SPETS ELECTRODE

COVERED ELECTRODES FOR MANUAL ARC WELDING, DEPOSITING AND CUTTING

The basic technical characteristics of covered metal electrodes producing by “SpetsElectrode” for manual arc welding are represented in this catalogue.
The catalogue includes the information about 81 trade-marks of covered electrodes unificated into 8 groups.
The characteristics of every trade-mark of electrode include data of usage applications, welding-technological properties of deposited and weld metal, special properties of electrode as well as date of technological features of welding process to be inserted.
The system of unification into groups and also classification according to American (AWS), International (ISO), German (DIN) and European (EN) standards makes suitable the right selection and usage of wide range of represented electrodes.
This catalogue is intended for wide range of engineers and technicians deal with welding in their practical activity.

Contents

SPETSELECTRODE

"SPETSELECTRODE" is one of the leading Russian industrial enterprises specialising in the field of development, manufacturing and delivering of coated metal electrodes for welding and depositing as well as of base technological equipment for production of electrodes.

Our electrodes are of various destination: for welding of mild and alloyed steels, heat resistant, corrosion resistant, creep resistant high alloyed steels; copper and nickel alloys, cast irons; for manufacturing and repairing deposition. There is not a branch of industry which does not used electrodes of our Company. Some of our grades and sizes of electrodes are not supplied by others Russian enterprises. For consumer's special desire it is easy to produce electrodes of diameter 3,15 and 3,25 mm in accordance with GOST.

The innovation potential of the Company organised by leading specialists of Moscow experimental welding factory, is based on the more than half age experience of specialising in the field of everything connected with welding electrodes. These are: investigation and development of electrodes of various destination, equipment and devices for their manufacturing using in different branches of industry, commercial delivery of electrodes to numerous consumers. In that way all the links of electrode production from applied investigations till manufacturing and testing of experimental industrial production, delivery and engineering are concentrated in "united hands". This allows not only to respond efficiently to consumer's requirements or to technical and economic conditions of producing being changed with speed, but also to discover often forestalling technical decisions.

Please note the following in the use of this catalogue.

1. Standards of Welding Consumables

The Standards used here are abbreviated as follows:

ГОСТ - Russian National Standard
AISI - American National Standard
AWS - American Welding Society
DIN - Deutsches Institut fur Normung
ISO - International Organisation for Standardisation.

2. Description of designation

Number of electrodes per kg electrodes is calculated on average.

Current and polarity:

AC - alternative current
DC(+) - direct current, plus on electrode
DC(-) - direct current, minus on electrode
DC - direct current, plus or minus depending on electrode positions at welding

The catalogue of our Company production has been designed to enable you to find easily the coated electrodes required for your welding work. We feel sure that the quality and service, which we could to offer, will fully satisfy your requirements.

Our Company has "Advice Service" for helping purchaser to make right choice of welding consumables and technology for welding and depositing of different materials (Tel: 07 (095) 177-00-10, 177-00-51).

In accordance with continuous investigation and improvement of coated electrodes by Company's "Research Service" some difference from information introduced in the catalogue can be obtained.

Electrodes in this catalogue are divided into several groups:

- electrodes for welding of mild, carbon and low alloyed structural steels;
- electrodes for welding of alloyed structural steels of high and higher strength;
- electrodes for welding of heat resistant steels;
- electrodes for welding of high alloyed steels and alloys;
- electrodes for depositing;
- electrodes for welding and depositing of different cast irons;
- electrodes for welding of non-ferrous alloys;
- electrodes for cutting of different materials.

Description of each grade of covered electrodes contains usage and application of the electrode, electrode's characteristics including mechanical properties and chemical analysis of all weld metal, size of electrode and welding parameters, special properties and technological features of welding process.

The description of electrodes makes possible to choose electrode, which give to purchaser the right weld metal and quality at the lowest cost.

All grades of electrodes of our Company are certified by Russian and Ukrainian "Gostandard", and some of the grades - by Russian Maritime Register of Shipping and by Lloyd's Register of Shipping (UK).

The information of catalogue can be useful for specialists of different fields of welding.

Please do not hesitate to contact our Company. Our adress:
Russia 111394, Moscow, Perowskaya street, 71
Tel: 7 (495) 739-50-84,739-50-85,739-50-86,739-50-89
E-mail: postmaster@spetselectrode.ru; WWW: http://www.spetselectrode.ru

ELECTRODES FOR WELDING MILD AND LOW ALLOYES STEELS

RUTILE ELECTRODES

ОЗС-4 (OZS-4)

ГОСТ 9466, AWS E6013,
ISO E433R25, DIN E4330R3

General purpose electrode for welding of complicated structures of mild and carbon steel with tensile strength up to 450 MPa. Welding in all positions at DC (±) or AC current is used.

Type of electrode - rutile.
Deposition rate factor - 9,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,4 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	0,65
Si	0,15	S	0,020
P	0,026		

Typical all weld metal mechanical properties

Tensile strength, MPa	520
Yield strength, MPa	430
Elongation, %	25
Impact values (U-notch specimen), Joule/sm^2	137

Special properties
Extraordinarily good efficiency in welding of rust edged metal.

Thechnological features of welding process
Electrodes are suitable for welding in wide range of arc length. Dry electrodes before welding at 120-160°C; 0,7 hour.

Dia, mm	Length, mm	Current range, A
3,0	350	70-120
4,0	450	110-180
5,0	450	150-250

Approvals*
GOST R, UkrSEPRO, GOSATOMNADZOR

ОЗС-4И (OZS-4I)

ГОСТ 9466, AWS E6012,
ISO E433AR24, DIN E4330AR7,
EN E38AR12

Ilmenite electrodes are employed for welding of structural mild and carbon steels with tensile strength up to 450 MPa in all welding positions except vertical down at DC(±) or AC current.

Type of electrode - ilmenite.
Deposition rate factor - 8,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,7 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	0,52
Si	0,08	S	0,025
P	0,033		

Typical all weld metal mechanical properties

Tensile strength, MPa	490
Yield strength, MPa	410
Elongation, %	27
Impact values (U-notch specimen), Joule/sm^2	110

Special properties
Electrodes are used for welding of wet, rust and bad cleaned metal, have high efficiency of welding.

Technological features of welding process
Welding of middle or big cross sections of weldments can be used at higher welding currents with bend forward electrode in the direction of welding. Welding must be done at medium length of arc. Dry electrodes before welding at 140-180°C for half an hour.

Dia, mm	Length, mm	Current range, A
3,0	350	80-150
4,0	450	110-230
5,0	450	130-280

Approvals
GOST R, UkrSEPRO

МР-3 (MR-3)

ГОСТ 9466, AWS E6013,
ISO E433R23, EN E38AR12

Electrodes for welding of structures of carbon steels with tensile strength up to 490 MPa in all welding positions are used. Suitable for welding at AC and DC(+). The open circuit is not less 65 V.

Type of electrode - rutile.
Deposition rate factor - 8,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,7 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,11	Mn	0,58
Si	0,17	S	≤0,040
P	≤0,045		

Typical all weld metal mechanical properties

Tensile strength, MPa	≥450
Yield strength, MPa	≥4
Elongation, %	≥18
Impact values (U-notch specimen), Joule/sm^2	≥80

Special properties
Electrodes are used for welding of rust and bad cleaned metal with high efficiency of welding.

Thechnological features of welding process
Welding must done at medium and short length of arc. Dry electrodes before use at 170-200°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	80-140
4,0	450	140-200
5,0	450	160-260

Approvals
GOST R, UkrSEPRO

*GOSATOMNADZOR - Federal supervision of Russia on nuclear safety; UkrSEPRO - The Ukrainian system of certification.
All production has the Hygienic Russian and Ukrainian certificate

Classification of Covered Electrodes According to EN 499

Mechanical properties			
Symbol	Yield strength[1], N/mm²	Tensile strength, N/mm²	Elongation[2], %
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
1) According to min values			
2) L=5d			

Chemical composition classification			
Alloy	Chemical composition [1) 2) 3)]		
	Mn	Mo	Ni
- Mo MnMo 1Ni 2Ni 3Ni Mn1Ni	2,0 1,4 >1,4 до 2,0 1,4 1,4 1,4 >1,4 до 2,0	- 0,3-0,6 0,3-0,6 - - - -	- - - 0,6-1,2 1,8-2,6 >2,6 до 3,8 0,6-1,2
1NiMo	1,4	0,3 - 0,6	0,6 - 1,2
Z	Other composition		
1) If no requirements, Mo<0,2 Ni<0,3 Cr<0,2 V<0,05 Nb<0,05 Cu<0,3			
2) The single meanings are max			
3) The meanings are to be round of according to ISO 31-0, part B, rule A			

Impact properties	
Symbol	Temperature required for 47 J Impact resistance, °C
Z	No requirement
A	+20
0	0
2	-20
3 4 5 6	-30 -40 -50 -60

E 50 6 3Ni B 2 2 H10

Efficiency/Current type		
Symbol	Electrode efficiency, %	Current type
1	≤ 105	AC, DC
2	≤ 105	DC
3	> 105 ≤ 125	AC, DC
4	> 105 ≤ 125	DC
5 6	> 125 ≤ 160	AC, DC DC
7	> 160	AC, DC
8	> 160	DC
Welding at AC are to be produced with U≤65		

Covering type
A - acid C - cellulosic R - rutile RR - rutile (thick) RC - rutile+cellulosic RA - rutile+asid RB - rutile+basic B - basic

Symbol of welding position
1 - all positions 2 - all positions except vertical-down 3 - flat, butt and fillet; horizontal vertical fillet 4 - flat butt and fillet 5 - vertical-down and positions according to symbol 3

Hydrogen contents	
Symbol	ml/100 g (max)
H5 H10 H15	5 10 15

МР-3М (MR-3M)

ГОСТ 9466, AWS E6012,
ISO E433AR24, DIN E4330AR7,
EN E38AR12

Rutile-ilmenite electrodes are employed of welding of carbon steels with carbon contents ≤0,25%. Welding in all positions except vertical-down can be used. Suitable for welding at DC(±) or AC current. The open circuit is not less 65 V.

Type of electrode - rutile-ilmenite.
Deposition rate factor - 8,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,7 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C 0,11	Mn 0,35
Si 0,17	S ..... ≤0,040
P ..... ≤0,040	

Typical all weld metal mechanical properties

Tensile strength, MPa 471
Yield strength, MPa 373
Elongation, % 20
Impact values (U-notch specimen), Joule/sm^2 150

Special properties

Electrodes are used for welding of wet, rust and bad cleaned metal, have high efficiency of welding.

Technological features of welding process

Welding of middle or big cross sections of weldments can be used at higher welding currents with bend forward electrode in the direction of welding. Welding must be done at medium length of arc. Dry electrodes before welding at 140-180°C for half an hour.

Dia, mm	Length, mm	Current range, A
3,0	350	80-140
4,0	450	120-170
5,0	450	130-240

Approvals

GOST R, UkrSEPRO

ОЗС-12 (OZS-12)

ГОСТ 9466, AWS E6013,
ISO E432R12, DIN E4330R3,
EN E38AR12

General purpose electrode for welding of complicated structures of mild and carbon steel with tensile strength up to 450 MPa. Welding in all positions at DC (±) or AC current is used.

Type of electrode - rutile.
Deposition rate factor - 8,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,2 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C 0,09	Mn 0,60
Si 0,15	S 0,017
P 0,026	

Typical all weld metal mechanical properties

Tensile strength, MPa 510
Yield strength, MPa 420
Elongation, % 25
Impact values (U-notch specimen), Joule/sm^2 137

Special properties

Easy to handle electrode in all positions of tack welding and joint welding for all branches of sheet metal fabrication and pipe line construction. Very suitable for welding with low amperage from small (home) transformers. Extraordinarily good efficiency in welding of concave fillets and rust edged metal.

Technological features of welding process

Electrodes are suitable for welding in wide range of arc length and easy to strike and restrike, slag is easy to remove. Dry electrodes before welding at 150-180°C; 0,5 hour.

Dia, mm	Length, mm	Current range, A
2,0	300	30-90
2,5	350	50-110
3,0	350	70-130
4,0	450	110-180
5,0	450	130-220

Approvals

GOST R, UkrSEPRO, Lloyd's Register of Shipping, Russian Maritime Register of Shipping, "Moscow Quality", Russian River Register

ОЗС-12К (OZS-12K)

ГОСТ 9466, AWS E6012,
ISO E433AR24, DIN E4330AR7

Electrodes for welding of structures of mild stees with tensile strength up to 410 MPa in all positions at AC and DC(-).

Type of electrode - ilmenite.
Deposition rate factor - 8,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,7 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C 0,10	Mn 0,55
Si 0,09	S 0,024
P 0,034	

Typical all weld metal mechanical properties

Tensile strength, MPa 500
Yield strength, MPa 420
Elongation, % 27
Impact values (U-notch specimen), Joule/sm^2 100

Special properties

Electrodes can be used for welding of rustand bad cleaned metal.

Thechnological features of welding process

Welding must be done at medium length of arc. Dry electrodes before use at 140-180°C for 0,5 hour.

Dia, mm	Length, mm	Current range, A
3,0	350	80-150
4,0	450	110-230
5,0	450	130-280

Approvals

GOST R

Classification of Electrodes for Welding of Carbon and low Alloyed Structure Steels According to ISO 2560

Symbol of electrode	Mechanical properties of all weld metal			Temperature required for 28 J/sm², Impact resistance (°C)
	Tensile strength	Minimum elongation, %		
	MPa	Symbol	%	°C
E 430	430 - 510	0	Not specified	
E 431	430 - 510	1	20	+20
E 432		2	22	0
E 433		3	24	-20
E 434		4	24	-30
E 435		5	24	-40
E 510	510 - 610	0	Not specified	
E 511	510 - 610	1	18	+20
E 512		2	18	0
E 513		3	20	-20
E 514		4	20	-30
E 515		5	20	-40

Covering type
A - acid
AR - rutile-acid
B - basic
C - cellulosic
O - oxide
R - rutile (medium thickness)
RR - rutile (big thickness)
S - others

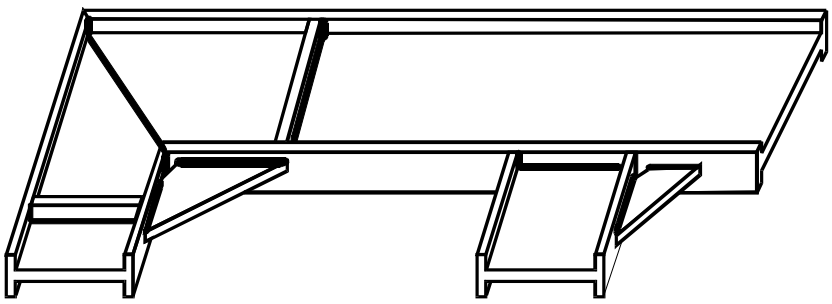
H - Hydrogen contents in deposited metal ≤15 ml/g

E 432 RR 160 4 6

Efficiency, %	
Symbol	K_c, %
110	105 - 115
120	115 - 125
130	125 - 135
140	135 - 145
150	145 - 155
160	155 - 165
170	165 - 175
180	175 - 185
190	185 - 195
200	195 - 205

Symbol	Welding position
1	All positions
2	all positionc except vertical-down
3	Flat, horizontal and vertical
4	Flat (butt and multi-layer weld)
5	Like "3" and vertical-down

Symbol	DC polarity	Open-circuit voltage with AC (V)
0	Negative (+)	-
1	Any polarity (+/-)	50
2	Positive (-)	50
3	Negative (+)	50
4	Any polarity (+/-)	70
5	Positive (-)	70
6	Negative (+)	70
7	Any polarity (+/-)	90
8	Positive (-)	90
9	Negative (+)	90



ОЗС-3 (OZS-3)

ГОСТ 9466, AWS E7024,
ISO E432RR16046,
DIN E4320RR11160,
EN E38ARR74

A very fast high efficiency rytile iron powder electrode giving a metal recovery of approx. 180%. Particularly suitable for fillet welds on mild steel with tensile strength up to 450 MPa. Can be used for welding only in flat position on AC or DC(+) current.

Type of electrode - rutile.
Deposition rate factor - 15,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 3,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,3 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	0,60
Si	0,20	S	0,030
P	0,030		

Typical all weld metal mechanical properties

Tensile strength, MPa	490
Yield strength, MPa	390
Elongation, %	27
Impact values (U-notch specimen), Joule/sm^2	140

Special properties

The electrode is very easy to strike and is ideal for short welds. OZS-3 gives smooth weld beads, and slag is easy to remove.

Technological features of welding process

Keep arc short as possible with touching tip of the electrode to the molten pool. Dry electrodes at 150-170°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	150-210
4,0	450	180-240
5,0	450	240-320

Approvals

GOST R

ОЗС-6 (OZS-6)

ГОСТ 9466, AWS E6020,
ISO E430RR12023,
DIN E4300RR11120,
EN E38ARR32

Electrode with metal powder in coating for welding of mild steel of tensile strength up to 450 MPa. Suitable for welding in all positions except vertical-downward. Welding at AC or DC(+) current.

Type of electrode - rutile.
Deposition rate factor - 10,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,8 kg/h.
Consumption of electrodes per kg deposited metal - 1,5 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	0,55	Si	0,16
S	0,020	P	0,030		

Typical all weld metal mechanical properties

Tensile strength, MPa	480
Yield strength, MPa	390
Elongation, %	26
Impact values (U-notch specimen), Joule/sm^2	120

Special properties

Excellently smooth and slag-free welds. Easy to weld base metal with rusted edges. OZS-6 is easy to strike and restrike and is therefore an ideal electrode for tacking.

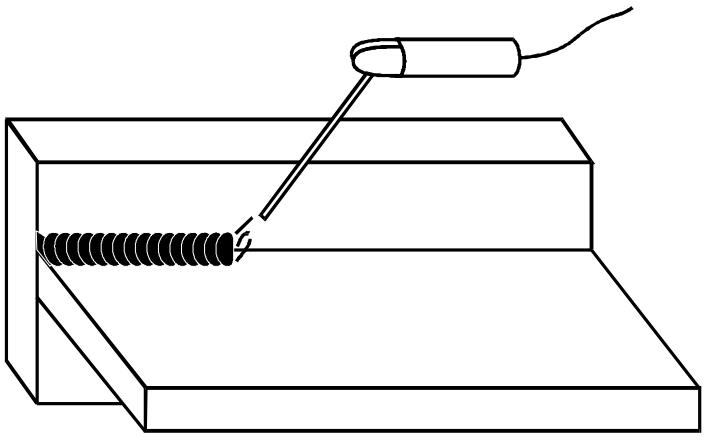
Technological features of welding process

Easy handling in all positions. Welding can be used in wide range of arc length. Slag is easy to remove. Dry electrodes before welding at 150-180°C for 0,5 hour.

Dia, mm	Length, mm	Current range, A
3,0	350	60-130
4,0	450	100-210
5,0	450	150-280

Approvals

GOST R, UkrSEPRO, GOSATOMNADZOR



УОНИ-13/45 (UONI-13/45)

ГОСТ 9Э42А, ISO E434B20,
DIN E4340B10, EN E35AB22H10

Basic electrodes are employed for welding structures of mild and low carbon steels where welds of higher ductility and impact properties are required. Welding in all positions except vertical-down can be used. Suitable for welding at DC(+) current.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 3,0 mm) - 1,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	0,57
Si	0,23	S	0,025
P	0,027		

Typical all weld metal mechanical properties

Tensile strength, MPa	460
Yield strength, MPa	350
Elongation, %	26
Impact values (U-notch specimen), Joule/sm^2	200

Special properties

Welds has good cracking resistance and low hydrogen contents. UONI-13/45 sometimes is used for making root pass in welding of higher tensile strength steels to prevent cracking in root bead.

Technological features of welding process

Keeps arc short, clean and dry edges of base metal before welding. Dry electrodes before welding at 250-300°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	300	40-80
2,5	350	50-100
3,0	350	60-130
4,0	450	110-180
5,0	450	130-220

Approvals

GOST R, UkrSEPRO, Russian River Register, GOSATOMNADZOR

УОНИ-13/55К (UONI-13/55К)

ГОСТ 9Э46А, ISO E433B20H,
DIN E4330B10H,
EN E38AB22H10

Electrodes are employed for welding of hard structures of carbon and low alloyed steels where difficult stress conditions cannot be avoided. Electrodes are suitable for welding of different machine's structures where high resistance to shock variable loads at low temperatures are required. Electrodes are easy to handle in all positions except vertical-downward. Welding at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,06	Mn	0,58
Si	0,24	S	0,016
P	0,024		

Typical all weld metal mechanical properties

Tensile strength, MPa	490
Yield strength, MPa	400
Elongation, %	28
Impact values (U-notch	230

Special properties

Weld metal has excellent resistance to hot and cold cracking and low hydrogen contents.

Technological features of welding process

Keep welding arc short as possible, clean and dry edges of base metal before welding. Dry electrodes before use at 250-300°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	60-130
4,0	450	100-180
5,0	450	140-220

Approvals

GOST R, Russian Maritime Register of Shipping

УОНИ-13/55 (UONI-13/55)

ГОСТ 9Э50А, AWS E7015,
ISO E514B20, DIN E5140B10,
EN E380B22H10

UONI-13/55 is insensitive to the composition of the base material within rather wide limits. The electrode can be used for welding of carbon and low alloyed steels with tensile strength up to 490 MPa where difficult stress conditions cannot be avoided and weld metal has ductility and impact values. Welding in all positions except vertical-down at DC(+) current can be used.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,4 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	0,83
Si	0,42	S	0,022
P	0,024		

Typical all weld metal mechanical properties

Tensile strength, MPa	540
Yield strength, MPa	410
Elongation, %	29
Impact values (U-notch specimen), Joule/sm^2	260

Special properties

Excellently smooth and slag-free welds. Crack resistant deposits of high toughness. Low hydrogen contents in the deposit.

Technological features of welding process

Welding with short as possible arc on cleaned adges of base metal is used. Dry the electrodes before welding at 250-300°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	300	40-90
2,5	350	50-100
3,0	350	60-130
4,0	450	100-180
5,0	450	140-210

Approvals

GOST R, UkrSEPRO, Russian Maritime Register of Shipping, Lloyd's Register of Shipping, "Moscow Quality", Russian River Register, GOSATOMNADZOR

Classification of Covered Electrodes for Welding of Carbon and Low Alloyed Structure Steels According to AWS A5.1

Symbol	Tensile strength, MPa	Yield strength, MPa	Elongation, %
	Mimimum		
E 60	435	350	22
E 70	506	421	22
E 80	562	471	19
E 90	632	541	17
E 100	703	611	16
E 110	773	682	15

Symbol	Welding position
1	All
2	Flat and horizontal-vertical
4	Especially good vertical-down

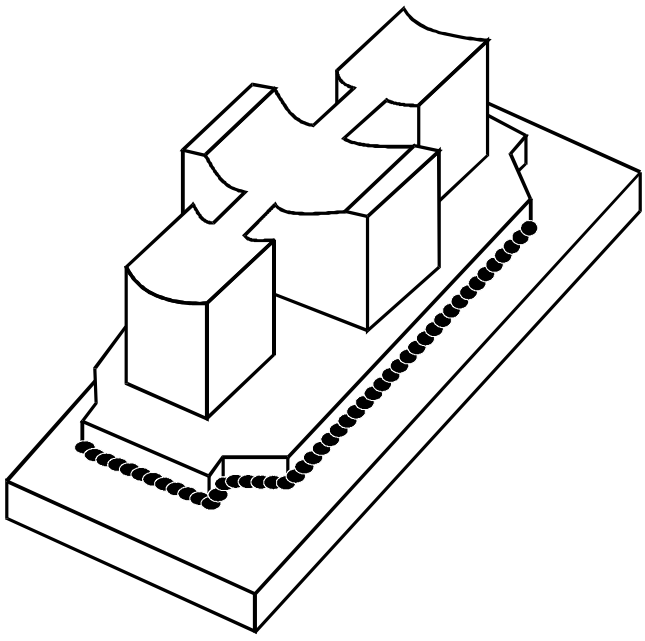
Symbol	CVN Impact requirement
E7016-1	27 J with -46ºC
E7018-1	27 J with -46ºC
E7024-1	27 J with -18ºC

E 70 18 – 1 H_4 R

Hydrogen contents	
H_4	≤ 4 ml/100 g
H_8	≤ 8 ml/100 g
H_{16}	≤ 16 ml/100 g

R - the last letter indicates the coating is moisture resistant tested electrodes as re-ceived or conditioned shall exhibit not >0,3% (by Wt) of moisture after exposure to an environment of 27ºC and 80% relative humidity for a period of not less than 9 hours

Symbol's classification First digit - welding position	Type of coating, type of current, efficiency etc.
10	Cellulosic Direct (+) Flux thin, deep penetration
11	Like "10", Alternative, direct (+)
12	Rutile Alternative, direct (-)
13	Like "12" Alternative, direct (-) Usable for welding with low amperage from small (home) transformers
14	Like "13" with covering containing Fe-powder (higher efficiency) Alternative, direct
15	Basic Direct (+)
16	Like "15" Alternative, direct (+)
18	Like "16" with covering containing Fe-powder (higher efficiency)
20	Acid with higher quantity of acid of Fe Alternative, direct Flux detachable
24	Rutile with higher Fe powder contents in comparison with electrode "14" Alternative, direct
27	Acid Alternative, direct (-) Welding by touching the tip of
28	Basic Efficiency higher electrodes in comparison with electrode "18" Alternative, direct (+)



УОНИ-13/55Т (UONI-13/55T)

ГОСТ Э50А, AWS E7018, ISO E515B12026H, DIN E423B42H10

Electrode can be used for welding structures of carbon and low alloyed steels. Welding in all positions except vertical-down at DC(+) or AC current can be used.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	1,0
Si	0,45	S	0,015
P	0,020		

Typical all weld metal mechanical properties

Tensile strength, MPa	540
Yield strength, MPa	450
Elongation, %	28
Impact values (U-notch specimen), Joule/sm^2	230

Special properties

Excellently smoth and slag-free welds. Crack resistant deposits of high toughness. Low hydrogen contents in the deposit.

Technological features of welding process

Welding with short as possible arc on cleaned adges of base metal is used. Dry the electrodes before welding at 250-300°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	100-140
4,0	450	150-200
5,0	450	190-260

ОЗС-33 (OZS-33)

ГОСТ Э50А, AWS E7016, ISO E514B24, DIN E5140B10, EN E38AB12H10

OZS-33 is insensitive to the composition of the base metal within rather wide limits with tensile strength up to 490 MPa. Welding at DC (±) or AC currents can be used.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,08	Mn	0,95
Si	0,40	S	0,018
P	0,021		

Typical all weld metal mechanical properties

Tensile strength, MPa	550
Yield strength, MPa	460
Elongation, %	27
Impact values (U-notch specimen), Joule/sm^2	220

Special properties

The electrodes are suitable for producing welds with high resistance against hot cracking and with lowest hydrogen content.

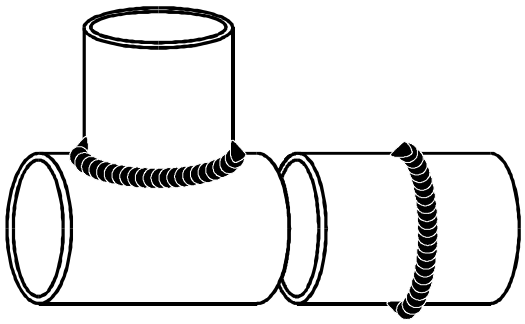
Technological features of welding process

Welding with short as possible arc can be used on cleaned edges of base metal. Dry the electrodes before welding at 350-380°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	80-140
4,0	450	130-210
5,0	450	160-270

Approvals

GOST R



УОНИ-13/55У (UONI-13/55U)

ГОСТ Э55, AWS E8016, ISO E513B26, DIN E5130B10, EN E46AB12H15

Basic covered electrodes are intended for welding of bars and railway tracks of carbon and low alloyed steels with tensile strength up to 550 MPa. Welding in all positions except vertical-downward at AC or DC current is used.

Type of electrode - basic.
Deposition rate factor - 10,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,8 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,12	Mn	1,3
Si	0,40	S	0,020
P	0,030		

Typical all weld metal mechanical properties

Tensile strength, MPa	600
Yield strength, MPa	450
Elongation, %	23
Impact values (U-notch specimen), Joule/sm^2	170

Special properties

Crack resistibility and mechanical properties are good due to hydrogen contents. Good weldability at short arc.

Technological features of welding process

The welding joints of bars and railway tracks by “pool” method can be used. Arc welding of bars and railway track by ordinary manual arc welding with short are also can be used. Dry the electrodes before welding at 250-300°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	450	130-200
5,0	450	160-300

ВСЦ-4М (VSTS-4M)

ГОСТ 9467, AWS E6010,
ISO E433C14, DIN E4330C4,
EN E35AC21

Electrodes are designed for site welding of pipe and pipelines in all positions, using conventional and "stove-pipe" techniques particularly for the root bead. Easily controlled arc with low tensile deposit. Welding can be used at DC (±) current in all positions. Ideal for root beads on higher tensile material.

Type of electrode - cellulosic.
Deposition rate factor - 9,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,2 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	0,45
Si	0,15	S	0,025
P	0,025		

Typical all weld metal mechanical properties

Tensile strength, MPa	460
Yield strength, MPa	380
Elongation, %	24
Impact values (U-notch specimen), Joule/sm^2	120

Special properties

Penetrating arc with low volume, fast-freezing, easily removable slag. Suitable for use with misalign and poor fit-up joints.

Technological features of welding process

Easily to weld in vertical-downward and overhead position with touching the tip of electrode to molten pool, good restriking and deep penetration. Attention must be paid not to use the currents exceeding the recommended. Dry the electrodes before use at 50-70°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	450	90-140

Approvals

GOST R

ОМА-2 (OMA-2)

ГОСТ 9467, AWS E6011,
ISO E430S16

Electrodes for welding of thin structures with thickness up to 1-3 mm of carbon steels with tensile strength up to 410 MPa. Welding at AC or DC(+) in all positions except vertical-down is used.

Type of electrode - acid-cellulosic.
Deposition rate factor - 8,0 g/A·h.
Efficiency of deposition (for dia 3,0 mm) - 0,7 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,11	Mn	0,28
Si	0,12	S	0,019
P	0,027		

Typical all weld metal mechanical properties

Tensile strength, MPa	465

Special properties

Electrodes with low penatration of base metal can be used for welding of rust and bad cleaned metal.

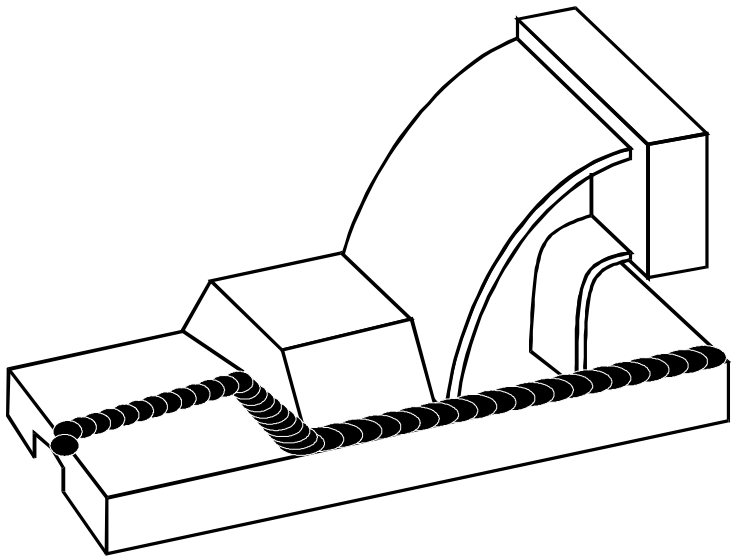
Thechnological features of welding process

Welding can be done at long length of arc. Dry electrodes before use at 120°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	300	40-70
2,5	350	50-80
3,0	350	60-120

Approvals

GOST R



Special electrodes

ТМУ-21У (TMU-21U)

ГОСТ Э50А, AWS E7015, ISO E513B20, DIN E4300B10, EN E42AB22H10

Low hydrogen electrode for welding of pipeline construction of carbon and low alloyed steels. Good weldability in all welding positions except vertical-downward. Welding at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,4 kg/h.
Consumption of electrodes per kg deposited metal - 1,5 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	0,80
Si	0,24	S	0,018
P	0,020		

Typical all weld metal mechanical properties

Tensile strength, MPa	540
Yield strength, MPa	430
Elongation, %	24
Impact values (U-notch specimen), Joule/sm^2	200

Special properties

Welding in narrow groove with mutual angle of about 15° can be used.

Technological features of welding process

Keep arc short as possible. Dry and clean edges of base metal before welding. Dry electrodes at 360-400°C for one hour before use.

Dia, mm	Length, mm	Current range, A
3,0	350	60-120
4,0	450	100-180
5,0	450	140-220

Approvals

GOST R, UkrSEPRO, GOSATOMNADZOR

ТМЛ-3У (TML-3U)

ГОСТ Э-09Х1МФ, AWS E8015-G, ISO E1CrMoVB20, DIN EKb,CrMoV120

Cr-V alloyed electrodes are intended for welding steam pipes of Cr-M-V (12Х1МФ, 15Х1МФ, 20ХМФЛ) heat resistant steels at operating temperatures up to 570°C, also available for welding and repairing welding of heating surfaces of steels such as 12Х1МФ, 12Х2МФБ and 12Х2МФСР. Suitable for welding in all positions except vertical-downward. Use DC(+) current.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,4 kg/h.
Consumption of electrodes per kg deposited metal - 1,5 kg.

Typical all weld metal chemical analysis, %

C	0,08	Mn	0,75
Si	0,25	Cr	0,90
Mo	0,50	V	0,18
S	0,020	P	0,023

Typical all weld metal mechanical properties

Tensile strength, MPa	570
Yield strength, MPa	480
Elongation, %	20
Impact values (U-notch specimen), Joule/sm^2	180

Special properties

Welding in narrow groove with mutual angle of 15° especially for welding of steam pipes can be used.

Technological features of welding process

Clean and dry edges of base metal before welding. Keep arc short during welding. Dry electrodes before use at 380-400°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	60-120
4,0	450	100-180
5,0	450	140-220

Approvals

GOST R, GOSATOMNADZOR

ТМЛ-1У (TML-1U)

ГОСТ Э-09Х1М, AWS E7015-B2, ISO E1CrMoB20, DIN EKb,CrMo120

Cr-Mo alloyed electrodes for welding of steam pipe construction of heat resistant Cr-Mo-V steels (12МХ, 15МХ, 12Х1МФ, 15Х1М1Ф and 20ХМФЛ) at operating temperature up to 540°C, and also heating surfaces of steels 12Х1МФ, 12Х2МФБ. TML-1U is suitable for welding at DC(+) current in all positions except vertical-downward.

Type of electrode - basic.
Deposition rate factor - 9,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,4 kg/h.
Consumption of electrodes per kg deposited metal - 1,5 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	0,70
Si	0,25	Cr	0,90
Mo	0,48	S	0,018
P	0,020		

Typical all weld metal mechanical properties

Tensile strength, MPa	530
Yield strength, MPa	470
Elongation, %	19
Impact values (U-notch specimen), Joule/sm^2	120

Special properties

Welding in narrow groove with mutual angle of 15° especially for welding of steam pipes construction can be used.

Technological features of welding process

Clean and dry edges of base metal before welding. Keep short arc during welding. Dry electrodes before use at 360-400°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	60-120
4,0	450	100-180
5,0	450	140-220

Approvals

GOST R, GOSATOMNADZOR

Classification of Covered Electrodes for Welding of Low alloyed Heat Resistant Steel According to ISO 3580

Symbol	Chemical composition, %					
	C*	Si	Mn	Cr	Mo	Others
	max					
Mo	0,12	0,8	1,5	-	0,4 - 0,7	-
05CrMo	0,12	0,8	1,5	0,3 - 0,8	0,4 - 0,7	-
05CrMoV	0,12	0,8	1,5	0,3 - 0,6	0,8 - 1,2	V 0,25 - 0,60
1CrMo	0,12	0,8	1,5	0,8 - 1,5	0,4 - 0,7	-
1CrMoV	0,12	0,8	1,5	0,9 - 1,3	0,4 - 0,7	V 0,10 - 0,35
2CrMo	0,12	0,8	1,5	2,0 - 2,6	0,9 - 1,3	-
5CrMo	0,12	0,9	1,5	4,0 - 6,0	0,4 - 0,7	-
5CrMoV	0,12	0,9	1,5	4,0 - 6,0	0,4 - 0,7	V 0,10 - 0,35
9CrMo	0,12	0,9	1,5	8,0 - 10,0	0,9 - 1,2	-
12CrMoV	0,15 - 0,22	0,8	1,5	11,0 - 13,0	0,8 - 1,2	V 0,2 - 0,4 W 0,4 - 0,6

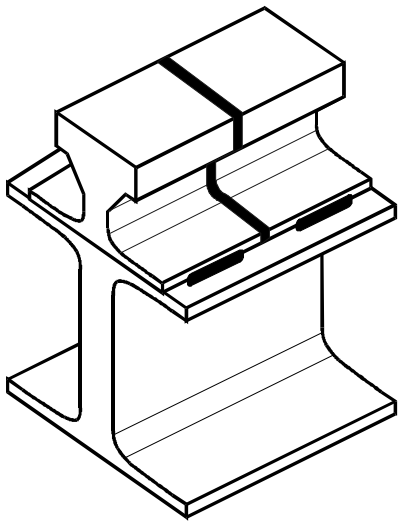
* If carbon contents in weld metal less 0,05%, index L is to be added to classification symbol

Type of coating
A - acid AR - rutile-acid B - basic C - cellulosic O - oxide R - rutile (medium thickness) RR - rutile (big thickness) S - others

E 5CrMoV B 2 0

Symbol	Welding position
1	All positions
2	All positions except vertical-down
3	Flat, horizontal-vertical, vertical
4	Flat
5	As ”3” and vertical-downward

Symbol	Polarity of DC	Open-circuit voltage with AC (V)
0	Negative (+)	-
1	Any polarity (+/-)	50
2	Positive (-)	50
3	Negative (+)	50
4	Any polarity (+/-)	70
5	Positive (-)	70
6	Negative (+)	70
7	Any polarity (+/-)	90
8	Positive (-)	90
9	Negative (+)	90



ЦУ-5 (TSU-5)

ГОСТ Э50А, AWS E7015,
ISO E510B20, DIN E5130B10

Electrodes for welding of heating parts of high temperature boilers and tube steels at operating temperatures up to 400°C. Also very suitable for welding root passes of thick tubes. Excellent to handle at DC(+) current in all welding positions except vertical-downward.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 2,5 mm) - 0,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	1,30
Si	0,35	S	0,012
P	0,018		

Typical all weld metal mechanical properties

Tensile strength, MPa	530
Elongation, %	24
Impact values (U-notch specimen), Joule/sm^2	170

Special properties

Preheating, interpass temperature, and postweld heat treatment as required by the base metal.

Technological features of welding process

Keep arc short as possible. Dry and clean edges of base metal before welding. Dry electrodes before use at 340-380°C for one hour.

Dia, mm	Length, mm	Current range, A
2,5	300	50-100

Approvals

GOST R, UkrSEPRO, GOSATOMNADZOR

УОНИ-13/65 (UONI-13/65)

ГОСТ Э60, AWS E8015,
ISO E513B20, DIN E5130B10,
EN E50AB22H10

Basic electrode with excellent quality for fine grained structural steels with tensile strength up to 590 MPa. Suitable for low temperature service down to -40°C. Easily weldable in all positions except vertical-downward at DC(+) current.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,4 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,13	Mn	1,25
Si	0,45	S	0,017
P	0,027		

Typical all weld metal mechanical properties

Tensile strength, MPa	630
Yield strength, MPa	500
Elongation, %	24
Impact values (U-notch specimen), Joule/sm^2	180

Special properties

Weld metal ductile and cracking resistant. Deposits have low hydrogen contents.

Technological features of welding process

Easy to handle in all positions. Preheating and interpass temperature as well as postweld heat treatment as required by the base metal. Welding by short arc on clean edges has been used. Dry electrodes before welding at 250-300°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	300	35-65
2,5	350	50-100
3,0	350	60-120
4,0	450	110-180
5,0	450	130-230

Approvals

GOST R

УОНИ-13/85 (UONI-13/85)

ГОСТ Э85, AWS E12015

A low hydrogen electrode is employed for alloyed high strength steels with tensile strength up to 830 MPa. Easily weldable in all positions except vertical-downward. Welding at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 10,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,12	Mn	1,9
Si	0,75	Mo	0,65
S	0,017	P	0,027

Typical all weld metal mechanical properties

Tensile strength, MPa	940
Yield strength, MPa	780
Elongation, %	15
Impact values (U-notch specimen), Joule/sm^2	110

Special properties

Weld metal has good ductility and impact values, excellent resistance to cracking. Deposits have very low hydrogen contents.

Technological features of welding process

Use welding at short as possible arc. Base metal edges must be cleaned and dried. Preheating, interpass temperature and postweld heat treatment as required by the base metal. Dry electrodes before welding at 250-300°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	300	40-90
2,5	350	50-110
3,0	350	70-130
4,0	450	110-180
5,0	450	150-230

Approvals

GOST R

ОЗС-11 (OZS-11)

ГОСТ Э-09МХ, AWS E7015-B1,
ISO E05CrMoS23,
DIN EB(R),CrMo23

Cr-Mo alloyed electrodes for welding of heat resistant Cr-Mo-V steels (12МХ, 15МХ, 12МХФ, 15Х1М1Ф) working at temperatures up to 510°C. Welding in all positions except vertical-downward. Suitable for welding at AC or DC(+) current.

Type of electrode - rutile-basic.
Deposition rate factor - 8,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,2 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

C	0,08	Mn	0,61
Si	0,17	Cr	0,38
Mo	0,47	S	0,015
P	0,025		

Typical all weld metal mechanical properties

Tensile strength, MPa	550
Yield strength, MPa	440
Elongation, %	22
Impact values (U-notch specimen), Joule/sm^2	120

Special properties

Edges of base metal must be cleaned and dried before welding .

Technological features of welding process

For welding structures with wall thickness more than 12 mm preheating and heating during welding at temperature 150-200°C are required.

Dia, mm	Length, mm	Current range, A
3,0	350	70-120
4,0	450	110-170
5,0	450	130-220

Approvals

GOST R

ЦЛ-39 (TSL-39)

ГОСТ Э-09Х1МФ,
AWS E7015-G, ISO E1CrMoVB20,
DIN EKb,CrMoV120

Cr-V alloyed electrodes are employed for welding of heating surfaces of boilers, also available for welding root passed of thick walled steam tubes of heat resistant perlitic Cr-Mo-V steels (12Х1МФ, 15Х1МФ) at operating temperature up to 585°C. Suitable for welding in all positions except vertical-downward. Electrodes for DC(+) current are intended.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 2,5 mm) - 0,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	0,72
Si	0,27	Cr	1,1
Mo	0,45	V	0,23
S	0,020	P	0,024

Typical all weld metal mechanical properties

Tensile strength, MPa	560
Yield strength, MPa	480
Elongation, %	20
Impact values (U-notch specimen), Joule/sm^2	120

Special properties

Very suitable for welding of root beads in steam tubes.

Technological features of welding process

Welding tubes of heating surfaces with wall thickness less than 6 mm without preheating is required. Keep arc as short as possible. Dry electrodes before use at 340-380°C for one hour.

Dia, mm	Length, mm	Current range, A
2,5	300	50-100

Approvals

GOST R, GOSATOMNADZOR

ОЗС-1С (OZS-1C)

Electrodes for welding and repair welding of cast mild steels and pure electro-technical steel of «Armko» type. Welding in flat position is used, also good for fillet welds

Type of electrode - acid-basic.
Deposition rate factor - 10,0 g/A·h.
Efficiency of deposition (for dia 3,0 mm) - 1,0 kg/h.
Consumption of electrodes per kg deposited metal - 2,0 kg.

Typical all weld metal chemical analysis, %

C	0,04	Mn	0,14
Si	0,15	S	0,022
P	0,028		

Typical all weld metal mechanical properties

Tensile strength, MPa	490
Elongation, %	16
Impact values (U-notch specimen), Joule/sm^2	100
Hardness, HB (on the 3 layer)	132

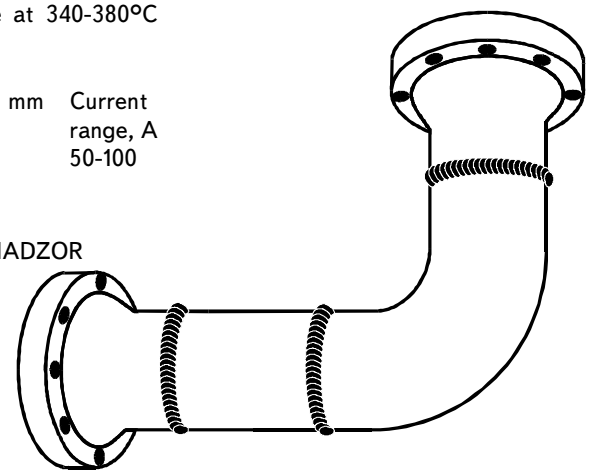
Special properties

Higher welding-technological properties.

Thechnological features of welding process

Welding must be done at short length of arc. Dry electrodes before use at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	60-100



НИАТ-3М (NIAT-3M)

ГОСТ 9465, AWS E12015-B1

Low hydrogen electrode for welding of structures of steels with tensile strength up to 980 MPa. Welding in all positions except vertical-downward at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal mechanical properties

Tensile strength, MPa 990
(for dia 2,0 and 2,5 mm ..... 1130)
Yield strength, MPa 790
Elongation, % 13
Impact values (U-notch specimen), Joule/sm^2 100

Typical all weld metal chemical analysis, %

C	0,13	Mn	1,37
Si	0,34	Cr	0,79
Mo	0,41	S	0,014
P	0,025		

Special properties

Weld metal has good cracking resistance and low hydrogen contents, high ductility and impact values.

Technological features of welding process

Back step method and strikes the arc on a small steel plate prepared for this purpose are required. Preheating, interpass temperature and postweld heat treatment as are required by the base metal. Dry electrodes before welding at 450-500°C for two hour.

Dia, mm	Length, mm	Current range, A
2,0	300	40-80
2,5	350	50-100
3,0	350	70-140
4,0	450	110-180
5,0	450	180-250

Approvals

GOST R

НИАТ-5 (NIAT-5)

ГОСТ 9467-11Х15Н25М6АГ2,
ISO E16.25.6B30,
DIN E16.25.6B30

Austenitic electrodes are used for welding structures of hardened alloyed steels with higher tensile strength (30ХГСА, 30ХГСНА), also are suitable for welding without heat treatment low alloyed and alloyed hardened steels with stainless alloys. Welding in flat and vertical-upward position at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 12,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	1,6
Si	0,23	Ni	25,4
Cr	15,4	Mo	5,8
N	0,12	S	0,011
P	0,022		

Typical all weld metal mechanical properties

Tensile strength, MPa 660
Yield strength, MPa 400
Elongation, % 38
Impact values (U-notch specimen), Joule/sm^2 180

Special properties

Weld metal has good cracking resistance, high ductility and impact values at low temperatures.

Technological features of welding process

Welding at short arc as possible is required. Dry electrodes before welding at 240-250°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	280	30-60
2,5	280	30-80
3,0	320	50-110
4,0	360	90-160
5,0	360	130-180

Approvals

GOST R, UkrSEPRO

ОЗШ-1 (OZSH-3)

ГОСТ 9100, AWS E12015-B1

Basic electrodes for welding of steels with high and super high tensile strength up to 1080 MPa in all positions except vertical-down at DC(±) current.

Type of electrode - basic.
Deposition rate factor - 8,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,1 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

C	0,15	Mn	1,46
Si	0,94	Cr	1,04
Mo	0,77	S	0,016
P	0,024		

Typical all weld metal mechanical properties

Tensile strength, MPa 1180
Yield strength, MPa 1100
Elongation, % 13
Impact values (U-notch specimen), Joule/sm^2 85
Hardness of weld metal is 320-365HB

Special properties

Electrodes can be used for hardfacing (type Э-16Г2ХМ according to GOST 10051-75).

Technological features of welding process

- If possible, each joint should be welded without stop, except when changing the electrode and removing the slag;
- When multi-run welding, maintain the interpass temperature at 100-150°C;
- Use only dry electrodes, preferably directly from a heated electrode holder.

Dry electrodes at 350-400°C for 1,5-2 hours.

Dia, mm	Length, mm	Current range, A
2,0	300	40-90
2,5	350	50-110
3,0	350	70-120
4,0	450	100-170
5,0	450	130-220

Electrodes for welding of dissimilar metals

АНЖР-1 (ANJR-1)

ISO E24.60.10Mn2B20,
DIN EL-NiCr24Mo10Mn2

Austenitic electrode for welding of heat resistant steel with high alloyed creep resistant austenitic steel, also available for welding of hardened steel without preheating and post weld heat treatment. ANJR-1 is suitable for welding and repairing welding of complicated structures operated at 550-660°C. Welding at DC(+) current in all positions except vertical-downward is used.

Type of electrode - basic.
Deposition rate factor - 15,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,8 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,06	Mn	1,92
Si	0,30	Ni	59,6
Mo	9,9	Cr	23,6
Ti	0,07	S	0,011
P	0,019		

Typical all weld metal mechanical properties

Tensile strength, MPa 730
Yield strength, MPa 470
Elongation, % 36
Impact values (U-notch specimen), Joule/sm^2 180

Special properties

The adges of base metal before welding should be cleaned and dried.

Technological features of welding process

Welding at short as possible arc is required. Dry electrodes before use at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	310	70-95
4,0	350	100-125
5,5	350	120-145

Approvals

GOST R, UkrSEPRO, Russian Maritime Register of Shipping

АНЖР-2 (ANJR-2)

ISO E24.40.8Mn2B20,
DIN E24.40.8Mn2B20

Austenitic electrode for welding of low alloyed heat resistant steel with high alloyed austenitic creep resistant steel, and also for welding and repairing welding of structures operating at temperatures up to 450-550°C. Suitable for welding at DC(+) current at all positions except vertical-downward.

Type of electrode - basic.
Deposition rate factor - 14,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,7 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,07	Mn	1,94
Si	0,36	Ni	39,9
Mo	7,6	Cr	24,2
Ti	0,05	S	0,009
P	0,019		

Typical all weld metal mechanical properties

Tensile strength, MPa 680
Yield strength, MPa 440
Elongation, % 39
Impact values (U-notch specimen), Joule/sm^2 160

Special properties

Welding of structures of hardened steels and alloys without preheating and postweld heat treatment is used.

Technological features of welding process

Welding at short as possible arc on cleaned and dried edges is required. Dry electrodes before use at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	320	70-95
4,0	370	100-125
5,5	370	120-160

Approvals

GOST R, UkrSEPRO

ОЗЛ-6 (OZL-6)

ГОСТ Э-10Х25Н13Г2,
AWS E309-15, ISO E23.12B20,
DIN E23.12B20

Electrode for welding of equipment to be produced from highly heat resisting steels of grades 20Х23Н13, 20Х23Н18 and similar to them for operating temperatures up to 1000°C in oxidising media if sulphurous attack does not acquire. OZL-6 is suitable for welding of chrome steels: 15Х25Т, 25Х25Н20С2; electrodes also can be used for welding of carbon and low alloyed steels with stainless steel and for root pass in clad steel. Welding at DC(+) current in all positions except vertical downward is used.

Type of electrode - basic.
Deposition rate factor - 11,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,5 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	1,9
Si	0,38	Ni	12,8
Cr	24,9	S	0,011
P	0,022		

Typical all weld metal mechanical properties

Tensile strength, MPa 610
Yield strength, MPa 410
Elongation, % 33
Impact values (U-notch specimen), Joule/sm^2 150

Special properties

Weld metal has highly heat resisting properties up to 1000°C and high resistance to intercrystalline corrosion according with GOST 6032-89 "АМУ" method. In temperature range of s-phase formation weld metal can to become brittle. Deposit has ferrite content in range of 2,5-10%. Typical meaning - 5,3%.

Technological features of welding process

Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	50-80
4,0	350	100-140
5,0	450	120-160

Approvals

GOST R, UkrSEPRO

ОЗЛ-6С (OZL-6S)

ГОСТ Э-10Х25Н13Г2,
AWS E309-15, ISO E23.12S20,
DIN E23.12S20

Electrode for welding of carbon or low alloyed steel with stainless steel. Welding at DC(+) current in all positions except vertical-downword is used. The alloying elements enter the weld metal from the covering. The mild steel core wire gives good current to lerance which results in a high deposition rate.

Type of electrode - special.
Deposition rate factor - 11,0 g/A·h.
Efficiency of deposition (for dia 3,0 mm) - 1,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,65 kg.

Typical all weld metal chemical analysis, %

C	0,07	Mn	1,5
Si	0,3	Ni	13,0
Cr	24,0	S	0,010
P	0,009		

Typical all weld metal mechanical properties

Tensile strength, MPa	580
Yield strength, MPa	470
Elongation, %	35
Impact values (U-notch specimen), Joule/sm^2	100

Special properties

Weld metal has an excellent resistance to intercrystalline corrosion according to GOST 6032-89 "АМУ" method. Deposit has ferrite content in range of 2,5-10%. Typical meaning - 5,3%.

Technological features of welding process

Welding can be used at higher welding current without unnessesary testing of electrode's core wire. Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
2,5	300	60-110
3,0	350	80-140

Approvals

GOST R, UkrSEPRO

ЭА-395/9 (EA-395/9)

ISO E16.25.6B20,
DIN E16.25.6B20

The Austenitic electrode for welding structures of alloyed steels with higher tensile strength and hardenable steels particularly when preheating cannot be used. It is also suitable for welding high tensile ships plate. EA-395/9 can be used for welding austenitic steel with carbon low alloyed steel. Welding in all positions except vertical-downward at DC(+) current can be used.

Type of electrode - basic.
Deposition rate factor - 11,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,5 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	1,2
Si	0,6	Ni	25,0
Cr	15,5	Mo	5,4
N	0,12	S	0,007
P	0,020		

Typical all weld metal mechanical properties

Tensile strength, MPa	690
Yield strength, MPa	470
Elongation, %	37
Impact values (U-notch specimen), Joule/sm^2	210

Special properties

Weld metal has good ductility and impact toughness at subzero temperatures, and high resistance to weld cracking.

Technological features of welding process

Welding at short arc as possible is required. Dry electrodes before welding at 200-250°C for two hours.

Dia, mm	Length, mm	Current range, A
3,0	320	60-110
4,0	360	100-170
5,0	360	120-200

Approvals

GOST R, UkrSEPRO, Russian Maritime Register of Shipping, GOSATOMNADZOR

НИИ-48Г (NII-48G)

ГОСТ Э-10Х20Н9Г6С,
AWS E307-15, ISO E18.8MnB20,
DIN E18.8Mn6B20

Electrodes are intended for welding of structures of low alloyed steels and alloys for special purpose. NII-48G is very suitable for welding of highly manganese steels (13%Mn) such as gr. 110Г13Л and extra suitable for welding mentioned above steels with Cr-Ni stainless steels. Welding at DC(+) current in all positions except vertical downward is used.

Type of electrode - basic.
Deposition rate factor - 11,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	5,9
Si	0,60	Ni	9,7
Cr	19,6	S	0,012
P	0,018		

Typical all weld metal mechanical properties

Tensile strength, MPa	580
Elongation, %	39
Impact values (U-notch specimen), Joule/sm^2	150

Special properties

Weld metal has extra good wear resisting properties up to 800°C.

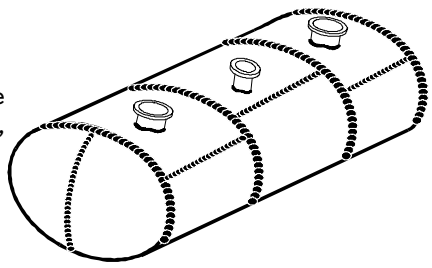
Technological features of welding process

Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	320	90-130
4,0	330	130-180
5,0	350	170-200

Approvals

GOST R



ОЗЛ-25Б (OZL-25B)

ГОСТ Э-10Х20Н70Г2М2Б2В,
AWS ENiCrFe-2,
DIN EL-NiCr15MoNb

Electrodes for welding equipment of corrosion resistant heat and creep resistant nickel-base alloy gr. ХН78Т. OZL-25B is suitable for welding of cryogenic steels, creep resistant nickel-base alloys as well as for producing austenite-ferrite joints for service temperatures between -196 and 1000°C. Welding at DC(+) current in all positions except vertical-downward is used.

Type of electrode - basic.
Deposition rate factor - 14,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,5 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

Ni	bal.	C	0,06
Mn	2,25	Si	0,34
Mo	1,9	Cr	19,8
Nb	1,6	W	0,19
S	0,007	P	0,016

Typical all weld metal mechanical properties

Tensile strength, MPa	670
Yield strength, MPa	430
Elongation, %	38
Impact values (U-notch specimen), Joule/sm^2	140

Special properties

Weld metal has high mechanical and special properties: highly heat resisting up to 1000°C, high temperature strength about of 75 MPa at 850°C, corrosion resistance less then 0,02 mm per year (30%H_2SO_4+10%HNO_3 at 80°C for 96 hours). Stable arc, easy slag removal, and finely rippled beads free of undercuts. Fully austenitic weld metal, resistant to hot cracking, not susceptible to embrittlement.

Technological features of welding process

Dry electrodes before use at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	280	60-100
4,0	340	90-130

Approvals

GOST R, UkrSEPRO, «Moscow Quality»

ИМЕТ-10 (IMET-10)

ГОСТ Э-04Х10Н60М24,
DIN EL-NiCr10Mo23

Electrodes for welding of heat and creep resistant equipment of nickel base alloys such as grades 37Х12Н8Г8МФБ, ХН67ВМТЮ, ХН75МБТЮ, ХН78Т, ХН77ТЮ and similar to them for operating at temperatures up to 900°C. IMET-10 is very suitable for welding of dissimilar steels and alloys where highest quality and properties of structures are required. Welding at DC(+) current in flat and vertical upward position is used.

Type of electrode - rutile-basic.
Deposition rate factor - 15,0 g/A·h.
Efficiency of deposition (for dia 3,0 mm) - 1,2 kg/h.
Consumption of electrodes per kg deposited metal - 1,3 kg.

Typical all weld metal chemical analysis, %

Ni	bal.	C	0,05
Mn	0,68	Si	0,22
Mo	23,1	Cr	10,4
S	0,010	P	0,019

Typical all weld metal mechanical properties

Tensile strength, MPa	750
Yield strength, MPa	510
Elongation, %	23

Special properties

Weld metal has highly heat resistance up to 900°C and good creep resistance (high temperature strength at 850°C for 100 hours is about 80 MPa). The composition of electrode is balanced to give good crack resistance of welded metal.

Technological features of welding process

Welding is produced by narrow beads with width less 3 dia of electrode. Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
2,5	290	30-75
3,0	290	50-100

Approvals

GOST R

ОЗЛ-44 (OZL-44)

DIN EL-NiCr21Mo2Mn2Nb1

Electrodes are intended for welding of cryogenic structures (tanks, tubes etc) of ferritic 6 and 9% Ni steels, for welding of dissimilar metals and alloys. Welding at DC(+) current in all positions except vertical-downward is used.

Type of electrode - basic.
Deposition rate factor - 13,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

Ni	bal.	C	0,05
Mn	1,9	Si	0,25
Mo	2,4	Cr	21,3
Nb	1,0	Ti	0,1
W	0,2	Al	0,1
S	0,01	P	0,01

Typical all weld metal mechanical properties

Tensile strength, MPa	680
Yield strength, MPa	490
Elongation, %	35
Impact values (U-notch specimen), Joule/sm^2	185

Special properties

Weld metal has extra good impact properties at -196°C (KCV=60-75 Joule/cm^2) and higher porosity resistance of beads are welded in all positions. Weld joints are thermal shock resistant, fully austenitic, with low coefficient of thermal expansion between 6-9% nickel steel and nickel-base weld metal.

Technological features of welding process

Multi-run technique of welding with low heat input and interpass temperature less 100-150°C is required. Dry electrodes at 190-210°C before welding for one hour.

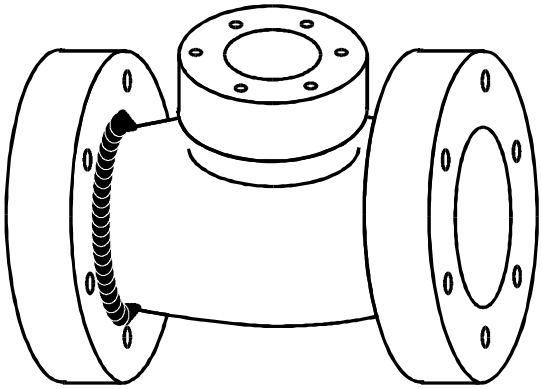
Dia, mm	Length, mm	Current range, A
3,0	300	60-90
4,0	340	90-150

ЦТ-28 (TST-28)

ГОСТ Э-08Х14Н65М15В4Г2,
AWS ENiCrMo-5,
DIN EL-NiCr14Mo15W4Mn2

Nickel base electrode for welding of high heat resistant and creep resistant alloys such as gr. ХН78Т, ХН70ВМЮТ and similar to them “Inconel” types of alloys. TST-28 is very suitable for welding of nickel-base alloys with ferritic, perlitic and chromium steels. Welding at DC(+) current in all positions except vertical-downward is used.

Type of electrode - basic.
Deposition rate factor - 10,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,5 kg.



Typical all weld metal chemical analysis, %

Ni	bal.	C	0,06	Mn	2,4
Si	0,18	Mo	14,6	Cr	13,1
W	4,1	S	0,009	P	0,018

Typical all weld metal mechanical properties

Tensile strength, MPa	730
Yield strength, MPa	450
Elongation, %	38
Impact values (U-notch specimen), Joule/sm^2	150

Special properties

Weld metal has highly heat resisting properties (the depth of oxidising at 1000°C for 3000 hours is about 0,1 mm) and high creep resisting properties (the high temperature strength at 565°C for 10000 hours is about 100 MPa).

Technological features of welding process

Produce the narrow beads with width less then 2,5 dia of electrode.
Dry electrode at 190-210°C for one hour before use.

Dia, mm	Length, mm	Current range, A
3,0	300	70-100
4,0	330	100-140

Approvals

GOST R

Choice og Electrodes for Welding of Dissimilar Metals and Alloys

Group of steels or alloys	Mild and low alloyed steels	Alloyed steels of higher and extra high strength	Heat resistant steels	Stainless steels	Creep resistant steels	Nickel-base alloys
Mild and low alloyed steels		Э42А - Э100, ОЗЛ-27, ОЗЛ-28	Э42А - Э50А	ОЗЛ-6 (ОЗЛ-6С), НИАТ-5, ЭА-395/9, НИИ-48Г	ОЗЛ-25Б	ЦТ-28, ОЗЛ-25Б
Alloyed steels of higher and extra high strength	Э42А - Э100, ОЗЛ-27, ОЗЛ-28		Э50А - Э85	НИАТ-4, ЭА-395/9		ЦТ-28, ОЗЛ-25Б
Heat resistant steels	Э42А - Э50А	Э50А - Э85		ЭА-395/9	АНЖР-1, АНЖР-2	ЦТ-28, ОЗЛ-25Б
Stainless steels	ОЗЛ-6 (ОЗЛ-6С), НИАТ-5, ЭА-395/9, НИИ-48Г	НИАТ-4, ЭА-395/9	ЭА-395/9		ОЗЛ-25Б, ИМЕТ-10	ОЗЛ-25Б
Creep resistant steels	ОЗЛ-25Б		АНЖР-1, АНЖР-2	ОЗЛ-25Б, ИМЕТ-10		ИМЕТ-10, ОЗЛ-25Б
Nickel-base alloys	ЦТ-28, ОЗЛ-25Б	ЦТ-28, ОЗЛ-25Б	ЦТ-28, ОЗЛ-25Б	ОЗЛ-25Б	ИМЕТ-10, ОЗЛ-25Б	

Electrodes for welding of stainless steel

ОЗЛ-8 (OZL-8)

ГОСТ Э-07Х20Н9, AWS E308-15, ISO E19.9B20, DIN E19.9B20

Electrodes are intended for welding of corrosion resistant steels of GOST gr. 08X18H10, 12X18H10T and AISI gr. 304, 308 and similar. Electrodes are easy to handle at DC(+) current in flat, vertical, overhead positions.

Type of electrode - basic.
Deposition rate factor - 13,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C 0,08	Mn 1,3		
Si 0,75	Cr 20,3		
Ni 9,2	S 0,010		
P 0,020			

Typical all weld metal mechanical properties

Tensile strength, MPa 610
Yield strength, MPa 400
Elongation, % 41
Impact values (U-notch specimen), Joule/sm^2 160

Special properties

Weld metal has an excellent resistance to intercrystalline corrosion in accordance with corrosion test without provocation tempering (GOST 6032-89, "AMY" method). Deposit has content of ferrite in range of 2-8%. Typical ferrite content is about 4,7%.

Technological features of welding process

Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	300	30-50
2,5	310	40-60
3,0	340	50-100
4,0	360	90-150
5,0	450	120-180

Approvals

GOST R, UkrSEPRO

ОЗЛ-8С (OZL-8S)

ISO E19.9.1CoWS20,
DIN E19.9.1CoWS20

A fast high efficiency electrode for welding of corrosion resistant stainless Cr-Ni steels GOST gr. 08X18H10T, 12X18H10T and AISI gr. 304, 308 and similar to them for producing of structures, tanks, swimming-pools equipment for food industry, textile industry and etc. Because it's high recovery (140%) and short fusion time, OZL-8S has very high deposition rate. This has been made possible by the use of an unalloyed core wire, all the alloying elements being done via the covering. Welding in all positions except vertical-downward is used at DC(+) current.

Type of electrode - special.
Deposition rate factor - 12,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 2,2 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

C 0,08	Mn 1,3	Si 0,45	Mo 0,95
Ni 9,0	Co 1,5	Cr 19,7	W 0,5
S 0,016	P 0,012		

Typical all weld metal mechanical properties

Tensile strength, MPa 650
Yield strength, MPa 520
Elongation, % 34
Impact values (U-notch specimen), Joule/sm^2 130

Special properties

OZL-8S can be welded in a wider current range than the mostly used types of stainless electrodes. Weld metal has good corrosion resistance according to GOST 6032-89 "AMY" method. Deposit has ferrite content in range of 2-8% (typical 3,0%).

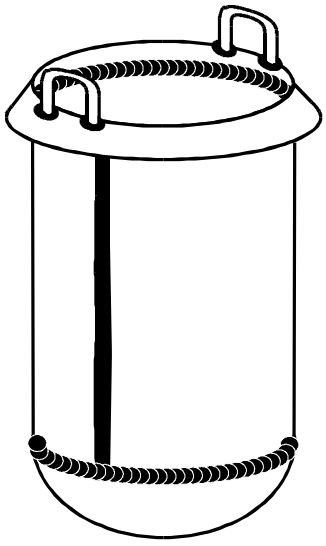
Technological features of welding process

Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	80-140
4,0	450	110-190

Approvals

GOST R, UkrSEPRO



ОЗЛ-36 (OZL-36)

ГОСТ Э-04Х20Н9, AWS E308-15,
ISO E19.9LS20, DIN E19.9nCRB20

Electrodes for welding of structures and equipment of corrosion resistant Cr-Ni steels corresponding to GOST gr. 08Х18Н10Т, 06Х18Н10Т, 08Х18Н12Т and AISI gr. 304, 304L, 308, 308L and similar to them. OZL-36 is excellent if high corrosion resistance after welding and after low time heating in interval of critical temperatures are required. Welding in all positions except vertical-downward at DC(+) current is used.

Type of electrode - rutile.
Deposition rate factor - 13,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 2,0 kg/h.
Consumption of electrodes per kg deposited metal - 1,5 kg.

Typical all weld metal chemical analysis, %

C 0,045	Mn 1,92		
Si 0,56	Cr 19,6		
Ni 9,3	S 0,008		
P 0,018			

Typical all weld metal mechanical properties

Tensile strength, MPa 620
Yield strength, MPa 440
Elongation, % 37
Impact values (U-notch specimen), Joule/sm^2 180

Special properties

Weld metal has high corrosion resistance properties in accordance with corrosion test including provocation tempering at 650°C for one hour (GOST 6032-89, "AMY" method). Deposit has ferrite content in range of 4-10% (typical 7,4%).

Technological features of welding process

Dry electrodes before welding at 200°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	300	70-110
4,0	330	110-170
5,0	350	140-190

Approvals

GOST R

ЦЛ-11 (TSL-11)

ГОСТ Э-08Х20Н9Г2Б,
AWS E347-15, ISO E19.9NbB20, DIN E19.9NbB20

Electrodes for welding of structures and equipment of corrosion resistant Ti and Nb stabilised steels of GOST gr. 12Х18Н10Т, 12Х18Н9Т, 08Х18Н12Т, 08Х18Н12Б and AISI gr. 347, 321, 304, 308, and similar to them. TSL-11 is employing where high intercrystalline corrosion of weld metal is required. Welding at DC(+) current in all positions except vertical downward is used.

Type of electrode - basic.
Deposition rate factor - 11,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,5 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C 0,10	Mn 1,8	Si 0,53	Cr 20,8
Ni 9,8	Nb 0,99	S 0,011	P 0,020

Typical all weld metal mechanical properties

Tensile strength, MPa 660
Yield strength, MPa 420
Elongation, % 34
Impact values (U-notch specimen), Joule/sm^2 120

Special properties

Weld metal has extra good resistance to intercrystalline corrosion in accordance with corrosion test without provocation tempering (GOST 6032-89, "AMY" method). Deposit has content of ferrite in range of 2,5-10%. Typical meaning 6,1%.

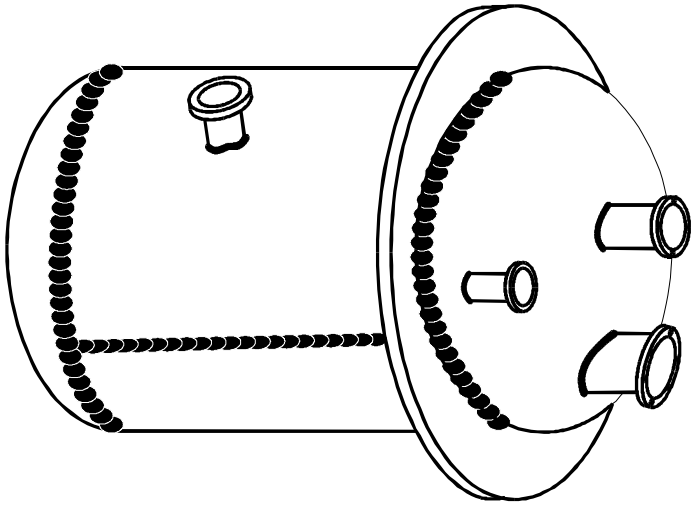
Technological features of welding process

Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	290	30-55
2,5	290	40-65
3,0	340	50-90
4,0	350	110-150
5,0	440	120-180

Approvals

GOST R, UkrSEPRO, Lloyd's Register of Shipping, "Moscow Quality"



ОЗЛ-7 (OZL-7)

ГОСТ Э-08Х20Н9Г2Б,
AWS E19.9NbB20, ISO E347-15,
DIN E19.9NbB20

Electrodes are employed for welding of structures of steels GOST gr. 08Х18Н10, 08Х18Н10Т, 08Х18Н12Б and AISI gr. 321, 347, 304, 308 and similar to them. Electrodes are suitable for welding of Cr-Ni, stainless niobium stabilised steels. OZL-7 can be used when high intercrystalline corrosion resistance of structures operating in aggressive media is required. Welding at DC(+) current in all positions except vertical downward is used.

Type of electrode - basic.
Deposition rate factor - 12,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,4 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,08	Mn	1,7
Si	0,85	Ni	9,0
Cr	19,5	Nb	1,1
S	0,012	P	0,023

Typical all weld metal mechanical properties

Tensile strength, MPa	660
Yield strength, MPa	440
Elongation, %	36
Impact values (U-notch specimen), Joule/sm^2	120

Special properties

Weld metal has high corrosion resistance properties in accordance with corrosion test without provocation tempering (GOST 6032-89, "АМУ" method). Deposit has high corrosion resistance after tempering at 650°C for two hours. Weld metal contents of ferrite in range of 2-10%. Typical meaning 5,7%.

Technological features of welding process

Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	290	25-50
2,5	300	30-50
3,0	300	50-80
4,0	330	90-130
5,0	350	120-160

Approvals

GOST R

ЭА-400/10У (EA-400/10U)

AWS E317-15, ISO E19.12.3B20,
DIN E19.12.3B20

Electrodes for welding of equipment of corrosion resistant Cr-Ni and Cr-Ni-Mo steels GOST gr. 08Х18Н10Т, 08Х18Н12Т, 10Х17Н13М2Т and AISI gr. 304, 308, 317 and similar to them. EA-400/10T is very suitable for welding of equipment operating in aggressive media at temperatures up to 350°C. Welding at DC(+) current in all positions except vertical-downward is used.

Type of electrode - basic.
Deposition rate factor - 12,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

C	0,07	Mn	2,4
Si	0,48	Mo	2,5
Cr	18,0	Ni	10,5
V	0,52	S	0,020
P	0,025		

Typical all weld metal mechanical properties

Tensile strength, MPa	≥540
Yield strength, MPa	≥340
Elongation, %	≥25
Impact values (U-notch specimen), Joule/sm^2	≥90

Special properties

Weld metal has high intercrystalline corrosion resistance properties according with test GOST 6032-89 "АМ" and "АМУ" methods. Deposit has ferrite content in range of 2-8%.

Technological features of welding process

Welding without preheating and postweld heat treatment is used. Dry electrodes before welding at 120-150°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	300	30-60
2,5	300	40-80
3,0	300	60-110
4,0	340	100-160
5,0	350	120-180

Approvals

GOST R, UkrSEPRO, Russian Maritime Register of Shipping, Lloyd's Register of Shipping, "Moscow Quality", GOSATOMNADZOR

ЭА-400/10Т (EA-400/10T)

AWS E317-15, ISO E19.12.3B20,
DIN E19.12.3B20

Electrodes for welding of equipment of corrosion resistant Cr-Ni and Cr-Ni-Mo steels GOST gr. 08Х18Н10Т, 08Х18Н12Т, 10Х17Н13М2Т and AISI gr. 304, 308, 317 and similar to them. EA-400/10T is very suitable for welding of equipment operating in aggressive media at temperatures up to 350°C. Welding at DC(+) current in all positions except vertical-downward is used.

Type of electrode - basic.
Deposition rate factor - 12,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

C	0,07	Mn	2,2
Si	0,5	Mo	2,8
Cr	18,1	Ni	10,5
V	0,58	S	0,020
P	0,025		

Typical all weld metal mechanical properties

Tensile strength, MPa	≥540
Yield strength, MPa	≥340
Elongation, %	≥25
Impact values (U-notch specimen), Joule/sm^2	≥90

Special properties

Weld metal has high intercrystalline corrosion resistance properties according with test GOST 6032-89 "АМ" and "АМУ" methods. Deposit has ferrite content in range of 2-8%.

Technological features of welding process

Welding without preheating and postweld heat treatment is used. Dry electrodes before welding at 120-150°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	300	30-60
2,5	300	40-80
3,0	300	60-110
4,0	340	100-160
5,0	350	120-180

Approvals

GOST R, UkrSEPRO, GOSATOMNADZOR

Classification of High Alloyed Covered Electrodes According to ISO 3581

Symbol	Содержание элементов, %				
	C, max	Cr	Ni	Mo	Others
13	0,12	11-14	-	-	-
13.1	0,07	12-15	0,8-1,5	-	-
13.4	0,07	12-15	3-5	≤1,0	-
17	0,10	15-18	-	-	-
17.0.1	0,25	15-18	-	1,0-1,5	-
19.9	0,08	18-21	8-11	-	-
19.9.L	0,04	18-21	8-11	-	-
19.9.Nb	0,08	18-21	8-11	-	Nb(8×C-1,2)
19.9.LNb	0,04	18-21	8-11	-	Nb(8×C-1,2)
16.8.2	0,10	14,5-16,5	7,5-9,5	1,0-2,0	-
16.25.6	0,12	14-17	23-25	5-7	-
17.8.2	0,10	16,5-18,5	8,0-9,5	1,5-2,5	-
18.8Mn	0,20	17-20	7-10	-	Mn 5-8
18.15.3L	0,04	16,5-19,5	13-16	2,5-3,5	-
19.12.2	0,08	17-20	11-14	2,0-2,5	-
19.12.2L	0,04	17-20	11-14	2,0-2,5	-
19.12.2Nb	0,08	17-20	11-14	2,0-2,5	Nb(8×C-1,2)
19.12.3	0,08	17-20	10-14	2,5-3,5	-
19.12.3L	0,04	17-20	10-14	2,5-3,5	-
19.12.3Nb	0,08	17-20	10-14	2,5-3,5	Nb(8×C-1,2)
19.13.4	0,08	17-21	11-15	3,5-5,5	-
19.13.4L	0,04	17-21	11-15	3,5-5,5	-
19.13.4Nb	0,08	17-21	11-15	3,5-5,5	Nb(8×C-1,2)
20.9.Nb	0,13	18-21	8-10	0,35-0,65	Nb(8×C-1,2)
20.9.3	0,10	18,5-21	8-10	2-4	-
22.12	0,15	20-23	10-13	-	-
23.12	0,15	22-26	11-15	-	-
23.12.L	0,04	22-26	11-15	-	-
23.12.Nb	0,12	22-25	11-15	-	-
23.12W	0,20	22-25	11-15	-	W 2-4
23.12.2	0,12	22-25	11-15	2-3	-
25.20	0,20	24-28	18-22	-	-
25.20L	0,04	24-28	18-22	-	-
25.20Nb	0,12	24-28	18-22	-	Nb(8×C-1,2)
25.20.2	0,12	25-28	20-22	2-3	-
25.25.2Nb	0,10	24-27	24-26	2-3	Nb(8×C-1,2)
25.4	0,15	24-27	4-6	-	-
29.9	0,15	28-32	8-12	-	-
18.36	0,25	14-19	33-38	-	-
17.12Si	0,15	17-19	11-13	-	Si 3,8-4,8
24.14Si	0,12	22-25	13-15	-	Si 1,5-2,2

Type of coating
A - acid AR - rutile-acid B - basic C - cellulosic O - oxide R - rutile (medium thickness) RR - rutile (big thickness) S - others

Symbol	Welding position
1	All positions
2	All positions except vertical-down
3	Flat, horizontal-vertical, vertical
4	Flat
5	As ”3” and vertical-downward

E 19.9Nb B 2 0

Symbol	Polarity of DC	Open-circuit voltage with AC (V)
0	Negative (+)	-
1	Any polarity (+/-)	50
2	Positive (-)	50
3	Negative (+)	50
4	Any polarity (+/-)	70
5	Positive (-)	70
6	Negative (+)	70
7	Any polarity (+/-)	90
8	Positive (-)	90
9	Negative (+)	90

НЖ-13 (NJ-13)

ГОСТ Э-09Х19Н10Г2М2Б,
AWS E318-15,
ISO E19.12.2NbB20,
DIN E19.12.2NbB20

Electrodes are intended for welding of structures of corrosion resistant Cr-Ni-Mo steels of GOST gr. 10X17H13M3T, 08X21H6M2T and AISI gr. 304, 308, 318 and similar to them operating at temperatures up to 350°C. Welding in all positions except vertical-downward. DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 13,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,7 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	1,6
Si	0,80	Ni	10,2
Mo	2,2	Cr	18,2
Nb	1,0	S	0,011
P	0,017		

Typical all weld metal mechanical properties

Tensile strength, MPa 640
Yield strength, MPa 470
Elongation, % 33
Impact values (U-notch specimen), Joule/sm^2 120

Special properties

Weld metal has high corrosion resistance to intercrystalline corrosion in accordance with corrosion test (GOST 6032-89, "АМУ" method). Deposit has content of ferrite in range of 2-10%.

Technological features of welding process

Dry electrodes before use at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	300	60-90
4,0	340	110-140
5,0	350	120-180

Approvals

GOST R, UkrSEPRO

НЖ-13С (NJ-13S)

ГОСТ Э-09Х19Н10Г2М2Б,
AWS E318-15, ISO E19.12.2NbS20,
DIN E19.12.2NbS20

Electrodes are intended for welding of structures of corrosion resistant Cr-Ni-Mo steels of GOST gr. 10X17H13M3T, 08X21H6M2T and AISI gr. 304, 308, 318 and similar to them operating at temperatures up to 350°C. Welding in all positions except vertical-downward. DC(+) current is used. The alloying elements enter the weld metal from the covering. The low alloyed steel core wire gives good current tolerance which results in a high deposition rate.

Type of electrode - special.
Deposition rate factor - 11,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,55 kg.

Typical all weld metal chemical analysis, %

C	0,08	Mn	1,6
Si	0,55	Ni	9,5
Mo	2,2	Cr	18,0
Nb	1,1	S	0,015
P	0,009		

Typical all weld metal mechanical properties

Tensile strength, MPa 700
Yield strength, MPa 590
Elongation, % 30
Impact values (U-notch specimen), Joule/sm^2 100

Special properties

Weld metal has high corrosion resistance to intercrystalline corrosion in accordance with corrosion test (GOST 6032-89, "АМУ" method). Deposit has content of ferrite in range of 2-10%.

Technological features of welding process

Welding can be used at higher welding current without unnessesary heating of electrode' core wire. Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
2,5	300	60-110
3,0	350	90-150
4,0	450	110-210

Approvals

GOST R

ОЗЛ-17У (OZL-17U)

ISO E23.26.3Mn2Cu3NbRB20

Electrodes for welding of equipment of corrosion resistant alloys such as gr. 06ХН28МДТ, 03ХН28МДТ ((23%Cr-27%Ni-3%Mo-3%Cu) and 03Х21Н21М4ГБ (21%Cr-21%Ni-4%Mo-Mn-Nb) with thickness as rule up to 12 mm for service in media containing sulphuric and phosphoric acids with admixtures of fluorite compounds and media similar to these. Welding at DC(+) current in all positions except vertical-downward.

Type of electrode - rutile-basic.
Deposition rate factor - 14,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 2,0 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,035	Mn	2,1
Si	0,53	Mo	3,4
Cr	23,4	Ni	26,4
Nb	0,45	Cu	2,9
S	0,009	P	0,019

Typical all weld metal mechanical properties

Tensile strength, MPa 590
Yield strength, MPa 380
Elongation, % 32
Impact values (U-notch specimen), Joule/sm^2 190

Special properties

Weld metal has total corrosion resistance and good resistance to intercrystalline corrosion in accordance with corrosion GOST 6032-89 "ВУ" test method.

Technological features of welding process

Welding of base metal of thickness up to 12 mm is required to weld by wide bead across full section of groove, welding of thickness more then 12 mm is required to weld in X type of groove. During welding root bead must be removed by abrasive tool.

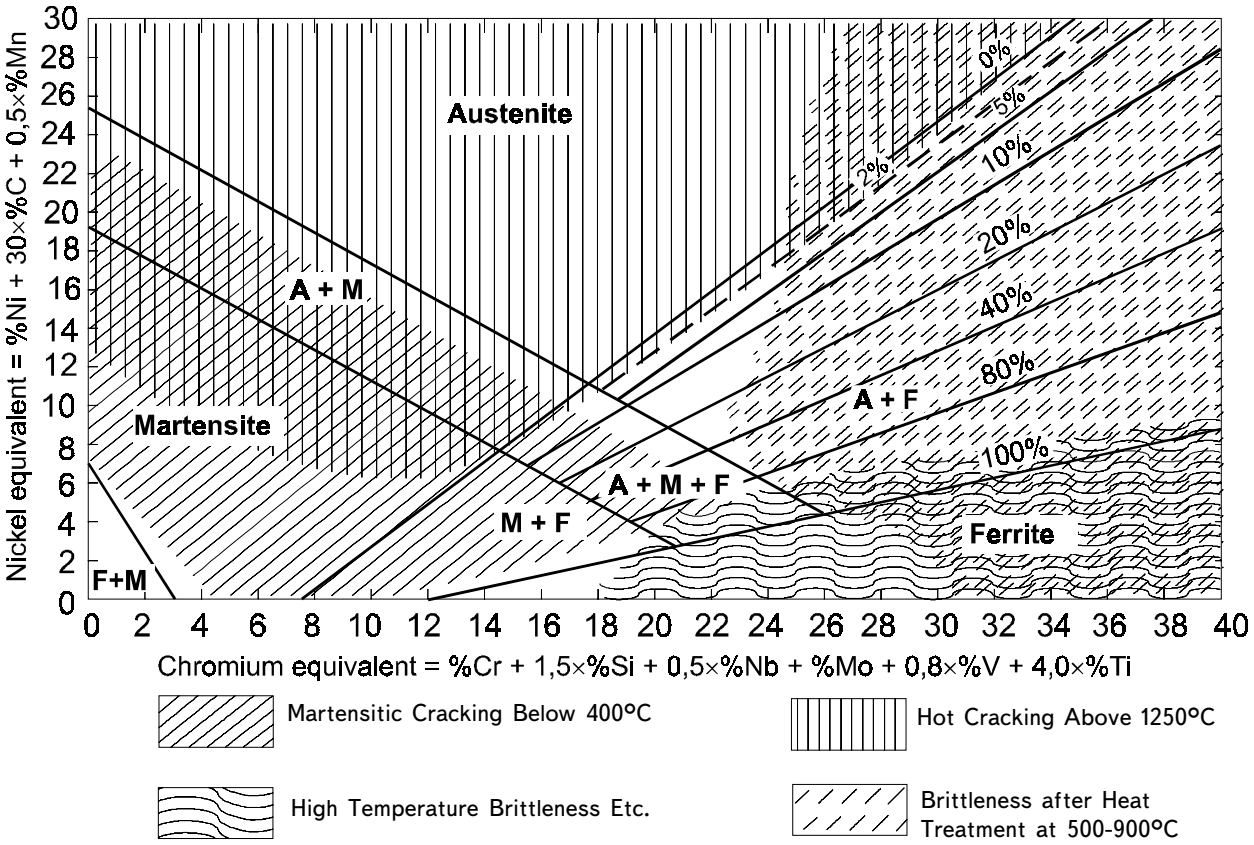
Dia, mm	Length, mm	Current range, A
3,0	300	65-130
4,0	330	90-160

Approvals

GOST R, UkrSEPRO

SCHAEFFLER DIAGRAM

Showing approximate regions of potential weld problems depending on composition and phase balance



ОЗЛ-37-2 (OZL-37-2)

ISO E25.27.4Mn2Cu3NbB20

Electrodes for welding of equipment of corrosion resistant alloys gr. 03Х23Н25М3Д3Б, 03ХН28МДТ, 06ХН28МДТ, 03Х21Н21М4ГБ for service in media containing sulphuric and phosphoric acid with admixtures fluorite compounds. Welding at DC(+) current in all welding positions except vertical-downward is used.

Type of electrode - rutile-basic.
Deposition rate factor - 13,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 2,0 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,03	Mn	2,26
Si	0,45	Mo	3,8
Cr	24,6	Ni	26,8
Nb	0,55	Cu	2,9
S	0,007	P	0,017

Typical all weld metal mechanical properties

Tensile strength, MPa	610
Yield strength, MPa	430
Elongation, %	35
Impact values (U-notch specimen), Joule/sm^2	160

Special properties

Weld metal has high total corrosion resistance and extra good intercrystalline corrosion resistance according with GOST 6032-89 “ВУ” method. Deposit has high hot cracking resistance during of multi-run welding.

Technological features of welding process

During welding root passes must be removed by abrasive tool. Dry electrodes before use at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	320	65-130
4,0	340	90-160

ЦТ-15 (TST-15)

ГОСТ Э-08Х19Н10Г2Б,
AWS E347-15, ISO E19.9NbB20,
DIN E19.9NbB20

Electrodes for welding elements of structures of steels GOST gr. Х20Н12Т-Л, Х16Н13Б, 12Х18Н9Т and AISI gr. 321, 347, 304, 308 and similar to them. TST-15 is used for structures operating at temperatures up to 570-650°C and high pressure. Electrodes also are suitable if higher intercrystalline corrosion resistance of weld metal is required. Welding at DC(+) current is used. Good to handle in all positions except vertical-downward.

Type of electrode - basic.
Deposition rate factor - 10,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	1,82	Si	0,25	Ni	9,5
Cr	20,2	Nb	0,81	S	0,009	P	0,019

Typical all weld metal mechanical properties

Tensile strength, MPa	610
Yield strength, MPa	490
Elongation, %	33
Impact values (U-notch specimen), Joule/sm^2	130

Special properties

Weld metal has high resistance to intercrystalline corrosion according with corrosion test (GOST 6032-89, “АМУ” method) and high creep resistance at operating temperatures. Deposit has ferrite content in weld metal in range of 2,5-5,5% (Typical 3,7%).

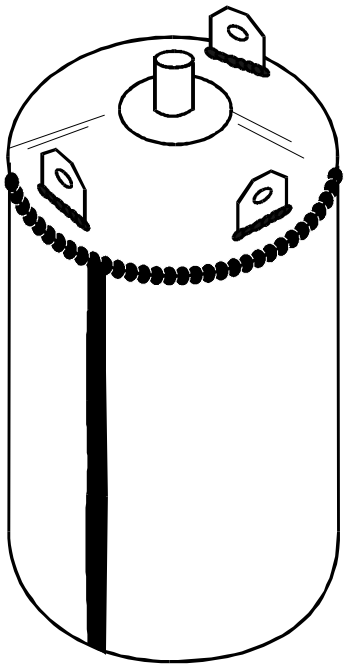
Technological features of welding process

Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
2,0	290	40-70
2,5	290	60-90
3,0	340	70-100
4,0	350	100-140
5,0	440	135-180

Approvals

GOST R, UkrSEPRO



ОЗЛ-9А (OZL-9A)

ГОСТ Э-28Х24Н16Г6,
ISO E2516MnS20,
DIN E2516Mn6RB20

Electrodes are intended for welding of equipment of highly heat resisting steels GOST gr. 12Х25Н16Г7АР, 45Х25Н20С2, Х18Н35С2 and similar for operating in oxidising media up to 1050°С and for operating in carburizing media at temperature up to 1000°С. OZL-9A is suitable for welding steels of grades 20Х23НВ, 20Х23Н18. Welding at DC(+) current in flat and vertical positions is used.

Type of electrode - rutile-basic.
Deposition rate factor - 13,5 g/А·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,28	Mn	5,4	Si	0,30	Ni	16,5
Cr	24,8	S	0,008	P	0,018		

Typical all weld metal mechanical properties

Tensile strength, MPa	690
Yield strength, MPa	460
Elongation, %	32
Impact values (U-notch specimen), Joule/sm^2	130

Special properties

Weld metal has good heat resistance (depth of oxidising at 1050°С for 1000 hours is 0,15 mm) and high creep resistance (high temperature strength at 1000°С for 700 hours is about 15 MPa).

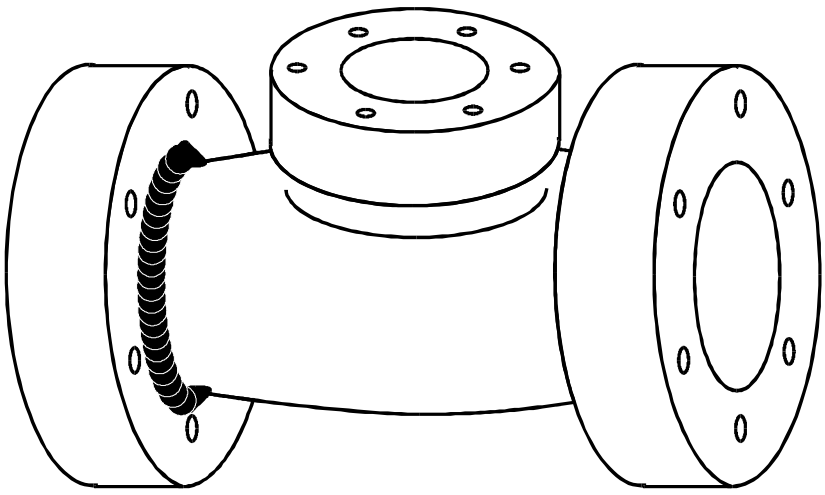
Technological features of welding process

Before depositing of full thickness of weld root pass should be removed by abrasive tool or by remelting by following passes. It is advisable to weld the root bead by GS-1 electrodes if the rigid structures of plate steels are welded. It is recommended to plate the welds directed to the working media with one or two layers of metal are welded by electrodes of other grades: for carburizing media - OZL/TST-31M, for oxidising media - OZL-35 or OZL-5. Dry electrodes before use at 180-200°С for one hour.

Dia, mm	Length, mm	Current range, A
2,5	290	30-70
3,0	280	50-90
4,0	350	90-130

Approvals

GOST R



ГС-1 (GS-1)

AWS E209-15, ISO E23.9.Mn6B20,
DIN E23.9.Mn6B20

Electrodes are intended for welding of thin walled highly resisting structures of steels grades 20Х20Н14С2, 20Х25Н20С2 and 45Х25Н20С2 and similar for operating in carburizing media at temperatures up to 1000°С. GS-1 is available for welding of root pass and surface layers. Welding at DC(+) current in all positions except vertical downward is used.

Type of electrode - basic.
Deposition rate factor - 10,5 g/А·h.
Efficiency of deposition (for dia 4,0 mm) - 1,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,09	Mn	6,3
Si	2,5	Ni	9,4
Cr	23,1	S	0,011
P	0,023		

Typical all weld metal mechanical properties

Tensile strength, MPa	770
Yield strength, MPa	560
Elongation, %	28
Impact values (U-notch specimen), Joule/sm^2	90

Special properties

Electrodes for producing weld metal with high carburizing resistance in carburizing and similar to their media and also high heat resistance of deposits (the oxidising depth at 1000°С for 5000 hour is about 0,2 mm). Typical ferrite contents in weld metal is about 13,7%.

Thechnological features of welding process

Dry electrodes before welding at 190-210°С for one hour.

Dia, mm	Length, mm	Current range, A
3,0	320	60-90
4,0	330	90-130

Electrodes for hardfacing and cladding on steel

ОЗН-300М (OZN-300M)

DIN E1-UM300-P

Electrodes are intended for tough, hard and impact-proofed surfacing of carbon and low alloyed steels. OZN-300M is very suitable for hardfacing of wear loaded machine members having dragged and crushed loads. Welding at DC(+) and AC current in flat position is used.

Type of electrode - basic.
Deposition rate factor - 10,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

C	0,10	Mn	3,0
Si	1,3	S	0,020
P	0,030		

Typical weld metal hardness

Hardness HB 330
(heat treatment after surfacing - none)

Special properties

Weld metal has very stable characteristics of hardness and wear resistance in wide range of cooling speeds of metal during hardfacing.

Technological features of welding process

Dry electrodes before use at 290-310°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	450	140-160
5,0	450	160-180

Approvals

GOST R, UkrSEPRO

ОЗН-400М (OZN-400M)

DIN E1-UM400-P

Electrodes are employed for tough, hard and impact-proofed surfacing of carbon and low alloyed steels. OZN-400M is very suitable for hardfacing of wear loaded machine members having dragged and crushed loads. Welding at DC(+) and AC current in flat position is used.

Type of electrode - basic.
Deposition rate factor - 10,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

C	0,13	Mn	3,5
Si	1,7	S	0,020
P	0,030		

Typical weld metal hardness

Hardness HB 420
(heat treatment after surfacing - none)

Special properties

Weld metal has very stable characteristics of hardness and wear resistance in wide range of cooling speeds of metal during hardfacing.

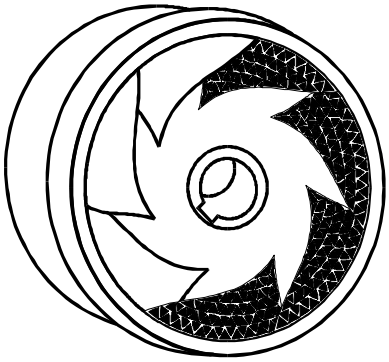
Technological features of welding process

Dry electrodes before use at 290-310°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	450	140-160
5,0	450	160-180

Approvals

GOST R



ЦНИИН-4 (TSNIIN-4)

ГОСТ Э-65Х25Г13Н3,
DIN E8-UM300-P

Electrodes for surfacing of wearing parts, repairing of defects of cast railway crosspieces and another work pieces of high manganese steels (13% Mn) such as gr. 110Г13Л. Surfacing in flat position at DC(+) current is used. Electrodes also are suitable for tough, hard and impact-proofed surfacing also for rail frog and for armouring worn out parts on rails surfaces and flanks for wear-loaded machine members of unalloyed and low alloyed steels having dragged and crushing load; e.g. worms toothed geared, shafts and gear parts.

Type of electrode - basic.
Deposition rate factor - 10,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,4 kg/h.
Consumption of electrodes per kg deposited metal - 1,5 kg.

Typical all weld metal chemical analysis, %

C	0,6	Mn	12,4
Si	0,4	Ni	2,7
Cr	26,3	S	0,010
P	0,021		

Typical weld metal hardness

Hardness HRCэ 26
(heat treatment after surfacing - none)

Special properties

The weld metal is machinable.

Technological features of welding process

Surfacing of work pieces with minimum of preheating is required. Dry electrodes before welding at 160-200°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	340	120-140

Approvals

GOST R

ЭН-60М (EN-60M)

ГОСТ Э-70Х3СМТ,
DIN E2-UM55-GT

Electrodes are intended for hardfacing of all types of pressing dies with operating surface contact temperatures up to 400°C. EN-60M is also very suitable for hardfacing of wearing and tearing parts of different tool machines (rollers, wheels, knifes, eccentrics, gears etc). Hardfacing in flat and half-flat position at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 8,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,1 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

C	0,8	Mn	0,9
Si	1,0	Mo	0,6
Cr	2,7	Ti	0,1
S	0,013	P	0,022

Typical weld metal hardness

Hardness HRCэ 55
(heat treatment after surfacing - none)
Hardness HRCэ 55
(hardened from 790-900°C + tempering at 300°C for one hour)

Special properties

Hardfacing on cold press dies has extra good resistance to stress abrasion, metal to metal friction, heavy shocks.

Technological features of welding process

Hardfacing is used by 2-5 layers of thickness less 10 mm or by "pool method" with thickness less 50 mm accompanied by preheating up to 300-400°C. Dry electrodes before use at 280-300°C for one hour

Dia, mm	Length, mm	Current range, A
2,5	350	60-75
3,0	350	80-100
4,0	450	110-140
5,0	450	140-180

Approvals

GOST R, UkrSEPRO, «Moscow Quality»

ОЗН-6 (OZN-6)

DIN E2-UM60-GP

Electrodes can be used for hardfacing of rapidly wearing and tearing parts of mining and construction machines: dredger teeth, beater bars, scrappers, conveyor worms, mill hammers, mixer arms, crusher jaws, cones and other work pieces exposed to the conditions of intensive abrasive wear and considerable shock loads. Surfacing in flat and vertical position at DC(+) or AC current is used.

Type of electrode - basic.
Deposition rate factor - 11,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,7 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

C	1,0	Mn	2,6
Si	3,7	Cr	4,4
B	0,9		

Typical weld metal hardness

Hardness HRCэ 62
(heat treatment after surfacing - none)

Special properties

Weld metal is characterised by high resistance to crack formation during multi-run depositing and under operating conditions with intensive shock loads.

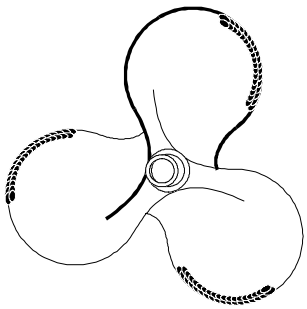
Technological features of welding process

Dry electrodes before use at 330-350°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	450	120-160
5,0	450	140-180

Approvals

GOST R



Т-590 (T-590)

ГОСТ Э-320Х25С2ГР,
DIN E10-UM60-G

Electrodes are intended for hardfacing on materials with very high strength and ductility especially with high abrasive wear under corrosion conditions. Especially for mixer blades and arms, pug mill knifes, excavator worms, glide pathes, skids etc. Hardfacing in flat and half-vertical position at DC(+) current is used.

Type of electrode - special.
Deposition rate factor - 9,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

C	3,2	Mn	1,2
Si	2,2	Cr	25,0
B	1,0		

Typical weld metal hardness

Hardness HRCэ 61
(heat treatment after surfacing - none)

Special properties

Deposit has high wear resistance in abrasive medium and middle impact properties. Furthermore deposited metal features a tendency to cracking without decreasing of service resistance of deposited parts.

Technological features of welding process

To avoid spelling, it is not recommended to deposit steel parts with more than 2 layers, and cast iron- with more than 1 layer. When a thicker depositing is necessary, bottom layers are deposited by other types of electrodes depending upon properties of the base metal. Dry electrodes before use at 180-200°C for two hours.

Dia, mm	Length, mm	Current range, A
4,0	450	200-220
5,0	450	250-270

Approvals

GOST R, UkrSEPRO

Classification of Covered Electrodes According to DIN 8555

Welding method	
G	Gas welding
E	Manual-arc welding
MF	Metal-arc welding using cored wire electrodes
TIG	Tungsten inert gas welding
MIG	Metal shielding gas welding
UP	Submerged-arc welding

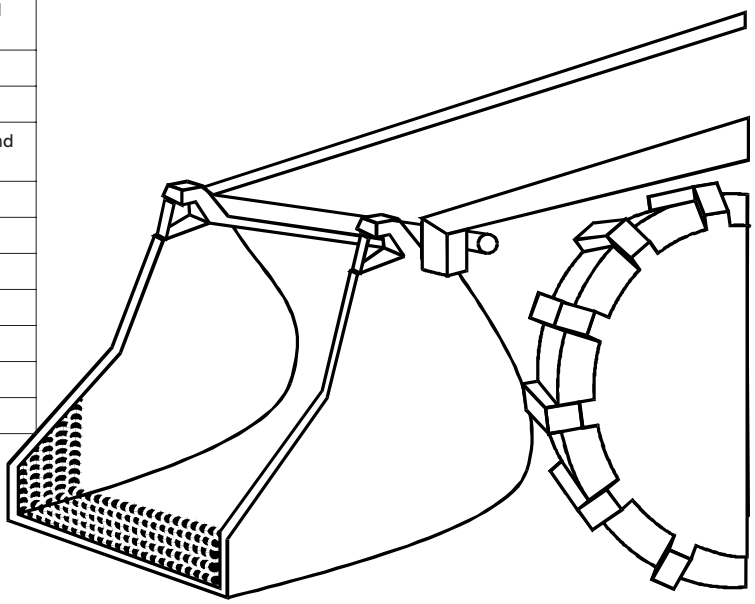
Weld metal hardness (HB)	
150	125 - 175
200	176 - 225
250	226 - 275
300	276 - 325
350	326 - 375
400	376 - 425
40	37 - 42
45	42 - 47
50	47 - 52
55	52 - 57
60	57 - 62
65	62 - 67
70	Over 67

Weld metal properties	
C	Corrosion resistant
G	Resistant to abrasive wear
K	Capable of work hardening
N	Non-magnetizable
P	Impact resistant
R	Rust resistant
S	Cutting ability (high speed steels etc.)
T	High temperature strength as for high-temperature tool steels
Z	Heat resistant (non-scalling) e.e. for temp. Over about 600ºC

E 2 UM 55 GP

Alloy group	
1	Unalloyed up to 0,4% C or low alloy up to 0,4% C and a maximum of 5% of the alloying elementσCr, Mn, Mo, Ni in total
2	Unalloyed with up to more than 0,4% C or low alloy with more than 0,4% C and up to maximum of 5% of the alloying elements Cr, Mn, Mo, Ni in total
3	Alloyed, with the properties of hot working steels
4	Alloyed, with the properties of high speed steels
5	Alloyed with more than 5% Cr, with a low C content (up to about 0,2%)
6	Alloyed with more than 5% Cr, with a higher C content (about 0,2 to 2,0%)
7	Mn austenites with 11-18% Mn, more than 0,5% C and up to 3% Ni
8	Cr-Ni-Mn type austenitic alloys
9	Cr-Ni steels (resistant to rusting, acid and heat)
10	With a high C content and high Cr alloying content and without additional carbide forming agents
20	Co based, Cr-W alloyed, with or without Ni and Mo
21	Carbide based (sintered, cast or cored) alloys
22	Ni based, Cr or Cr-B alloyed
23	Ni based, Mo alloyed, with or without Cr
30	Cu based, Sn alloyed
31	Cu based, Al alloyed
32	Cu based, Ni alloyed

Production method	
GW	Rolled
GO	Cast
GZ	Drawn
GS	Sintered
GF	Cored
UM	Covered



ЦН-6Л (TSN-6L)

ГОСТ Э-08Х17Н8С6Г

Electrodes can be used for surfacing heating tubes of boiler's operating at 570°C and pressure of 78 MPa. Surfacing in flat position at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 14,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,8 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

C 0,07	Mn 1,3
Si 5,5	Ni 8,3
Cr 16,8	S 0,010
P 0,020	

Typical weld metal hardness

Hardness HRCэ 31
(tempering at 725°C for one hour with slow cooling to 200°C)

Special properties

Deposited metal has high corrosion and erosion resistance in medium of steam and water and not sensitive to bully.

Technological features of welding process

Preheating at 300-400°C before surfacing is used but for surfacing of small work pieces preheating is not required. Heat treatment of large structures is required immediately after depositing. Dry electrodes before use at 120-150°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	340	110-130
5,0	440	180-200

Approvals

GOST R

ЦН-12М-Б7 (TSN-12M-B7)

ГОСТ Э-13Х16Н8М5С5Г4Б

Electrodes are employed for depositing of heating tube's surfaces of power engineering equipment operating at 600°C and pressure of 78 MPa. Surfacing in flat position at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 13,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,8 kg/h.
Consumption of electrodes per kg deposited metal - 1,5 kg.

Typical all weld metal chemical analysis, %

C 0,13	Mn 4,0
Si 4,1	Mo 5,7
Ni 7,9	Cr 16,3
Nb 0,8	S 0,009
P 0,017	

Typical weld metal hardness

Hardness HRCэ 46
(tempering at 725°C for one hour with slow cooling to 200°C)

Special properties

Deposited metal has high corrosion and erosion resistance in medium of water and steam and not sensitive to bully.

Technological features of welding process

Preheating at 300-400°C before surfacing is required, but for surfacing of small work pieces preheating is not required. Heat treatment of large work pieces is required immediately after depositing. Dry electrodes before use at 120-150°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	350	120-140
5,0	450	160-190

Approvals

GOST R

ОЗШ-8 (OZSH-8)

DIN E9-UM250«55»-TZ

Electrodes are intended for hardfacing of heavy duty loaded hot press dies for operating at temperatures up to 1100°C and also used for hardfacing of difficult geometry parts. Welding in flat and half-flat position at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 14,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

C 0,08	Mn 1,2
Si 1,2	Mo 3,1
Ni 10,5	Cr 31,5
V 0,2	Al 0,28
S 0,016	P 0,021

Typical weld metal hardness

Hardness HRCэ 30
(heat treatment after surfacing - none)
Hardness HRCэ 54
(tempering at 720°C for 3 hour)

Special properties

Deposit has high heat and creep resistance, high wears and corrosion resistance in acid and alkaline media and low sensitive to cracks.

Technological features of welding process

Hardfacing of work pieces of hardened steels is used with preheating and heating during welding at temperature up to 300-450°C (300°C - for die's steels of gr. 5ХНМ (5%Cr). Dry electrodes before use at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	90-100
4,0	350	140-150

Approvals

GOST R, UkrSEPRO

ОЗШ-3 (OZSH-3)

ГОСТ Э-37Х9С2,
DIN E6-UM55-T

Electrodes are intended for hardfacing of shearing and cutting dies of cold and hot (up to 650°C) forging and other rapidly wearing and tearing parts of machines. Depositing in flat and vertical-upward position at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 9,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C 0,4	Mn 0,5
Si 1,9	Cr 9,9
S 0,013	P 0,021

Typical weld metal hardness

Hardness HRCэ 56
(heat treatment after surfacing - none)

Special properties

Deposited metal has high wear resistance and good impact properties.

Technological features of welding process

Hardfacing is performed in 1 to 4 layers with preheating up to 300-400°C, but sometimes deposition without preheating is available. Dry electrodes before use at 340-360°C for one hour.

Dia, mm	Length, mm	Current range, A
2,5	350	70-110
3,0	350	90-130
4,0	450	110-150
5,0	450	130-180

Approvals

GOST R, UkrSEPRO

ОЗН-7М (OZN-7M)

DIN E2-UM55-GP

Electrodes are intended for hardfacing of rapidly wearing and tearing work pieces as rule of steel gr. 110Г13Л (13%Mn). OZN-7M is also suitable for hardfacing of equipment exposed to the conditions of intensive abrasive wear and considerable impact loads. Hardfacing in flat and half-vertical position at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 12,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,5 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

C 0,7	Mn 0,4
Si 1,4	Ni 2,0
Cr 4,1	V 0,6
B 0,5	S 0,018
P 0,026	

Typical weld metal hardness

Hardness HRCэ ..... ≥56
(heat treatment after surfacing - none)

Special properties

Deposited metal has higher resistance to cracking during multi-run depositing and operating.

Technological features of welding process

Dry electrodes before use at 340-360°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	450	150-180
5,0	450	180-210

Approvals

GOST R

ОЗИ-Б (OZI-B)

ГОСТ Э-10К18В11М10Х3СФ,
DIN E4-UM55«65»SZ

Electrodes can be used for hardfacing of machining tools (instead of steels gr. P18 and P6M5), dies and other parts exposed to very high temperatures up to 800-850°C and severe loads. Hardfacing in flat position at DC(+) current is used.

Type of electrode - special.
Deposition rate factor - 10,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,8 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C 0,09	Mn 0,4
Si 0,9	Mo 9,4
Co 19,0	Cr 2,2
V 0,6	W 9,9
S 0,015	P 0,020

Typical weld metal hardness

Hardness HRCэ 52
(heat treatment after surfacing - none)
Hardness HRCэ 64
(tempering at 600°C for 2 hour)

Special properties

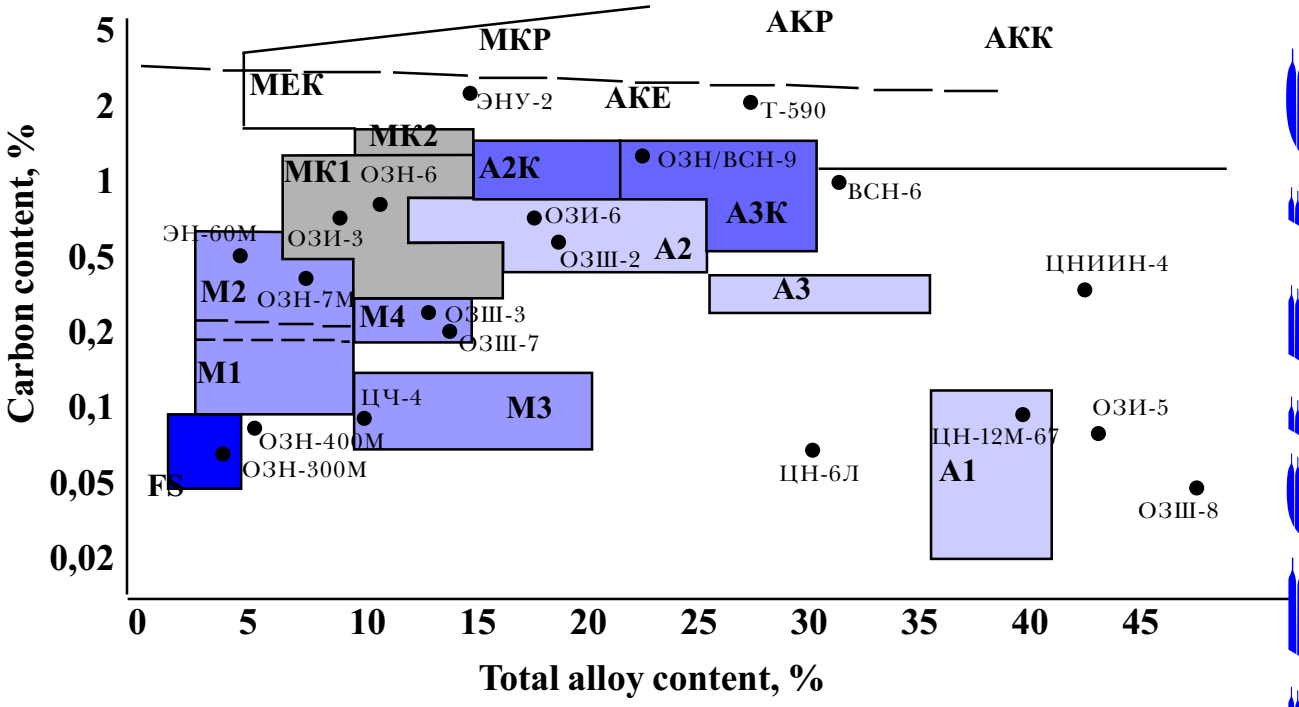
Weld metal is extra good against abrasion and crumple at big loads and temperatures up to 850°C.

Technological features of welding process

Hardfacing is performed in 1 to 3 layers with thickness from 2 to 6 mm by a “welding pool” method with preheating up to 400-700°C. Dry electrodes before hardfacing at 340-360°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	100-140
4,0	450	140-200
5,0	450	180-250

MAP OF IRON-BASED HARDSURFACING ALLOY COMPOSITIONS



Ferrite (with secondary phase) - FS
Martensite Type I - Low C, Low Alloy - M1
Martensite Type II - High C, Low Alloy - M2
Martensite Type III - Low C, High Alloy - M3
Martensite Type IV - Medium, High Alloy - M4
Martensite + Carbides - Type II - MK1
Martensite + Added Carbides - Type II - MK2
Martensite + Eutectic Carbides - MEK
Martensite + Primary Carbides - MKP
Austenite Type I (Cr Ni) and Austenite + Ferrite - A1-AФ
Austenite Type II - High C, Medium Alloy (Mn) - A2
Austenite Type III - Medium C, High Alloy (Mn Cr) - A3
Austenite Type II and III + Added Carbides - A2K, A3K
Austenite + Primary Carbides - AKP
Austenite + Eutectic Carbides - AKE
Austenite + Primary, Eutectic and Extra Carbides - AKK

Electrodes for welding of nonferrous metal

ОЗА-1 (OZA-1)

AWS E1100, DIN EL-A199,5

Welding and depositing of structures of commercially pure aluminium when a pure aluminium electrode should be used. Welding at DC(+) current in flat and half-vertical position is used.

Type of electrode - special.
Deposition rate factor - 6,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 0,7 kg/h.
Consumption of electrodes per kg deposited metal - 2,0 kg.

Typical all weld metal chemical analysis, %

Al	bal.	Si	0,4
Ti	0,2	Fe	0,1

Typical all weld metal mechanical properties

Tensile strength, MPa 70

Special properties

Weld metal has good corrosion resistance.

Thechnological features of welding process

Preheating of the start point to 250-400°C according to thickness of base metal is used. Clan the edges before welding. Agter welding clean the weld by means of hot water. Dry electrodes before use at 150-200°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	350	100-120
5,0	400	120-150

Approvals

GOST R

ОЗА-2 (OZA-2)

AWS E4043, DIN EL-A1Si5

Welding of cast or rolled weldable aluminium alloys of grades АЛ-4, АЛ-9, АЛ-11 with additions of silicon. Welding at DC(+) current in flat and half-vertical position is used.

Type of electrode - special.
Deposition rate factor - 6,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 0,7 kg/h.
Consumption of electrodes per kg deposited metal - 2,0 kg.

Typical all weld metal chemical analysis, %

Al	bal.	Si	5,0
Ti	0,2	Fe	0,1

Typical all weld metal mechanical properties

Tensile strength, MPa 90

Special properties

Weld metal has good corrosion resistance.

Thechnological features of welding process

Preheating of the start point to 250-400°C according to thickness of base metal is used. Clan the edges before welding. Agter welding clean the weld by means of hot water. Dry electrodes before use at 150-200°C for one hour.

Dia, mm	Length, mm	Current range, A
4,0	360	100-120
5,0	390	120-150

Approvals

GOST R

ОЗБ-2М (OZB-2M)

AWS ECuSn-C, ISO ECuSn2B2, DIN ELCuSn6

Electrodes are intended for welding and depositing of tin-bronze and red brass. OZB-2M is very suitable for welding and repairing welding of artistic cast work pieces, also for repairing of defects of cast iron and for depositing on steels. Electrodes are available for welding of cast iron without preheating, for joining copper or bronze to steel. It is also suitable for cladding. Welding in flat, vertical up and horizontal positions at DC(+) current is used.

Type of electrode - basic.
Deposition rate factor - 14,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 2,1 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

Cu	bal.	Mn	1,0
Ni	0,8	Fe	0,5
Sn	6,0	P	0,35

Typical all weld metal mechanical properties

Tensile strength, MPa 340
Yield strength, MPa 230
Elongation, % 10
Hardness, HB 115

Special properties

Weld metal has excellent wear resistance. OZB-2M is easy to employ for repairing welding of old bronze artistic monuments.

Technological features of welding process

When welding copper or bronze the work piece should be preheated to about 300°C, in order to obtain better joint fusion. When welding large objects, a continuous heat supply is necessary. Dry electrodes before use at 340-360°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	90-120
4,0	350	120-160

Approvals

GOST R

АНЦ/ОЗМ-3 (ANTS/OZM-3)

AWS ECu-15

Electrodes are intended for welding and depositing of pure copper containing up to 0,01% of oxygen. Electrodes are suitable for welding and depositing of Cu-base alloys and for welding copper with steel. Welding at DC(+) current in flat and half-vertical position is used.

Type of electrode - special.
Deposition rate factor - 16,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 4,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

Cu	bal.	Mn	≤0,2
Si	≤0,05	Al	≤0,2
Fe	≤0,3	B	≤0,02

Typical all weld metal mechanical properties

Tensile strength, MPa 200
Yield strength, MPa 100
Elongation, % 31
Impact values (U-notch specimen), Joule/sm^2 100

Special properties

Weld metal has electrical conductivity up to 60% of electrical conductivity of pure copper.

Technological features of welding process

Welding of work pieces without preheating with thickness of base metal less 10 mm is used. Preheat of base metal with thickness more 10-mm at temperatures in range from 150°C to 350°C in accordance with thickness and weight of work piece is required.

Dia, mm	Length, mm	Current range, A
4,0	350	220-300
5,0	450	350-400

Approvals

GOST R

КОМСОМОЛЕЦ-100 (KOMSOMOLETS-100)

Electrodes for welding and depositing work pieces of pure copper grades M1, M2, and M3. Welding at DC(+) current in flat and half-flat position is used.

Type of electrode - special.
Deposition rate factor - 14,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,8 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

Cu	bal.	Mn	5,1
Si	0,75	Fe	0,8

Typical all weld metal mechanical properties

Tensile strength, MPa 410
Yield strength, MPa 230
Elongation, % 26
Impact values (U-notch specimen), Joule/sm^2 50
Hardness, HB 120

Special properties

Weld metal has electrical conductivity up to 20% of electrical conductivity of pure copper.

Technological features of welding process

Preheat base metal before welding up to 300-700°C in accordance with thickness of base metal and weight of structure. Dry electrodes before welding at 160-200°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	70-110
4,0	350	100-140
5,0	450	150-190

Approvals

GOST R

ОЗБ-3 (OZB-3)

Electrodes for surfacing and repairing of cladded electrodes of spot resistance-welding equipment for welding of bars for building of structures. Welding at DC(+) current in flat position is used.

Type of electrode - special.
Deposition rate factor - 12,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 3,5 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

Cu	bal.	Si	0,7
Ni	2,5	Cr	1,0
S	0,025		

Typical all weld metal mechanical properties

Hardness, HV 120-130

Thechnological features of welding process

Dry electrodes before welding at 340-360°C for two hours.

Dia, mm	Length, mm	Current range, A
4,0	350	220-300
5,0	450	350-400

Approvals

GOST R

ОЗЛ-32 (OZL-32)

AWS ENi1-15, DIN EL-NiTi3

Electrodes are employed for welding of equipment of pure nickel gr. НП-2, НА-1, for depositing of corrosion resistant layers on carbon or high alloyed corrosion resistant steel. OZL-32 is suitable for welding of equipment for chemical industry producing of synthetic materials, soda, soap etc, and for welding of pure nickel with carbon or stainless steel. Welding at DC(+) current in flat and vertical up position is used.

Type of electrode - rutile-basic.
Deposition rate factor - 12,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,9 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

C	0,07	Mn	1,8
Si	1,2	Ni	65,0
Ti	1,1	Al	0,3
Fe	1,8	S	0,006
P	0,009		

Typical all weld metal mechanical properties

Tensile strength, MPa 470
Yield strength, MPa 340
Elongation, % 30
Impact values (U-notch specimen), Joule/sm^2 185

Special properties

Weld medal has high corrosion resistance in medium of Cl or alkaline.

Technological features of welding process

Welding is used with narrow beads of width less than two dia of electrode. Electrodes to be operated at 90°C to weldment. Dry electrodes at 190-210°C for one hour before welding.

Dia, mm	Length, mm	Current range, A
3,0	300	110-140
4,0	340	140-180

В-56У (V-56U)

AWS ENICu7, DIN EL-NiCu30Mn

Electrodes are intended for welding of equipment of clad steels (low alloyed steel + monel metal). V-56U is very suitable for making corrosion resistant layers on monel metal, also is suitable to weld monel metal and low alloyed steel. Welding in flat and half-flat position at DC(+) current is suitable.

Type of electrode - rutile-basic.
Deposition rate factor - 11,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,5 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

C	0,03	Mn	4,1	Si	0,3
Ni	65,0	Ti	0,2	Al	0,2
Fe	0,9	S	0,008	Cu	other

Typical all weld metal mechanical properties

Tensile strength, MPa 550
Elongation, % ..... ≥20
Impact values (U-notch specimen), Joule/sm^2 130

Special properties

Weld metal is very corrosion resistant in medium such as HCl and H_2S at operating temperature about 200°C.

Technological features of welding process

Welding with bead width less then 12 mm is required. Dry electrodes at 450-460°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	340	90-110
4,0	360	120-140

Approvals

GOST R

ELECTRODES FOR WELDING OF CAST IRON

ЦЧ-4 (TSCH-4)

Electrodes are intended for cold welding of structures of high strength cast iron with a spheroidal graphite and of grey cast iron with lamellar graphite and their combinations with steel, for repairing of defects in castings and for preliminary depositing of the first 1-2 layers upon worn out cast iron parts as preparation for subsequent depositing with special types of electrodes. Welding at DC(+) current in flat position is used.

Type of electrode - basic.
Deposition rate factor - 10,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,1 kg/h.
Consumption of electrodes per kg deposited metal - 1,8 kg.

Typical all weld metal chemical analysis, %

Fe	bal.	C	0,13	Mn	0,9	Si	0,5
V	8,6	S	0,014	P	0,023		

Typical all weld metal mechanical properties

Tensile strength, MPa 490
Hardness, HB 180

Special properties

Machining is applicable to weld metal “as welded”.

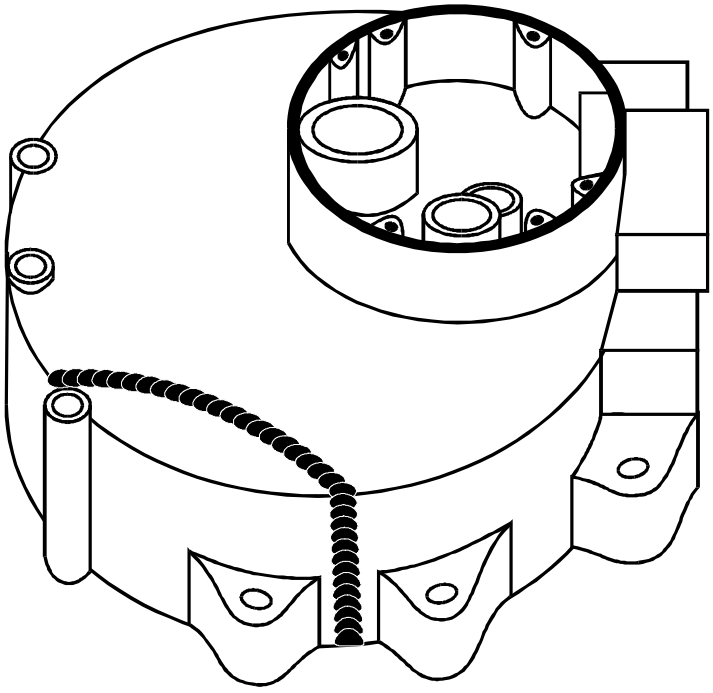
Technological features of welding process

Welding is performed with short beads of 25-35 mm long with interpass temperature down 60°C. When welding malleable cast iron or high strength cast iron, length of the bead may be increased up to 80-100 mm. Dry electrodes at 160-200°C for one hour before welding.

Dia, mm	Length, mm	Current range, A
3,0	350	65-80
4,0	450	90-120
5,0	450	130-150

Approvals

GOST R, Russian Maritime Register of Shipping, «Moscow Quality»



ОЗЧ-6 (OZCH-6)

Copper base electrodes are intended for cold welding of structures of grey and malleable cast iron. Electrodes arc preferable for repair of through defects, especially in thin walled details. Welding at DC(+) current in flat and vertical up position is used.

Type of electrode - basic.
Deposition rate factor - 15,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 2,2 kg/h.
Consumption of electrodes per kg deposited metal - 1,4 kg.

Typical all weld metal chemical analysis, %

Cu	bal.	C	0,05
Mn	1,1	Si	0,3
Ni	1,2	Cr	0,7
Fe	10,0	B	0,2

Typical all weld metal mechanical properties

Tensile strength, MPa 320
Yield strength, MPa 200
Elongation, % 14
Hardness, HB 160

Special properties

Extra good for site repairing welding of through defects of thin walled structures, for repairing of oiled cast iron.

Technological features of welding process

Welding is necessary to perform with short beads of 30-50 mm long with interpass temperature down to 100°C. Each part of the weld should be caulked by light hammer blows. Dry electrodes at 190-210°C for 45 min before use.

Dia, mm	Length, mm	Current range, A
2,0	300	50-80
2,5	300	60-90
3,0	350	70-100
4,0	350	130-160
5,0	450	160-200

Approvals

GOST R, «Moscow Quality»

МНЧ-2 (MNCH-2)

AWS ENiCu-B, ISO ENiCu2BG2, DIN ENiCuG3

MNCH-2 is a Ni-Cu alloyed monel electrode is intended for cold welding, repairing of casting defects. Electrode is suitable for welding of first layer of joints requiring high tightness. It can be used for filling up cavities in castings, or cavities that might form after machining. Welding at DC(+) current in all position except overhead and vertical downward is used.

Type of electrode - special.
Deposition rate factor - 11,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,5 kg/h.
Consumption of electrodes per kg deposited metal - 1,5 kg.

Typical all weld metal chemical analysis, %

Mn ..... 2,2 Ni 66,0
Fe 2,9
Cu ..... other

Typical all weld metal mechanical properties

Hardness, HB 150

Special properties

Heat affected zone is very narrow. Porosity free weld metal can be easily machined. Filler metal has the same colour with that of the work piece.

Technological features of welding process

Welding is performed with short beads of 20-30 mm long. After each bead is welded, it should be caulked with light hammer blows. The interpass temperature is 60°C. When welding cast iron without preheating the smallest possible electrode diameter and the lowest possible welding current should be selected to limit the width of the Heat Affected Zone that might occur due to excess heating. Dry electrodes before welding at 190-210°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	70-110
4,0	350	100-140
5,0	450	140-190

Approvals

GOST R, Russian Maritime Register of Shipping

ОЗЖЧ-1 (OZJN-1)

AWS ENiFe-CI, ISO ENiFeBGI, DIN ENiFe-1BGII

Nickel-iron electrodes arc employed for repairing welding of grey and high strength cast iron with laminar and globular graphite structure, also for joints of cast iron with unalloyed steels. The alloyed weld metal mainly is produced from the core wire 50% Ni and 50% Fe. Welding at DC(+) current in flat and vertical positions is used.

Type of electrode - basic.
Deposition rate factor - 11,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,6 kg/h.
Consumption of electrodes per kg deposited metal - 1,3 kg.

Typical all weld metal chemical analysis, %

C ..... 0,1 Mn ..... 0,4 Si ..... 0,6 Ni 48,0
S ..... ≤0,030 P ..... ≤0,030 Fe ..... other

Typical all weld metal mechanical properties

Tensile strength, MPa 510
Yield strength, MPa 340
Elongation, % 26
Hardness, HB 200

Special properties

The weld metal is easy to machine and crack resistant; the colour of weld is like of base metal. When large defects are repaired or large volume of metal is deposited the present electrodes should be used together with OZCH-3 or MNCH-2 grade electrodes where as the intermediate layers are alternately applied by OZJN-1 and OZCH-3 or MNCH-2 electrodes.

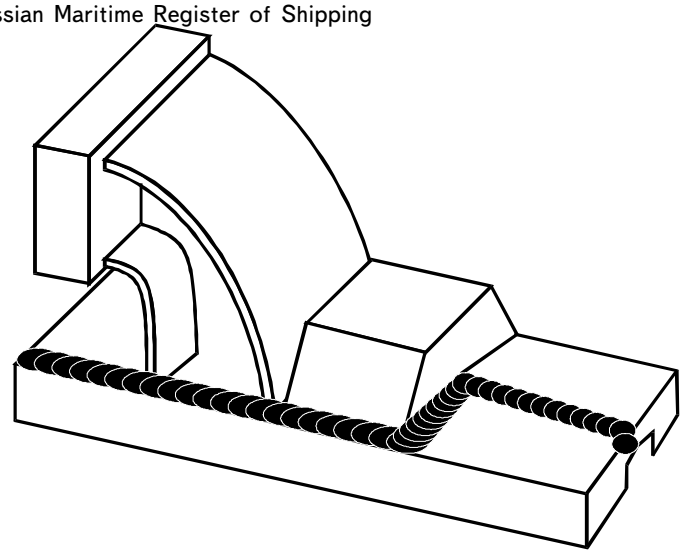
Technological features of welding process

Welding is performed with short beads of 30-50 mm long. After each bead is welded, it should be caulked with light hammer blows. The interpass temperature down 60°C is required. Dry electrodes before use at 340-360°C for one hour.

Dia, mm	Length, mm	Current range, A
2,5	300	70-100
3,0	350	90-120
4,0	360	120-150
5,0	400	150-180

Approvals

GOST R, Russian Maritime Register of Shipping



ОЗЧ-2 (OZCH-2)

Electrode containing iron powder in coating is intended for welding and depositing of grey and malleable cast iron without preheating and for repairing of defects in cast iron. Welding in flat and vertical-up position at DC(+) current is used.

Type of electrode - acid.
Deposition rate factor - 13,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,8 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

Cu	bal.	Mn	1,8
Si	0,2	Ni	2,0
Fe	10,0		

Typical all weld metal mechanical properties

Tensile strength, MPa	250
Hardness, HB	170

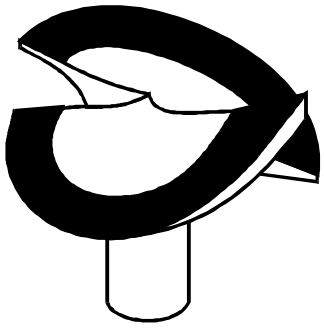
Special properties

OZCH-2 is to be employed together with MNCH-2 grade electrode if extra good mechanability or tightness of weld joints is required.

Technological features of welding process

Welding is performed with short beads 30-60 mm long with interpass temperature down 60°C. For higher crack resistance weld metal should be caulked by light hammer blows immediately after welding.

Dia, mm	Length, mm	Current range, A
3,0	350	80-100
4,0	350	100-140
5,0	450	150-190



ОЗЧ-3 (OZCH-3)

AWS ENi-CI, ISO ENiBG2, DIN ENiBGII

Nickel electrode is intended for cold welding and repairing of grey cast iron and higher strength cast iron. Electrodes are suitable for repairing and joining of various kinds of cast iron products such as cylinder covers, motor beds, castings and gears. Repairing of alloyed and malleable cast iron are also used. Welding in flat and vertical up position at DC(+) current is required.

Type of electrode - basic.
Deposition rate factor - 11,0 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,6 kg.

Typical all weld metal chemical analysis, %

Ni	≥99,0	C	≤0,04
Mn	≤0,1	Si	≤0,14
Cu	≤0,06	Fe	≤0,1
S	≤0,005	P	≤0,003

Typical all weld metal mechanical properties

Tensile strength, MPa	540
Elongation, %	24
Hardness, HB	160

Special properties

The weld metal is soft machinable, also the fusion zone. Hardening of fusion zone is small. Electrode produces low penetration of base metal.

Technological features of welding process

Welding is performed with short beads of 30-50 mm long. After each bead is welded it should be caulked with light blows of hammer. Welding up of large defects or depositing of large volumes of metal should be done by alternating layers deposited by OZCH-3 and OZJN-1. Dry electrodes before welding at 250-280°C for one hour.

Dia, mm	Length, mm	Current range, A
2,5	280	50-80
3,0	310	70-110
4,0	330	100-130
5,0	400	120-160

Approvals

GOST R

ОЗЧ-4 (OZCH-4)

AWS ENi-CI, ISO ENiBG2, DIN ENiBGII

Electrodes are intended for welding of various kinds of grey and high strength iron products. Such as cylinder covers, motor beds casings and gears. OZCH-4 is recommended for depositing of the last layer of parts exposed to abrasive action or impact loads, for repairing of alloy and malleable cast iron. Welding at DC(+) current without preheating in flat and vertical up position can be used.

Type of electrode - basic.
Deposition rate factor - 11,5 g/A·h.
Efficiency of deposition (for dia 4,0 mm) - 1,3 kg/h.
Consumption of electrodes per kg deposited metal - 1,7 kg.

Typical all weld metal chemical analysis, %

Ni	bal.	C	0,30
Mn	0,5	Si	0,5
Cu	1,5	Fe	1,5
S	0,005	P	0,003

Typical all weld metal mechanical properties

Tensile strength, MPa	520
Elongation, %	17
Hardness, HB	170

Special properties

OZCH-4 is electrode depositing nickel weld metal. Hardening of fusion zone is small and machining of the welds is comparatively easy.

Technological features of welding process

Depositing is performed with short beads of 30-50 mm long. After each bead is deposited it should be caulked with light blows of hammer, interpass temperature is 60°C. Base material should be chip off completely at the repairing part. Dry electrodes at 250-280°C for one hour before welding.

Dia, mm	Length, mm	Current range, A
2,5	280	50-80
3,0	310	70-110
4,0	330	100-130
5,0	400	120-160

Electrodes for cutting and joint preparing

ОЗР-1 (ОЗР-1)

Electrodes are used for gouging in and joint preparation of all types of steel, cast iron and non-ferrous metal. It is general-purpose electrode especially used before repair and maintenance welding applications. Cutting in all positions at DC(+) and AC current is used.

Type of electrode special.
Speed of cutting (for dia 4,0 mm):
- low alloyed steel of thickness 14 mm: 12 m/hour;
- high alloyed steel for example gr. 08Х18Н9Т (18%Cr-9%Ni-Ti) of thickness 12 mm: 12m/hour.
Consumption of electrodes per kg deposited metal - 0,6 kg.

Special properties

The surface of cutting is clean and seldom requires further dressing.

Technological features of welding process

The incline of electrode during cutting should be disposed in the direction of cutting (cutting with "angle-forward" method). The tip of electrode should have difficult movie - "forward-back" or "up-down". Dry electrodes before use at 160-190°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	110-170
4,0	350	180-260
5,0	350	250-350

Approvals

GOST R

ОЗР-2 (ОЗР-2)

Electrodes are intended for gouging in and joint preparation of all types of steel, cast iron and non-ferrous metal. It is general-purpose electrode especially used before repair and maintenance welding applications. Cutting in all positions at DC(+) and AC current is used.

Type of electrode - special.
Speed of cutting (for dia 4,0 mm):
- low alloyed steel of thickness 14 mm : 12 m/hour;
- high alloyed steel for example gr. 08Х18Н9Т (18%Cr-9%Ni-Ti) of thickness 12 mm: 12m/hour.
Consumption of electrodes per kg deposited metal - 0,6 kg.

Special properties

The surface of cutting is clean and seldom requires further dressing. Electrodes are of higher efficiency for cutting of structure's bars of high dia. Time of cutting of bar dia 16 mm is about 2-3 sec, dia 40 mm 14-16 sec.

Technological features of welding process

The incline of electrode during cutting should be disposed in the direction of cutting (cutting with "angle-forward" method). The tip of electrode should have difficult movie - "forward-back" or "up-down". Dry electrodes before use at 160-190°C for one hour.

Dia, mm	Length, mm	Current range, A
3,0	350	150-220
4,0	350	260-300
5,0	350	420-480

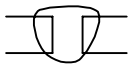
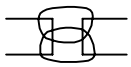
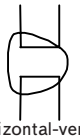
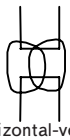
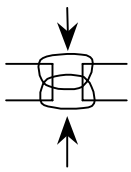
Approvals

GOST R, «Moscow Quality»

Supplement

Calculation of Electrode Consumption

Square butt joints: Weld metal weights, kg/m

Position	Plate thickness, mm	Gap, mm	Weight/length weld metal, kg/m
 Flat	1 1,5 2 3	0 0,5 1 1,5	0,02 0,02 0,03 0,05
 Flat	4 5 6 7	2 2 2,5 3	0,13 0,16 0,21 0,28
 Horizontal-vertical	1 1,5 2 3	0 0,5 1 1,5	0,02 0,03 0,04 0,07
 Horizontal-vertical	4 5 6 7	2 2,5 3 3	0,17 0,20 0,25 0,33
 Overhead	4 5 6 7 4 5 6 7	2 2 2,5 3 2 2 2,5 3	0,07 0,08 0,10 0,13 0,08 0,13 0,14 0,16

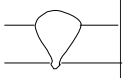
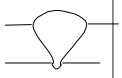
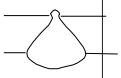
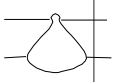
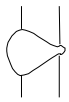
The first run and backing run V-joints:

Weld metal weights, kg/m

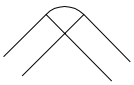
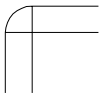
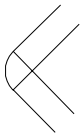
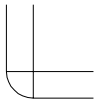
Position	Thickness, mm	Weight/length weld metal, kg/m	Electrode diameter, mm
Flat	6 - 12	0,10	3,0
Flat	> 12	0,15	4,0
Vertical	> 8	0,15	3,0
Horizontal-vertical	> 8	0,15	3,0
Overhead	> 10	0,10	3,0

Single V-joints:

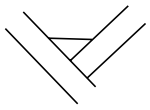
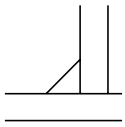
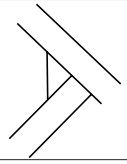
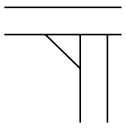
Weld metal weight, kg/m

Plate thickness, mm	Gap, mm	50°  Flat	60°  Flat	70°  Vertical	80°  Overhead	60°  Horizontal-vertical
4 5 6 7	1 1 1 1,5	0,09 0,13 0,17 0,26	0,10 0,15 0,20 0,30	0,132 0,19 0,29 0,38	0,14 0,22 0,30 0,44	0,11 0,16 0,24 0,33
8 9 10 11	1,5 1,5 2 2	0,31 0,38 0,49 0,56	0,37 0,44 0,57 0,66	0,47 0,59 0,76 0,89	0,55 0,69 0,86 1,02	0,44 0,51 0,64 0,76
12 14 15 16	2 2 2 2	0,65 0,86 0,97 1,04	0,77 1,02 1,15 1,23	1,05 1,34 1,55 1,75	1,23 1,60 1,81 2,02	0,89 1,17 1,34 1,46
18 20 25	2 2 2	1,33 1,63 2,46	1,60 1,94 2,94	2,17 2,62 4,00	2,51 3,11 4,76	1,83 2,21 3,34

Corner welds:
Weld metal weights, kg/m

Plate thickness, mm	Section size, mm²				
2	2	0,03	0,02	0,03	0,03
3	4,5	0,05	0,05	0,05	0,06
4	8	0,07	0,07	0,07	0,08
5	12,5	0,10	0,11	0,11	0,13
6	18	0,15	0,15	0,16	0,17
7	24,5	0,20	0,21	0,22	0,25
8	32	0,26	0,27	0,28	0,32
9	40,5	0,33	0,34	0,36	0,40
10	50	0,40	0,42	0,44	0,50
11	60,5	0,49	0,53	0,57	0,62
12	72	0,58	0,62	0,66	0,73
15	113	0,91	0,97	1,04	1,11
18	162	1,31	1,37	1,49	1,60
20	200	1,62	1,62	1,78	1,98
22	242	1,95	2,00	2,16	2,39
25	323	2,58	2,60	2,90	3,18

Fillet weld:
Weld metal weights, kg/m

Throat thickness, mm	Section size, mm²				
2	4	0,04	0,05	0,04	0,04
2,5	6,5	0,06	0,07	0,06	0,07
3	9	0,08	0,10	0,09	0,09
3,5	12,5	0,11	0,13	0,12	0,13
4	16	0,14	0,16	0,15	0,17
4,5	20,5	0,18	0,20	0,19	0,21
5	25	0,22	0,25	0,24	0,26
5,5	30,5	0,26	0,29	0,28	0,32
6	36	0,31	0,33	0,34	0,37
6,5	42,5	0,37	0,39	0,40	0,44
7	49	0,43	0,45	0,44	0,51
7,5	56,5	0,47	0,51	0,50	0,58
8	64	0,55	0,58	0,60	0,65
9	81	0,69	0,74	0,75	0,86
10	100	0,85	0,89	0,91	1,02
11	121	1,03	1,08	1,12	1,23
12	144	1,22	1,27	1,33	1,48
13	169	1,41	1,49	1,53	1,73
14	196	1,62	1,76	1,78	2,02
15	225	1,86	1,95	2,07	2,31

Determination of the Preheating Temperature

$T(°C)=350\cdot([C_{eq}] - 0,25)^{1/2}$, where

$[C_{eq}]=[C_c]\cdot(1+0,005\cdot e)$, $[C_c]=C+Mn/6+(Cr+Mo+V)/5+(Ni+Cu)/15$, e - thickness, mm

Preheating temperature required for steel of gr. 16Г2АФ of 25 thickness.

C	Si	Mn	Cr	Ni	Cu	V
0,17	0,4	1,5	0,2	0,1	0,2	0,12

$[C_c]=0,17+1,5/6+(0,2+0,12)/5+(0,1+0,2)/15=0,17+0,25+0,064+0,02=0,504$

$[C_{eq}]=0,504\cdot(1+0,005\cdot25)=0,567$

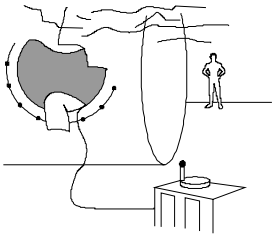
$T(°C)=350\cdot(0,567 - 0,25)^{1/2}\approx 200.$

Safety in welding

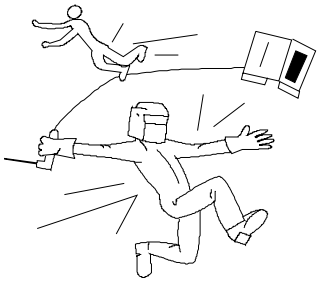
Repair or replace defective cables immediately

Never watch the arc except through filters of the correct shade

In cinfined spaces, adequate ventilation and constant observation are essential

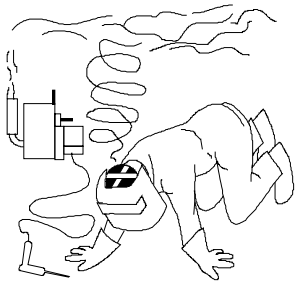


Leads and cables should be kept clear of passageways

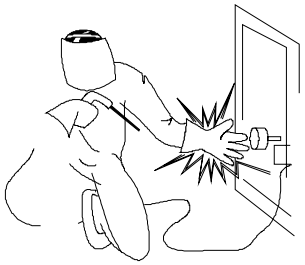


Keep fire exinguishing equipment at a handy location near the job

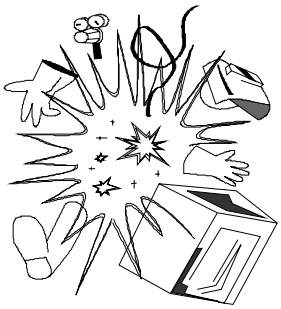
Conduct engine exhaust to outside atmosphere



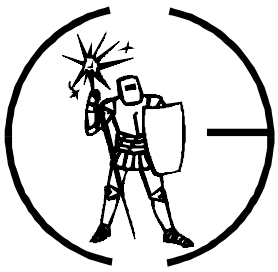
Keep primary terminals and live parts effectively covered



Never strike an electrode on any gas cylinder



Never use oxygen for venting containers



«SpetsElectrode»
Russia 111394, Moskow, Perowskaya street , 71
Tel: 7 (495) 739-50-84, 739-50-85, 739-50-86, 739-50-89
E-mail: postmaster@spetselectrode.ru WWW: http://www.spetselectrode.ru