

Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested with satisfactory results in accordance with the relevant requirements of the Lloyd's Register Type Approval System.

| | |
|---------------------------|---|
| Manufacturer | KME Germany GmbH & Co. KG |
| Address | Klosterstr. 29, Osnabrück, 49074, Germany |
| Type | Tube And Tube Bundles |
| Description | Tubes with plastic sheath and tube bundles. Tube material from either copper, copper-nickel or stainless steel, jacket material from either KME type OSNA 2000 Type 1, PE-LD, OSNA PE HM2 or OSNA TPU. Insulated tubes and traced tube bundles with electric heaters or steam tracing. OSNALINE® Protection tube with crude oil resistant and antistatic outer jacket for cargo tanks |
| Trade Name | OSNALINE® Tubes and Tube Bundles, Multitubing, Multicore, OSNALINE® Protection |
| Application | Hydraulic and pneumatic control lines on ships, offshore installations and in chemical and petrochemical industries classed or intended for Classification with Lloyd's Register |
| Specified Standard | ASTM B 68, B 75, DIN EN 13600, 12449, 12451, 1127, 10216-5, 10217-7, DIN 8905, VDE 0207 T 3, 5 and 24, IEC 332-1 Part 1, IEC 332 - 1 Part 3 Category A/F, AD 2000 Merkblatt W2 |
| Ratings | see Appendix |

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| Additional Tests | Pressure test to 1.5 times the design pressure stated by customer. All tubes to be checked after coiled around drums by ball test in order to ensure the roundness of the tubes |
| Other Conditions | Tube ends to be protected by shrink caps |

This certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register EMEA of any modification or changes to the equipment in order to obtain a valid Certificate.

The Design Appraisal Document No. HMD 10868-03, Issue No. 3 and its supplementary Type Approval Terms and Conditions form part of this Certificate.

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Appendix

RATINGS

M.A.W.P. (bar) of metallic tubes

| | | Tube material | | | | | | | | | | | | |
|------------------|------------------|--------------------------|-----|-------------|-----|------------------|-----|--------------------------|--|-----|-----|-----------------------|-----|-----|
| | | Cu-DHP | | CuNi10FE1Mn | | Stainless steel | | | | | | | | |
| | | | | | | 1.4571/AISI316Ti | | | 1.4404/AISI316L / 1.4435/AISI316L (min. 2,5% Mo) | | | 1.4547/ UNS S31254 | | |
| | | Working temperature [°C] | | | | | | Working temperature [°C] | | | | | | |
| Tube size [mm] | Tubes per bundle | 50 | 100 | 50 | 100 | 20 | 50 | 100 | 20 | 50 | 100 | 20 | 50 | 100 |
| 6x0,5mm | 1 to 19 | * | * | * | * | 189 | 182 | 167 | 171 | 164 | 150 | * | * | * |
| 6x1,0mm | 1 to 19 | 145 | 141 | * | * | 412 | 396 | 363 | 373 | 357 | 325 | 425 | 410 | 375 |
| 6x1,5mm | 1 to 19 | * | * | * | * | * | * | * | * | * | * | 690 | 670 | 615 |
| 8x0,5mm | 1 to 19 | * | * | * | * | 139 | 134 | 123 | * | * | * | * | * | * |
| 8x1,0mm | 1 to 19 | 104 | 101 | 172 | 170 | 296 | 285 | 261 | 268 | 256 | 234 | 305 | 290 | 270 |
| 10x1,0mm | 1 to 19 | 81 | 79 | 135 | 133 | 231 | 222 | 203 | 209 | 200 | 182 | 240 | 230 | 210 |
| 10x1,2mm | 1 to 19 | * | * | 165 | 162 | 283 | 272 | 249 | 256 | 245 | 223 | * | * | * |
| 10x1,5mm | 1 to 19 | * | * | 212 | 209 | 364 | 350 | 321 | 329 | 316 | 288 | 380 | 365 | 335 |
| 12x1,0mm | 1 to 10 | 66 | 65 | 110 | 109 | 189 | 182 | 167 | 171 | 164 | 150 | 195 | 190 | 175 |
| 12x1,5mm | 1 to 10 | 104 | 101 | 172 | 170 | 296 | 285 | 261 | 268 | 256 | 234 | 305 | 295 | 270 |
| 12x2,0mm | 1 | * | * | * | * | 412 | 396 | 363 | 373 | 357 | 325 | 425 | 410 | 375 |
| Tube size [inch] | | | | | | | | | | | | | | |
| 1/4"x0,035" | 1 to 19 | 118 | 115 | * | * | 336 | 324 | 296 | 304 | 292 | 266 | * | * | * |
| 1/4"x0,049" | 1 to 19 | 121 | 118 | * | * | 498 | 479 | 438 | 450 | 431 | 393 | 510 | 500 | 455 |
| 3/8"x0,035" | 1 to 19 | * | * | * | * | 214 | 206 | 189 | 194 | 182 | 169 | * | * | * |
| 3/8"x0,040" | 1 to 19 | 87 | 84 | 144 | 141 | - | - | - | - | - | - | - | - | - |
| 3/8"x0,049" | 1 to 19 | * | * | 181 | 178 | 311 | 298 | 274 | 280 | 269 | 245 | 320 | 310 | 285 |
| 3/8"x0,062" | 1 to 19 | * | * | * | * | * | * | * | 368 | 352 | 321 | 425 | 405 | 375 |
| 3/8"x0,065" | 1 to 19 | * | * | * | * | * | * | * | 390 | 374 | 341 | 445 | 430 | 395 |
| 1/2"x0,035" | 1 to 10 | 55 | 54 | * | * | 157 | 151 | 138 | 142 | 136 | 124 | * | * | * |
| 1/2"x0,040" | 1 to 10 | 63 | 62 | 105 | 103 | * | * | * | * | * | * | 190 | 180 | 165 |
| 1/2"x0,062" | 1 to 10 | * | * | * | * | 292 | 281 | 257 | 265 | 254 | 232 | 305 | 295 | 270 |
| 1/2"x0,065" | 1 to 10 | * | * | * | * | 309 | 297 | 272 | 280 | 268 | 244 | 320 | 310 | 285 |
| 3/4"x0,049" | 1 | * | * | * | * | 145 | 140 | 128 | 131 | 126 | 115 | * | * | * |

RATINGS, CONT

Temperature limits for plastic jackets

| KME Type | during assembly [°C] | | before and 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 |
| OSNA Protection | -20 | +50 | -20 | +100 |

Minimum bending radius

| | |
|---------------------------------|----------|
| Tube bundles copper | 8 x dia |
| Tube bundles st. steel and CuNi | 10 x dia |
| Single tupes | 6 x dia |