ELECTRODES FACTORY

IHTIMAN

CATALOGUE

CONTENTS

1. Rutile – ceullosic, rutile type electrodes for mild and low alloy steels

2. Basic type electrodes according to ISO2560-A for mild, low alloy and high tensile steels

3. Electrodes for high alloy stainless steels

4. Electrodes for hardfacing application

5. Other useful information

6. Notes

"ELECTRODES FACTORY"LTD - Ihtiman

UNIVERS 51 R

Classification

ISO 2560-A : E 38 0 RC11
AWS A 5.1: E 6013 (E 7014)

Typical application and characteristics:

A heavy coated rutile-cellulosic electrode for welding mild and low alloy steels, steel pipes and sheet steels for boilers in all position, including vertical down. Very good welding performance and easily removable slag. Approved by TUV.

Welded materials:

Mild structural steels for general application:

BSS 2592-71:	Б Ст0, Б Ст1, Б Ст2, Б Ст3, В Ст2, В Ст3								
EN 10025-93:	S 185	S 235 JR	S 235 JRG1	S 235 JRG2	S 235 J0	S 275 JR	S 275 J0	S 355 JR	S 355 J0
W№ :	1.0035	1.0037	1.0036	1.0038	1.0114	1.0044	1.0143	1.0045	1.0553
DIN 17100 :	St 33	St 37-2	USt 37-2	RSt 37-2	St 37-3	St 44-2	St 44-3	-	St 52-3

Steel pipes:

BSS 5785-83:	05 кп, 08 пс, 10 кп, 10 пс, 15 кп, 15 пс, 20 кп, 20 пс
EN :	-
W№:	1.0308 до 1.0581
DIN 1629 :	St 35 до St 52.4

Heat resistant steel pipes:

BSS 6609-73:	12 к, 18 к	
EN :	-	
W№:	1.0305	1.0405
DIN 17175-79:	St 35.8	St 45.8

Fine-grained steel pipes:

BSS 4880-89:	08 ГБ, 09 Г2, 09 Г2С, 09 Г2Б				
EN 10208-2-96:	-	L 245 NB	L 290 NB	-	L 360 NB
W№ :	1.0307	1.0457	1.0484	1.0409	1.0582
DIN 17172 :	StE 210.7	StE 240.7	StE 290.7	StE 320.7	StE 360.7
ANSI/ API 5L:	-	B	X42	-	X52

Sheet steels for boilers:

BSS 5930-76:	1 кпК, 12 К, 16 К, 18 К	
EN 10028-93:	P 235 GH	P 265 GH
W№:	1.0345	1.0425
DIN 17155-83:	H I	H II

Carbon structural steels:

BSS 5785-83:	Ст 05 до Ст 25
EN :	-
W№:	1.0301, 1.0401, 1.0453, 1.0402, 1.0460
DIN 17200:	C 10 и Ск 10, C 15 и Ск 15, C 16.8, C 22 и Ск 22, C 22.8

Steel castings:

BSS 3492-8:	15 Л, 25 Л	
EN :		
W№:	1.0420	1.0446
DIN 1681-85:	GS - 38	GS - 45

Typical weld metal composition %

C	Si	Mn
0.08	0.35	0.5

Mechanical properties of all-weld metal:

Yield strength:	R_eH [N/mm²]	≥ 380
Tensile strength:	Rm [N/mm²]	470 - 600
Elongation:	A_5 [%]	≥ 20
Impact energy:	KV [J] 0°C	≥ 47

Welding parameters:

AC or DC(-)

ø[mm]	2.50	3.20	4.00
I [A]	70 - 100	100 - 130	130 - 170

Size, Net weight, Packing data:

Diameter [mm]	2.50	3.20	4.00
Length [mm]	350	350	350
Weight per box [kg]	5.0	5.0	5.0
Weight per cardbox [kg]	20	20	20
Number of electrodes per box	250	185	104



= − | ~

IMPORTANT! To be dried 1 hour at 100°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

ROJEN

Classification

ISO 2560-A : E 38 0 RR12
AWS A 5.1: E 6013

Typical application and characteristics:

A heavy coated rutile electrode for welding mild and low alloy steels. Very good welding performance and easily self-removable slag. Suitable for welding lift equipment, pressure vessels and pipelines. It is an easy to use electrode so that even an inexperienced welder produces very good results. Approved by TUV.

Welded materials:

Mild structural steels for general application:

BSS 2592-71:	Б Ст0, Б Ст1, Б Ст2, Б Ст3, В Ст2, В Ст3						
EN 10025-93:	S 185	S 235 JR	S 235 JRG1	S 235 JRG2	S 235 J0	S 275 JR	S 275 J0
W№ :	1.0035	1.0037	1.0036	1.0038	1.0114	1.0044	1.0143
DIN 17100 :	St 33	St 37-2	USt 37-2	RSt 37-2	St 37-3	St 44-2	St 44-3

Steel pipes:

BSS 5785-83:	05 кп, 08 пс, 10 кп, 10 пс, 15 кп, 15 пс, 20 кп
EN :	-
W№:	1.0308 до 1.0581
DIN 1629 :	St 35 до St 52.4

Heat resistant steel pipes:

BSS 6609-73:	12 к, 18 к	
EN :	-	
W№:	1.0305	1.0405
DIN 17175-79:	St 35.8	St 45.8

Fine-grained steel pipes:

BSS 4880-89:	08 ГБ		
EN 10208-2-96:	-	L 245 NB	L 290 NB
W№ :	1.0307	1.0457	1.0484
DIN 17172 :	StE 210.7	StE 240.7	StE 290.7
ANSI/ API 5L:	A	B	X42

Sheet steels for boilers:

BSS 5930-76:	1 кпК, 12 К, 16 К, 18 К	
EN 10028-93:	P 235 GH	P 265 GH
W№:	1.0345	1.0425
DIN 17155-83:	H I	H II

Carbon structural steels:

BSS 5785-83:	Ст 05 до Ст 25
EN :	-
W№:	1.0301, 1.0401, 1.0453, 1.0402, 1.0460
DIN 17200:	C 10 и Ск 10, C 15 и Ск 15, C 16.8, C 22 и Ск 22, C 22.8

Steel castings:

BSS 3492-8:	15 Л, 25 Л	
EN :		
W№:	1.0420	1.0446
DIN 1681-85:	GS - 38	GS - 45

Typical weld metal composition %

C	Si	Mn	S	P
≤ 0.12	0.2-0.4	0.3-0.6	≤ 0.030	≤ 0.035

Mechanical properties of all-weld metal:

Yield strength:	R_eH [N/mm²] ≥ 380	410 typical
Tensile strength:	Rm [N/mm²] 470-600	500 typical
Elongation:	A_5 [%] ≥ 20	22 typical
Impact energy:	KV [J] 0°C ≥ 47	70 typical

Welding parameters:

AC or DC(-)

ø[mm]	2,50	3,20	4,00	5,00
I [A]	60 - 90	90 - 140	140 - 190	190 - 240

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	350	350	450	450
Weight per box [kg]	5,0	5,0	6,0	6,0
Weight per cardbox [kg]	20	20	18	18
Number of electrodes per box	250	142	88	60



IMPORTANT! To be dried 1 hour at 150°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

MARTA M

Classification

ISO 2560 - A: E 38 2 RB12
AWS A 5.1: E 6013

Typical application and characteristics:

A heavy coated rutile-basic electrode, especially suitable for root beads subjected to non-destructive testing. Recommended for welding metal structures of mild and low alloy steels, pipelines etc. Good welding performance with AC. Welding in all positions except vertical down.

Welded materials:

Mild structural steels for general application:

BSS 2592-71:	B Ст1, B Ст2, B Ст3, B Ст4												
EN 10025-93:	S 185	S 235JR	S 235JRG1	S 235JRG2	S 235J0	S 275JR	S 275J0	S 275J2G3	S 275J2G4	S 355JR	S 355J0	S 355J2G3	E 295
WNo:	1.0035	1.0037	1.0036	1.0038	1.0114	1.0044	1.0143	1.0144	1.0145	1.0045	1.0553	1.0570	1.0050
DIN 17100 :	St 33	St 37-2	USt 37-2	RSt 37-2	St 37-3	St 44-2	St 44-3	St 44-3N	-	-	St 52-3	St 52-3N	St 50-2

Steel pipes:

BSS 5785-83:	05 кп, 08 пс, 10 кп, 10 пс, 15 кп, 15 пс, 20 кп, 20 пс
WNo:	1.0308 до 1.0581
DIN 1629 :	St 35 до St 52.4

Heat resistant steel pipes:

BSS 6609-73:	12 к, 18 к			
WNo:	1.0305	1.0405	1.0481	1.0482
DIN 17175-79:	St 35.8	St 45.8	17 Mn4	19 Mn5

Fine-grained steel pipes:

BSS 4880-89:	08 ГБ							
EN 10208-2-96:	-	L 245 NB	L 290 NB	-	L 360 NB	L 245 MB	L 290 MB	L 360 MB
WNo:	1.0307	1.0457	1.0484	1.0409	1.0582	1.0418	1.0429	1.0578
DIN 17172 :	StE 210.7	StE 240.7	StE 290.7	StE 320.7	StE 360.7	-	StE 290.7 TM	StE 360.7 TM
ANSI/API 5L:	A	B	X42	-	X52	B	X42	X52

Carbon structural steels:

BSS 5785-83:	Ст 05 до Ст 25				
WNo:	1.0301	1.0401	1.0453	1.0402	1.0460
DIN 17200:	C 10 и Ск 10	C 15 и Ск 15	C 16.8	C 22 и Ск 22	C 22.8

Steel castings:

BSS 3492-86:	15 Л, 25 Л	
WNo:	1.0420	1.0446
DIN 1681-85:	GS - 38	GS - 45

Sheet steels for boilers:

BSS 5930-76:	1 кпК, 12 К, 16 К, 18 К				
EN 10028-93:	P 235 GH	P 265 GH	P 295 GH		P 355 GH
WNo:	1.0345	1.0425	1.0481	1.0473	
DIN 17155-83:	H I	H II	17 Mn4	19 Mn6	

Fine-grained structural steels:

BSS 4880-89:	08ГБ, 09Г2,09Г2С, 09Г2БФ, 10Г2САФ, 10Г2СФГ, 12Г2СБ							
EN 10113-93:	S 275 N	S 275 NL	S 355 N	S 355 NL	S 275 M	S 275 ML	S 355 M	S 355 ML
WNo:	1.0490	1.0491	1.0545	1.0546	1.8818	1.8819	1.8823	1.8834
DIN 17102 :	StE 285	TStE 285	StE 355	TStE 355	-	-	StE 355TM	TStE 355TM

Typical weld metal composition %

C	Si	Mn	S	P
≤ 0,1	0,15-0,3	0,4-0,55	≤ 0,025	≤ 0,025

Mechanical properties of all-weld metal:

Yield strength:	R_eH [N/mm²]	≥ 420	450 typical
Tensile strength:	Rm [N/mm²]	500-640	550 typical
Elongation:	A_5 [%]	≥ 20	22 typical
Impact energy:	KV [J] -40°C	≥ 47	65 typical

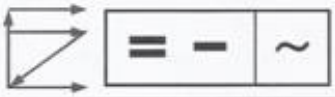
Welding parameters:

AC or DC (-)

ø[mm]	2,50	3,20	4,00
I [A]	70 - 100	100 - 140	140 - 180

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00
Length [mm]	350	350	450
Weight per box [kg]	5,0	5,0	6,0
Weight per cardbox [kg]	25	25	30
Number of electrodes per box	250	152	93



IMPORTANT! To be dried 1 hour at 150°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

HARD

Classification

ISO 2560-A : E 42 5 B 42 H5
AWS A 5.1: E 7018-1

Typical application and characteristics:

A heavy coated basic electrode for welding carbon and low allow structural steels, lift equipment and pressure vessels, operating in temperature range between -40 to +450° C . Good welding performance and easily removable slag. Deposited metal with warranted very low diffusible hydrogen content (H DM < 5ml/100g). Approved by TUV.

Welded materials:

Mild structural steels for general application:

BSS 2592-71:	Б Ст0, Б Ст1, Б Ст2, Б Ст3, В Ст2, В Ст3											
EN 10025-93:	S 185	S 235JR до S 235J2G4	S 275JR до S 275J2G4		S 355JR	S 355J0	S 355J2G3	S 355J2G4	S 355K2G3	S 355K2G4	E 295	E 335
WNo:	1.0035	1.0037 до 1.0117	1.0044 до 1.0145		1.0045	1.0553	1.0570	1.0577	1.0595	1.0596	1.0050	1.0060
DIN 17100 :	St 33	St 37-2 до St 37-3 N	St 44-2 до St 44-3N		-	St 52-3	St 52-3N	-	-	-	St 50-2	St 60-2

Steel pipes:

BSS 5785-83:	05 кп, 08 пс, 10 кп, 10 пс, 15 кп, 15 пс, 20 кп, 20 пс				
WNo:	1.0308 до 1.0581				
DIN 1629 :	St 35 до St 52.4				

Heat resistant steel pipes:

BSS 6609-73:	12 к, 18 к			
WNo:	1.0305	1.0405	1.0481	1.0482
DIN 17175-79:	St 35.8	St 45.8	17 Mn4	19 Mn5

Fine-grained steel pipes:

BSS 4880-89:	08 ГБ, 09 Г2, 09 Г2С, 09 Г2Б, 10 Г2САФ						
EN 10208-2-96:	-	L 245 NB	L 290 NB	L 360 NB	L 245 MB	L 290 MB	L 360 MB
WNo :	1.0307	1.0457	1.0484	1.0582	1.0418	1.0429	1.0578
DIN 17172 :	StE 210.7	StE 240.7	StE 290.7	StE 360.7	-	StE 290.7TM	StE 360.7TM
ANSI/API 5L:	-	B	X42	X52	B	X42	X52

Carbon structural steels:

BSS 5785-83:	Ст 08, Ст 10, Ст 15, Ст 20				
WNo:	1.0301	1.0401	1.0453	1.0402	1.0460
DIN 17200:	C 10 и Ск 10	C 15 и Ск 15	C 16.8	C 22 и Ск 22	C 22.8

Shipbuilding weldable steels:

BSS 9801-84 and BSR grades: A, B, Д, A32, Д36, E36
GL, DNV, LR, Russian SR: A, B, D, E, AH32, DH32, EH32, AH36, DH36, EH36; Weld material: grade: 3Y

Sheet steels for boilers:

BSS 5930-76:	1 кпК, 12 К, 16 К, 18 К, 16 ГС, 17 ГС, 09 Г2С, 10 Г2С1			
EN 10028-93:	P 235 GH	P 265 GH	P 295 GH	P 355 GH
WNo:	1.0345	1.0425	1.0481	1.0473
DIN 17155-83:	H I	H II	17 Mn4	19 Mn6

Steel castings:

BSS 3492-86:	15 Л, 25 Л			
WNo:	1.0420	1.0446	1.0552	1.0558
DIN 1681-85:	GS - 38	GS - 45	GS - 52	GS - 60

Fine-grained structural steels:

BSS 4880-89:	08 ГБ, 09 Г2,09 Г2С, 09 Г2Б, 10 Г2СБФ, 10 Г2 САФ, 10 Г2 СФТ, 12 Г2 СБ							
EN 10113-93:	S 275 N	S 275 NL	S 355 N	S 355 NL	S 275 M	S 275 ML	S 355 M	S 355 ML
WNo :	1.0490	1.0491	1.0545	1.0546	1.8818	1.8819	1.8823	1.8834
DIN 17102 :	StE 285	TStE 285	StE 355	TStE 355	-	-	StE 355 TM	TStE 355 TM

Typical weld metal composition %

C	Si	Mn	S	P
≤0,10	0,2-0,5	0,8-1,2	≤ 0,025	≤ 0,025

Mechanical properties of all-weld metal:

Yield strength:	R_eH [N/mm²] ≥ 420	450 typical
Tensile strength:	Rm [N/mm²] 510-640	550 typical
Elongation:	A_5 [%] ≥ 20	30 typical
Impact energy:	KV [J] -50°C ≥ 47	100 typical

Welding parameters:

DC (+)

ø[mm]	2,50	3,20	4,00	5,00
I [A]	60 - 80	80 - 120	120 - 160	160 - 200

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	350	350	450	450
Weight per box [kg]	5,0	5,0	6,0	6,0
Weight per cardbox [kg]	20	20	18	18
Number of electrodes per box	218	135	88	59



= +

IMPORTANT! To be dried 1 hour at 350°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY" LTD - Ihtiman

EB - 62

Classification

BSS 5517-77: E 60 — EN 499-94: E 50 4 B 42
DIN 8529-84: EY 50 55 MnB — AWS A 5.5: E 8018-G

Typical application and characteristics:

A heavy coated basic electrode for welding mild and low alloy high-strength steels. Also applicable for welding higher carbon steels with up to 0,6% carbon. Suitable for butt welding of railroad rails. Crack resistant weld metal. Recovery 115% approx. Suitable for welding in all positions except vertical down. Diffusible hydrogen content less than 5 ml/100 g deposited metal (H_{DM} < 5ml/100 g).

Welded materials:

Mild structural steels for general application:

BSS 2592-71:	Б Ст4, Б Ст5, Б Ст6, В Ст4, В Ст5, В Ст6					
EN 10025-93:	S 355 J0	S 355 J2G3	E 295	E 335	S 355 K2G3	E 360
WN° :	1.0553	1.0570	1.0050	1.0060	1.0595	1.0070
DIN 17100 :	St 52-3	St 52-3N	St 50-2	St 60-2	-	St 70-2

Fine-grained steel pipes:

BSS 4880-89:	08 ГБ, 09 Г2,09 Г2С, 09 Г2Б, 10 Г2СБФ, 10 Г2 САФ, 10 Г2СФТ, 12 Г2СБ, 12 Г2БФ, 09 Г2БФ										
EN 10113-93:	-	S 355 N	S 420 N	S 460 N	-	-	-	-	-	-	-
WN° :	1.0505	1.0545	1.8902	1.8901	1.8907	1.0506	1.0565	1.8930	1.8932	1.8935	1.8937
DIN 17102 :	StE 315	StE 355	StE 420	StE 460	StE 500	WStE 315	WStE 355	WStE 380	WStE 420	WStE 460	WStE 500

Steel castings:

BSS 3492-86:	15 Л, 25 Л, 35 Л			
WN°:	1.0420	1.0446	1.0552	1.0558
DIN 1681-85:	GS - 38	GS - 45	GS - 52	GS - 60

Typical weld metal composition %

C	Si	Mn
0,06	0,7	1,7

Mechanical properties of all-weld metal:

Yield strength:	R_eH [N/mm²]	≥ 500
Tensile strength:	Rm [N/mm²]	610-720
Elongation:	A_5 [%]	≥ 20
Impact energy:	KV [J] +20°C	≥ 80
	-40°C	≥ 47

Welding parameters:

DC (+)

ø[mm]	2,50	3,20	4,00	5,00
I [A]	80 - 100	100 - 140	140 - 180	180 - 230

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	350	350	450	450
Weight per box [kg]	5,0	5,0	6,0	6,0
Weight per cardbox [kg]	25	25	30	30
Number of electrodes per box	210	150	84	60

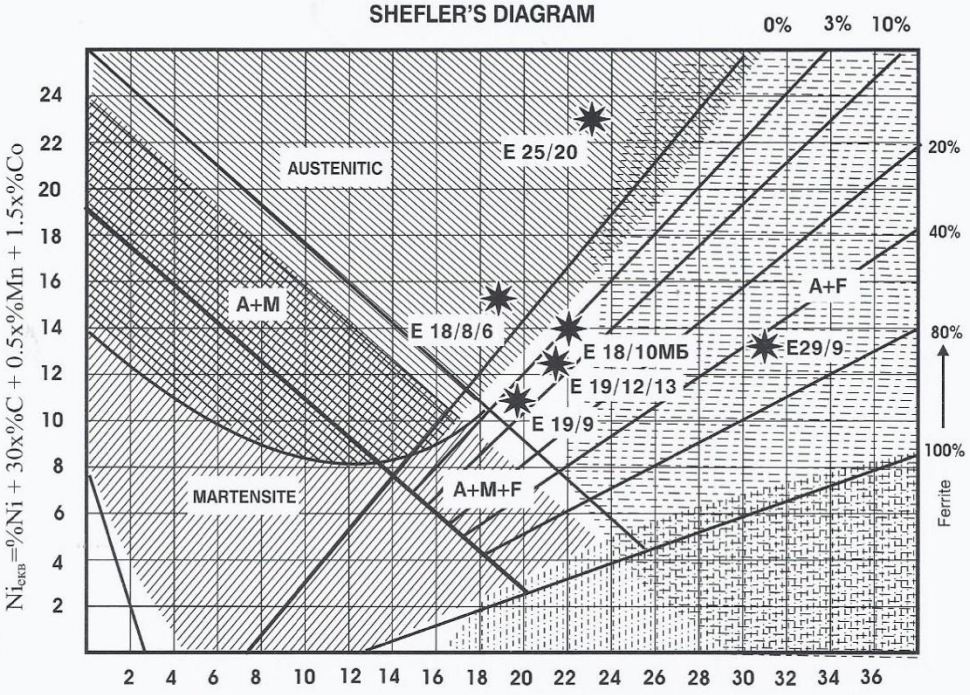


= +

IMPORTANT! To be dried 1 hour at 350°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

SHEFLER'S DIAGRAM



Sensibility to crack formation because of hardness. Preheating up to 450°C

Sensibility to hot crack formation. Preheating up to 1250°C

σ-phase cold-shortness 500-900°C

Grain consolidation more than 1250°C

"ELECTRODES FACTORY"LTD - Ihtiman

E 18/10 МБ

Classification

BSS 5517-77: ЕО9Х19Н10Г2М2Б
DIN 8556-86: E 19 12 3 Nb B 20+
EN 1600-97: E 19 12 3 Nb B 42
AWS/ASME SFA 5.4: E 318 - 17

Typical application and characteristics:

Stabilized austenitic electrode with alloy core rod and ferritic phase 5%. Applicable in any industrial branches for welding similar Cr-Ni-Mo steels, as well as for ferritic chromium steels (13% Cr). The high impact toughness of the all-weld metal ensures possible welding of comparatively thick cross sections. Alloying with Mo improves scale-resistance, allows service in Cl ions containing medium and increases the resistance to stress corrosion cracking. Nb-stabilized electrode provides resistance to intercrystal corrosion up to 400°C. It is recommended to weld with low heat input and to remove possible blue tinting of the weld by polymer brush or by high alloy wire rush. Preheating of base metal or postweld heat treatment of deposited metal are not recommended.

Welded materials:

BSS 6738-72:	X18H9T, 0X18H10T, X18H12T, 0X18H12Б, 0X17H13M2T, 1X18H9C				
EN 10088-95:	X6CrNiMoTi 17-12-2	X6CrNiMoNb 17-12-2	GX5CrNiMoNb 19-11	X10CrNiMoNb 18-12	X4CrNiMo 17-12-2
W№ :	1.4571	1.4580	1.4581	1.4583	1.4401
DIN :	X6CrNiMoTi 17 12 2	X6CrNiMoNb 17 12 2	GX5CrNiMoNb 18 10	X10CrNiMoNb 18 12	X5CrNiMo 17 12 2
ASTM/AISI:	316 Ti	316 Св	316 L	-	316
EN 10088-95:	X2CrNiMo 17-12-2	-	X2CrNiMoN 17-11-2	GX5CrNiMo 19-11	GX2CrNiMo 19-11
W№ :	1.4404	-	1.4406	1.4408	1.4409
DIN :	X2CrNiMo 17 13 2	GX2CrNiMo 18 10	X2CrNiMoN 17 12 2	GX6CrNiMo 18 10	-
EN 10088-95:	X2CrNiMoN 17-13-3	X2CrNiMo 18-14-3	X3CrNiMo 17-13-3	X2CrNiMo 17-12-3	
W№ :	1.4429	1.4435	1.4436	1.4432	
DIN :	X2CrNiMoN 17 13 3	X2CrNiMo 18 14 3	X3CrNiMo 17 13 3	X2CrNiMo 17-13-3	

Typical weld metal composition %

C	Si	Mn	Cr	Ni	Mo	Nb
0,07	0,50	2,00	19,00	11,00	2,80	> 8 x %C

Mechanical properties of all-weld metal:

Yield strength:	R_eH [N/mm²]	≥ 400
Tensile strength:	Rm [N/mm²]	600-740
Elongation:	A_5 [%]	≥ 30
Impact energy:	KV [J]	≥ 47
	KV [J] typical	≥ 90

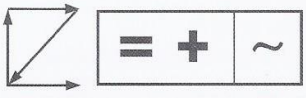
Welding parameters:

DC (+) or AC

ø[mm]	2,50	3,20	4,00	5,00
I [A]	50 - 80	80 - 120	110 - 150	140 - 180

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	250	350	350	350
Weight per box [kg]	4,0	6,0	5,0	5,0
Weight per cardbox [kg]	20	30	25	25
Number of electrodes per box	285	174	98	62



IMPORTANT! To be dried 1 hour at 300°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

E 18/8/6

Classification

BSS 5557-77: E1OX19H8Г7C
DIN 8556-86: E 18 8 Mn R 23
EN 1600-97: E 18 8 Mn R 32
AWS/ASME SFA 5.4: E 307 - 16

Typical application and characteristics:

A high alloy austenitic electrode for joining dissimilar steels. Suitable for welding mild, high tensile, quenched and tempered armor and high alloy steels and for dissimilar joints of these steels as well as for welding of boiler and structural steels to high alloyed Cr and Cr-Ni steels. Suitable for welding austenitic manganese steels (up to 14% Mn) and for dissimilar joints of these steels with other steels. Recommended service temperature for dissimilar joints up to 300°C. Suitable for depositing ductile buffer layers for absorption welding stresses when hardfacing difficult-to-weld steels. Good cavitation resistance. The all-weld metal is strengthened by cold working. Scale resistance up to 850°C. Non-sensitive to σ-phase formation up to 500°C. Resistible to thermoshocks. Good resistance to intercrystal corrosion (BSS 7039-method A) and hot cracking. Recovery 110%. Preheating and heat treatment depends on the base metal requirements.

Welded materials:

High-tensile carbon and alloy heat-treatable steels, armoured steels, austenitic-manganese steels, ferritic stainless chromium steels, non-magnetic steels etc.

Typical weld metal composition %

C	Si	Mn	Cr	Ni
0,1	0,80	6,00	19,00	8,00

Mechanical properties of all-weld metal:

Yield strength:	R_eH [N/mm²]	≥ 380
Tensile strength:	Rm [N/mm²]	560-690
Elongation:	A_5 [%]	≥ 30
Impact energy:	KV [J]	≥ 70
	KV [J] typical	≥ 90

Welding parameters:

DC (+) or AC

ø[mm]	2,50	3,20	4,00	5,00
I [A]	50 - 80	80 - 120	120 - 160	160 - 200

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	300	350	350	350
Weight per box [kg]	5,0	5,0	5,0	5,0
Weight per cardbox [kg]	25	25	25	25
Number of electrodes per box	290	150	96	62



IMPORTANT! To be dried 1 hour at 300°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

E 29/9

Classification	BSS 5557-77: -	EN 1600-97: E 29 9 R 32
	DIN 8556-86: E 29 9 R 23	AWS A 5.4-92: ~E 312 - 17

Typical application and characteristics:

A heavy coated high strength rutile electrode providing duplex austenite-ferrite structure of the all-weld metal. Ferrite phase content is approximately FN 50. Hot crack resistant weld metal.
Corrosion resistance: Good resistance to hot sulphurous gasses. Good corrosion resistance in liquid medium up to 300°C.
Scale resistance: 1100°C approx. in air

Welded materials:

- Duplex steels with 50% approx. ferritic phase ;
- Difficult-to-weld steels: high carbon equivalent steels, for quenching and for spring; steels, operating at high temperatures;
- Hatfild's steels (manganese steels with Mn content up to 14%);
- Dissimilar joints of high alloy stainless steels to high carbon steels;
- Deposition of intermediate high strength layer before depositing wear resistant layers on parts, operating in abrasive environment.

Typical weld metal composition %

C	Si	Mn	Cr	Ni
0,11	1,10	0,80	29,00	10,00

Mechanical properties of all-weld metal:

Yield strength:	R_eH [N/mm²]	≥ 450	540 typical
Tensile strength:	Rm [N/mm²]	≥ 650	820 typical
Elongation:	A_5 [%]	≥ 15	20 typical
Impact energy:	KV[J]	≥ 20	

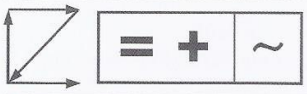
Welding parameters:

DC (+) or AC

ø[mm]	2,50	3,20	4,00	5,00
I [A]	60 - 80	80 - 110	110 - 170	140 - 220

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	250	350	350	350
Weight per box [kg]	1,0	1,0	1,0	1,0
Weight per cardbox [kg]	16	16	16	16



IMPORTANT! To be dried 1 hour at 300°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

EH - 250

Classification

BSS 5513-77 : E 13 Г2Х — EN:
DIN 8555-83 : E 1-UM-250 — AWS:

Typical application and characteristics:

A heavy coated basic electrode for welding machine made of structural and cast steels. Machining of deposited metal is possible. The deposited metal is not prone to formation of quenched microstructures.

Typical machineparts for hardfacing:

Machine parts mainly subjected to metal/metal wearing combined with impact load: shafts, gears, running parts, rails and frogs.

Typical weld metal composition %

C	Si	Mn	Cr
0,15	0,60	1,60	1,00

Strenght of poor all-weld metal:

Strength of poor al-weld metal 250 HB.
Poor all-weld metal with sufficient for practice precision is appeared after third deposited layer. At least deposited layers, strength 250 HB ensures by using EH 350.

Welding parameters:

DC (+)

ø[mm]	3,20	4,00	5,00
I [A]	110 - 140	140 - 180	180 - 210

Size, Net weight, Packing data:

Diameter [mm]	3,20	4,00	5,00
Length [mm]	350	450	450
Weight per box [kg]	5,0	6,0	6,0
Weight per cardbox [kg]	25	30	30
Number of electrodes per box	134	84	60



IMPORTANT! To be dried 1 hour at 350°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

EH - 350

Classification

BSS 5513-77 : E 20 Г2Х2 EN :
DIN 8555-83 : E 1-UM-350 AWS :

Typical application and characteristics:

A heavy coated basic electrode for hardfacing machine parts made of construction and cast steels. Deposited metal machining is possible. Preheating of base metal (hardfaced part) in temperature range of 100 - 300°C is recommended, depending on the base metal and heat flow.

Typical machineparts for hardfacing:

Machine parts subjected to metal/metal friction combined with impact load: shafts, gears, running parts, rails, frogs, railway points etc.
The electrode is especially suitable for hardfacing running parts of crawling machines /track wheels, support rollers, sections of track chains, etc.

Typical weld metal composition %

C	Si	Mn	Cr
0,20	1,00	1,60	1,80

Strenght of poor all-weld metal:

Poor all-weld metal (HB ≥ 350) with sufficient practice precision is appeared after third deposited layer.

Welding parameters:

DC (+)

ø[mm]	2,50	3,20	4,00	5,00
I [A]	90 - 110	100 - 130	130 - 170	170 - 200

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	350	350	450	450
Weight per box [kg]	5,0	5,0	6,0	6,0
Weight per cardbox [kg]	25	25	30	30
Number of electrodes per box	206	134	90	64



IMPORTANT! To be dried 1 hour at 350°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

EH - 550

Classification

BSS 5513-77 : E 70 X9C3 EN :
DIN 8555-83 : E 6-UM-60 AWS :

Typical application and characteristics:

A heavy coated basic electrode for hardfacing machine parts of structural and cast steels, operating in conditions of intensive impact-abrasive wearing. Preheating in the temperature range of 200-300°C is recommended for materials with problematic weldability /high carbon equivalent, cast microstructure, three-dimensional heat flow, etc./ Heat treatment after hardfacing:

*quenching from 1000-1050°C in oil;

*annealing for 5 h at 780-820°C, cooling in furnace down to 300°C.

The electrode is suitable for depositing wear resistant layers on machine parts from austenitic manganese steels (Hatfild's steel 1,2%C; 12-14%Mn). When hardfacing these steels: maximal heat removal, minimal heat input and firm fixing should be provided followed by hammering of deposited layers /in order to reduce the residual tensile stresses and temperature deformations/

Typical machineparts for hardfacing:

Excavators parts, grader buckets, augers, clamping jaws, etc., operating in conditions of impact-abrasive wearing. Hardfacing mining equipment components and tools for impact drilling of rock.

Typical weld metal composition %

C	Si	Mn	Cr
0,50	2,40	0,40	9,00

Strenght of poor all-weld metal:

Poor all-weld metal (≈56 HRC) with sufficient practice precision is appeared after third deposited layer.

Welding parameters:

DC(+)

ø[mm]	2,50	3,20	4,00	5,00
I [A]	80 - 100	100 - 140	140 - 180	180 - 200

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	350	350	450	450
Weight per box [kg]	5,0	5,0	6,0	6,0
Weight per cardbox [kg]	20	20	18	18
Number of electrodes per box	205	135	86	56



= +

IMPORTANT! To be dried 1 hour at 350°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

EH - 600

Classification

BSS 5513-77 : E 70 X9C3 EN :
DIN 8555-83 : E 6-UM-60 AWS :

Typical application and characteristics:

A heavy coated basic electrode for hardfacing machine parts of structural and cast steels, operating in conditions of intensive impact-abrasive wearing. Preheating in the temperature range of 200-300°C is recommended for materials with problematic weldability /high carbon equivalent, cast microstructure, three-dimensional heat flow, etc./ Heat treatment after hardfacing:

*quenching from 1000-1050°C in oil;

*annealing for 5 h at 780-820°C, cooling in furnace down to 300°C.

The electrode is suitable for depositing wear resistant layers on machine parts from austenitic manganese steels (Hatfild's steel 1,2%C; 12-14%Mn). When hardfacing these steels: maximal heat removal, minimal heat input and firm fixing should be provided followed by hammering of deposited layers /in order to reduce the residual tensile stresses and temperature deformations/ The high worn-out resistance and strength are due to the content of CrC and BC in the deposited metal.

Typical machineparts for hardfacing:

Excavators parts, grader buckets, augers, clamping jaws, etc., operating in conditions of impact-abrasive wearing. Hardfacing mining equipment components and tools for impact drilling of rock.

Typical weld metal composition %

C	Si	Mn	Cr	B
0,50	2,40	0,40	9,00	0,25

Strenght of poor all-weld metal:

Poor all-weld metal (=60 HRC) with sufficient practice precision is appeared after third deposited layer.

Welding parameters:

DC(+)

ø[mm]	3,20	4,00	5,00
I [A]	100 - 140	140 - 180	180 - 200

Size, Net weight, Packing data:

Diameter [mm]	3,20	4,00	5,00
Length [mm]	350	450	450
Weight per box [kg]	5,0	6,0	6,0
Weight per cardbox [kg]	20	18	18
Number of electrodes per box	135	86	56



IMPORTANT! To be dried 1 hour at 350°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

EH - CCr60

Classification

BSS :
DIN 8555-83 : E 10-UM-60GRZ

EN :
AWS A5.13: E FeCr - A1

Typical application and characteristics:

A heavy coated basic electrode for welding, machine parts subjected to heavy abrasive wearing. The deposited metal is a high CrC alloy, witch provides extremely high abrasive resistance. The deposited metal is not resistant to impact loading. A buffer layer is recommended when hardfacing difficult-to-weld steels with high carbon equivalent.

Typical machineparts for hardfacing:

Parts of earth moving and casting equipments. Machine parts of equipments for production of manual metal arc welding electrodes.

Typical weld metal composition %

C	Si	Mn	Cr
3,20	1,00	0,40	31,00

Strenght of poor all-weld metal:

≈60 HRC after the second layer.

Welding parameters:

DC (+)

ø[mm]	3,20	4,00	5,00
I [A]	130 - 170	170 - 210	200 - 230

Size, Net weight, Packing data:

Diameter [mm]	3,20	4,00	5,00
Length [mm]	350	450	450
Weight per box [kg]	5,0	6,0	6,0
Weight per cardbox [kg]	25	30	30
Number of electrodes per box	120	74	40



= +

IMPORTANT! To be dried 1 hour at 350°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

EH - 19/9 Si

Classification

BSS 5513-77 : E 08X17H8C6Г — EN :
DIN : — AWS :
ГОСТ 9466-75; ГОСТ 10051-75: Э 08X17H8C6Г

Typical application and characteristics:

A rutile-basic electrode for hardfacing sealing surfaces of boiler fittings operating at temperatures up to 570°C and pressure 18 MPa. The deposited metal is resistant to corrosion and cavitation in water and steam medium and also to scratching. Preheating at no less than 300°C is recommended before hardfacing.

Typical machineparts for hardfacing:

Boiler fittings and installations operating at temperatures up to 570°.

Typical weld metal composition %

C	Si	Mn	Cr	Ni
0,10	5,00	1,50	16,00	8,00

Strenght of poor all-weld metal:

≈30 HRC after heat treatment (high temperature annealing at 720°C, keeping 1 h, cooling in furnace up to 200°C).

Welding parameters:

DC (+)

ø[mm]	2,50	3,20	4,00	5,00
I [A]	50 - 80	80 - 120	110 - 150	140 - 180

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	350	350	350	350
Weight per box [kg]	5,0	5,0	5,0	5,0
Weight per cardbox [kg]	25	25	25	25
Number of electrodes per box	330	150	74	40



= +

IMPORTANT! To be dried 1 hour at 350°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

"ELECTRODES FACTORY"LTD - Ihtiman

E - NiFe

Classification

BSS :
DIN 8573-83 : E NiFe - BG 2+

EN :
AWS A 5.15 : E NiFe - Cl

Typical application and characteristics:

1.A medium coated electrode with basic-graphite coating and Fe-Ni core for welding and hardfacing gray cast iron with lamellar and spheroidal graphite without preheat. At "cold" welding of cast iron, low heat input is recommended (small electrode diameter, low current and no oscillations). Short weld seams are recommended (25-30 mm or 10xø of the electrode). Immediately after deposition the weld seam should be uniformly hammered. Deposition of the next layer should be done after cooling the weld neighbor zone down to 50-60°C.

2. The FeNi type alloying provides the lowest tendency to crack-formation. When welding thick sections, preheating to 150°C - 300°C is advisable in order to minimize the probability of cracking. Optimal mechanical properties (closest to these of the base metal) are ensured by preheating above 300°C.

Welded materials:

Repairing welding of machine parts from gray cast iron.

Typical weld metal composition %

C	Ni	Fe
1,00	53,00	Ост.

Mechanical properties of all-weld metal:

< 250 HB 165 typical
Rm [N/mm²] ≥ 350

Welding parameters:

DC (+)

ø[mm]	2,50	3,20	4,00	5,00
I [A]	50 - 80	80 - 100	90 - 120	120 - 150

Size, Net weight, Packing data:

Diameter [mm]	2,50	3,20	4,00	5,00
Length [mm]	250	350	350	350
Weight per box [kg]	5,0 (1,0)	6,0 (1,0)	6,0 (1,0)	6,0 (1,0)
Weight per cardbox [kg]	25 (16)	25 (16)	30 (16)	30 (16)
Number of electrodes per box	433 (93)	214 (35)	140 (23)	30

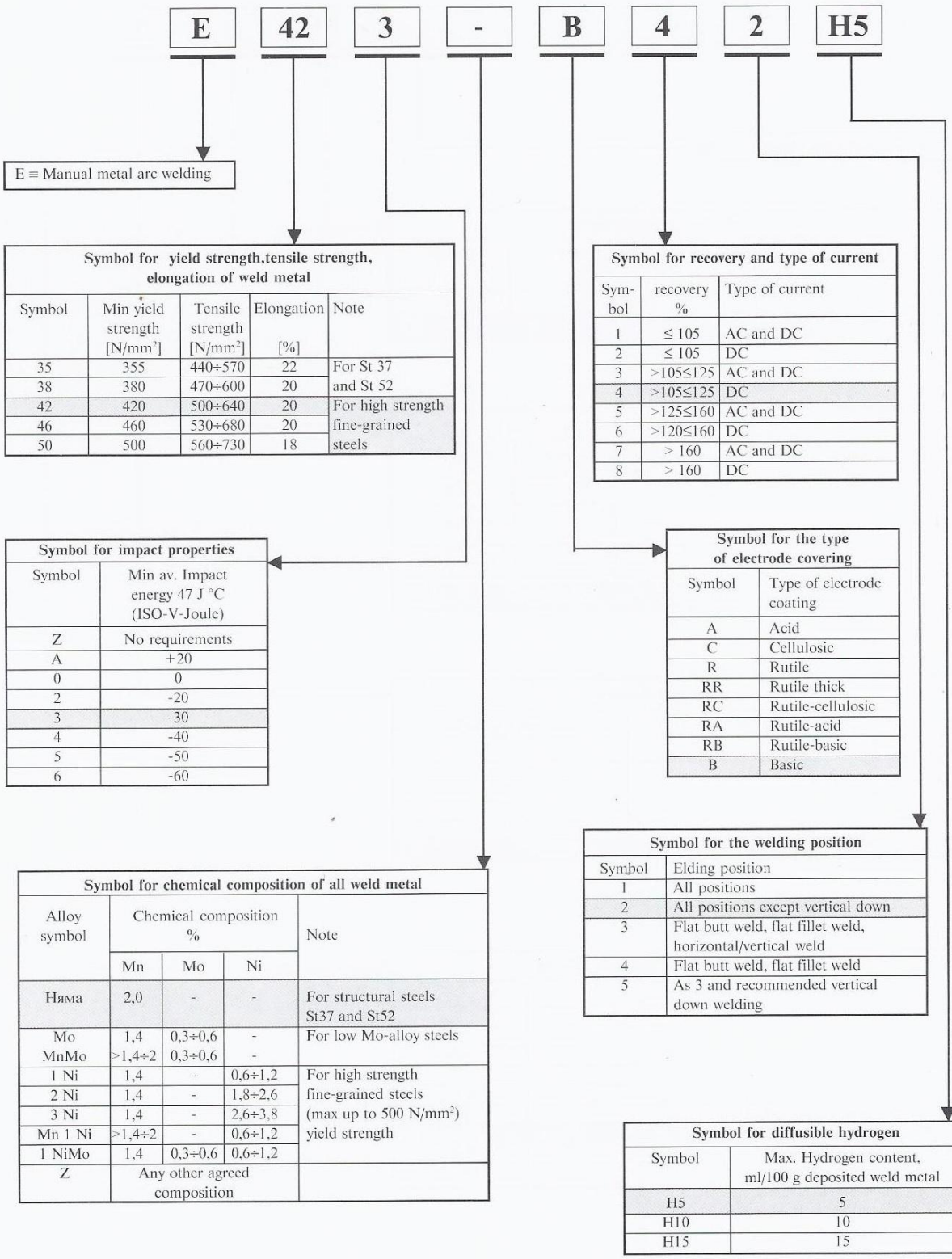


= +

IMPORTANT! To be dried 1 hour at 150°C

* Weight is warranted, number of electrodes is approximate. The opposite is optional!

Guide to the ISO 2560-A coding



Symbol for yield strength,tensile strength, elongation of weld metal				
Symbol	Min yield strength [N/mm²]	Tensile strength [N/mm²]	Elongation [%]	Note
35	355	440÷570	22	For St 37
38	380	470÷600	20	and St 52
42	420	500÷640	20	For high strength
46	460	530÷680	20	fine-grained
50	500	560÷730	18	steels

Symbol for recovery and type of current		
Sym-bol	recovery %	Type of current
1	≤ 105	AC and DC
2	≤ 105	DC
3	>105≤125	AC and DC
4	>105≤125	DC
5	>125≤160	AC and DC
6	>120≤160	DC
7	> 160	AC and DC
8	> 160	DC

Symbol for impact properties	
Symbol	Min av. Impact energy 47 J °C (ISO-V-Joule)
Z	No requirements
A	+20
0	0
2	-20
3	-30
4	-40
5	-50
6	-60

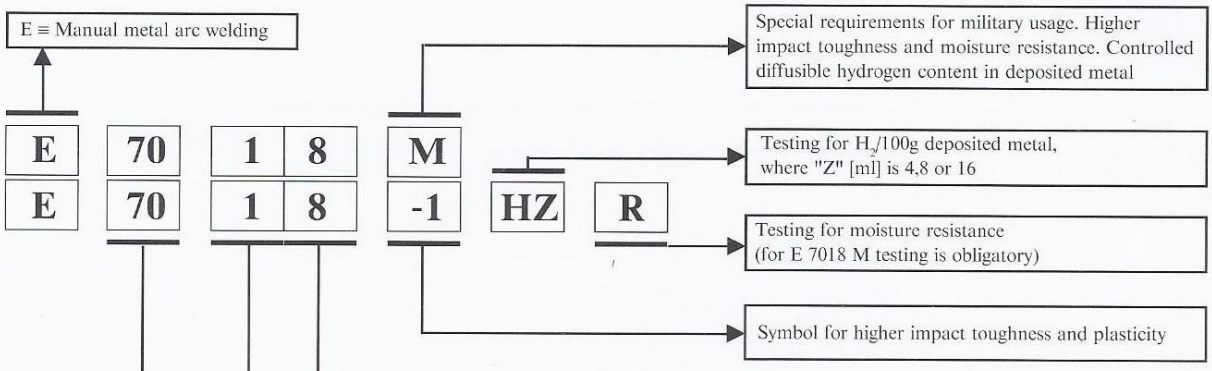
Symbol for the type of electrode covering	
Symbol	Type of electrode coating
A	Acid
C	Cellulosic
R	Rutile
RR	Rutile thick
RC	Rutile-cellulosic
RA	Rutile-acid
RB	Rutile-basic
B	Basic

Symbol for chemical composition of all weld metal				
Alloy symbol	Chemical composition %			Note
	Mn	Mo	Ni	
Няма	2,0	-	-	For structural steels St37 and St52
Mo	1,4	0,3÷0,6	-	For low Mo-alloy steels
MnMo	>1,4÷2	0,3÷0,6	-	
1 Ni	1,4	-	0,6÷1,2	For high strength fine-grained steels (max up to 500 N/mm²) yield strength
2 Ni	1,4	-	1,8÷2,6	
3 Ni	1,4	-	2,6÷3,8	
Mn 1 Ni	>1,4÷2	-	0,6÷1,2	
1 NiMo	1,4	0,3÷0,6	0,6÷1,2	
Z	Any other agreed composition			

Symbol for the welding position	
Symbol	Elding position
1	All positions
2	All positions except vertical down
3	Flat butt weld, flat fillet weld, horizontal/vertical weld
4	Flat butt weld, flat fillet weld
5	As 3 and recommended vertical down welding

Symbol for diffusible hydrogen	
Symbol	Max. Hydrogen content, ml/100 g deposited weld metal
H5	5
H10	10
H15	15

Guide to the AWS A5.1 - 1991 coding



Symbol for mechanical properties of all weld metal							Welding position	Symbol for the type of electrode coating, liquid silicate and type of the current			
AWS classification	Tensile strength /min/		Yield strength		elongation	Min. impact energy Charpy-V		Symbol	Type of electrode coating	Current	
	ksi	N/mm²	ksi	N/mm²	min %	J/°C				AC	DC
E 6010	60	414	48	331	22	27/-29	1	0*	cellulosic	-	+
E 6011	60	414	48	331	22	27/-29	1	1	cellulosic, potassium silicate	X	+
E 6012	60	414	48	331	17	No requirements	1	2	rutile, sodium silicate	X	-
E 6013	60	414	48	331	17	No requirements	1	3	rutile, potassium silicate	X	+/-
E 6019	60	414	48	331	22	27/-18	1	9	Ore-acid	X	+/-
E 6020	60	414	48	331	22	No requirements	2	0	rutile, potassium silicate	X	+/-
E 6022	60	414				No requirements	2	2	rutile, sodium silicate	X	-
E 6027	60	414	48	331	22	27/-29	2	7	Ore-acid with iron powder, potassium silicate	X	+/-
E 7010	70	482	58	399		No requirements	1	0*	cellulosic	-	+/-
E 7014	70	482	58	399	17	27/-29	1	4	Rutile with iron powder, potassium silicate	X	+/-
E 7015	70	482	58	399	22	27/-29	1	5	basic, sodium silicate	-	+
E 7016	70	482	58	399	22	27/-29	1	6	basic, potassium silicate	X	+
E 7016-1	70	482	58	399	22	27/-46	1	6	basic, potassium silicate	X	+
E 7018	70	482	58	399	22	27/-29	1	8	Basic with iron powder	X	+
E 7018-1	70	482	58	399	22	27/-46	1	8	Basic with iron powder	X	+
E 7018 M	a)	482	b)	b)	24	27/-29	1	8	Basic with iron powder	-	+
E 7024	70	482	58	399	17	No requirements	2	4	Rutile with iron powder, potassium silicate	X	+/-
E 7027	70	482	58	399	22	27/-29	2	7	Ore-acid with iron powder, potassium silicate	X	+/-
E 7028	70	482	58	399	22	27/-29	2	8	Basic with iron powder	X	+
E 7048	70	482	58	399	22	27/-29	4	8	Basic with iron powder	X	+

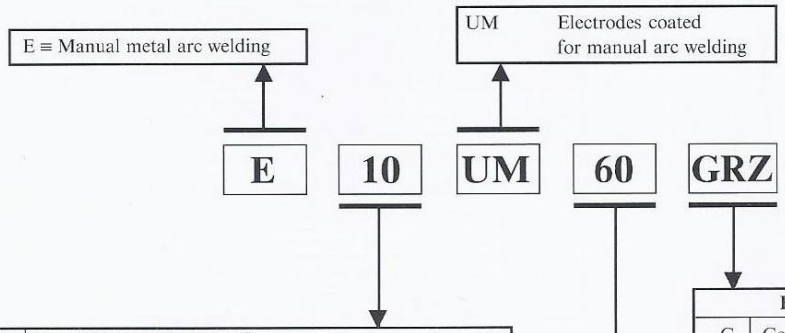
Symbol for mechanical properties of all weld metal [ksi]
1[ksi] = 1000[psi] = 6,3 [N/mm²]
in this case: 70 000 pounds (1p=0,452kg)/inch²
(25,4 mm)²

$$\text{or: min } Rm = \frac{70.1000.0{,}452.9{,}8}{(25{,}4)^2} = 480[N/mm^2]$$

Code	Welding position
1	All positions. For cellulosic electrodes including vertical down
2	Butt weld joints — PA Fillet weld — PA Horizontal / vertical — PC
4	All positions. Vertical-only down.

***Note**: If the fourth digit is "0" type of the coating and current type are determined by the third digit.

Guide to the DIN 8555-83 coding for hardfacing



Alloying group	Type of the all weld metal
1	Non-alloyed up to 0,4% C or low-alloyed up to 0,4% C and max. up to 5% alloyed by Cr, Mn, Mo and Ni as a combination
2	Non-alloyed more than up to 0,4% C or low-alloyed more than 0,4% C and max. up to 5% alloyed by Cr, Mn, Mo and Ni as a combination
3	Alloyed - properties as a heat resistant steels
4	Alloyed - properties as a high-speed steels
5	Alloyed more than up to 5%Cr and low carbon content (for about 0,2%).
6	Alloyed more than 5% Cr and high carbon content (from 0,2%C to 2%).
7	Mn-austenitic: from 11 to 18% Mn and more than 0,5% and up to 3% Ni.
8	Cr-Ni-Mn-austenitic.
9	Cr-Ni-steels (stainless, acid-resistant and red-hard steels).
10	High carbon content and high alloyed by Cr with/ without carbide formation.
20	On the base of Co, alloyed by Cr-W, with/without Ni and Mo.
21	On the carbide base (melted or fillet).
22	On the base of Ni, alloyed by Cr, Cr and B.
23	On the base of Ni, alloyed by Mo with/without Cr.
30	On the base of Cu, alloyed by Sn.
31	On the base of Cu, alloyed by Al.
32	On the base of Cu, alloyed by Ni.

Properties of the all weld metal	
C	Corrosion-resistant
G	Resistance to the abrasive wearing
K	Strengthen. Resistance to the wearing of the all weld metal depends of post strength treatment. Ability for strength on impact loading.
N	Non-magnetic.
P	Hit-resistant
R	Stainless (corrosion-resistant).
S	Cutting properties (for ex. high-speed SD).
T	High temperature toughness, including for cutting tools
Z	Red-hard (temperatures more than 600°C).

Symbol for the hardness*	
150	125 to 175 HB
200	from 175 to 225 HB
250	from 225 to 275 HB
300	from 275 to 325 HB
350	from 325 to 375 HB
400	from 375 to 450 HB
40	37 to 42 HRC
45	from 42 to 47 HRC
50	from 47 to 52 HRC
55	from 52 to 57 HRC
60	from 57 to 62 HRC
65	from 62 to 67 HRC
70	from 67 HRC

*) average value of 10 measuring

NOTES:

‘ELECTRODES FACTORY’ LTD

Bulgaria; 2050 – Ihtiman

Predgarova street, 4

Phone: +359(0)724 8 20 02

M: +359(0)887 200 171

M: +359(0)887 795 828

M: +359(0) 884 090 064

Email: office@electrodi.net

www.electrodi.net