# Large diameter pipes

CATALOG

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# PRODUCTION OF LARGE DIAMETER PIPES

1

Electric-welded large diameter pipes (LDP) are primarily designed for the construction of main pipelines in any climatic zones, including the Far North and sea areas.

TMK produces pipes with advanced performance characteristics for main gas, oil and petroleum product pipelines, underwater pipelines, pipelines of high corrosion resistance, for building structures, as well as for the construction of pipelines for various purposes, including water pipelines, heat network pipelines, low-pressure gas pipelines, urban and settlement gas supply systems with high-pressure natural and liquefied gas, complying with Russian and world standards GOST, TU, ISO, EN, API*, and others.

Large-diameter pipes are produced in Chelyabinsk and Volzhsky. These two plants also apply various types of coating.

TMK's electric-weld pipe shops use submerged arc longitudinal welding to produce single and double-seam pipes with diameters from 508 to 1,422 mm and wall thicknesses from 7 to 48 mm.

On the basis of the electric-weld pipe shop in Chelyabinsk, the innovative industrial production of LDP with a longitudinal weld made with the use of Laser-Arc Hybrid Welding (LAHW) was implemented for the first time in the global practice of LDP manufacturing.

TMK has a section producing double-seam longitudinal welded pipes with diameters from 1,520 to 2,520 mm and a wall thickness from 15 to 34 mm.

Most pipelines in Russia are built with pipes manufactured by TMK plants. Combining the ease of supply to Central Russia, Siberia, the Far East, Kazakhstan, and China with the proximity to major plate rolling mills, the Chelyabinsk site is optimally positioned to capture multiple synergies.

Similarly, TMK's plant in Volzhsky is located close to railway, motor road, sea and river routes, which makes it possible to deliver products to consumers on time.



# PRODUCTION OF LONGITUDINAL WELDED LDP

2

TMK produces both single-seam longitudinal welded pipes in Chelyabinsk and Volzhsky, as well as 1,020 – 1,220 mm double-seam longitudinal welded pipes made from two half-cylinders in Chelyabinsk.

TMK has a section producing double-seam pipes ranging from 1,520 to 2,520 mm in diameter for general purposes, construction, and other applications.

In its production lines, the company uses all three pipe forming processes used globally to manufacture large-diameter longitudinal welded pipes: three-roll bending (TRB), press forming (UO), and step-by-step forming (JCO).

The production lines can produce pipes with lengths of up to 18 m and in grades up to K80 (Russian classification), X100 (ISO classification) and L690 (API* classification).

TMK uses the most advanced technologies and highly automated processes. Again, the technology solutions are continuously improved, along with product quality. The laser-arc hybrid welding technology implemented and used at TMK to weld longitudinal pipe seams is unique in the industry.

## QUALITY POLICY

As high standards for product quality are essential for winning customer loyalty, TMK is committed to following global best practices in all aspects of its operations.

A Quality Management System certified to ISO 9001:2008 is in place at all TMK plants.

The Company takes a responsible approach to environmental protection and social commitments, and is actively engaged in addressing environmental problems in the region.

The plants have an Environmental Management System in place.

All large diameter pipes are subject to mandatory non-destructive testing, including ultrasonic, X-ray and magnetic particle inspections, as well as mechanical testing, chemical analysis, and hydrostatic testing.

# STANDARDS FOR LONGITUDINAL WELDED LDP

| Standards | Pipe dimensions | | Steel and pipe grade |
|---|---|---|---|
| | Outside diameter, mm | Wall thickness, mm | |
| 1 | 2 | 3 | 4 |
| API*Specification 5L,<br>Line Pipe, 46th Edition | 508–1,422 | 7.1–48.0 | A; B; X42; X46; X52; X56; X60; X65; X70; X80; L245; L290; L320; L360; L390; L415; L450; L485; L555 |
| DNV-OS- F101<br>Submarine pipeline systems | 508–1,422 | 8.0–45.0 | 245–555 (F; D; I) |
| DIN EN 10217-1:2005<br>Welded steel tubes for pressure purposes. Part 1: Non-alloy steel tubes with specified room temperature properties | 508–1,422 | 8.0–40.0 | P195TR1; P235TR1; P265TR1; P195TR2; P235TR2; P265TR2 |
| DIN EN 10217-3:2019<br>Welded steel tubes for pressure purposes. Part 3: Electric welded and submerged arc welded alloy fine grain steel tubes with specified room, elevated and low temperature properties | 508–1,422 | 8.0–40.0 | P275–P460; (N; NH; NL1; NL2) |
| ISO 3183:2012<br>Steel pipe for pipeline transportation systems | 508–1,422 | 7.92–40.0 | L290 or X42; L555 or X80 |
| ISO 3183:2019<br>Petroleum and natural gas industries – Steel pipe for pipeline transportation systems | 508–1,422 | 7.0–48.0 | A; B; X42; X46; X52; X56; X60; X65; X70; X80; L245; L290; L320; L360; L390; L415; L450; L485; L555 |
| ÖNORM EN 10219-1:2006 / ÖNORM EN 10219-2:2019<br>Cold formed welded structural hollow sections of non-alloy and fine grain steels | 508–1,422 | 7.0–48.0 | Non-alloy steels: S235JRH; S275J0H; S275J2H; S355J0H; S355J2H; S355K2H.<br>Fine-grain steels: S275MH–S460MLH; S275NH–S460NLH |
| Casing pipes with OTsK welded connectors | 508 | 15.9 | Pipes: X52; X56; X60; X65; X70<br>Connectors: X80<br>Locking ring: X100 |
| Casing pipes with a welded pin and an OTsB shoe | 508 | 15.9 | Pipes: X52; X56; X60; X65; X70<br>Connectors: X80<br>Casing shoe body: X52; X56; X60; X65; X70 |
| Casing crossover with a welded box connector and a pin or box | 508 | 15.9 | Pipes: X52; X56; X60; X65; X70<br>Connectors: X80<br>Locking ring: X100<br>Crossover pin or box: X80 |
| GOST ISO 3183-2015<br>Steel pipes for pipelines of petroleum and natural gas industries | 508–1,422 | 7.0–48.0 | A; B; X42; X46; X52; X56; X60; X65; X70; X80; L245; L290; L320; L360; L390; L415; L450; L485; L555 |
| GOST 10704-91 / GOST 10706-76<br>Longitudinal electric-welded steel pipes | 508–1,420<br>1,520–2,520 | 7.0–48.0 | St2kp (K33); St2ps; St2sp (K34); St3kp (K37); St3ps; St3sp (K38); Low-alloy steels (CE ≤ 0.48); K45 |
| GOST 20295-85<br>Steel welded pipes for main gas-and-oil pipelines | 508–1,420 | 7.0–48.0 | Carbon and low-alloy steels of grades 3Sp (K34); K38; st20 (K42); K48; K50; K52; K54; K55; K56; K60 |
| GOST 31447-2012<br>Steel welded pipes for main gas pipelines, oil pipelines, and oil products pipelines | 530–1,420 | 7.0–48.0 | Carbon and low-alloy steels of grades K34; K38; K42; K48; K50; K52; K54; K55; K56; K60 |
| GOST 33228-2015<br>General purpose steel welded pipes | 508–1,420<br>1,520–2,520 | 7.0–34.0 | KP175–KP460 |
| GOST R 58064-2018<br>Steel welded pipes for building structures | 508–1,420 | 8.0–48.0 | C245–C440 |
| TU 24.20.21-001-57357928-2022<br>Longitudinal electric-welded steel pipes of grade K60 for main gas pipelines with an operating pressure of 11.8 MPa and field gas pipelines with an operating pressure of 12.9 MPa | 530–1,420 | 9.9–37.9 | K60 |
| TU 24.20.21-006-57357928-2022<br>Longitudinal electric-welded steel pipes of grade K65 with a diameter of 1,420 mm for main gas pipelines with an operating pressure of 11.8 MPa | 1,420 | 23.0<br>27.7<br>33.4 | K65 |
| TU 24.20.21-012-57357928-2022<br>Longitudinal electric-welded steel pipes for encasements with diameters from 530 mm to 1,420 mm | 530–1,420 | 15.2–32.0 | K34; K38; K42; K48; K50; K52; K54; K55 |
| 1 | 2 | 3 | 4 |

| Standards | Pipe dimensions | | Steel and pipe grade |
|---|---|---|---|
| | Outside diameter, mm | Wall thickness, mm | |
| 1 | 2 | 3 | 4 |
| TU 24.20.21-016-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 508 mm to 1,420 mm for main gas pipelines with an operating pressure of up to 9.8 MPa inclusive | 508–1,420 | 7.0–32.0 | K52; K54; K55; K56; K60; X56; X60; X65; X70 |
| TU 24.20.21-018-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 1,220 mm for pipelines | 530–1,220 | 7.0–35.0 | K50; K52; K54; K55; K56; K60 |
| TU 24.20.21-020-57357928-2022<br>Improved low-temperature service longitudinal electric-welded steel pipes with diameters from 530 mm to 1,420 mm with enhanced weldability for use in steel structures of buildings | 530–1,420 | 7.0–45.0 | K52; K54; K56; K60; X56; X60; X65; X70 |
| TU 24.20.21-027-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 1,420 mm for main gas pipelines with an operating pressure of up to 9.8 MPa inclusive, crossing active tectonic fault zones | 530–1,420 | 8.0–40.0 | K52; K54; K55; K56; K60; X52; X56; X60; X65; X70 |
| TU 24.20.21-060-57357928-2022<br>Longitudinal electric-welded steel pipes for hydrogen sulfide service to be used in the construction and repair of pipelines in Central Asia | 530–1,220 | 8.0–30.0 | K48; K50; K52; X42; X46; X52 |
| TU 24.20.21-061-57357928-2022<br>Longitudinal electric-welded steel pipes for gas gathering systems | 530 | 16.0–26.0 | K60 |
| TU 24.20.21-067-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 508 mm to 1,422 mm for main and field pipelines | 508–1,422 | 8.0–38.0 | K52; K55; K56; K60; X56; X60; X65; X70 |
| TU 24.20.21-068-57357928-2022<br>Longitudinal electric-welded steel pipes for unique building structures | 508–1,420 | 7.0–45.0 | C345; C375; C390; C440; K52; K55; K56; K60; X56; X60; X65; X70 |
| TU 24.20.21-074-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 820 mm for main and field pipelines | 530–820 | 8.0–12.0 | K52; K55; K56; K60; X56; X60; X65; X70 |
| TU 24.20.21-076-57357928-2022<br>Longitudinal electric-welded steel pipes for field pipelines with an operating pressure of up to 24.0 MPa inclusive | 508 | 22.2<br>23.8<br>24.9 | X65; SAWL 450 IFD |
| TU 1381-079-00186654-2016<br>Longitudinal electric-welded steel pipes of carbon or low-alloy steel for steam and hot water pipelines | 530–1,420 | 8.0–25.0 | St3sp; 20; 09G2S; 17GS; 17G1S; 17G1S-U |
| TU 24.20.21-1573-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 1,420 mm and wall thicknesses of up to 32 mm for gas, oil, and petroleum product main pipelines | 530–1,420 | 8.0–32.0 | 12G2S; 09G2S; 17GS; 17G1S; 17G1S-U; 13GS; 13GS-U; 08GBYu; 12GSB; 09GSF; 13KhFA; 13G1S-U; 12G2SB; 09GBYu; 09G2FB; 10G2FBYu; 08G1NFB (pipe grades K50; K52; K54; K55; K56; K60) |
| TU 14-3-1698-2000<br>Longitudinal electric-welded steel pipes with a diameter of 1,020 mm to 1,220 mm for gas and oil pipelines | 1,020–1,220 | 10.0–22.0 | K52; K55; K56; K60 |
| TU 24.20.21-200-57357928-2022<br>Normal and low-temperature service longitudinal electric-welded steel pipes with high operational reliability for main pipelines | 530–1,220 | 8.0–35.0 | K50; K52; K54; K55; K56; K60 |
| TU 24.20.22-201-57357928-2022<br>Longitudinal electric-welded steel pipes of grade K65 with a diameter of 1,420 mm for main gas pipelines with an operating pressure of 11.8 MPa | 1,420 | 23.0; 27.7 | K65 |
| TU 24.20.21-202-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 1,420 mm for main and field pipelines with an operating pressure of up to 10.0 MPa inclusive | 530–1,420 | 8.0–32.0 | K52; K54; K55; K56; K60; K65; X56; X60; X65; X70; X80 |
| TU 24.20.21-203-57357928-2022<br>Longitudinal electric-welded steel pipes for main gas pipelines with an operating pressure of up to 9.8 MPa (100 kgf/cm$^2$) inclusive, operated in active tectonic fault zones, in earthquake-prone areas, and in permafrost zones | 530–1,420 | 10.0–32.0 | K52; K54; K55; K56; K60;<br>X52; X56; X60; X65; X70 |
| 1 | 2 | 3 | 4 |

| Standards | Pipe dimensions | | Steel and pipe grade |
|---|---|---|---|
| | Outside diameter, mm | Wall thickness, mm | |
| 1 | 2 | 3 | 4 |
| TU 24.20.21-204-57357928-2022<br>Longitudinal electric-welded steel pipes of grade K60 with diameters from 530 mm to 1,420 mm for main gas pipelines with an operating pressure of 11.8 MPa | 530–1,420 | 8.0–38.0 | K60 |
| TU 24.20.21-205-57357928-2022<br>Longitudinal electric-welded steel pipes with outside diameters from 530 mm to 1,220 mm for underwater gas pipelines | 530–1,220 | 8.0–32.0 | SMYS 245–485 |
| TU 24.20.21-206-57357928-2022<br>Highly corrosion-resistant, improved low-temperature service longitudinal electric-welded steel pipes for pipelines | 530–1,420 | 8.0–36.0 | 20A; 20FA; 09G2S; 17G1S-U; 09GSF; 13KhFA (K48; K50; K52); K54; K55; K56; K60 |
| TU 24.20.21-207-57357928-2022<br>Longitudinal electric-welded steel pipes for pipelines | 530–1,420 | 8.0–36.0 | K42–K60, V1, 2; K34–K60, V3 |
| TU 24.20.21-208-57357928-2022<br>Longitudinal electric-welded steel pipes for oil and gas field pipelines | 530–1,020 | 8.0–32.0 | L360–L485, 09GSF, 05KhGB, 13KhFA |
| TU 24.20.21-209-57357928-2022<br>Longitudinal electric-welded steel pipes with outside diameters from 530 mm to 1,420 mm for construction and repair of steam and water pipelines | 530–1,420 | 8.0–25.0 | St3sp, 09G2S, 17GS, 17G1S, 17G1SU |
| TU 24.20.21-210-57357928-2022<br>Electric-welded steel pipe for encasements | 530–1,420 | 15.2–32.0 | K34; K38; K42; K48; K50; K52; K54; K55 |
| 24.20.13-213-57357928-2022<br>Longitudinal electric-welded steel pipes for subsea pipelines | 530–820 | 15.0–27.0 | PCT 36W; PCT 40W; PCT 420W<br>X52; X60; X65; K54; K55; K56 |
| TU 14-158-136-2007<br>Highly corrosion-resistant, improved low-temperature service longitudinal electric-welded pipes of 20 and 20KSKh steel for oil and gas pipelines | 530–1,220 | 7.0–22.0 | 20; 20KSKh |
| TU 14-158-153-05 (double-seam modification)<br>Longitudinal electric-welded steel pipes with a diameter of 1,020 mm to 1,220 mm for gas and oil pipelines | 1,020; 1,220 | 10.0–22.0 | 17G1S-U; 09GSF; 13GS; 13GSU; 13G1SU; 12GSB; 12G2SB; 08G1NFBYu; 10G2FBYu; grades K52–K60 |
| TU 14-3P-1270-2009<br>Longitudinal electric-welded steel pipes with a diameter of 530 mm, 720 mm, or 820 mm for gas and oil main pipelines | 530–820 | 7.0–15.0 | 17GS; 17G1S; 17G1S-U; 13GS; 13GSU; 13G1SU; 08GBYu; 09GBYu; 12GSB; 12G2SB; 08G1NFBYu; 10G2FBYu; 09GSF; grades K52–K60 |
| TU 24.20.21-164-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 508 mm to 1,422 mm | 508–1,422 | 7.5–48.0 | L360–L485; 09GSF; 05KhGB; 13KhFA |
| TU 24.20.21-021-57357928-2022<br>Longitudinal electric-welded steel pipes for onshore and offshore field pipelines | 508; 514; 813; 820 | 27.0. 30.1. 30.2. 32.2. 38.7. 40.8. 45.8. 46.8 | K60; X65; 450 I FD |
| TU 24.20.21-039-57357928-2022<br>Longitudinal electric-welded steel pipes for underwater pipelines | 508–1,220 | 8.0–41.0 | X60; X65; X70; SAWL 415 IFD; SAWL 450 IFD; SAWL 485 IFD |
| TU 24.20.21-077-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 508 mm to 1,422 mm for use in a wide temperature range from minus 60 °C to plus 400 °C | 508–1,422 | 8.0–40.0 | K50; K52; K54; K55; K56; K60; X56; X60; X65; X70 |
| 1 | 2 | 3 | 4 |





| Standards | Pipe dimensions | | Steel and pipe grade |
|---|---|---|---|
| | Outside diameter, mm | Wall thickness, mm | |
| 1 | 2 | 3 | 4 |
| TU 24.20.21-102-57357928-2022<br>Highly corrosion-resistant, high-reliability, longitudinal electric-welded steel pipes for pipelines | 530–1,420 | 7.0–40.0 | 09GSF; 13KhFA |
| TU 24.20.21-103-57357928-2022<br>Low-temperature service longitudinal steel pipes for pipelines | 530–1,420 | 7.0–40.0 | K48; K50; K52; K54; K55; K56; K60 |
| TU 24.20.21-106-57357928-2022<br>Longitudinal electric-welded steel pipes for pipelines with an operating pressure of up to 24.0 MPa inclusive | 508–812.8 | 24.9–39.0 | K60; X70 |
| TU 24.20.21-108-57357928-2022<br>Longitudinal welded steel pipes with diameters from 508 mm to 1,422 mm made using laser-hybrid welding for main and field pipelines | 508–1,422 | 15.0–34.0 | K52; K54; K55; K56; K60 |
| TU 24.20.21-110-57357928-2022<br>Longitudinal electric-welded steel pipes for pipelines | 508–1,420 | 7.0–48.0 | K42-K60 |
| TU 24.20.21-132-57357928-2022<br>Longitudinal welded steel pipes with diameters from 508 mm to 1,422 mm for pipelines | 508–1,422 | 8.0–45.0 | K42-K60 |
| TU 24.20.22-013-53570464<br>Large-diameter welded steel casing pipes with diameters from 508 mm to 762 mm with welded TMK UP KATRAN HD connectors | 508–762 | 15.9–25.4;<br>25.4–38.1 | Pipes: X52–X70<br>Connectors: X80<br>Locking ring: X100 |
| TU 24.20.21-010-57357928-2023<br>Longitudinal welded steel pipes with diameters from 508 mm to 1,420 mm | 508–1,420 | 8.0–45.0 | K42-K60 |
| TU 24.20.21-099-57357928-2022<br>Longitudinal electric-welded steel pipes of strength class K65 with outside diameters from 508 mm to 1,420 mm with high strain capacity for gas pipelines with working pressure of up to 11.8 MPa inclusive, crossing zones of active tectonic faults, permafrost soils and zones of increased seismicity, as well as operated in areas with poorly bearing, sinking and subsidence soils | 508–1,422 | 8.0–48.0 | K65 |
| TU 24.20.21-011-57357928-2023<br>Longitudinal electric-welded steel pipes of strength class K70 for main gas pipelines with working pressure up to 14.71 MPa inclusive | 530–1,420 | 9.9–38.1 | K70 |
| TU 24.20.21-017-57357928-2024<br>Longitudinal electric-welded steel pipes with diameter from 508 mm to 1,422 mm for pipelines | 508–1,422 | 7.0–45.0 | K52-K65<br>X56-X80 |
| TU 24.20.21-022-57357928-2024<br>Longitudinal electric-welded pipes made of high-alloyed corrosion-resistant steel grades | 377–1,620 | 6.0–50.0 | 03Kh18N11; 04Kh18N10; 08Kh18N10; 08Kh18N10T; 08Kh18N12T; 08Kh18N12B; 12Kh18N9; 12Kh18N9T; 12Kh18N10T; 12Kh18N12T; 03Kh17Sh4M3; 08Kh17N13M2T; 08Kh17N15M3T; 10Kh17N13M2T; 20Kh23N13; 10Kh; 10Kh17N13M2T; 20Kh23N13; 10Kh23N18; 20Kh23N18; 03Kh22N5AM3; 03Kh22N6M2; 08Kh22N6T; 08Kh21N6M2T; 05KhN32T (KhN32T); 06KhN28MDT; AISI 304; 304N; 304L; 304LN; 304H; 309S; 310S; 316; 316N; 316L; 316LN; 316H; 316Ti; 317; 321; 321H; 347; 347H; 904L; 800; 318; 2205 |
| 1 | 2 | 3 | 4 |

# LONGITUDINAL SIZE RANGES

## LONGITUDINAL WELDED LDP PRODUCT RANGE AS PER GOST AND TU

| Outside diameter, mm | Wall thickness, mm | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 530 | | | | | | | | | | | | | | | | | | | | |
| 630 | | | | | | | | | | | | | | | | | | | | |
| 720 | | | | | | | | | | | | | | | | | | | | |
| 820 | | | | | | | | | | | | | | | | | | | | |
| 1,020 | | | | | | | | | | | | | | | | | | | | |
| 1,220 | | | | | | | | | | | | | | | | | | | | |
| 1,420 | | | | | | | | | | | | | | | | | | | | |

| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
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## LONGITUDINAL WELDED LDP PRODUCT RANGE AS PER EN, ISO, AND API*

| Outside diameter, mm | Wall thickness, mm | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 508 (20”) | | | | | | | | | | | | | | | | | | | | |
| 559 (22”) | | | | | | | | | | | | | | | | | | | | |
| 610 (24”) | | | | | | | | | | | | | | | | | | | | |
| 660 (26”) | | | | | | | | | | | | | | | | | | | | |
| 711 (28”) | | | | | | | | | | | | | | | | | | | | |
| 762 (30”) | | | | | | | | | | | | | | | | | | | | |
| 813 (32”) | | | | | | | | | | | | | | | | | | | | |
| 914 (36”) | | | | | | | | | | | | | | | | | | | | |
| 1,016 (40”) | | | | | | | | | | | | | | | | | | | | |
| 1,067 (42”) | | | | | | | | | | | | | | | | | | | | |
| 1,219 (48”) | | | | | | | | | | | | | | | | | | | | |
| 1,422 (56”) | | | | | | | | | | | | | | | | | | | | |

| 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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## LONGITUDINAL WELDED DOUBLE-SEAM LDP PRODUCT RANGE WITH DIAMETERS OVER 1,420 MM AS PER GOST AND TU

| Outside diameter, mm | Wall thickness, mm | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
| 1,520 | | | | | | | | | | | | | | | | | | | | |
| 1,620 | | | | | | | | | | | | | | | | | | | | |
| 1,720 | | | | | | | | | | | | | | | | | | | | |
| 1,820 | | | | | | | | | | | | | | | | | | | | |
| 2,020 | | | | | | | | | | | | | | | | | | | | |
| 2,220 | | | | | | | | | | | | | | | | | | | | |
| 2,420 | | | | | | | | | | | | | | | | | | | | |
| 2,520 | | | | | | | | | | | | | | | | | | | | |

# WEIGHT PER UNIT LENGTH (METER) AS PER API* SPEC 5L AND ISO 3183 (ASME B36.10M)

## VALUES ARE GIVEN AS PER ASME B36.10M

| Outside diameter, mm | | Wall thickness, mm | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 7.0 | 8.0 | 9.0 | 10.0 | 11.0 | 12.0 | 13.0 | 14.0 | 15.0 | 16.0 |
| mm | inch* | Weight per unit length (meter), kg | | | | | | | | | |
| 508 | 20 | 87.35 | 99.63 | 111.86 | 124.03 | 136.16 | 148.24 | 160.27 | 172.25 | 184.18 | 196.06 |
| 530 | - | 91.18 | 104.01 | 116.79 | 129.51 | 142.19 | 154.82 | 167.40 | 179.93 | 192.40 | 204.83 |
| 559 | 22 | 96.24 | 109.79 | 123.29 | 136.74 | 150.14 | 163.49 | 176.79 | 190.04 | 203.24 | 216.39 |
| 630 | - | 108.62 | 123.94 | 139.20 | 154.42 | 169.59 | 184.71 | 199.78 | 214.79 | 229.76 | 244.68 |
| 660 | 26 | - | 129.91 | 145.93 | 161.89 | 177.81 | 193.67 | 209.49 | 225.26 | 240.97 | 256.64 |
| 711 | 28 | - | 140.07 | 157.36 | 174.60 | 191.78 | 208.92 | 226.00 | 243.04 | 260.02 | 276.96 |
| 720 | - | - | 141.87 | 159.38 | 176.84 | 194.25 | 211.61 | 228.92 | 246.18 | 263.39 | 280.55 |
| 762 | 30 | - | 150.24 | 168.79 | 187.30 | 205.75 | 224.16 | 242.52 | 260.82 | 279.08 | 297.29 |
| 813 | 32 | - | - | 180.22 | 200.00 | 219.73 | 239.40 | 259.03 | 278.61 | 298.13 | 317.61 |
| 820 | - | - | - | 181.79 | 201.74 | 221.64 | 241.49 | 261.30 | 281.05 | 300.75 | 320.40 |
| 864 | 34 | - | - | 191.66 | 212.70 | 233.70 | 254.65 | 275.54 | 296.39 | 317.19 | 337.93 |
| 914 | 36 | - | - | - | 225.16 | 247.40 | 269.59 | 291.73 | 313.82 | 335.87 | 357.86 |
| 965 | 38 | - | - | - | 237.86 | 261.37 | 284.83 | 308.24 | 331.61 | 354.92 | 378.18 |
| 1,020 | 40 | - | - | - | 251.56 | 276.44 | 301.27 | 326.05 | 350.78 | 375.47 | 400.10 |
| 1,067 | 42 | - | - | - | - | 289.32 | 315.32 | 341.27 | 367.17 | 393.03 | 418.83 |
| 1,118 | 44 | - | - | - | - | 303.29 | 330.56 | 357.78 | 384.96 | 412.08 | 439.15 |
| 1,168 | 46 | - | - | - | - | - | 345.50 | 373.97 | 402.39 | 430.76 | 459.08 |
| 1,220 | 48 | - | - | - | - | - | 361.05 | 390.81 | 420.52 | 450.19 | 479.80 |
| 1,320 | 52 | - | - | - | - | - | - | - | 455.39 | 487.55 | 519.65 |
| 1,420 | 56 | - | - | - | - | - | - | - | 490.26 | 524.91 | 559.50 |

| Outside diameter, mm | | Wall thickness, mm | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 28.0 | 29.0 | 30.0 | 31.0 | 32.0 | 33.0 | 34.0 | 35.0 | 36.0 | 37.0 |
| mm | inch* | Weight per unit length (meter), kg | | | | | | | | | |
| 508 | 20 | - | - | - | - | - | - | - | - | - | - |
| 530 | - | 350.09 | 361.87 | - | - | - | - | - | - | - | - |
| 559 | 22 | 370.31 | 382.81 | - | - | - | - | - | - | - | - |
| 630 | - | 419.83 | 434.10 | 448.32 | - | - | - | - | - | - | - |
| 660 | 26 | 440.75 | 455.77 | 470.73 | - | - | - | - | - | - | - |
| 711 | 28 | 476.31 | 492.60 | 508.84 | 525.03 | 541.17 | - | - | - | - | - |
| 720 | - | 482.59 | 499.10 | 515.57 | 531.98 | 548.34 | - | - | - | - | - |
| 762 | 30 | 511.88 | 529.44 | 546.95 | 564.41 | 581.82 | - | - | - | - | - |
| 813 | 32 | 547.45 | 566.28 | 585.06 | 603.79 | 622.47 | 641.10 | 659.68 | 678.21 | 696.69 | 715.12 |
| 820 | - | 552.33 | 571.33 | 590.29 | 609.19 | 628.04 | 646.85 | 665.60 | 684.31 | 702.96 | 721.57 |
| 864 | 34 | 583.01 | 603.11 | 623.16 | 643.16 | 663.11 | 683.01 | 702.86 | 722.66 | 742.42 | 762.12 |
| 914 | 36 | 617.88 | 639.23 | 660.52 | 681.77 | 702.96 | 724.11 | 745.21 | 766.25 | 787.25 | 808.19 |
| 965 | 38 | 653.45 | 676.06 | 698.63 | 721.15 | 743.61 | 766.03 | 788.39 | 810.71 | 832.98 | 855.19 |
| 1,020 | 40 | 691.81 | 715.79 | 739.73 | 763.61 | 787.45 | 811.23 | 834.97 | 858.66 | 882.29 | 905.88 |
| 1,067 | 42 | 724.58 | 749.74 | 774.84 | 799.90 | 824.91 | 849.86 | 874.77 | 899.63 | 924.43 | 949.19 |
| 1,118 | 44 | 760.15 | 786.58 | 812.95 | 839.28 | 865.55 | 891.78 | 917.96 | 944.08 | 970.16 | 996.19 |
| 1,168 | 46 | 795.02 | 822.69 | 850.31 | 877.88 | 905.40 | 932.88 | 960.30 | 987.67 | 1,014.99 | 1,042.27 |
| 1,220 | 48 | 831.28 | 860.25 | 889.17 | 918.03 | 946.85 | 975.62 | 1,004.33 | 1,033.00 | 1,061.62 | 1,090.19 |
| 1,320 | 52 | 901.02 | 932.48 | 963.89 | 995.24 | 1,026.55 | 1,057.81 | 1,089.02 | 1,120.17 | 1,151.28 | 1,182.34 |
| 1,420 | 56 | 970.76 | 1,004.71 | 1,038.61 | 1,072.45 | 1,106.25 | 1,140.00 | 1,173.70 | 1,207.35 | 1,240.95 | 1,274.50 |

The theoretical weight is given for single-seam pipes with a factor of 1.01 to account for weld reinforcement.
In case of double-seam pipes, a factor of 1.015 is used.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 17.0 | 18.0 | 19.0 | 20.0 | 21.0 | 22.0 | 23.0 | 24.0 | 25.0 | 26.0 | 27.0 | |
| 207.90 | 219.68 | 231.41 | 243.09 | 254.72 | 266.30 | 277.83 | 289.32 | 300.75 | - | - | |
| 217.21 | 229.54 | 241.82 | 254.05 | 266.23 | 278.36 | 290.44 | 302.47 | 314.45 | 326.38 | 338.26 | |
| 229.49 | 242.54 | 255.54 | 268.49 | 281.39 | 294.25 | 307.05 | 319.80 | 332.50 | 345.16 | 357.76 | |
| 259.55 | 274.37 | 289.14 | 303.86 | 318.53 | 333.15 | 347.72 | 362.24 | 376.71 | 391.13 | 405.50 | |
| 272.25 | 287.82 | 303.34 | 318.80 | 334.22 | 349.59 | 364.91 | 380.17 | 395.39 | 410.56 | 425.68 | |
| 293.85 | 310.68 | 327.47 | 344.21 | 360.90 | 377.53 | 394.12 | 410.66 | 427.15 | 443.59 | 459.98 | |
| 297.66 | 314.72 | 331.73 | 348.69 | 365.60 | 382.47 | 399.28 | 416.04 | 432.75 | 449.41 | 466.03 | |
| 315.44 | 333.55 | 351.61 | 369.61 | 387.57 | 405.48 | 423.34 | 441.15 | 458.90 | 476.61 | 494.27 | |
| 337.04 | 356.41 | 375.74 | 395.02 | 414.25 | 433.42 | 452.55 | 471.63 | 490.66 | 509.64 | 528.57 | |
| 340.00 | 359.55 | 379.05 | 398.51 | 417.91 | 437.26 | 456.56 | 475.82 | 495.02 | 514.17 | 533.28 | |
| 358.63 | 379.28 | 399.88 | 420.42 | 440.92 | 461.37 | 481.77 | 502.12 | 522.42 | 542.67 | 562.86 | |
| 379.80 | 401.69 | 423.54 | 445.33 | 467.07 | 488.77 | 510.41 | 532.00 | 553.55 | 575.04 | 596.49 | |
| 401.39 | 424.56 | 447.67 | 470.73 | 493.75 | 516.71 | 539.63 | 562.49 | 585.31 | 608.07 | 630.78 | |
| 424.68 | 449.22 | 473.70 | 498.13 | 522.52 | 546.85 | 571.13 | 595.37 | 619.55 | 643.69 | 667.77 | |
| 444.58 | 470.29 | 495.94 | 521.54 | 547.10 | 572.60 | 598.06 | 623.46 | 648.82 | 674.12 | 699.38 | |
| 466.18 | 493.15 | 520.07 | 546.95 | 573.77 | 600.55 | 627.27 | 653.95 | 680.57 | 707.15 | 733.67 | |
| 487.35 | 515.57 | 543.74 | 571.86 | 599.93 | 627.95 | 655.92 | 683.84 | 711.71 | 739.53 | 767.30 | |
| 509.36 | 538.88 | 568.34 | 597.76 | 627.12 | 656.44 | 685.70 | 714.92 | 744.08 | 773.20 | 802.27 | |
| 551.71 | 583.71 | 615.67 | 647.57 | 679.43 | 711.23 | 742.99 | 774.69 | 806.35 | 837.96 | 869.51 | |
| 594.05 | 628.54 | 662.99 | 697.38 | 731.73 | 766.03 | 800.27 | 834.47 | 868.62 | 902.71 | 936.76 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 38.0 | 39.0 | 40.0 | 41.0 | 42.0 | 43.0 | 44.0 | 45.0 | 46.0 | 47.0 | 48.0 | |
| - | - | - | - | - | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - | - | - | - | |
| - | - | - | - | - | - | - | - | - | - | - | |
| 733.50 | 751.83 | 770.11 | - | - | - | - | - | - | - | - | |
| 740.12 | 758.63 | 777.09 | - | - | - | - | - | - | - | - | |
| 781.77 | 801.37 | 820.92 | - | - | - | - | - | - | - | - | |
| 829.09 | 849.94 | 870.73 | - | - | - | - | - | - | - | - | |
| 877.36 | 899.48 | 921.54 | - | - | - | - | - | - | - | - | |
| 929.41 | 952.90 | 976.34 | - | - | - | - | - | - | - | - | |
| 973.90 | 998.56 | 1,023.16 | - | - | - | - | - | - | - | - | |
| 1,022.17 | 1,048.09 | 1,073.97 | - | - | - | - | - | - | - | - | |
| 1,069.49 | 1,096.66 | 1,123.79 | - | - | - | - | - | - | - | - | |
| 1,118.70 | 1,147.17 | 1,175.59 | - | - | - | - | - | - | - | - | |
| 1,213.35 | 1,244.31 | 1,275.22 | - | - | - | - | - | - | - | - | |
| 1,308.00 | 1,341.44 | 1,374.84 | 1,408.19 | 1,441.49 | 1,474.74 | 1,507.95 | 1,541.10 | 1,574.20 | 1,607.25 | 1,640.25 | |

# WEIGHT PER UNIT LENGTH (METER) AS PER API* SPEC 5L AND ISO 3183 (ISO 4200)

## VALUES ARE GIVEN AS PER ISO 4200

| Outside diameter, mm | Wall thickness, mm | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 8 | 8.8 | 10 | 11 | 12.5 | 14.2 | 16 | 17.5 |
| 508 | 98.6 | 108 | 123 | 136 | 153 | 173 | 194 | 212 |
| 559 | 109 | 119 | 135 | 149 | 168 | 191 | 214 | 234 |
| 610 | 119 | 130 | 146 | 162 | 184 | 209 | 234 | 256 |
| 660 | 129 | 141 | 160 | 176 | 200 | 226 | 254 | 277 |
| 711 | 139 | 152 | 173 | 190 | 215 | 244 | 274 | 299 |
| 762 | 149 | 163 | 185 | 204 | 231 | 262 | 294 | 321 |
| 813 | 159 | 175 | 198 | 218 | 247 | 280 | 314 | 343 |
| 864 | 169 | 186 | 211 | 231 | 262 | 298 | 335 | 365 |
| 914 | 179 | 196 | 223 | 245 | 278 | 315 | 354 | 387 |
| 1,016 | 199 | 219 | 249 | 273 | 309 | 351 | 395 | 431 |
| 1,067 | 209 | 230 | 261 | 286 | 325 | 369 | 415 | 453 |
| 1,118 | 219 | 241 | 273 | 300 | 341 | 387 | 435 | 475 |
| 1,168 | 229 | 252 | 286 | 314 | 356 | 404 | 455 | 497 |
| 1,219 | 239 | 263 | 298 | 328 | 372 | 422 | 475 | 519 |
| 1,321 | 259 | 285 | 323 | 355 | 403 | 458 | 515 | 563 |
| 1,422 | 279 | 307 | 348 | 383 | 435 | 493 | 555 | 605 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20 | 22.2 | 25 | 28 | 30 | 32 | 36 | 40 |
| 241 | 266 | 298 | 331 | 354 | 376 | 419 | 462 |
| 266 | 294 | 329 | 367 | 391 | 415 | 464 | 512 |
| 291 | 322 | 361 | 402 | 429 | 455 | 510 | 562 |
| 316 | 349 | 392 | 436 | 465 | 496 | 554 | 612 |
| 341 | 377 | 423 | 472 | 504 | 536 | 599 | 662 |
| 366 | 405 | 454 | 507 | 542 | 576 | 645 | 712 |
| 391 | 433 | 486 | 542 | 579 | 616 | 690 | 763 |
| 416 | 461 | 517 | 577 | 617 | 657 | 735 | 813 |
| 441 | 488 | 548 | 612 | 654 | 696 | 780 | 862 |
| 491 | 544 | 611 | 682 | 729 | 777 | 870 | 963 |
| 516 | 572 | 642 | 717 | 767 | 817 | 915 | 1,013 |
| 542 | 600 | 674 | 753 | 805 | 857 | 961 | 1,063 |
| 565 | 627 | 705 | 787 | 842 | 896 | 1,005 | 1,113 |
| 591 | 655 | 736 | 822 | 880 | 937 | 1,050 | 1,163 |
| 642 | 711 | 799 | 893 | 955 | 1,017 | 1,141 | 1,264 |
| 692 | 766 | 861 | 963 | 1,030 | 1,097 | 1,231 | 1,363 |

# MECHANICAL PROPERTIES OF STEEL

| Standards | Pipe dimensions | | Steel and pipe grade | Ultimate tensile strength | Yield strength | Relative elongation | Impact strength KCU | Impact strength KCV | Shear area fraction | Angle of bend |
|---|---|---|---|---|---|---|---|---|---|---|
| | Outside diameter | Wall thickness | | MPa | MPa | % | J/cm² | J/cm² | % | degree° |
| | mm | mm | | min | min | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| ISO 3183-2019 / API* 5L 46 Edition<br>Petroleum and natural gas industries.<br>Steel pipe for pipeline transportation systems | 508-1,422 | 7.1-48.0 | B; X42-X80;<br>L245-L555 | 415-655<br>625-825 | 245-450<br>555-705 | in accordance with the specification | - | in accordance with the specification | in accordance with the specification | 180 |
| ÖNORM EN 10219-1:2006 / ÖNORM EN 10219-2:2019<br>Cold formed welded structural hollow sections of non-alloy and fine grain steels | 508-1,422 | 7.0-48.0 | Non-alloy steels:<br>S235JRH; S275J0H; S275J2H; S355J0H; S355J2H; S355K2H.<br>Fine-grain steels:<br>S275MH-S460MLH; S275NH-S460NLH | Non-alloy steels:<br>360-510;<br>470–630<br>Fine-grain steels:<br>370–510,<br>540–720 | Non-alloy steels:<br>225<br>355<br>Fine-grain steels:<br>265<br>460 | Non-alloy steels:<br>24-20<br>Fine-grain steels:<br>24-17 | - | Non-alloy steels:<br>27-40 J<br>(+20°, 0°, -20 °C)<br>Fine-grain steels:<br>27-40 J<br>(-20 °C, -50 °C) | - | - |
| TU 24.20.21-022-57357928-2024<br>Longitudinal electric-welded pipes made of high-alloy corrosion-resistant steel grades | 377-1,620 | 6.0-50.0 | 03Kh18N11; 04Kh18N10; 08Kh18N10; 08Kh18N10T; 08Kh18N12T; 08Kh18N12B; 12Kh18N9; 12Kh18N9T; 12Kh18N10T; 12Kh18N12T; 03Kh17Sh4M3; 08Kh17N13M2T; 08Kh17N15M3T; 10Kh17N13M2T; 20Kh23N13; 10Kh23N18; 20Kh23N18; 03Kh22N5AM3; 03Kh22N6M2; 08Kh22N6T; 08Kh21N6M2T; 05KhN32T (KhN32T); 06KhN28MDT; AISI 304; 304N; 304L; 304LN; 304H; 309S; 310S; 316; 316N; 316L; 316LN; 316H; 316Ti; 317; 321; 321H; 347; 347H; 904L; 800; 318; 2205 | 485-655 | 170-450 | 18-45 | - | - | - | 100 |
| GOST 10704-91, GOST 10706-76<br>Electrically welded steel line-weld tubes.<br>Technical requirementsi | 530-1,420<br>1,520-2,520 | 7.0-48.0 | St2kp, St2ps, St2sp, St3kp, St3ps, St3sp, low-alloy steel (CE ≤ 0.48%) | 325-440 | 215-265 | 18-22 | 29-59 (+20 °C)<br>15-20 (+20 °C)<br>24 (+40 °C) | | | - |
| GOST 20295-85<br>Steel welded pipes for main gas-and-oil pipelines | 530-1,420 | 7.0-48.0 | K34; K38; K42; K48; K50; K52; K54; K55; K56; K60 | 333-588 | 206-412 | 24-16 | 29.4 (-40 °C) | 29.4 (-5 °C) | | - |
| GOST 31447-2012<br>Steel welded pipes for main gas pipelines, oil pipelines, and oil products pipelines | 530-1,420 | 7.0-48.0 | K34; K38; K42; K48; K50; K52; K54; K55; K56; K60 | 335-590 | 205-460 | 24-20 | 34.3-49.0<br>(-40 °C or -60 °C) | 24.5-107.8<br>(-5 °C or -20 °C) | 50-85<br>(-5 °C or -20 °C) | 180 |
| GOST 33228-2015<br>General purpose steel welded pipes | 508-1,420<br>1,520-2,520 | 7.0-34.0 | KP175–KP460 | 255-590 | 175-460 | 16-9 | 24.5-78.4<br>(+20°, -20°, -40°, -60 °C) | - | - | - |
| GOST R 58064-2018<br>Steel welded pipes for building structures | 508-1,420 | 8.0-48.0 | C245-C440 | 370-540 | 235-440 | 25-20 | 29-34<br>(-40° or -70 °C) | 34-66<br>(0°, -20°, -40°, -60 °C) | - | - |
| TU 24.20.21-001-57357928-2022<br>Longitudinal electric-welded steel pipes of grade K60 for main gas pipelines with an operating pressure of 11.8 MPa and field gas pipelines with an operating pressure of 12.9 MPa | 530-1,420 | 9.9-37.9 | K60 | 590-710 | 485-595 | 20 | - | V1: 100-170 (-20°);<br>63 (40 °C)<br>V2: 110 (-19 °C)<br>V3: 90 (-36 °C)<br>V4: 100-225 (-42 °C) | V1: 85 (-20 °C)<br>V2: 85 (-5 °C)<br>V3: 85 (-20 °C)<br>V4: 85 (-42 °C) | 180 |
| TU 24.20.21-006-57357928-2022<br>Longitudinal electric-welded steel pipes of grade K65 with a diameter of 1,420 mm for main gas pipelines with an operating pressure of 11.8 MPa | 1,420 | 23.0<br>27.7<br>33.4 | K65 | 640-760 | 555-665 | 18-16 | - | 250 (-40°) parent met.,<br>70 (-40°) weld. joint | 85 (-20 °C) | 180 |
| TU 24.20.21-012-57357928-2022<br>Longitudinal electric-welded steel pipes for the manufacture of protective casings (encasements) with diameters from 530 mm to 1,420 mm | 530-1,420 | 15.2-32.0 | K34-K55 | 335-540 | 205-390 | 22-17 | 24.5 (-40° or -60 °C) | - | - | - |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

| Standards | Pipe dimensions | | Steel and pipe grade | Ultimate tensile strength | Yield strength | Relative elongation | Impact strength KCU | Impact strength KCV | Shear area fraction | Angle of bend |
|---|---|---|---|---|---|---|---|---|---|---|
| | Outside diameter | Wall thickness | | MPa | MPa | % | J/cm² | J/cm² | % | degree° |
| | mm | mm | | min | min | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| TU 24.20.21-016-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 508 mm to 1,420 mm for main gas pipelines with an operating pressure of up to 9.8 MPa inclusive | 508–1,420 | 7.0–32.0 | K52–K60<br>X56–X70 | 490–598<br>590–698 | 360<br>485 | 20 | 39.2–58.8 (–60 °C) | 39.2–107.8 (–20 °C) | 50–85 (–20 °C)" | 180 |
| TU 24.20.21-018-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 1,220 mm for pipelines | 530–1,220 | 7.0–35.0 | K50–K60 | 490–598<br>590–688 | 345<br>460 | 20 | 49–74 (–60 or –40 °C) | 49–88 (–20 or –5 °C) | 60–80<br>(–20° or –5 °C) | 120 |
| TU 24.20.21-020-57357928-2022<br>Improved low-temperature service longitudinal electric-welded steel pipes with diameters from 530 mm to 1,420 mm with enhanced weldability for use in steel structures of buildings | 530–1,420 | 7.0–45.0 | K52–K60<br>X56–X70 | 490–608<br>590–708 | 360<br>485 | 20 | – | 34 (–40 °C) | – | 180 |
| TU 24.20.21-027-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 1,420 mm for main gas pipelines crossing active tectonic fault zones with an operating pressure of up to 9.8 MPa inclusive | 530–1,420 | 8.0–40.0 | K52; K54; K55; K56; K60;<br>X52; X56; X60; X65; X70 | 460–570<br>590–710 | 355–455<br>485–595 | 21–20 | 59 (–60 °C) | 80–150 (–40 °C) | 85 (–20 °C) | 180 |
| TU 24.20.21-060-57357928-2022<br>Longitudinal electric-welded hydrogen sulfide resistant steel pipes designated for the construction and repair of pipelines in Central Asia | 530–1,220 | 8.0–30.0 | K48; K50; K52;<br>X42; X46; X52 | 414–532<br>510–628 | 265<br>359 | 20 | 49 (–60 °C) | 49 (–20 °C) | 60 (–20 °C) | 180 |
| TU 24.20.21-061-57357928-2022<br>Longitudinal electric-welded steel pipes for gas gathering systems | 530 | 16.0–26.0 | K60 | 590–730 | 485–605 | 20 | 39.2 (–60 °C) | 39.2 (–50 °C) | 50 (–20 °C) | 180 |
| TU 24.20.21-067-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 508 mm to 1,422 mm for main and field pipelines | 508–1,422 | 8.0–38.0 | K52–K60<br>X56–X70 | 490–610<br>590–710 | 355<br>485 | 20–18 | 50–60<br>(–60° or –40 °C) " | cat. C: 60–80 (–5 °C)<br>cat. D: 85–130<br>(–20°, –30°, –40 °C)<br>cat. E: 100–170 (–40 °C) | cat. C: 85 (–5 °C)<br>cat. D: 85<br>(–20°, –30°, –40 °C)<br>cat. E: 85 (–40 °C)" | 180 |
| TU 24.20.21-068-57357928-2022<br>Longitudinal electric-welded steel pipes for unique building structures | 508–1,420 | 7.0–45.0 | C345–C440;<br>K52–K60;<br>X56–X70 | 470–590<br>590–710 | 345<br>440 | 20 | – | 60–100<br>(–20°, –40°, –60 °C) | 80 (–20 °C) | 180 |
| TU 24.20.21-074-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 820 mm for main and field pipelines | 530–820 | 8.0–12.0 | K52–K60;<br>X56–X70 | 490–610<br>590–710 | 355<br>485 | 20–18 | 50–60<br>(–60° or –40 °C) | cat. C: 60–70 (–5 °C)<br>cat. D: 85–105<br>(–20°, –30°, –40 °C) | cat. C: 85 (–5 °C)<br>cat. D: 85<br>(–20°, –30°, –40 °C) | 180 |
| TU 24.20.21-076-57357928-2022<br>Longitudinal electric-welded steel pipes for field pipelines with an operating pressure of up to 24.0 MPa inclusive | 508 | 22.2;<br>23.8;<br>24.9 | X65; SAWL 450 IFD | 535–655 | 450–570 | 20 | – | 155 (–32 °C) | 85 (–10 °C) | 180 |
| TU 1381-079-00186654-2016<br>Longitudinal electric-welded steel pipes made of carbon and low-alloy steel grades for steam and hot water pipelines | 530–1,420 | 8.0–25.0 | St3sp; 20; 09G2S; 17GS;<br>17G1S; 17G1S-U | 370–480<br>510–660 | 235<br>360 | 23–20 | 29–44<br>(–20° or –40 °C) | – | – | 120 / 180 |
| TU 24.20.21-1573-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 1,420 mm and wall thicknesses of up to 32 mm for gas, oil, and petroleum product main pipelines | 530–1,420 | 8.0–32.0 | 12G2S; 09G2S; 17GS;<br>17G1S; 17G1S-U; 13GS;<br>13GS-U; 08GBYu; 12GSB;<br>09GSF; 13KhFA; 13G1S-U;<br>12G2SB; 09GBYu; 09G2FB;<br>10G2FBYu; 08G1NFB<br>(pipe grades K50; K52;<br>K54; K55; K56; K60) | 490–608<br>590–708 | 340–470<br>460–600 | 20 | 29.4–49.0<br>(–40° or –60 °C) | 29.4–49.0<br>(0°, –5°, –15°, –20°,<br>–40 °C) | 50–60<br>(0°, –5°, –15°, –20 °C) | 120 / 180 |
| TU 14-156-78-2008<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 1,420 mm for main gas pipelines with an operating pressure of 11.8 MPa | 530–1,420 | 9.9–37.9 | K60 | 590 | 485 | 20 | – | 100–170 at +20 °C | 85 at +20 °C | 180 |
| TU 24.20.22-201-57357928-2022<br>Longitudinal electric-welded steel pipes made of K65 grade with a diameter of 1,420 mm for main gas pipelines with an operating pressure of 11.8 MPa | 1,420 | 23.0;<br>27.7 | K65 | 640 | 555 | 18 | – | 250 at +40 °C | 85 at +20 °C | 180 |
| TU 14-156-98-2013 | 530–1,220 | 14.2–33.0 | K60 | 560–710 | 485–595 | 20 | – | 80–110 | 85 | 180 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

| Standards | Pipe dimensions | | Steel and pipe grade | Ultimate tensile strength | Yield strength | Relative elongation | Impact strength KCU | Impact strength KCV | Shear area fraction | Angle of bend |
|---|---|---|---|---|---|---|---|---|---|---|
| | Outside diameter | Wall thickness | | MPa | MPa | % | J/cm² | J/cm² | % | degree° |
| | mm | mm | | min | min | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| TU 24.20.21-206-57357928-2022<br>Longitudinal electric-welded steel pipes with enhanced corrosion resistance and cold resistance for pipelines | 530-1,220 | 8.0-30.0 | K48; K50; K52; K54; K55; K56; K60 | 471-710 | 295-460 | 20 | 34.3-44.1 | 39.2 | 50 | 180 |
| TU 24.20.21-203-57357928-2022<br>Longitudinal electric-welded steel pipes for main gas pipelines with an operating pressure of up to 9.8 MPa (100 kgf/cm2) inclusive designed for operation within active tectonic fault (ATF) zones, areas of high seismic activity, and permafrost regions | 530-1,420 | 10.0-36.0 | K52; K54; K55; K56; K60; X52; X56; X60; X65; X70 | 440-710 | 355-585 | 20-21 | 60 | 100-110 | 85 | 180 |
| TU 24.20.21-202-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 530 mm to 1,420 mm for main and field pipelines with an operating pressure of up to 10.0 MPa inclusive | 530-1,420 | 8.0-32.0 | K52; K54; K55; K56; K60; K65 X56; X60; X65; X70; X80 | 510-760 | 355-555 | 18-20,<br>18-20 | 40-50 | 85-130<br>(K52-K60),<br>160-250 (K65) | 85 | 180 |
| TU 24.20.21-205-57357928-2022<br>Longitudinal electric-welded steel pipes with outside diameters from 530 mm to 1,220 mm for underwater gas pipelines | 530-1,220 | 8.0-32.0 | SMYS 245-485 F; D | 370-570 | 245-485 | 18-22 | | 40.0-136.0 | 85 | 180 |
| TU 24.20.21-207-57357928-2022<br>Longitudinal electric-welded steel pipes for pipelines | 530-1,420 | 8.0-36.0 | K42-K60 V1; V2 | 415-760 | 290-635 | 18-20 | 45.0 (at -40 °C and -60 °C) | 50.0 (at- 20 °C) | 50 | 180 |
| | | | K34-K60 V3 | 310-570 | 175-485 | 18-20 | 39.2 (at -20 °C)<br>24.5 (at -40 °C<br>and -60 °C | 50.0 (at- 20 °C) | 50 | |
| TU 14-158-136-2007<br>Longitudinal electric-welded steel pipes for oil and gas pipelines with enhanced corrosion resistance and cold resistance made of steel grades 20 and 20 KSKh | 530-1,220 | 7.0-22.0 | 20; 20KSKh | 510-630 | 343 | 20 | 39.2 (-60 °C) | 39.2 (-20 °C) | 50 (-20 °C)<br>in impact test pieces | 180 |
| TU 14-158-153-05 (double-seam modification)<br>Longitudinal electric-welded steel pipes with a diameter of 1,020 mm or 1,220 mm for gas and oil pipelines | 1,020; 1,220 | 10.0-22.0 | 17G1S-U; 09GSF; 13GS; 13GSU; 13G1SU; 12GSB; 12G2SB; 08G1NFBYu; 10G2FBYu; grades K52–K60 | 510-630<br>590-690 | 360<br>480 | 20 | 39.2-49.0<br>(-40°, -60 °C) | 29.4-58.8<br>(0°, -15°, -20 °C) | 50-70 (0°, -15°, -20 °C) | 180 |
| TU 14-3R-1270-2009<br>Longitudinal electric-welded steel pipes with diameters of 530 mm, 720 mm, and 820 mm for gas and oil main pipelines | 530-820 | 7.0-15.0 | 17GS; 17G1S; 17G1S-U; 13GS; 13GSU; 13G1SU; 08GBYu; 09GBYu; 12GSB; 12G2SB; 08G1NFBYu; 10G2FBYu; 09GSF; grades K52-K60 | 510-628<br>590-708 | 353<br>460 | 20 | 39.2 (-40°, -60 °C) | 39.2 (-5°, -20 °C) | 50-70 (0°, -15°, -20 °C) | - |
| TU 24.20.21-164-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 508 mm to 1,422 mm | 508-1,422 | 7.5-48.0 | L360-L485<br>09GSF; 05KhGB; 13KhFA | 460-760<br>570-760 | 360-530<br>485-635 | 20 | 60 (-60°, -70 °C) | 50 (-60 °C) | 85 (-20 °C)<br>50 (-60 °C)<br>in impact test pieces | 180 |
| TU 24.20.21-021-57357928-2022<br>Longitudinal electric-welded steel pipes for onshore and offshore field pipelines | 508; 514; 813; 820 | 27.0; 30.1; 30.2; 32.2; 38.7; 40.8; 45.8; 46.8 | K60; X65; 450 I FD | 535-655<br>590-710 | 450-570 | 20-18 | - | V1: 200 (-40 °C)<br>V2: 155-225 (-25°, -30 °C) | 85 (-10 °C) | 180 |
| TU 24.20.21-039-57357928-2022<br>Longitudinal electric-welded steel pipes for offshore pipelines | 508-1,220 | 8.0-41.0 | X60; X65; X70;<br>SAWL 415 IFD; SAWL 450 IFD; SAWL 485 IFD | 520<br>570 | 415<br>485 | 18 | - | 42-50 (-20°, -40 °C) | 85 (-20 °C) | 180 |
| TU 24.20.21-077-57357928-2022<br>Longitudinal electric-welded steel pipes with diameters from 508 mm to 1,422 mm designed for operation in a wide temperature range from minus 60 °C to plus 400 °C | 508-1,422 | 8.0-40.0 | K50-K60<br>X56-X70 | 490-610<br>590-710 | 345<br>485 | 20-18 | 60 (-60 °C) | 80-180<br>(-20°,-30°,-40,-50°, -60 °C) | 85 (-20°, -40 °C) | 180 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

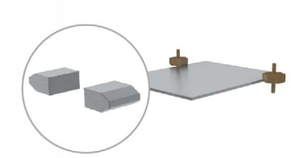
| Standards | Pipe dimensions | | Steel and pipe grade | Ultimate tensile strength | Yield strength | Relative elongation | Impact strength KCU | Impact strength KCV | Shear area fraction | Angle of bend |
|---|---|---|---|---|---|---|---|---|---|---|
| | Outside diameter | Wall thickness | | MPa | MPa | % | J/cm² | J/cm² | % | degree° |
| | mm | mm | | min | min | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| TU 24.20.21-102-57357928-2022<br>Longitudinal electric-welded steel pipes with enhanced corrosion resistance and reliability for pipelines | 530–1,420 | 7.0–40.0 | 09GSF, 13KhFA | 510–630 | 353 | 20 | 34.3–44.1 (–60 °C) | 39,2 (–20 °C) | 50 (–20 °C)<br>in impact test pieces | 180 |
| TU 24.20.21-103-57357928-2022<br>Low-temperature service longitudinal steel pipes for pipelines | 530–1,420 | 7.0–40.0 | K48–K60 | 471–591<br>590–710 | 334<br>460 | 20 | 34.3 - 44.1 (–60 °C) | 39.2 (–20 °C) | 50 (–20 °C)<br>in impact test pieces | 180 |
| TU 24.20.21-106-57357928-2022<br>Longitudinal electric-welded steel pipes for pipelines with an operating pressure of up to 24.0 MPa inclusive | 508–812.8 | 24.9–39.0 | K60; X70 | 590–710 | 485–605 | 20–18 | 150 (–60 °C) | 150 (–40°, –43 °C) | 85 (–20°, –24 °C) | 180 |
| TU 24.20.21-108-57357928-2022<br>Longitudinal welded steel pipes with diameters from 508 mm to 1,422 mm made using laser-hybrid welding for main and field pipelines | 508–1,422 | 15.0–34.0 | K52–K60 | 510–630<br>590–710 | 355<br>485 | 20 | 60 (–60 °C) | 85–130 (–20 °C) | 85 (–20 °C) | 180 |
| TU 24.20.21-110-57357928-2022<br>Longitudinal electric-welded steel pipes for pipelines | 508–1,420 | 7.0–48.0 | K42–K60 | 310<br>570–760 | 175<br>485–635 | 20–18 | 24.5–45.0<br>(from –20° to –60 °C) | 59–118 (–20 °C) | 50 (–20 °C)<br>in impact test pieces | 120 / 180 |
| TU 24.20.21-132-57357928-2022<br>Longitudinal welded steel pipes with diameters from 508 mm to 1,422 mm | 508–1,422 | 8.0–45.0 | K42–K60 | 410<br>590 | 245<br>460 | 20–16 | 29.4–59.0 (–40 °C) | 39.2–59 (–20°, –40 °C) | 50 (–20 °C)<br>in impact test pieces | 180 |
| TU 24.20.21-010-57357928-2023<br>Longitudinal welded steel pipes with diameters from 508 mm to 1,420 mm | 508–1,420 | 8.0–45.0 | K42–K60 | 410–590 | 245–460 | 20–16 | 39.2–59.0 (–60 °C) | 34.0–59.0<br>(–20 °C, –40 °C, –60 °C) | 50 (–40 °C)<br>in impact test pieces | 120 / 180 |
| TU 24.20.21-099-57357928-2022<br>Longitudinal electric-welded steel pipes, pipe grade K65, with outer diameter ranging from 508 to 1,420 mm and high deformation capacity for gas pipelines with an operating pressure of up to and 11.8 MPa inclusive, crossing zones of active tectonic faults, permafrost, and zones of increased seismicity; fit for use in areas with weak, heaving, and subsiding soils | 508–1,422 | 8.0–48.0 | K65 | 650–760 | 555–665 | 18–19 | 60 | 160–250 | 85 | 180 |
| TU 24.20.21-011-57357928-2023<br>Longitudinal electric-welded steel pipes, K70 pipe grade, for main gas pipelines with an operating pressure of up to 14.71 MPa inclusive | 530–1,420 | 9.9–38.1 | K70 | 700–850 | 600–750 | 16 | - | 250–320 | 85 | 180 |
| TU 24.20.21-017-57357928-2024<br>Longitudinal electric-welded steel pipes with diameters from 508 to 1,422 mm for pipelines | 508–1,422 | 7.0–45.0 | K52–K65<br>X56–X80 | 510–640<br>490–625 | 355–555<br>390–555 | 18.0–20.0 | cat. C: 40–60 (–40 °C)<br>cat. D: 40–60 (–60 °C) | cat. C: 50–90 (–5 °C)<br>cat. D: 50–130<br>(–20 °C, –30 °C, –40 °C)<br>cat. E: 53–180<br>(–20 °C, –30 °C, –40 °C) | cat. C: 85 (–5 °C)<br>cat. D: 85<br>(–20 °C, –30 °C, –40 °C)<br>cat. E: 85<br>(–20 °C, –30 °C, –40 °C) | 180 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |

# LONGITUDINAL WELDED PIPE PRODUCTION PROCESS, 508–1,422 MM MILL (VOLZHSKY)

**1** Plate handling



**2** Milling of longitudinal edges of the plate



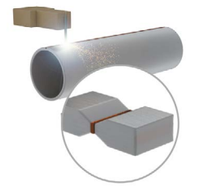
**3** Bending



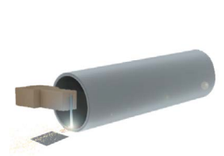
**4** Post-bending



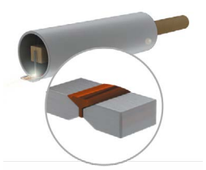
**5** Preparation, tack welding



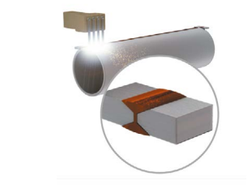
**6** Run-off tab welding



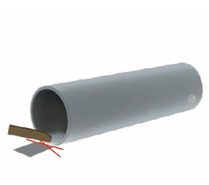
**7** Welding of the internal seam



**8** Welding of the external seam



**9** Removal of weld reinforcement at the ends and run-off tabs



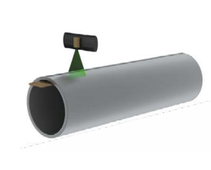
**10** Preliminary visual inspection



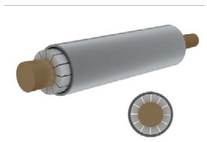
**11** Ultrasonic inspection



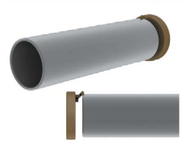
**12** X-ray inspection



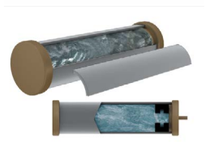
**13** Expansion



**14** Pipe end finishing



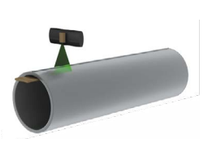
**15** Hydrostatic testing



**16** Ultrasonic inspection



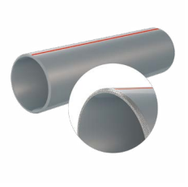
**17** Radiography



**18** Bevel cutting



**19** Visual and dimensional inspection, magnetic particle inspection



**20** Labeling and weighing

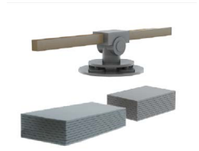


**21** Packaging, storage

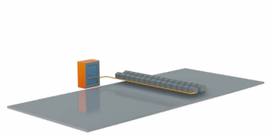


# LONGITUDINAL WELDED PIPE PRODUCTION PROCESS, 508–1,422 MM MILL (CHELYABINSK)

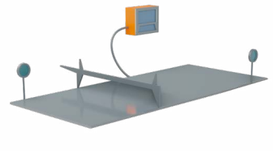
**1** Plate handling



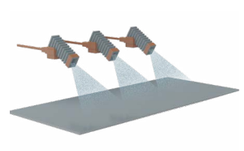
**2** Plate ultrasonic inspection



**3** Plate geometric parameter control



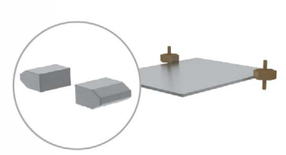
**4** Plate shot blasting



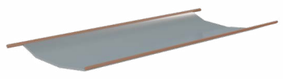
**5** Tab welding



**6** Plate longitudinal edge milling



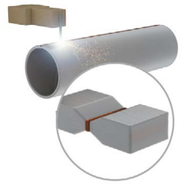
**7** Edge pre-bending



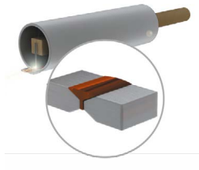
**8** Pipe stock step forming



**9** Fit-up, technological seam welding



**10** Welding of the internal seam



**11** Welding of the external seam



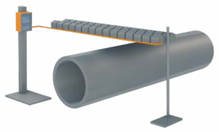
**12** External seam slug crust removal



**13** Tab cutting-off



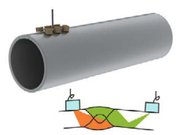
**14** Automatic control of pipe stock geometry



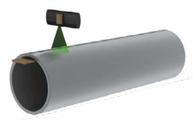
**15** Preliminary visual control



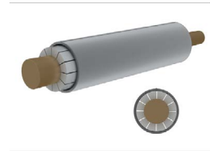
**16** Ultrasonic inspection



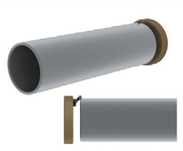
**17** X-ray inspection



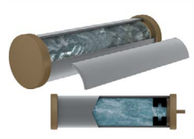
**18** Expansion



**19** Pipe end finishing



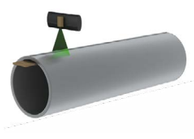
**20** Hydrostatic testing



**21** Ultrasonic inspection



**22** X-ray inspection



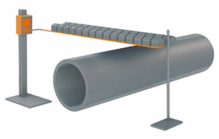
**23** Bevel cutting



**24** Visual and dimensional inspection, magnetic particle inspection



**25** Automatic control of finished pipe geometry



**26** Labeling and weighing

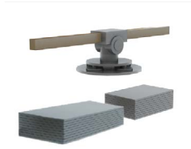


**27** Packaging, storage



# LONGITUDINAL WELDED PIPE PRODUCTION PROCESS, 530–820 MM MILL (CHELYABINSK)

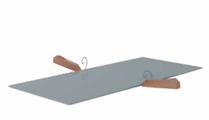
**1** Plate handling



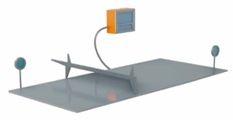
**2** Plate leveling



**3** Plate cutting



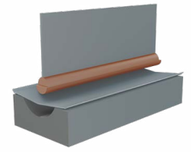
**4** Plate width measurement



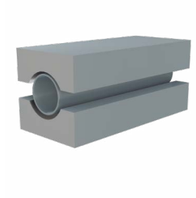
**5** Plate edge pre-bending



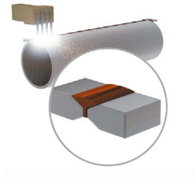
**6** Preliminary pipe stock forming



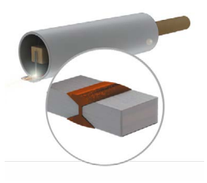
**7** Final pipe stock forming



**8** Fit-up and welding of the external seam



**9** Welding of the internal seam



**10** Preliminary visual inspection



**11** Ultrasonic inspection



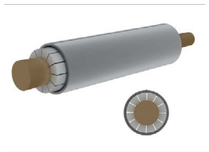
**12** X-ray inspection



**13** Pipe end plasma cutting



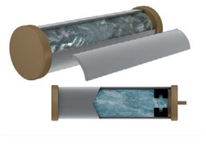
**14** Expansion



**15** Pipe end finishing



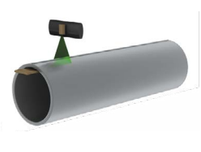
**16** Hydrostatic testing



**17** Ultrasonic inspection



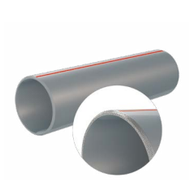
**18** X-ray inspection



**19** Bevel cutting



**20** Visual and dimensional inspection, magnetic particle inspection



**21** Labeling and weighing

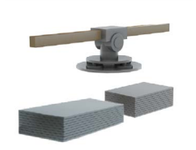


**22** Packaging, storage



# LONGITUDINAL WELDED PIPE PRODUCTION PROCESS, 1,020–1,220 MM MILL (CHELYABINSK)

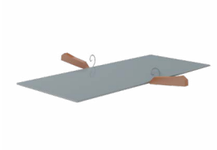
**1** Plate handling



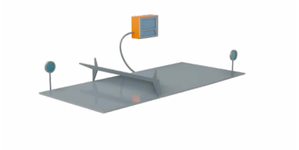
**2** Plate leveling



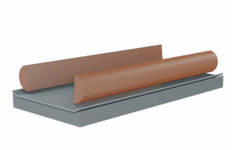
**3** Plate cutting



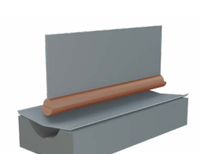
**4** Plate width measurement



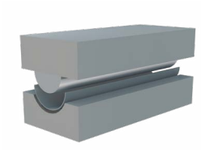
**5** Plate edge pre-bending



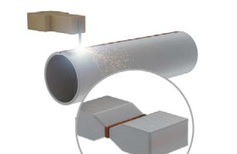
**6** Preliminary pipe stock forming



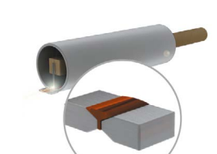
**7** Final pipe stock forming



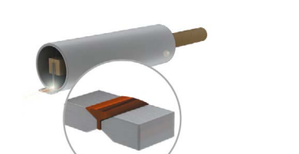
**8** Fit-up, welding of two technological seams



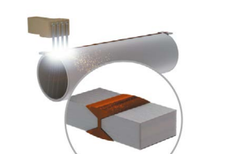
**9** Welding of first internal seam



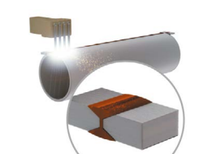
**10** Welding of second internal seam



**11** Welding of first external seam



**12** Welding of second external seam



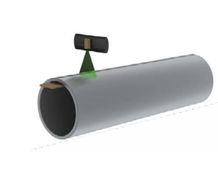
**13** Preliminary visual inspection



**14** Ultrasonic inspection



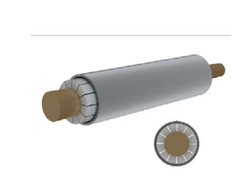
**15** X-ray inspection



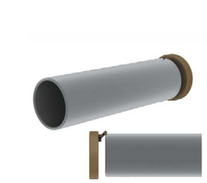
**16** Pipe end plasma cutting



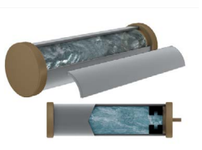
**17** Expansion



**18** Pipe end finishing



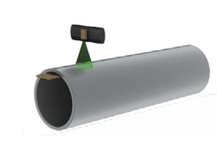
**19** Hydrostatic testing



**20** Ultrasonic inspection



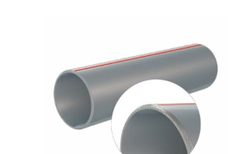
**21** X-ray inspection



**22** Bevel cutting



**23** Visual and dimensional inspection, magnetic particle inspection



**24** Labeling and weighing



**25** Packaging, storage





# PRODUCTION OF LONGITUDINAL HIGH-FREQUENCY INDUCTION WELDED LDP FROM STEEL COILS

3

Longitudinal welded large-diameter pipes are manufactured by HFI welding from steel coils at the TMK facility located in Polevskoy, Sverdlovsk Oblast.

The products are designed to meet the demands of oil and gas companies in Russia and the CIS utilizing electric-welded longitudinal pipes for oil and gas production and transportation, as well as the growing needs of the construction industry.

The plant's location facilitates efficient product transportation to the oil and gas provinces of KhMAO, YNAO, and Siberia.

# TABLE OF STANDARDS

| Standards | Pipe dimensions | | Pipe grade |
|---|---|---|---|
| | Outside diameter, mm | Wall thickness, mm | |
| 1 | 2 | 3 | 4 |
| API* 5L<br>Specification for line pipes. PSL-1 | 508 | 6.35-11.91 | A; B; X42 |
| DIN EN 10217-1<br>Welded steel tubes for pressure purposes | 508 | 6.3-11.0 | P235TR1; P265TR1 |
| DIN EN 10219-1 and 10219-2<br>Cold formed welded structural hollow sections of non-alloy and fine grain steels | 508 | 6.0-12.0 | S235JRH; S275J0H; S275J2H<br>S355J0H; S355J2H |
| GOST 10704/10705<br>Electrically welded steel pipes | 530 | 7.0-12.0 | St.2, St.3, 10, 20, 22GYu,<br>09G2S, 17G1S, 17G1S-U |
| GOST 20295-85<br>Steel welded pipes for main gas-and-oil pipelines. Technical requirements | 530 | 7.0-12.0 | K34; K38; K42; K48; K50; K52 |
| TU 14-162-173-2019<br>Longitudinal electric-welded steel pipes for field pipelines, technological pipelines and general purpose field applications | 530 | 7.0-12.0 | K34; K38; K42; K46; K50; K52 |
| TU 14-162-180-2022<br>Longitudinal electric-welded steel pipes for field applications | 530 | 7.0-12.0 | 09G2S, 17G1S-U, 20A |
| TU 14-162-174-2020<br>Electric-welded steel line pipes for oil and gas pipelines | 530 | 7.0-12.0 | K42; K46; K50; K52 |
| 1 | 2 | 3 | 4 |

# PROCESS FLOWCHART: PRODUCTION OF MEDIUM-DIAMETER WELDED PIPES (POLEVSKOY)

**1** Strip preparation



**2** Edge trimming



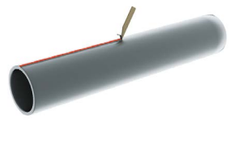
**3** Strip forming



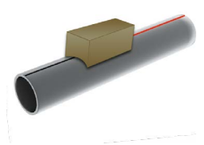
**4** High-frequency welding



**5** External and internal flash removal



**6** Heat treatment of the weld seam



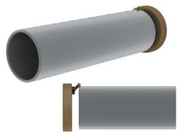
**7** Cooling, sizing and straightening of continuous pipes



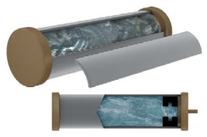
**8** Saw cutting to length



**9** Pipe end finishing



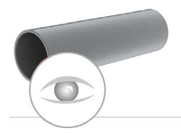
**10** Hydrostatic testing



**11** Non-destructive testing of the weld seam



**12** Visual inspection, dimensional control, labeling of pipes



**13** Packaging, storage






# EXTERNAL PIPE COATING

4

TMK production capacities can apply the following types of external anticorrosion pipe coating (including highly reinforced coating):

- Two-layer polyethylene coating
- Three-layer polyethylene and polypropylene coating
- Monolayer polyethylene coating
- Single and two-layer epoxy coating
- External protective coating.

The coating is applied to the external surface of welded and seamless pipes with diameters ranging from 114 to 1,420 mm. The operating temperature of the pipes ranges from -60 °C to +80 °C (for polyethylene coating) and from -20 °C to +110 °C (for polypropylene coating).

# TABLE OF EXTERNAL ANTICORROSION COATING STANDARDS

| Standards | Purpose of coating |
|---|---|
| 1 | 2 |
| DIN 30670:2012<br>Polyethylene coatings on steel pipes and fittings – Requirements and testing | Protection of buried or submerged steel pipelines |
| DIN 30678:2013<br>Polypropylene coatings on steel pipes and fittings – Requirements and testing | For the protection of buried or submerged pipelines at temperatures from minus 20 °C to 110 °C |
| ISO 21809-1-2018<br>Petroleum and natural gas industries. External coatings for buried or submerged pipelines used in pipeline transportation systems Part 1: Polyolefin coatings (3-layer PE and 3-layer PP) | Corrosion protection of welded and seamless steel pipes for pipeline transportation systems in the petroleum and natural gas industries |
| GOST 31448-2012<br>Steel pipes with external protective coating for main oil and gas pipelines | For the construction and repair of main gas pipelines, oil pipelines, and petroleum product pipelines |
| GOST R 51164-98<br>Steel main pipelines. General requirements for corrosion protection | Protection of the external surface of steel main pipelines from underground and atmospheric corrosion |
| GOST 9.602-2016<br>Underground structures. General requirements for corrosion protection | Corrosion protection of the external surface of underground steel structures: pipelines transporting natural gas (main and distribution gas pipelines), crude oil, petroleum products, and their branch lines; water pipelines; piles, sheet piles, columns, and other load-bearing underground steel structures |
| 1 | 2 |

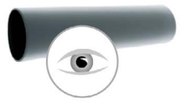
| Standards | Purpose of coating |
|---|---|
| 1 | 2 |
| TU 24.20.13-003-57357928-2022<br>Seamless and welded steel pipes with diameters ranging from 219 to 1,420 mm, inclusive, with external three-layer protective coating based on extruded polyethylene | For the construction, reconstruction, and major repairs of underground and subsea main pipeline facilities; for protective casings during the construction of main pipeline crossings over natural and artificial barriers |
| TU 24.20.13-118-57357928-2022<br>Steel pipes with external protective polyethylene coating | For the construction, reconstruction, and major repairs of underground and aboveground pipeline facilities; for crossings over natural and artificial barriers constructed using directional drilling |
| TU 24.20.13-160-57357928-2022<br>Steel pipes with external protective polyethylene coating | For the construction, reconstruction, and repair of field pipelines laid underground and above ground at oil, gas, and gas condensate fields |
| TU 24.20.13-045-57357928-2022<br>Steel pipes with external anticorrosion polypropylene coating | For the construction, reconstruction, and major repairs of high-temperature sections of underground gas pipelines and their branches, high-temperature process gas pipelines, and marine (subsea) sections of gas pipelines, as well as sections of gas pipelines laid using directional drilling |
| TU 24.20.13-223-57357928-2022<br>Seamless and welded steel pipes with diameters ranging from 114 to 1,420 mm with external protective polyethylene coating | For the construction, reconstruction, and major repairs of underground and subsea main pipeline facilities. For protective casings during the construction of main pipeline crossings over natural and artificial barriers |
| TU 24.20.13-222-57357928-2022<br>Electric-welded or seamless steel pipes<br>with external anticorrosion polypropylene coating | For the construction, reconstruction, and major repairs of high-temperature sections of underground gas pipelines and their branches, high-temperature process gas pipelines, and marine (subsea) sections of gas pipelines, as well as sections of gas pipelines laid using directional drilling |
| TU 24.20.13-014-57357928-2022<br>Steel pipes with external anticorrosion polyethylene coating for gas pipelines | For the construction, reconstruction, and major repair of underground and offshore (subsea) gas pipelines and their branches, as well as sections of gas pipelines laid using directional drilling |
| TU 24.20.13-220-57357928-2022<br>Steel pipes with external anticorrosion polyethylene coating for gas pipelines | For the construction, reconstruction, and major repair of underground and offshore (subsea) gas pipelines and their branches, as well as sections of gas pipelines laid using the directional drilling method |
| TU 24.20.13-225-57357928-2022<br>Steel pipes with diameters ranging from 114 to 1,420 mm with extruded polyethylene-based external coating | For the construction of field and process pipelines, underground, subsea, and above-ground (in embankments) general-purpose pipelines and their branches |
| TU 24.20.13-226-57357928-2022<br>Seamless and welded steel pipes with external protective coating based on extruded polyethylene for offshore production and main pipelines | For the construction of production and main oil and gas pipelines. Protection of pipelines against external corrosion during subsea installation |
| TU 24.20.13-148-57357928-2022<br>External two-layer epoxy coating for pipes | For the construction, reconstruction, major repair; as well as for pipes<br>with diameter of up to 1,420 mm inclusive designed for use as protective casings |
| TU 24.20.13-007-57357928-2023<br>Steel pipes with external anticorrosion epoxy coating for liquid and gas pipeline transportation systems | For the construction of liquid and gas pipeline transportation systems |
| TU 24.20.13-008-57357928-2023<br>Steel pipes with external anticorrosion polyethylene coating for liquid and gas pipeline transportation systems | For the construction of liquid and gas pipeline transportation systems |
| TU 24.20.13-056-57357928-2022<br>Steel pipes with external anticorrosion single-layer epoxy coating | For subsequent application of polyurethane foam thermal insulation in a protective sheath, and for use in the construction, reconstruction, and repair of main pipelines, product pipelines, field and process pipelines, pumping and compressor stations, and other gas industry facilities |
| TU 24.20.13-123-57357928-2022<br>Steel pipes with external anticorrosion epoxy coating | For the construction, reconstruction, and major repair of pipelines laid underground and above ground (in embankments), and for protective casings in the construction of pipeline crossings over natural and artificial barriers, and for the subsequent application of polyurethane foam thermal insulation with a protective sheath |
| TU 24.20.13-158-57357928-2022<br>Steel pipes with external anticorrosion epoxy coating | For the construction, reconstruction, and major repair of pipelines laid underground and above ground (in embankments), and for protective casings in the construction of pipeline crossings over natural and artificial barriers, and for the subsequent application of polyurethane foam thermal insulation with a protective sheath |
| TU 24.20.13-023-57357928-2024<br>Steel pipes with external anticorrosion polyethylene coating for pipelines | For the construction, reconstruction, and major repair of underground and offshore (subsea) gas pipelines and their branches. With additional protection from solar radiation pipes with external anticorrosion polyethylene coating may be used for above-ground pipeline installation |
| TU 24.20.13-018-57357928-2025<br>Pipes with external protective glass-reinforced thermoplastic coating | For comprehensive protection of the pipe surface, including external anticorrosion coating against mechanical damage during the construction, reconstruction and major repair of pipelines |
| 1 | 2 |





# EXTERNAL COATING APPLICATION PROCESS

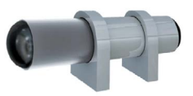
**1** Pipe incoming inspection
(visual)



**2** Preheating in the gas furnace



**3** Abrasive blasting of the external pipe surface using steel grit in a shot blasting machine



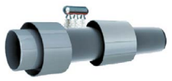
**4** Pipe internal surface purging to remove dust



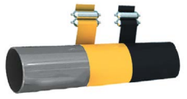
**5** Quality control of pipe surface preparation
(visual)



**6** Heating. Chromating.
Subsequent heating before coating



**7а** Two-layer PE or PP coating
1) Application of adhesive
2) Application of polyethylene
(or propylene)



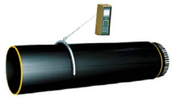
**7б** Three-layer PE or PP coating
1) Application of epoxy primer
2) Application of adhesive
3) Application of polyethylene
(or propylene)



**8** Water cooling of coated pipes



**9** Holiday testing with a high-voltage flaw detector



**10** Removal of coating from pipe ends



**11** Final quality control of coated pipes
(visual)



**12** Pipe labeling. Installation of protective parts.
Pipe storage



# PROPERTIES OF ANTICORROSION COATING

## THREE-LAYER EXTRUDED POLYETHYLENE COATING

| Property | Parameters |
|---|---|
| 1. Minimum thickness, μm | |
| 1st layer | 100–250 |
| 2nd layer | 150–400 |
| Total thickness | 2,000–4,000 (depending on requirements) |
| 2. Cut-back length, mm | 80–180 |
| coating bevel, deg. | 20–45 |
| 3. Adhesive strength, N/cm width | |
| at t +20 ± 5°C | 250 |
| at t +80 ± 3°C | 100 |
| 4. Maximum indentation resistance, mm | |
| at t +25 ± 2°C | 0,2 |
| at t +80 ± 3°C | 0,3 |
| 5. Minimum impact strength, J | |
| at t +23 ± 2°C | 18 |
| 6. Elongation at break, % | |
| minimum, at t -45 ± 5°C | 100 |
| 7. Cathodic disbondment of coating, maximum, $cm^2$ | 4 |
| 8. Degree of cure of epoxy primer | - 2 < ΔTg < + 3 |







# PROPERTIES OF PROTECTIVE GLASS-REINFORCED THERMOPLASTIC COATING (GTC)

| Property | Parameters | |
|---|---|---|
| | Standard GTC Design | Special GTC Design |
| 1. GTC thickness | 3.0–8.0 mm | 6.0–14.0 mm |
| 2. Indentation impact resistance, min. | 280 J | 400 J |
| 3. Indentation puncture resistance, min. | 30 kN | 70 kN |
| 4. Longitudinal indentation shear resistance, min. | - | 14 kN |
| 5. GTC shear resistance relative to anticorrosion coating, min. | - | 0.6 MPa |
| 6. Adhesion strength, min. | 0.6 MPa | 0.6 MPa |
| 7. Interlayer adhesion, min.: | | |
| - initial value | 0.6 MPa | 0.6 MPa |
| - after 1,000 hours of exposure to water at a temperature of (60±3) °C | 0.6 MPa | 0.6 MPa |
| 8. GTC resistance to thermal cycling at temperatures from minus (60±3) °C to plus (23±5) °C, min. | 5 cycles | 5 cycles |



# INTERNAL PIPE COATING

5

TMK production capacities can apply the following types of internal coating on the pipe:

- internal flow (antifriction) coating
- protective coating

Internal coating can be applied either before or after external coating application.

Internal flow coating enhances pipeline by reducing losses during transportation, while protecting the pipe interior from atmospheric corrosion during transportation, storage, and installation. This coating can be applied to pipes with diameters ranging from 530 to 1,422 mm.

The allowable pipe operating temperature for long-term gas pipeline service ranges from -20 °C to +80 °C.

The internal protective coating is designed to prevent corrosion on the internal pipe surface in water supply systems, including drinking water pipelines, agricultural water supply lines, and sewage systems.

The coating can be applied to pipes with diameters ranging from 530 to 1,422 mm. The allowable long-term operating temperature for these pipelines ranges from +5 °C to +60 °C.

# STANDARDS. COATING PROPERTIES

| Standards | Purpose of coating |
|---|---|
| API* 5L2 (RP 5L2)-2015<br>Recommended Practice for Internal Coating of Line Pipe for Non-corrosive Gas Transmission Service (smooth coating) | For non-corrosive gas transmission. The coating is intended for drag reduction in gas pipelines and for the protection of internal surface of the pipes against atmospheric corrosion during transportation, storage, and construction and installation works |
| DIN EN 10301<br>Internal coating for the reduction of friction for conveyance of non-corrosive gas | For the reduction of friction of tubes and pipeline fittings for conveyance of non-corrosive gas |
| TU 24.20.13-227-57357928-2022<br>Electric-welded steel pipes with internal anticorrosion coating for water pipelines | For the construction, reconstruction, and major repair of water pipelines, agricultural water supply pipelines, and sewerage systems. Corrosion protection of the internal surface of pipelines |
| TU 24.20.13-005-57357928-2022<br>Electric-welded steel pipes with internal flow coating for the construction of main gas pipelines | For the construction, reconstruction, and major repair of main gas pipelines and their branches, including offshore gas pipelines.<br>The coating is designed to reduce the hydraulic resistance of gas pipelines, as well as to protect the internal surface of the pipes from atmospheric corrosion during transportation, storage, and construction and installation work |
| TU 1390-017-00186654-2009<br>Electric-welded steel pipes with diameters ranging from 530 to 1,420 mm with internal anticorrosion coating for the construction of water pipelines | For the construction, reconstruction, and major repair of underground and underwater water pipelines, including those for drinking water with an operating temperature of up to +60 °C |

| Standards | Purpose of coating |
|---|---|
| TU 24.20.13-221-57357928-2022<br>Electric-welded steel pipes with internal flow coating for gas pipelines | For the construction, reconstruction, and major repair of gas pipelines and their branches |
| TU 24.20.13-072-57357928-2022<br>Electric-welded steel pipes for the oil industry with internal anticorrosion coating | For the construction, reconstruction, and major repair of oilfield pipelines |
| TU 24.20.13-112-57357928-2022<br>Electric-welded steel pipes with internal anticorrosion coating | For the construction, reconstruction, and repair of field, process, and on-site pipelines |
| TU 24.20.13-166-57357928-2022<br>Steel pipes with internal anticorrosion coating | For the construction, reconstruction, and repair of field pipelines for underground and aboveground (in embankments) construction in oil, gas, and gas condensate fields |
| TU 24.20.13-004-57357928-2023<br>Electric-welded steel pipes with internal anticorrosion coating for fluid and gas pipeline transportation systems | For the construction and reconstruction of fluid and gas pipeline systems |

## COATING PROPERTIES: INTERNAL FLOW COATING

| Property | Measuring unit | Norm |
|---|---|---|
| 1. Thickness of cured coating | μm | 60–150 |
| 2. Cross-cut test of coating adhesion, maximum | points | 1 |
| 3. Maximum adhesion of coating after holding for 240 hours in water at (20±5) with the cross-cut test | points | 2 |
| 4. Maximum coating resistance to bending | mm | 10 |
| 5. Minimum Buchholz hardness | hardness units | 94 |
| 6. Maximum number of pores in the coating<br>a) uncured<br>b) cured | pores/cm$^2$ | <br>0<br>1 |
| 7. Coating resistance to changes in gas pressure | – | No bubbles or damage after the 10th cycle |
| 8. Coating resistance to changes in hydraulic pressure | – | No bubbles or damage after the 1st cycle |
| 9. Resistance against exposure to salt spray at (25±3) °C for 240 hours | – | Absence of bubbles and peeling |
| 10. Maximum coating roughness (Rz) | μm | 15 |

## PROTECTIVE COATING

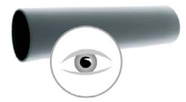
| Property | Measuring unit | Norm |
|---|---|---|
| 1. Minimum thickness of cured coating | μm | 250–400 (depending on requirements) |
| 2. Determination of adhesion by X-cut test method | points | 0 or 1 |
| 3. Pull-off test for adhesion, minimum | kgf/cm$^2$ | 50 |
| 4. Degree of cure of coating | – | No softening or washout |
| 5. Resistance against exposure to 1% solution of NaOH and/or $H_2SO_4$ at (24±3) °C for 30 days | – | No blistering or peeling |
| 6. Resistance against exposure to water at (24±5) °C for 30 days | – | No blistering or peeling |





# INTERNAL COATING APPLICATION PROCESS

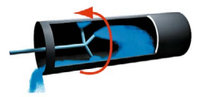
**1** Pipe incoming inspection



**2** Pipe heating



**3** Degreasing of internal surface of the pipe



**4** Second heating of the pipe



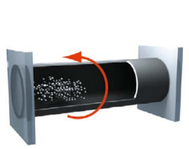
**5** Cleaning of pipe internal surface in shot blasting machine No. 1



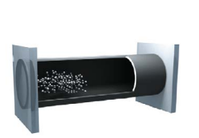
**6** Quality control of shot blasting of the internal surface of the pipe



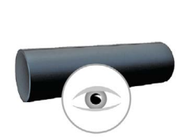
**7** Treatment of pipe internal surface in shot blasting machine No. 2



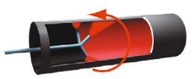
**8** Internal surface purging



**9** Quality control of preparation of the internal surface of the pipe



**10** Pipe coating
(in the coating booth)



**11** Precuring of internal pipe coating



**12** Induction heating of the pipe



**13** Coating curing in the full polymerization chamber



**14** Quality control of the internal flow coating of the pipe



**15** Pipe labeling.
Pipe storage with protective canvas caps





# THERMAL INSULATION COATING OF PIPES

6

TMK production capacities (Chelyabinsk) can apply thermal insulation coating on pipes with the following types of outer jackets:

- Made of galvanized steel for aboveground and cased pipelines
- Made of steel with polymer coating for underground pipelines
- Made of polyethylene for underground and aboveground pipelines

Thermal insulation coating is designed to maintain the temperature of the transported product, prevent heat loss, and mitigate the negative impact of elevated temperatures on the environment.

Polyurethane foam insulated pipes can be equipped with fire barriers, indicator wires for the continuous leakage monitoring system, and tubes for the installation of skin-effect pipeline heating systems.

Allowable ambient temperature for handling products with thermal insulation:

- During transportation, storage and operation for pipes with galvanized steel jackets or steel with polymer jackets: -60°C to +60°C; for pipes with polyethylene jackets: -20°C to +60°C
- During loading/unloading, construction and installation for pipes with galvanized steel jackets or steel with polymer jackets: -50°C to +60°C; for pipes with polyethylene jackets: -20°C to +60°C.



# STANDARDS. COATING PROPERTIES

| Standards | Purpose of coating |
|---|---|
| GOST 30732-2020<br>Steel pipes and shaped products with foamed polyurethane thermal insulation in protective sheath | Pipes and fittings for underground heating networks (uncased, in ducts impassable for people or in crawl space; or, when steel galvanized sheath is provided, in service ducts or tunnels) or aboveground heating networks (hereinafter referred to as insulated pipes and fittings) with the following design parameters of heat transfer medium (superheated water): working pressure according to the design documentation and temperature up to 150°C, with heat supply control range of 150°C to 70°C |
| TU 23.99.19-055-57357928-2022<br>Steel pipes and fittings with foamed polyurethane thermal insulation in protective sheath | For the construction, reconstruction, and repair of main pipelines, product pipelines, field and process pipelines, pump and compressor station pipelines, and other gas industry facilities |
| TU 23.99.19.111-062-00186654-2018<br>Steel pipes and shaped parts with foamed polyurethane thermal insulation in protective sheath (based on GOST 30732) | For underground heating networks (uncased, in ducts impassable for people or in crawl space), for aboveground heating networks, in passable ducts or tunnels, with the following design parameters of heat transfer medium (superheated water): working pressure up to 1.6 MPa and temperature up to 150°C |
| TU 23.99.19-125-57357928-2022<br>Steel pipes and fittings with foamed polyurethane thermal insulation in protective sheath | For the construction, reconstruction, and repair of field and process pipelines, general-purpose pipelines, and other oil and gas production facilities |
| TU 24.20.13-161-57357928-2022<br>Steel pipes and fittings with foamed polyurethane thermal insulation in protective sheath | For the construction, reconstruction, and repair of field and process pipelines, general-purpose pipelines, and other oil and gas production facilities |
| TU 24.20.13-009-57357928-2023<br>Steel pipes and fittings with foamed polyurethane thermal insulation in protective sheath for liquid and gas pipeline transportation systems | For the construction of liquid and gas pipeline transportation systems |

# STANDARDS. COATING PROPERTIES

## PROPERTIES OF POLYURETHANE FOAM THERMAL INSULATION

| Наименование показателя | Значение показателя |
|---|---|
| 1. Appearance | Rigid cellular plastic of light yellow to light brown color with a uniform fine-cell structure |
| 2. Minimum apparent density, kg/m3 | 60 |
| 3. Minimum compressive strength at 10% deformation in radial direction, MPa | 0.3 |
| 4. Maximum thermal conductivity at (50±3) °C, W/m·K | 0.033 |
| 5. Maximum water absorption in a 90-minute boiling test, vol % | 10 |
| 6. Minimum axial shear strength at (23±2) °C, MPa | 0.12 |
| 7. Minimum tangential shear strength at (23±2) °C, MPa | 0.2 |

A complete list of tests and testing methods can be found in applicable technical standards.





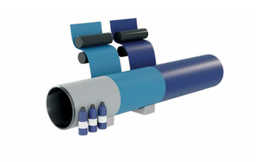


# THERMAL INSULATION APPLICATION PROCESS

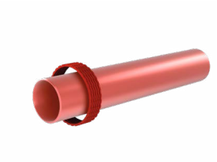
**1** Shell manufacturing (spiral winding machine)



**1.1** Anticorrosion coating (metal-polymer shells)



**2** Preliminary pipe and shell heating



**3** Pipe + shell assembly



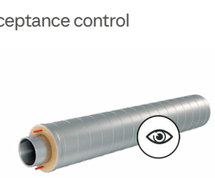
**4** Polyurethane foam pouring



**5** Thermal insulation end finishing



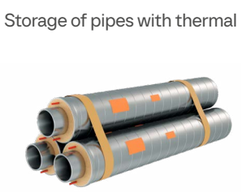
**6** Acceptance control



**7** Labeling



**8** Storage of pipes with thermal insulation



NOTES





NOTES

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***** API***** - Effective March 17, 2022, the API Monogram/APIQR Program ceased offering certification services within the Russian Federation in response to restrictions on financial and business activities imposed by the U.S. and Russian governments. As a result, now all TMK facilities are not authorized to apply the API Monogram on their products.

TMK facilities held API license continuously for over 25 years. They have vast experience in manufacturing pipes in accordance with API standards for the clients worldwide. Since 2003, TMK facilities have produced more than 3 million tons of casing, tubing, drill pipe and line pipe in accordance with API Standards and marked them with the API monogram.

The quality and reliability of TMK's products are confirmed by many years of supply experience.

Today, despite the restrictions on applying the API monogram, TMK facilities still have the right to declare that their products comply with API standards and specifications, provided that they actually comply with the requirements of the API standard or specification. As previously, the TMK facilities guarantee full compliance with the requirements of API Standards and the quality of supplied products.

In order to provide additional guarantees to our customers, in the summer of 2022 TMK facilities were inspected by AJA Registrars CIS ltd. According to the audit results, it was confirmed that TMK facilities comply with the requirements of API Spec. 5CT, API Spec. 5L, API Spec. 5DP and API Spec. Q1.

During the production of orders, an independent third-party inspection may be invited to ensure that all products are manufactured in strict compliance with API standards and customer specifications. The use of third-party testing laboratories may also be agreed upon.

This reference catalog is issued by TMK to provide general information on its products. TMK disclaims all responsibility or liability for any loss, damage or injury resulting from the use of the information contained in this catalog. Size ranges, specifications and standards need to be agreed with TMK's technical services.

## CONTACTS

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FOR SUPPLIERS

DEALERS

PRODUCT CATALOGS
OF TMK GROUP

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