

OSNALINE® Specification for tubes and tube bundles containing metal tubes

78M RB Rev 2

1.0 Content

The specification describes the minimum requirements for sheathed tubes and tube bundles containing metal tubes.

2.0 Design

Sheathed tubes consist of one tube, tube bundles of two or more tubes, continuously numbered (55mm distance) throughout their length, stranded and covered with an extruded seamless outer jacket of plastic.

Tube bundle can also contain a halogen free, flame retardant filler jacket..



3.0 Standards

Tube Materials:

Cu-DHP
CuNi10FE1Mn
Stainless Steel (AISI 304, 316L, 316Ti)

Tube materials see table 1
Dimensions and working pressure see table 2

Jacket materials:
Tube bundles are covered with an extruded seamless outer jacket of black **PVC OSNA 2000 (lead-free)**

Other materials on special inquiry:

PE-LD
black, halogen free
OSNA TPU acc. VDE 0282 Part 10
black, halogen free
OSNA PE-LD HM2 acc. VDE 0207
Part 24 black

Coloured jackets on special request

Filler jacket halogen free, flame retardant

Standards, flammability and working temperature see table 3 and 4

4.0 Delivery form

Tube bundle ends are capped and sealed against dust and moisture.

Outer jacket printed with dimension, material, marking of length and production code.

- Dimension range of tubes 6-12,7mm
- Delivery length depends on diameter and wall thickness of the tube
Delivery length:
 - Cu up to 3000m
 - CuNi up to 650m
 - Stainless steel (longitudinal welded or seamless) with orbital welding up to 2000m
 - Stainless steel (seamless) up to 900m

Dimensions and delivery length see table 5 and 6, permissible bending radius see table 7.

5.0 Packing

- Single tubes (bare or sheathed) coiled on wooden pallet resp. box, alternatively on drums (boarded up), with heat treatment acc. IPPC ISPM 15
- Tube bundle on drums (boarded up), with heat treatment acc. IPPC ISPM 15

Dimensions of drums see table 8

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6.0 Special constructions

- Tube bundle with combination of different tube sizes and materials
- Tubes with single sheath in a bundle
- Tube bundles including electrical conductors or wires for metering, control and telephone purposes.
- Tube bundles with steel ropes

7.0 Approvals

- Inspection certificate acc. DIN EN 10204 3.1
- Additional Inspection by classification societies as per request

The Quality Management System implemented in all German companies is certified to ISO 9001

Additional certificates of OSNALINE Tube Bundles:

LRS Type Approval Certificate Extension 98/200 23 (E1)

Det Norske Veritas Schweisszulassung ESN-06-5970 Rev 1

Schweißzulassung RW TÜV gemäß AD-2000 Merkblatt HP2/1, EN 288-3

ABS Product Design Assessment Certificate 01-HG2 42690/1-PDA

CCS Certificate of works approval BJW-95010006

DNV Manufacturing survey arrangement R1747

Bureau Veritas SMS.W. II/3567/A.O

Russian Maritime Register of shipping - Recognition certificate for Manufacturer 07.00236.272

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Table 1: Tube Materials

Letter symbol	Material-number	Standard	Properties and delivery conditions	Dimensions and tolerances of the product
Cu-DHP	CW024A	EN 12449 ASTM B68, B75	Seamless coils Condition R220 Cleanness of the inner surface acc. to DIN 8905 Part 1	EN 12449 table 20
CuNi10Fe1Mn	CW352H	EN 12449 ASTM B466	Seamless coils Condition R290	EN 12449 table 20
X6CrNiMoTi17 12 2 X5CrNi18 10 X2CrNiMo17 13 2 X2CrNiMo18 14 3	1.4571 AISI 316Ti 1.4301 AISI 304 1.4404 AISI 316L 1.4435 AISI 316L min. 2,5% Mo	DIN EN 10217-7 (metric) ASTM A269 (imperial)	longitudinal and orbital welded and calibrated Tube hardness max. HRB 90 (180HV5)	DIN EN ISO 1127 Tolerance class D3, T4
X6CrNiMoTi17 12 2 X5CrNi1810 X2CrNiMo17 13 2 X2CrNiMo18 14 3	1.4571 AISI 316Ti 1.4301 AISI 304 1.4404 AISI 316L 1.4435 AISI 316L	DIN EN 10216-5 (metric) ASTM A269 (imperial)	Seamless straightened (CFA) Tube hardness max. HRB 90 (180HV5)	DIN EN ISO 1127 Tolerance class D3, T4

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Table 2: Dimensions and working pressure [bar]

Standard value for max. design pressure (bar) of metal tubes acc. to

American Bureau of Shipping (ABS) Rules Safety factor =1,8 against Rp 0,2% yield strength

Tube material													
	Cu-DHP		CuNi10FE1Mn		Stainless steel								
					1.4571			1.4301			1.4404 / 1.4435		
	Working temperature [°C]				Working temperature [°C]								
Dimensions	50	100	50	100	20	50	100	20	50	100	20	50	100
6x0,5mm	-	-	-	-	189	182	167	-	-	-	-	-	-
6x1,0mm	145	141	-	-	412	396	363	-	-	-	-	-	-
8x0,5mm	-	-	-	-	139	134	123	129	117	104	-	-	-
8x1,0mm	104	101	172	170	296	285	261	275	249	221	268	256	234
10x0,8mm	64	62	-	-	181	174	159	168	153	135	164	157	143
10x1,0mm	81	79	135	133	231	222	203	214	195	173	209	200	182
10x1,2mm	-	-	165	162	283	272	249	-	-	-	-	-	-
10x1,5mm	-	-	212	209	364	350	321	338	307	272	329	316	288
12x1,0mm	66	65	110	109	189	182	167	176	159	141	171	164	150
12x1,5mm	104	101	172	170	296	285	261	275	249	221	268	256	234

Tube material													
	Cu-DHP		CuNi10FE1Mn		Stainless steel								
					1.4571			1.4301			1.4404 / 1.4435		
	Working temperature [°C]				Working temperature [°C]								
Dimensions	50	100	50	100	20	50	100	20	50	100	20	50	100
1/4" x 0,035"	118	115	-	-	336	324	296	-	-	-	304	292	266
1/4" x 0,040"	-	-	-	-	-	-	-	-	-	-	355	340	310
1/4" x 0,049"	121	118	-	-	-	-	-	-	-	-	450	431	393
3/8" x 0,035"	-	-	-	-	214	206	189	-	-	-	194	182	169
3/8" x 0,040"	87	84	144	141	-	-	-	-	-	-	-	-	-
3/8" x 0,049"	-	-	181	178	311	298	274	-	-	-	280	269	245
3/8" x 0,062"	-	-	-	-	-	-	-	-	-	-	368	352	321
1/2" x 0,035"	55	54	-	-	157	151	138	-	-	-	142	136	124
1/2" x 0,040"	63	62	105	103	-	-	-	-	-	-	-	-	-
1/2" x 0,062"	-	-	-	-	292	281	257	-	-	-	265	254	232

Other dimensions on request

The pressure test (bar) is carried out with air under water considering the maximum design pressure multiplied by factor 1.5, however max. 300 bar. Higher test pressures by a hydrostatic test (water) on request.

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Table 3: Jacket material

KME Type	Letter symbol	Material-description	Standard	Standard	Flammability	Flammability tested by
OSNA 2000 Typ1	YM3	PVC Polyvinylchloride	DIN VDE 0207 Part 5	DIN VDE 0207 Part 5	IEC 332-3-22 Category A/F	ABS HN 987717
PE-LD	2YM1 and 2YM2	PE - LD low density polyethylene	DIN VDE 0207 Teil 3 ASTM D 1248: Type II, Class C, Category 5	DIN VDE 0207 Teil 3 ASTM D 1248: Type II, Class C, Category 5		
OSNA PE HM2*	HM2*	TPE-O* Thermoplastic Elastomer	DIN VDE 0207, Part 24, M2	DIN VDE 0207, Part 24, HM2	IEC 332-3-22 Category A/F	ABS HN 789265
OSNA TPU*	TPU*	TPU* Thermoplastic Polyurethane	DIN VDE 0282 Part10	DIN VDE 0282 Part10	IEC 332-3-22 Category A/F	ABS 03-ES 331499

* Tube bundle only with additional filler jacket
Other jacket material on request

Table 4: Working temperatures of jacket materials

KME Type	During assembly [°C]		Before a. after assembly [°C]	
	Min.	Max.	Min.	Max.
OSNA 2000 Type 1	-5	+50	-40	+80
PE-LD	-20	+50	-60	+70
OSNA PE HM2	-15	+50	-25	+80
OSNA TPU	-40	+50	-60	+120

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Table 5: Delivery program (metric)

Number and outer diameter of tubes	Sheath thickness ca.	Outer diameter with filler ∠ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm	Outer diameter without filler ∠ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm	Maximum delivery length* Stainless steel with orbital weldings	Maximum delivery length* Cu	Ca. Weight* [Kg/100m]
1 x 6,0 mm	1,0 mm	8 mm ± 0,3 mm	-	2000 m	3000 m	16
2 x "	1,4 mm	15,0 mm	17,0 mm	1800 m	1800 m	43
3 x "	1,4 mm	16,0 mm	18,0 mm	1800 m	1800 m	56
4 x "	1,6 mm	18,0 mm	20,0 mm	1800 m	1800 m	72
5 x "	1,6 mm	20,0 mm	22,0 mm	1800 m	1800 m	87
6 x "	1,8 mm	22,0 mm	24,0 mm	1800 m	1800 m	105
7 x "	1,8 mm	22,0 mm	24,0 mm	1800 m	1800 m	115
8 x "	1,8 mm	24,0 mm	26,0 mm	1800 m	1800 m	132
10 x "	1,8 mm	29,0 mm	31,0 mm	1800 m	1800 m	178
12 x "	1,8 mm	30,0 mm	32,0 mm	1800 m	1800 m	197
14 x "	1,8 mm	31,0 mm	33,0 mm	1800 m	1800 m	223
16 x "	2,2 mm	34,0 mm	36,0 mm	1500 m	1500 m	257
19 x "	2,2 mm	35,0 mm	37,0 mm	1400 m	1400 m	296

Number and outer diameter of tubes	Sheath thickness ca.	Outer diameter with filler ∠ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm	Outer diameter without filler ∠ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm	Maximum delivery length* Stainless steel with orbital weldings	Maximum delivery length* Cu	CuNi10Fe1Mn	Ca. Weight* [Kg/100m]
1 x 8,0 mm	1,0 mm	10 mm ± 0,3 mm	-	2000 m	1100 m	650 m	22
2 x "	1,8 mm	20,0 mm	22,0 mm	1400 m	1100 m	650 m	64
3 x "	1,8 mm	21,5 mm	23,5 mm	1400 m	1100 m	650 m	84
4 x "	1,8 mm	23,5 mm	25,5 mm	1400 m	1100 m	650 m	104
5 x "	1,8 mm	26,0 mm	28,0 mm	1400 m	1100 m	650 m	126
6 x "	2,0 mm	28,5 mm	30,5 mm	1400 m	1100 m	650 m	152
7 x "	2,0 mm	28,5 mm	30,5 mm	1400 m	1100 m	650 m	164
8 x "	2,0 mm	31,0 mm	33,0 mm	1400 m	1100 m	650 m	190
10 x "	2,2 mm	38,0 mm	40,0 mm	1300 m	1100 m	650 m	263
12 x "	2,2 mm	38,5 mm	41,0 mm	1100 m	1100 m	650 m	287
14 x "	2,4 mm	41,5 mm	44,0 mm	950 m	950 m	650 m	327
16 x "	2,4 mm	43,5 mm	46,0 mm	800 m	800 m	650 m	367
19 x "	2,6 mm	46,5 mm	49,0 mm	800 m	800 m	650 m	425

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Table 5: Delivery Program (metric)

Number and outer diameter of tubes	Sheath thickness ca.	Outer diameter with filler ∠ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm	Outer diameter without filler ∠ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm	Maximum delivery length* Stainless steel with orbital weldings	Maximum delivery length*		Ca. Weight* [Kg/100m]
					Cu	CuNi10Fe1Mn	
1 x 10,0 mm	1,2 mm	12,5 mm ± 0,3 mm	-	2000 m	850 m	500 m	30
2 x "	1,8 mm	24,5 mm	26,5 mm	1400 m	850 m	500 m	86
3 x "	1,8 mm	26,0 mm	28,0 mm	1400 m	850 m	500 m	113
4 x "	2,0 mm	29,0 mm	31,0 mm	1400 m	850 m	500 m	140
5 x "	2,0 mm	32,0 mm	34,0 mm	1400 m	850 m	500 m	169
6 x "	2,2 mm	35,5 mm	37,5 mm	1300 m	850 m	500 m	204
7 x "	2,2 mm	35,5 mm	37,5 mm	1300 m	850 m	500 m	218
8 x "	2,2 mm	38,5 mm	40,5 mm	1000 m	850 m	500 m	254
10 x "	2,6 mm	47,0 mm	50,0 mm	650 m	650 m	500 m	360
12 x "	2,6 mm	48,0 mm	51,0 mm	650 m	650 m	500 m	393
14 x "	2,6 mm	50,5 mm	53,0 mm	600 m	600 m	500 m	438
16 x "	2,6 mm	54,0 mm	56,5 mm	450 m	450 m	450 m	496
19 x "	3,0 mm	57,5 mm	60 mm	450 m	450 m	450 m	572

Number and outer diameter of tubes	Sheath thickness ca.	Outer diameter with filler ∠ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm	Outer diameter without filler ∠ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm	Maximum delivery length* Stainless steel with orbital weldings	Maximum delivery length*		Ca. Weight* [Kg/100m]
					Cu	CuNi10Fe1Mn	
1 x 12,0 mm	1,2 mm	14,5 mm ± 0,3 mm	-	1500 m	650 m	400 m	36
2 x "	2,0 mm	29,0 mm	31,0 mm	900 m	700 m	400 m	110
3 x "	2,0 mm	30,5 mm	32,5 mm	900 m	700 m	400 m	144
4 x "	2,2 mm	34,0 mm	36,0 mm	900 m	700 m	400 m	179
5 x "	2,2 mm	37,5 mm	39,5 mm	900 m	700 m	400 m	215
6 x "	2,4 mm	41,5 mm	44,0 mm	850 m	700 m	400 m	258
7 x "	2,4 mm	41,5 mm	44,0 mm	850 m	700 m	400 m	274
8 x "	2,6 mm	46,0 mm	48,5 mm	800 m	700 m	400 m	325
10 x "	2,8 mm	55,5 mm	58,0 mm	450 m	450 m	400 m	457

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Table 6: Delivery program (imperial)

Number and outer diameter of tubes	Sheath thickness ca.	Outer diameter with filler ∅30 mm ± 1,0 mm ∨ ∅30 mm ± 1,5 mm ∧	Outer diameter without filler ∨ ∅30 mm ± 1,0 mm ∧ ∅30 mm ± 1,5 mm	Maximum delivery length * Stainless steel with orbital weldings	Maximum delivery length* Cu	Ca. Weight* [Kg/100m]
1 x 1/4"	1,0 mm	8,35 mm ± 0,3 mm	-	2000 m	2500 m	16
2 x "	1,4 mm	15,5 mm	17,5 mm	1800 m	1800 m	43
3 x "	1,4 mm	16,5 mm	18,5 mm	1800 m	1800 m	57
4 x "	1,6 mm	18,5 mm	20,5 mm	1800 m	1800 m	72
5 x "	1,6 mm	20,5 mm	22,5 mm	1800 m	1800 m	87
6 x "	1,8 mm	23,0 mm	25,0 mm	1800 m	1800 m	106
7 x "	1,8 mm	23,0 mm	25,0 mm	1800 m	1800 m	115
8 x "	1,8 mm	25,5 mm	27,5 mm	1800 m	1800 m	135
10 x "	1,8 mm	29,5 mm	31,5 mm	1800 m	1800 m	180
12 x "	1,8 mm	30,5 mm	32,5 mm	1800 m	1800 m	198
14 x "	1,8 mm	32,0 mm	34,0 mm	1600 m	1600 m	223
16 x "	2,2 mm	35,0 mm	37,0 mm	1300 m	1300 m	257
19 x "	2,2 mm	36,5 mm	39,0 mm	1200 m	1200 m	296

Number and outer diameter of tubes	Sheath thickness ca.	Outer diameter with filler ∨ ∅30 mm ± 1,0 mm ∧ ∅30 mm ± 1,5 mm	Outer diameter without filler ∨ ∅30 mm ± 1,0 mm ∧ ∅30 mm ± 1,5 mm	Maximum delivery length * Stainless steel with orbital weldings	Maximum delivery length* Cu		Ca. Weight* [Kg/100m]
						CuNi10Fe1Mn	
1 x 3/8"	1,2 mm	11,9 mm ± 0,3 mm	-	2000 m	1000 m	550 m	26
2 x "	1,8 mm	23,0 mm	25,0 mm	1400 m	1000 m	550 m	78
3 x "	1,8 mm	24,5 mm	26,5 mm	1400 m	1000 m	550 m	100
4 x "	2,0 mm	27,5 mm	29,5 mm	1400 m	1000 m	550 m	125
5 x "	2,0 mm	30,0 mm	32,0 mm	1400 m	1000 m	550 m	150
6 x "	2,2 mm	33,5 mm	35,5 mm	1300 m	1000 m	550 m	181
7 x "	2,2 mm	33,5 mm	35,5 mm	1300 m	1000 m	550 m	193
8 x "	2,2 mm	37,0 mm	39,0 mm	1200 m	1000 m	550 m	227
10 x "	2,6 mm	45,0 mm	47,5 mm	800 m	800 m	550 m	320
12 x "	2,6 mm	46,0 mm	48,5 mm	800 m	800 m	550 m	348
14 x "	2,6 mm	48,5 mm	51,0 mm	650 m	650 m	550 m	388
16 x "	2,6 mm	51,0 mm	53,5 mm	600 m	600 m	550 m	431
19 x "	3,0 mm	55,0 mm	57,5 mm	450 m	450 m	450 m	503

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Table 6: Delivery Program (imperial)

Number and outer diameter of tubes	Sheath thickness ca.	Outer diameter		Maximum delivery length * Stainless steel with orbital weldings	Maximum delivery length*		approx. Weight* [Kg/100m]
		with filler ∨ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm	without filler ∨ Ø30 mm ± 1,0 mm ∧ Ø30 mm ± 1,5 mm		Cu	CuNi10Fe1Mn	
1 x 1/2"	1,2 mm	15,1 mm ± 0,3 mm		1500 m	650 m	400 m	35
2 x "	2,0 mm	30,5 mm	32,5 mm	900 m	650 m	400 m	115
3 x "	2,0 mm	32,5 mm	34,5 mm	900 m	650 m	400 m	148
4 x "	2,2 mm	36,0 mm	38,0 mm	900 m	650 m	400 m	183
5 x "	2,2 mm	40,0 mm	42,0 mm	900 m	650 m	400 m	218
6 x "	2,4 mm	44,0 mm	46,0 mm	800 m	650 m	400 m	261
7 x "	2,4 mm	44,0 mm	46,0 mm	800 m	650 m	400 m	276
8 x "	2,6 mm	49,0 mm	51,5 mm	650 m	650 m	400 m	327
10 x "	2,8 mm	58,5 mm	61,0 mm	450 m	450 m	400 m	470

* Values given are nominal values within the limits of normal manufacturing tolerances.
Approx. weight @ 1mm wall thickness of tubes

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Table 7: Permissible bending radius

Type	Standard value of permissible bending radius
Tube bundle Cu-DHP	8 x da
Tube bundle 1.4571, 1.4404, 1.4301, 1.4435 und CuNi10FE1Mn	10 x da
Tubes	6 x da

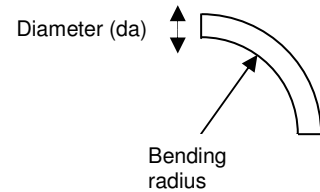


Table 8: Dimensions of drums

Type	Height (Ø mm)	Width [mm]	Hub Ø (mm)	Weight Partley boarded up [Kg]	Weight Boarded up [Kg]
KME-099/4	900	630	400	42	52
KME-109/5	1000	680	500	76	89
KME-129/6	1250	850	640	109	128
KME-149/7	1400	850	700	137	159
KME-149/10	1400	850	1000	149	171
KME-169/8	1600	1060	800	185	216
KME-169/10	1600	1060	1000	207	234
KME-189/10	1800	1060	1000	247	281
KME-189/14	1800	1060	1400	301	335
KME-209/12	2000	1300	1200	416	462
KME-229/14	2200	1400	1400	565	620

