm = -

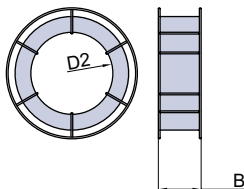
Distance from axis
e1 mm = -
e2 mm = -
Weight
25kg

Basket rim K 570, Coil A/90

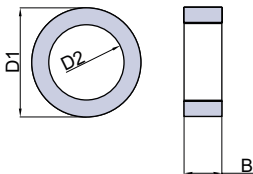
Packaging units, coil types

FLIESS
SINCE 1915

Basket rim (B)



Coil (C)



DIN EN ISO 544

-

Type

K 570: Basket rim (B)
Coil A/90: Coil (C)

Outer diameter $D1$ mm

K 570: 760
Coil A/90: 660 - 740

Inner diameter $D2$ mm

K 570: 570
Coil A/90: 570 (+20)

Outer width B mm

K 570: 115
Coil A/90: 90 (-10)

Bore diameter $D3$ mm

-

Diameter driver pin hole

K 570:
 $D4$ mm = -
 $D5$ mm = -

Coil A/90:
 $D4$ mm = -
 $D5$ mm = -

Distance from axis

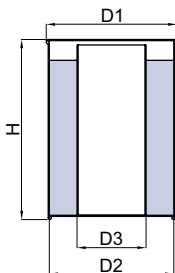
K 570:
 $e1$ mm = -
 $e2$ mm = -

Coil A/90:
 $e1$ mm = -
 $e2$ mm = -

Weight

K 570: 90-100kg
Coil A/90: 50-100kg

Drum (UP)



Outer diameter D1 mm

575

Inner diameter D2 mm

555

Inner tube / inner core D3 mm

315

Height H mm

940

Weight

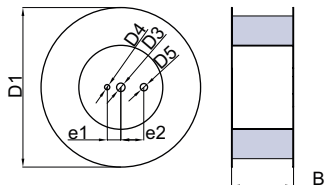
max. 400 kg

Steel Reel S 760

Packaging units, coil types Reel S 760 (Steel Reel)

FLIESS
SINCE 1915

Reel (S)



DIN EN ISO 544

S 760E

Type

Reel/spool (S)

Outer diameter D1 mm

760 (-10)

Inner diameter D2 mm

-

Outer width B mm

290 (+10/-1)

Bore diameter D3 mm

40,5 (+1)

Diameter driver pin hole

D4 mm: 25 (+1)

D5 mm: 35 (+1)

Distance from axis

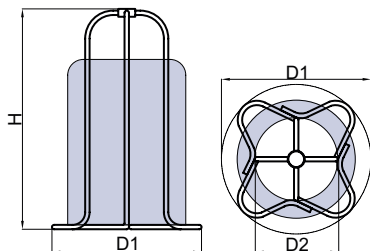
e1 mm: 65 (± 1)

e2 mm: 110 (± 1)

Weight

max. 330 kg

One-Way Spider



Outer diameter D1 mm

950

Inner diameter D2 mm

500

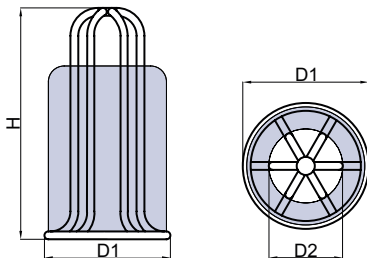
Height H mm

1400

Weight

max. 1000kg

Spider



Outer diameter $D1$ mm

800

Inner diameter $D2$ mm

480

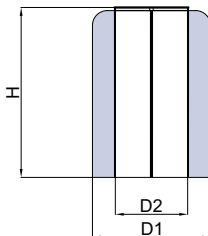
Height H mm

1500/1200

Weight

max. 1000 kg

Fliess-Coil



Outer diameter D1 mm

800

Inner diameter D2 mm

500

Height H mm

1000

Weight

max. 1000kg

Shielding gas acc EN ISO 14175

Symbol		Components in per cent by volume (nominal)					
Main group	Sub group	Oxidizing		Inert		Reducing	sluggish in reaction
		CO ₂	O ₂	Ar	He	H ₂	N ₂
I	1			100			
	2				100		
	3			rest	0,5 ≤ He ≤ 95		
M1	1	0,5 ≤ CO ₂ ≤ 5		rest*		0,5 ≤ H ₂ ≤ 5	
	2	0,5 ≤ CO ₂ ≤ 5		rest*			
	3		0,5 ≤ O ₂ ≤ 3	rest*			
	4	0,5 ≤ CO ₂ ≤ 5	0,5 ≤ O ₂ ≤ 3	rest*			
M2	0	5 ≤ CO ₂ ≤ 15		rest*			
	1	15 ≤ CO ₂ ≤ 25		rest*			
	2		3 ≤ O ₂ ≤ 10	rest*			
	3	0,5 ≤ CO ₂ ≤ 5	3 ≤ O ₂ ≤ 10	rest*			
	4	5 ≤ CO ₂ ≤ 15	0,5 ≤ O ₂ ≤ 3	rest*			
	5	5 ≤ CO ₂ ≤ 15	3 ≤ O ₂ ≤ 10	rest*			
	6	15 ≤ CO ₂ ≤ 25	0,5 ≤ O ₂ ≤ 3	rest*			
	7	15 ≤ CO ₂ ≤ 25	3 ≤ O ₂ ≤ 10	rest**			
M3	1	25 ≤ CO ₂ ≤ 50		rest*			
	2		10 ≤ O ₂ ≤ 15	rest*			
	3	25 ≤ CO ₂ ≤ 50	2 ≤ O ₂ ≤ 10	rest*			
	4	5 ≤ CO ₂ ≤ 25	10 ≤ O ₂ ≤ 15	rest*			
	5	25 ≤ CO ₂ ≤ 50	10 ≤ O ₂ ≤ 15	rest*			
C	1	100					
	2	rest	0,5 ≤ O ₂ ≤ 30				
R	1			rest*		0,5 ≤ H ₂ ≤ 15	
	2			rest*		15 ≤ H ₂ ≤ 50	
N	1						100
	2			rest*			0,5 ≤ N ₂ ≤ 5
	3			rest*			5 ≤ N ₂ ≤ 50
	4			rest*		0,5 ≤ H ₂ ≤ 10	0,5 ≤ N ₂ ≤ 5
	5					0,5 ≤ H ₂ ≤ 50	Rest
O	1		100				
Z	Mixed gas with components not mentioned above or mixed gas with a composition out of the above mentioned range. Two mixed gases in the same Z-classification must not be exchanged against another.						

* Ar can be replaced completely or partially by He

Run length of the wire in mm

Wire diameter in mm Weight in kg	4,0	3,0	2,4	2,0	1,6	1,2	1,0	0,8
1000	10.137	18.021	28.159	40.549	63.357	112.636	162.196	253.431
400	4.054	7.208	11.263	16.219	25.343	45.054	64.878	101.372
330	3.345	5.947	9.292	13.381	20.908	37.169	53.524	83.632
300	3.041	5.406	8.447	12.164	19.007	33.790	48.658	76.029
150	1.520	2.703	4.223	6.082	9.503	16.895	24.329	38.014
100	1.013	1.802	2.815	4.054	6.335	11.263	16.219	25.343
75	760	1.351	2.111	3.041	4.751	8.447	12.164	19.007
50	506	901	1.408	2.027	3.167	5.631	8.109	12.671
30	304	540	844	1.216	1.900	3.379	4.865	7.602
25	253	450	704	1.013	1.583	2.815	4.054	6.335
20	202	360	563	811	1.267	2.252	3.243	5.068
19	192	342	535	770	1.203	2.140	3.081	4.815
18	182	324	506	729	1.140	2.027	2.919	4.561
17	172	306	478	689	1.077	1.914	2.757	4.308
16	162	288	450	648	1.013	1.802	2.595	4.054
15	152	270	422	608	950	1.689	2.432	3.801
14	141	252	394	567	887	1.576	2.270	3.548
13	131	234	366	527	823	1.464	2.108	3.294
12	121	216	337	486	760	1.351	1.946	3.041
11	111	198	309	446	696	1.239	1.784	2.787
10	101	180	281	405	633	1.126	1.622	2.534
9	91	162	253	364	570	1.013	1.459	2.280
8	81	144	225	324	506	901	1.297	2.027
7	71	126	197	283	443	788	1.135	1.774
6	60	108	169	243	380	675	973	1.520
5	50	90	140	202	316	563	811	1.267
4	40	72	112	162	253	450	648	1.013
3	30	54	84	121	190	337	486	760
2,7	27	48	76	109	171	304	437	684
2	20	36	56	81	126	225	324	506
1	10	18	28	40	63	112	162	253
0,5	5	9	14	20	31	56	81	126

Comparative table of hardness

Rm	HV	HB	HRC	Rm	HV	HB	HRC	Rm	HV	HB	HRC
575	180	171	-	860	268	255	25	1150	358	340	
580	181	172	-	870	272	258	26	1160	361	343	
590	184	175	-	880	275	261		1170	364	346	37
600	187	178	-	890	278	264		1180	367	349	
610	190	181	-	900	280	266	27	1190	370	352	
620	193	184	-	910	283	269		1200	373	354	38
630	197	187	-	920	287	273	28	1210	376	357	
640	200	190	-	930	290	276		1220	380	361	
650	203	193	-	940	293	278	29	1230	382	363	39
660	205	195	-	950	295	280		1240	385	366	
670	208	198	-	960	299	284		1250	388	369	
680	212	201	-	970	302	287	30	1260	392	372	40
690	215	204	-	980	305	290		1270	394	374	
700	219	208	-	990	308	293		1280	397	377	
710	222	211	-	1000	311	296		1290	400	380	
720	225	214	-	1010	314	299		1300	403	383	41
730	228	216	-	1020	317	301	32	1310	407	387	
740	230	219	-	1030	320	304		1320	410	390	
750	233	221	-	1040	323	307		1330	413	393	42
760	237	225	-	1050	327	311	33	1340	417	396	
770	240	228	-	1060	330	314		1350	420	399	
780	243	231	21	1070	333	316		1360	423	402	43
790	247	235		1080	336	319	34	1370	426	405	
800	250	238	22	1090	339	322		1380	430	409	
810	253	240		1100	342	325		1380	430	409	
820	255	242	23	1110	345	328	35	1390	431	410	
830	258	245		1120	349	332		1400	434	413	44
840	262	249		1130	352	334		1410	437	415	
850	265	252		1140	355	337	36	1420	440	418	

Comparative table of hardness

Rm	HV	HB	HRC	Rm	HV	HB	HRC	Rm	HV	HB	HRC
1430	443	421	45	1730	527		51	2020	607		
1440	446	424		1740	530			2030	610		
1450	449	427		1750	533			2040	613		
1460	452	429		1760	536			2050	615		56
1470	455	432		1770	539			2060	618		
1480	458	435	46	1780	541			2070	620		
1490	461	438		1790	544		52	2080	623		
1500	464	441		1800	547			2090	626		
1510	467	444		1810	550			2100	629		
1520	470	447		1820	553			2110	631		
1530	473	449	47	1830	556			2120	634		
1540	476	452		1840	559			2130	636		
1550	479	455		1850	561			2140	639		57
1560	481			1860	564			2150	641		
1570	484		48	1870	567			2160	644		
1580	486			1880	570			2170	647		
1590	489			1890	572			2180	650		
1600	491			1900	575			2190	653		
1610	494			1910	578		54	2200	655		58
1620	497		49	1920	580				675		59
1640	503			1930	583				698		60
1650	506			1940	586				720		61
1660	509			1950	589				745		62
1670	511			1960	591				773		63
1680	514		50	1970	594				800		64
1690	517			1980	596		55		829		65
1700	520			1990	599				864		66
1710	522			2000	602				900		67
1720	525			2010	605				940		68

Welding standardization according to the European Standard Overview of EN / ISO standards for welding consumables

EN-Norm	Title of the standard
EN ISO 544	Technical delivery conditions for welding filler metals - Type of product, dimensions, tolerances and marking
EN ISO 636	Rods, wires and deposits for tungsten inert gas welding of non alloy and fine grain steels
EN ISO 2560	Covered electrodes for manual metal arc welding of non alloy and fine grain steels
EN ISO 3580	Covered electrodes for manual metal arc welding of creep-resisting steels
EN ISO 3581	Covered electrodes for manual metal arc welding of stainless and heat resisting steels
EN 12074	Quality requirements for manufacture, supply and distribution of consumables for welding and allied processes
EN 12536	Rods for gas welding of non alloy and creep-resisting steels
EN ISO 14171	Wire electrodes and wire-flux combinations for submerged arc welding of non alloy and fine grain steels
EN ISO 14174	Fuxes for submerged arc welding
EN ISO 14175	Shielding gases for arc welding and cutting
EN ISO 14341	Wire electrodes and deposits for gas-shielded metal arc welding of non-alloy and fine grain steels

Welding standardization according to the European Standard

Overview of EN / ISO standards for welding consumables

EN-Norm	Title of the standard
EN ISO 14343	Wire electrodes, wires and rods for arc welding of stainless and heat-resisting steels
EN 14700	Welding consumables for hard-facing
EN ISO 16834	Wire electrodes, wires, rods and deposits for gas shielded metal arc welding of high strength steels
EN ISO 17632	Tubular cored electrodes for metal arc welding with and without a gas shield of non alloy and fine grain steels
EN ISO 17633	Tubular cored electrodes for metal arc welding with or without a gas shield of stainless and heat-resisting steels
EN ISO 17634	Tubular cored electrodes for gas shielded metal arc welding of creep-resisting steels
EN ISO 18275	Wire electrodes and wire-flux combinations for submerged arc welding of non alloy and fine grain steels
EN ISO 21952	Wire electrodes, wires and rods for arc welding of creep-resisting steels
EN ISO 24598	Wire electrodes, tubular cored electrodes and wire-flux combinations for submerged arc welding of creep resistant steels
EN ISO 26304	Solid wire electrodes, tubular cored electrodes and electrode-flux combinations for submerged arc welding of high strength steels

The above mentioned European standards are or were taken over by the national standards institutes and are thus identical in content to the national standards.

Certificates	
Declaration of compliance 2.1:	Statement of compliance with the order (no values).
Testreport 2.2:	Certificate of the manufacturer stating the values that were determined earlier (eg, mechanical properties out of TÜV approvals).
Inspection certificate 3.1:	Certificate of the manufacturer with details of values of the supplied material or on primary material. Examination at the primary material is permitted only if a material traceability is ensured. Tests at the primary material must be proved, for example, by the QM certificate (eg ISO 9001).
Inspection certificate 3.2:	Corresponds to inspection certificate 3.1, but a third party of the purchaser must confirm compliance with the order separately. Therefore usually neutral organizations (GL, TÜV, etc.) were used.
Additionally for nuclear orders: CMTR (Certified Material Test Report):	Here only the outgoing finished material is checked. Production assistance by QA. Surveillance of each production step. Documentation considerably more detailed than in test reports. If required the third party has to check all production steps and results at base of CMTR and documentation.

Explanation of designations

System of classification of EN ISO 16834 using the example of ED-FK 1

EN ISO 16834-A G 69 4 M21 Mn3Ni1CrMo

Symbol	Description
Welding process, welding consumable	
G	Symbol for product/process
Mechanical properties	
69	Symbol for the yield strength of all-weld metal
4	Symbol for the average impact energy of 47 J of all-weld metal
Shielding gas	
M21	Symbol for shielding gas
Type of alloy	
Mn3Ni1CrMo	Symbol for the chemical composition of wire electrodes

Symbol

Symbol for the product / process

Symbol	Description	Welding process
E	Shielded metal arc welding	111
G	Gas metal arc welding	13
W	Gas tungsten arc welding	14
S	Submerged arc welding	12
O	Oxy-fuel welding	31
P	Plasma welding	15

Symbol

Symbol for strength and elongation properties of all-weld metal

Symbol	ReL [N/mm ²]	Rm [N/mm ²]	A5 [%]
35	355	440-570	22
38	380	470-600	20
42	420	500-640	20
46	460	530-680	20
50	500	560-720	18
55	550	640-820	18
62	620	700-890	18
69	690	770-940	17
79	790	880-1080	16
89	890	940-1180	15

Symbol

Symbol for impact properties of all-weld metal

Symbol	Temperature in °C at notch bar impact energy > 47 J
Z	No requirements
A	20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60
7	-70
8	-80



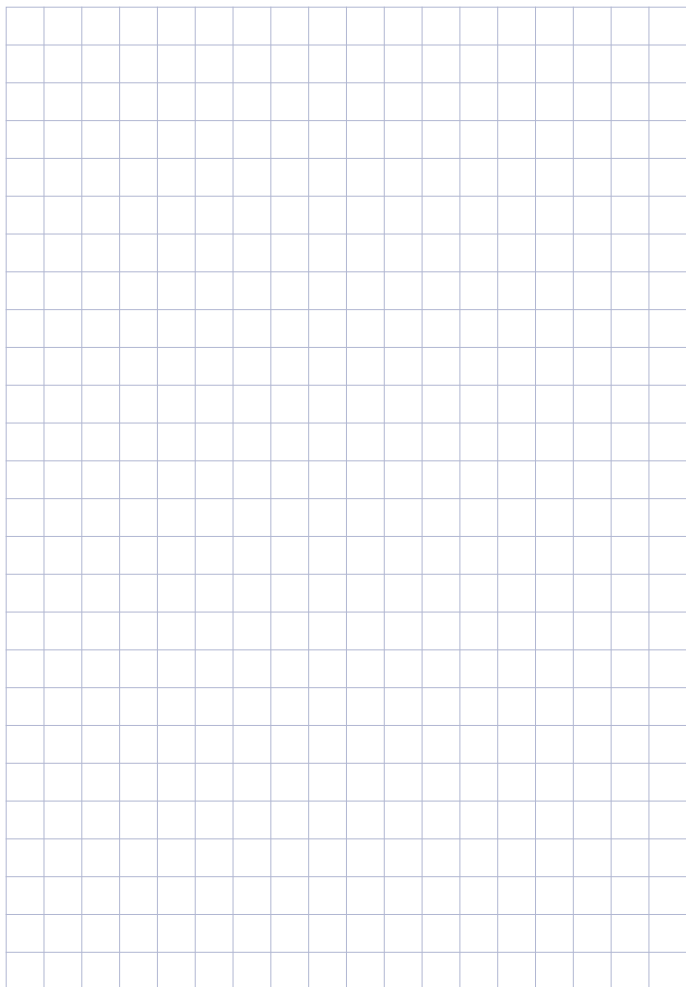
PIT – Cutting Edge HFMI Technology for Manufacturers and Operators of Dynamically Loaded Constructions

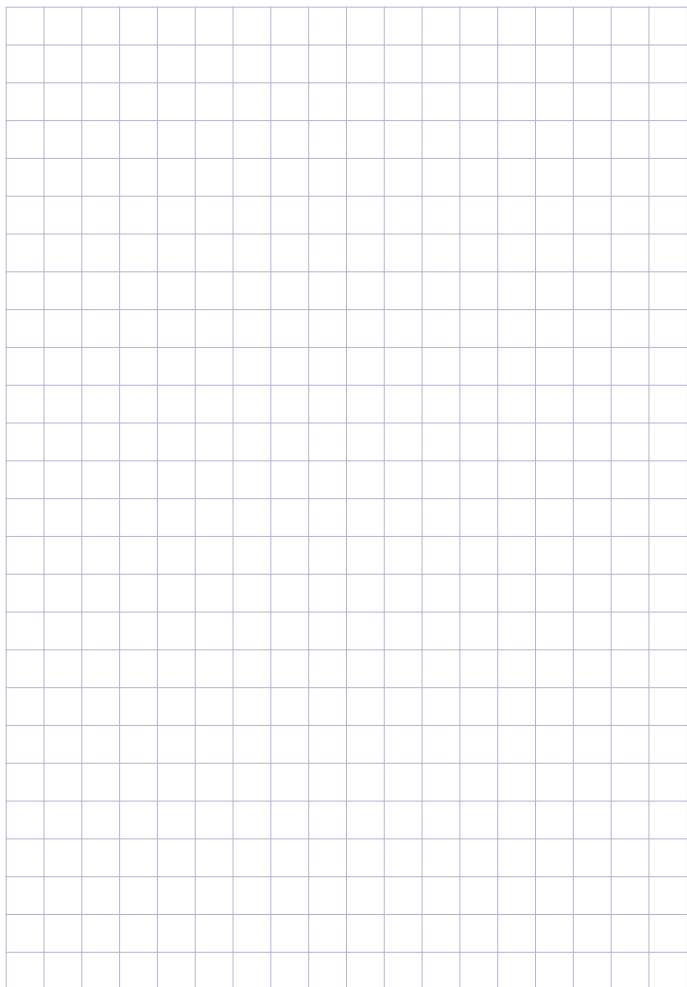
Reduce costs by producing more sustainably and economically as manufacturer or by avoiding machinery downtime as an operator.

Fatigue Improvement & HFMI Experts
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Our advantages:

- + reproducible increase in Fatigue Strength
- + multiple extension of remaining service life
- + enhanced component safety regarding Fatigue
- + significant lightweight construction potential
- + cost and time saving compared to conventional methods
- + prevention of Stress CorrosionCracking
- + reduction of residual stresses







FLIESS: Checked Quality – Made in Germany

Fliess manufactures quality products you can rely on!

Over 100 years of metallurgy and production experience result in the quality products Fliess offers today.

Every product undergoes a 100% quality check throughout the whole production process from the wire rod to the finished product.

All production of welding wire is in line with AWS A 5.01 Class S3 or higher.



MIG (GMAW) wires · TIG (GTAW) rods · SAW wires · Gas welding rods



FLIESS
SINCE 1915

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