



CATS ASSEMBLY SYSTEM
MEDIA DISTRIBUTION
STAINLESS STEEL PLIABLE CORRUGATED TUBES



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Preface

The company of AZ – Pokorný, s.r.o. is a flexible Czech manufacturer of stainless corrugated hoses and tubes, protective elements and other products designated first of all for the distribution of liquids and gases. One of the products of the company is the system of stainless pliable tubes - Cats.

The range of products manufactured includes both series-manufactured standard products and various individual solutions.

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1 Scope

1.1 This standard specifies requirements for the design, training, construction, assembly, installation, testing, commissioning, operation, repairs and maintenance of distribution pipework for:

- gas
- potable water (conditions of assembly depends on national regulations, see 5.2)
- water (any other except for potable water)
- liquids for cooling and heating systems
- compressed air
- steam
- other media subject to consultation with the manufacturer

1.2 As far as gas distribution systems are concerned, this standard applies to installation pipework, i.e. pipework downstream of the point of delivery, terminating at the appliance inlet connection

1.3 This standard is based on EN 1775:2008 and EN 15266. For the operating original pressure values see the Table 2

Important:

! *This document is continuously updated and amended. The current (last) version is always available on the web site of the manufacturer: www.az-pokorny.cz.*

2 Terminology

2.1

Cats system (variants WR04, WR16, WR316Ti)

a system of stainless steel corrugated tubes designated for the distribution of gas, water and other media.

WR04: tube material 1.4301 (AISI 304) – basic system material
 WR16: tube material 1.4404 (AISI 316L) – basic system material
 WR316Ti: tube material 1.4571 (AISI 316Ti) – only if so requested

NOTE The variants WR04 and WR16 may be sometimes referred to as WRO304 and WRO316

2.2

Cats-CE system (variant WR16-CE)

a part of the Cats system the tubes, joints and accessories of which comply with the standard EN 15266; tube material: 1.4404 (AISI 316L).

2.3

corrugated tube/hose

a thin-walled parallel-corrugated tube or hose, always made of stainless steel is subject to this standard.

2.4

gas

gaseous fuels of the 1, 2 and 3 family subject to EN 437 (for instance natural gas, LPG, manufactured gas).

2.5

manufacturer

AZ - Pokorný, s.r.o.

2.6

user

a party who creates the connection in the Cats system and/or installing Cats tubes in a distribution circuit (plumber, fitter).

2.7

authorised trainer

a person authorised by the manufacturer to train the users of the Cats system - the outcome of such a training is a certificate registered (verifiable) with the manufacturer.

2.8

Cats assembly system

non-ended Cats tubes including ending tools, end fittings, seals and other accessories supplied by the manufacturer. The system is designated for the made-to-measure preparation of the tube by a trained person.

2.9

ended Cats tube

a Cats tube ended by the manufacturer as requested by the customer. The tube may have pressed, brazed or welded end fittings. It may be shaped and provided with various types of coats, insulation and it may go with various accessories.

2.10

basic dimensions of the tube

the inner diameter of the tube in mm – ID and the outer diameter of the tube in mm – OD.

2.11

tube coating

a plastics coat firmly stuck to the tube (supplied by the manufacturer).

2.12

ending element

an element used for the ending of the tube by pressing (a union nut or male union thread).

2.13

coupling element

an element placed behind the ending element (behind the flat seal attached to the pressed end of the tube). It is used as a transition piece for the other system of thread type, dimension reduction coupling, distribution circuit branching (a reduction coupling, couplings, T-piece and the like).

2.14

non-system element

a coupling element not supplied by the manufacturer as a part of the Cats assembly system.

2.15

consultation with the manufacturer

a contact of the consulting party with the manufacturer in order to make clear the method of the use of the Cats system in the installation. If the subject-matter of the consultation is the application beyond the scope of application as permitted by this standard, any potential positive statement of the manufacturer has to be provided in writing (e-mail, letter etc.).

2.16

threaded joint

a disassemble joint the tightness of which is achieved by metal to metal contact within threads with the assistance of a sealant or contact surfaces.

2.17

corrugated tube

a pipe with a double plastics coat with a corrugated outer wall that improves the mechanical resistance of the tube.

2.18**gas leak protecting sleeve (G-sleeve)**

a tube, hose or pipeline of a gas-tight material through which the gas pipeline passes; it protects first of all the pipeline environs against gas leaks or, as the case may be, it may also protect the pipeline against effects of external forces – in such a case it assumes the function of a M-sleeve as well.

2.19**mechanical load protecting sleeve (M-sleeve)**

a tube or tubing designed to protect a gas pipeline against effects of external forces (mechanical impacts or excessive stress). If the structure of the M-sleeve complies with requirements to gas tightness, it functions as a G-sleeve, too.

2.20**gas installation pipework**

pipework downstream of the point of delivery, terminating at the appliance inlet connection.

NOTE 1 The point of delivery can be at a (main) means of isolation or at a meter connection.

NOTE 2 The point of delivery is typically nominated by the distribution system operator and may be defined in National Regulations or Codes of Practice.

2.21**outdoor gas installation pipework**

a part of the gas installation pipework outside the building downstream of the point of delivery from the main means of isolation to the beginning of the void of the gas pipeline in the outer peripheral wall.

2.22**indoor gas installation pipework**

a part of the gas installation pipework that starts at the void of the pipeline in the outer peripheral wall of the building and terminates at the appliance inlet connection.

2.23**riser**

Section of vertical installation pipework that is taller than one floor of a building.

2.24**terminology specified in the below referred to regulations is used for the purposes hereof:**

EN 1775 Gas supply – Gas pipework for buildings – Maximum operating pressure less than or equal to 5 bar – Functional recommendations

2.25**potable water**

water intended for human consumption (pursuant to the Council Directive 98/83/EC on the quality of water intended for human consumption)

3 General

3.1 Pursuant to EN 45020 art. 3.1, this Standard is a normative document containing technical specifications subject to art. 3.4 of EN 45020 based on the rules of the best available technology subject to art. 3.5 EN 45020. It was prepared by an expert authority in cooperation with the manufacturer – supplier of the system. This standard is a publicly available document. This standard is a document complying with the requirements imposed on the “Assembly and Installation Instructions”.

3.2 Only individual elements approved by the system supplier may be used for the connection of tubes and installation of the CATS system.¹⁾

¹⁾ The approval by the system supplier shall be written and demonstrable.

4 General technical requirements for the Cats system (for all media)

In this clause, the CATS system is generally described for all media. The conditions of the specific application are given in the clause 5.

4.1 Introduction

4.1.1 Versatile distribution pipework construction tool

Stainless corrugated tubes of the Cats system are a versatile tool for the construction of distribution pipework for various liquid and gaseous media. They may be installed in the distribution pipework of heating gases, water (including potable water), heating and cooling media, compressed air and other media. The tubes may be provided with non-removable plastics coats, plastics G-sleeves and insulation.

They are used for the construction of new liquid and gas pipework, repairs of existing pipework, for the connection of gas appliances, water taps, heating elements, radiators, fan coil convectors, sprinkler system heads, solar and cooling systems, heat exchangers and as a part of other systems such as gas-fired appliances, exchanger vessels, water heaters etc.

4.1.2 Features

A characteristic feature of these tubes is their pliability. Therefore, no shaped pieces need to be used in distribution pipework. The tubes may be easily bent in hand. After bending, the tubes keep their shape. This minimises assembly time and number of joints in the pipework. Another typical property is the versatility. A single system and one only tool is necessary for the in site construction of a made-to-measure pipework for various media and subject to different conditions using varied inner diameters.

4.1.3 Stainless steel corrugated tubes and hoses

The Cats system tubes application is similar to other pipeline types (steel, copper, plastics, multilayer etc.). However, the designer shall take into consideration their specific properties as described herein.

The stainless steel corrugated tubes shall not be mistaken for stainless steel corrugated hoses. At first sight, they may seem similar, but their range of application is considerably different. The tubes are designed for the construction of immovable parts of distribution pipework. The number of repeated bends at one place is limited, and therefore the tubes can be bent when installed rather than during operation. After the commissioning of the system, the tubes should be bent only in exceptional cases, for instance in the event of an unintentional movement of the distribution pipework (building settlement) that may be safely compensated by the tubing without any detriment to the tightness of the pipework.

Unlike the tubes, the stainless steel corrugated hoses are used for compensation of repeated movements (up to several thousands of movement cycles). AZ – Pokorný, s.r.o. manufactures corrugated hoses identified with the type symbols „WS“ and „VA/VA“.

4.2 Technical information and parameters

4.2.1 Tubes – DN dimensions, deviations, surfaces, coating

Cats tubes are manufactured in the dimensions from DN 8 to DN 50. The dimensions DN 8 to DN 25 may be processed by the Cats press. The dimensions DN 32 to DN 50 may be ended by welding, only, or, as the case may be, by brazing an ending element. For the tube dimensions see the Table 1.

Important:

! *Technical parameters of Cats tubes ended by the manufacturer are given in the instruction manual as supplied with a specific product.*

The manufacturer may provide the tubes by a plastics coating, thickness 0.5-1.0 mm in any colour design whatsoever. What have such a coating as a standard are tubes complying with EN 15266 – yellow colour (see 5.1.1).

As a standard, tubes without any ending are supplied in coils 5 or 60 meters each. The manufacturer supplies other lengths that are multiples of 5 meters.

Deviations of the length of tubes with ending are generally specified by the manufacturer as follows:

- Up to 2000 mm of the rated length: $-2/+10$ mm
- Above 2000 mm of the rated length: $\pm 0,5$ %
- Any tubes as supplied in other lengths are subject to the same bottom tolerance limit, however, there is not upper tolerance limit for them.
- Individual tubes with ending provided for by the manufacturer may have different deviations specified in the product documentation.

Important:

- | |
|--|
| <p>! <i>Should the shape of a tube be changed in any way (for instance it is supplied as coil and thereafter it is straightened again), its length is changed</i></p> <p>! <i>If exposed to pressure, the tube gets elongated (up to 5 % in extreme cases). The permanent elongation after the exposure to such a pressure may be up to 2 %. In general, the bigger is the internal diameter and pressure load, the larger is the elongation. For further details on the elongation please contact the manufacturer</i></p> <p>! <i>The tube gets permanently elongate also if exposed to tension (in order of hundreds of Newton)</i></p> |
|--|

Table 1 – Tube dimensions

| Designation | Dimension | Dimension to EN 15266 | Outer Ø | | Inner Ø | | Pitch of the wave | | Wall thickness | | Weight | Surface | Volume | Note | Nut thread* | Article No. ** | |
|--------------|-----------|-----------------------|---------|------|---------|--------------|-------------------|------|----------------|---------------------|--------|---------|--------|------|-------------|----------------|------------|
| | | | [mm] | [mm] | [mm] | [mm] | [mm] | [mm] | [kg/m] | [m ² /m] | | | | | | [l/m] | AISI 304 |
| DN 8 | DN 8 | - | 11.7 | ±0.2 | 8.1 | +0.4 -0.2 | 4.2 | ±0.2 | 0.26 | ±0.02 | 0.10 | 0.05023 | 0,068 | A | G3/8 | 14-002-001 | 14-002-101 |
| DN 12 | DN 12 | DN 12 | 15.6 | ±0.2 | 12.0 | +0.4 -0.2 | 5.0 | ±0.2 | 0.30 | ±0.02 | 0.14 | 0.06065 | 0,137 | A | G1/2 | 14-002-002 | 14-002-102 |
| DN 12 (16.8) | DN 12 | DN 12 | 16.8 | ±0.1 | 13.0 | +0.4 -0.2 | 5.0 | ±0.2 | 0.30 | ±0.02 | 0.15 | 0.07040 | 0,180 | B | G1/2 | 14-002-008 | 14-002-108 |
| DN 16 | DN 16 | DN 15 | 20.1 | ±0.2 | 15.7 | +0.4 -0.2 | 5.5 | ±0.2 | 0.30 | ±0.02 | 0.18 | 0.07923 | 0,235 | A | G3/4 | 14-002-003 | 14-002-103 |
| DN 18 | DN 18 | DN 15 | 21.6 | ±0.2 | 17.9 | +0.4 -0.2 | 5.0 | ±0.2 | 0.30 | ±0.02 | 0.17 | 0.08445 | 0,272 | B | G3/4 | 14-002-004 | 14-002-104 |
| DN 20 | DN 20 | DN 20 | 25.0 | ±0.2 | 19.7 | +0.4 -0.2 | 6.4 | ±0.2 | 0.30 | ±0.02 | 0.23 | 0.10425 | 0,366 | A | G1 | 14-002-005 | 14-002-105 |
| DN 23 | DN 23 | DN 20 | 27.9 | ±0.2 | 23.0 | +0.4 -0.2 | 6.5 | ±0.2 | 0.30 | ±0.02 | 0.25 | 0.11145 | 0,477 | B | G1 | 14-002-006 | 14-002-106 |
| DN 25 | DN 25 | DN 25 | 32.8 | ±0.2 | 26.5 | +0.4 -0.2 | 7.1 | ±0.3 | 0.30 | ±0.02 | 0.32 | 0.14350 | 0,655 | A | G5/4 | 14-002-007 | 14-002-107 |
| DN 32 | DN 32 | - | 41.0 | ±0.4 | 33.0 | ±0.4 | 7.6 | ±0.4 | 0.35 | ±0.02 | 0.48 | 0.18738 | 1,005 | C | - | 14-002-009 | 14-002-109 |
| DN 40 | DN 40 | - | 47.7 | ±0.4 | 40.0 | ±0.4 | 8.8 | ±0.4 | 0.35 | ±0.02 | 0.57 | 0.20967 | 1,422 | C | - | 14-002-010 | 14-002-110 |
| DN 50 | DN 50 | - | 61.0 | ±0.4 | 51.0 | ±0.4 | 9.4 | ±0.4 | 0.40 | ±0.02 | 0.84 | 0.28747 | 2,339 | C | - | 14-002-011 | 14-002-111 |

* The thread of the union nut of the assembly system. In the event the tube ending is provided by the manufacturer, the dimension of the nut for the given dimension may differ.

** The article number of the manufacturer depends on the tube material: 1.4301 (AISI 304) and 1.4404 (AISI 316L)

- A. The standard dimension of the assembly system (it may be pressed by the Cats press)
- B. The optional dimensions of the assembly system – if requested so by the customer (if appropriate jaws are purchased, the Cats press may be used)
- C. It is not supplied with the assembly system (supplied as an ended tube with required ending pieces)

4.2.2 Operating pressure, design pressure, rupture pressure

For the operating pressure for individual media and ending types see the Table 2.

Table 2 - Operating pressures for various media and types of ending

| Medium | DN 8 to DN 25 | | | | | DN 32 to DN 50 | |
|----------------|---------------|--------|--------|----------------|---------------|----------------|--------|
| | Ending type | | | | | | |
| | Pressed | Welded | Brazed | to EN 15266 | clamping ring | Welded | Brazed |
| Gas | 0.5 bar | 5 bar | 5 bar | 0.5 bar | 0.5 bar | 5 bar | 5 bar |
| Potable water* | 10 bar | 10 bar | - | Non applicable | 10 bar | 5 bar | - |
| Other media** | 16 bar | 16 bar | 16 bar | Non applicable | 10 bar | 5 bar | 5 bar |

* The value is based on the maximum operating pressure in the potable water distribution pipework. The other water media (except potable water) pressure is defined subject to the line "other media".

** "Other media" include media as specified in 4.2.6. The maximum operating pressure for media not specified in this clause is determined by the manufacturer individually for specific applications.

Table 3 - Additional pressure data

| | | |
|-----------------------------------|----------------|-------|
| Design pressure: | DN 8 to DN 25 | PN 16 |
| | DN 32 to DN 50 | PN 5 |
| Rupture original pressure: | 140 – 220 bar | |

4.2.3 Pressure losses

Pressure losses in the Cats tubes are affected by the tube corrugation. For their basic values see the Tables 4, 5 and 6. What is more practical is to open the Excel file with calculations and diagrams that is available on the manufacturer's web site: www.az-pokorny.cz => section „Download“.

This file may be used for an exact dimensioning of lines after entering the following data: inner diameter, length, pressure, temperature, number of bends and their angle and radius, medium transported, required flow rate values etc. What is an outcome is a diagram and tables of pressure losses including a comparison of the effects of the of pressure losses including a calculation of the power (inferior and superior calorific values) where can also be compared results with different entered number of bends. All resulting values were obtained by means of calculation.

Table 4 - Water flow rate at the pressure loss of 0.5 bar

| Flow rate [in m ³ /h] at the pressure loss Δp 50000 Pa (0.5 bar) – medium: water (H ₂ O) | | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | DN 12 | DN 12 (16,8) | DN 16 | DN 18 | DN 20 | DN 23 | DN 25 |
| Length [m] | (ID 12.0 mm) | (ID 13.0 mm) | (ID 15.7 mm) | (ID 17.9 mm) | (ID 19.7 mm) | (ID 23.0 mm) | (ID 26.5 mm) |
| 1 | 1.350 | 1.620 | 2.700 | 3.810 | 5.015 | 7.000 | 9.780 |
| 2 | 0.980 | 1.190 | 2.010 | 2.825 | 3.740 | 5.265 | 7.515 |
| 3 | 0.795 | 0.975 | 1.690 | 2.375 | 3.106 | 4.565 | 6.360 |
| 4 | 0.690 | 0.845 | 1.455 | 2.068 | 2.690 | 4.010 | 5.720 |
| 5 | 0.620 | 0.756 | 1.303 | 1.850 | 2.405 | 3.590 | 5.210 |
| 6 | 0.565 | 0.690 | 1.190 | 1.688 | 2.196 | 3.275 | 4.760 |
| 7 | 0.520 | 0.639 | 1.100 | 1.562 | 2.035 | 3.035 | 4.405 |
| 8 | 0.490 | 0.598 | 1.030 | 1.463 | 1.903 | 2.836 | 4.120 |
| 9 | 0.462 | 0.565 | 0.970 | 1.378 | 1.794 | 2.675 | 3.885 |
| 10 | 0.438 | 0.535 | 0.920 | 1.308 | 1.702 | 2.537 | 3.685 |
| 15 | 0.357 | 0.438 | 0.752 | 1.065 | 1.390 | 2.072 | 3.010 |
| 20 | 0.310 | 0.378 | 0.652 | 0.925 | 1.203 | 1.795 | 2.605 |
| 25 | 0.277 | 0.339 | 0.585 | 0.830 | 1.080 | 1.610 | 2.305 |
| 30 | 0.253 | 0.308 | 0.530 | 0.760 | 0.980 | 1.470 | 2.103 |
| 40 | 0.219 | 0.268 | 0.462 | 0.660 | 0.850 | 1.270 | 1.850 |
| 50 | 0.196 | 0.24 | 0.410 | 0.590 | 0.760 | 1.140 | 1.650 |
| 60 | 0.179 | 0.218 | 0.375 | 0.535 | 0.695 | 1.040 | 1.510 |
| 70 | 0.166 | 0.202 | 0.350 | 0.495 | 0.645 | 0.960 | 1.390 |
| 80 | 0.155 | 0.189 | 0.326 | 0.465 | 0.603 | 0.900 | 1.300 |
| 90 | 0.146 | 0.178 | 0.307 | 0.435 | 0.570 | 0.850 | 1.228 |
| 100 | 0.139 | 0.169 | 0.290 | 0.415 | 0.540 | 0.810 | 1.160 |

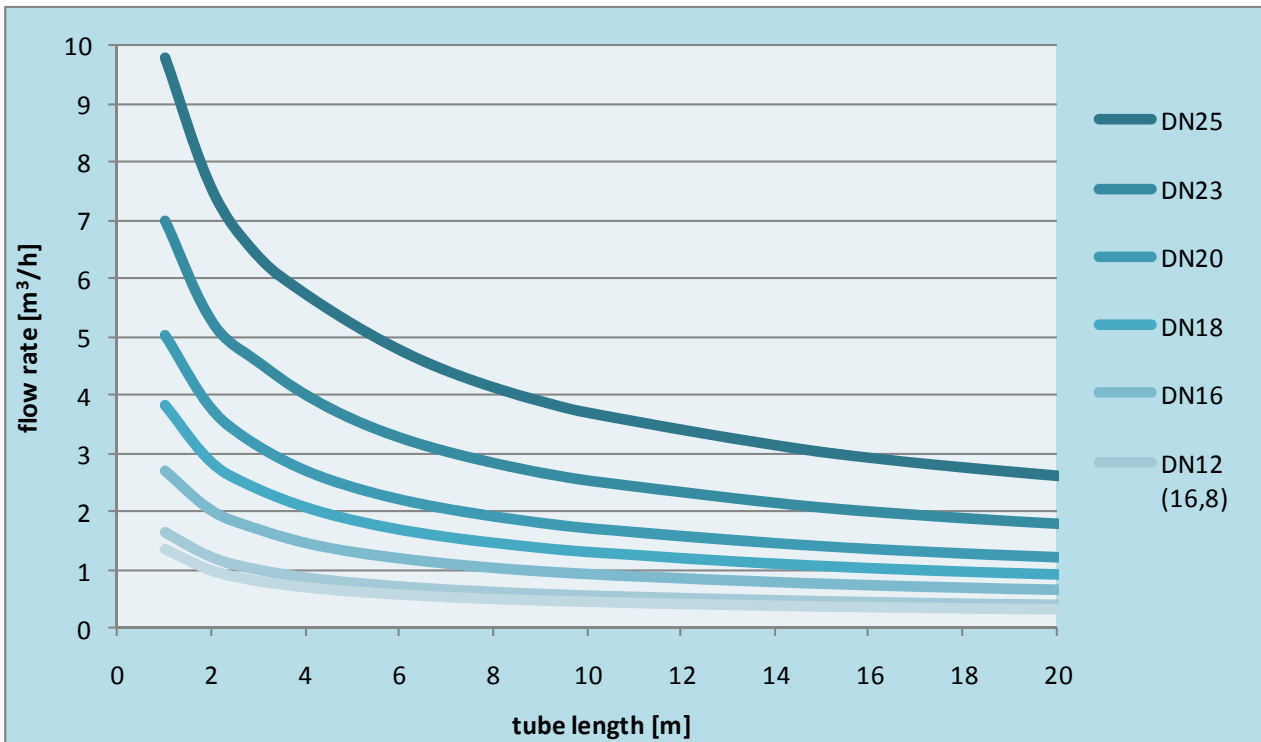


Table 5 – Natural gas flow rate at the pressure loss of 1 mbar

| Flow rate [in m ³ /h] at the pressure loss Δp 100 Pa (1 mbar) – medium: methane (CH ₄) | | | | | | | |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | DN 12 | DN 12 (16,8) | DN 16 | DN 18 | DN 20 | DN 23 | DN 25 |
| Length [m] | (ID 12.0 mm) | (ID 13.0 mm) | (ID 15.7 mm) | (ID 17.9 mm) | (ID 19.7 mm) | (ID 23.0 mm) | (ID 26.5 mm) |
| 1 | 2.350 | 2.870 | 4.930 | 7.030 | 9.130 | 13.600 | 19.800 |
| 2 | 1.660 | 2.030 | 3.500 | 4.950 | 6.450 | 9.610 | 14.100 |
| 3 | 1.360 | 1.700 | 2.850 | 4.060 | 5.280 | 7.870 | 11.400 |
| 4 | 1.180 | 1.460 | 2.450 | 3.490 | 4.570 | 6.800 | 9.870 |
| 5 | 1.060 | 1.290 | 2.170 | 3.110 | 4.040 | 6.100 | 8.850 |
| 6 | 0.960 | 1.180 | 1.970 | 2.820 | 3.680 | 5.560 | 8.140 |
| 7 | 0.890 | 1.090 | 1.820 | 2.600 | 3.380 | 5.150 | 7.550 |
| 8 | 0.830 | 1.020 | 1.700 | 2.420 | 3.150 | 4.780 | 6.980 |
| 9 | 0.790 | 0.960 | 1.640 | 2.270 | 2.960 | 4.490 | 6.570 |
| 10 | 0.750 | 0.910 | 1.550 | 2.150 | 2.790 | 4.250 | 6.230 |
| 15 | 0.610 | 0.750 | 1.270 | 1.760 | 2.250 | 3.410 | 5.030 |
| 20 | 0.530 | 0.650 | 1.100 | 1.530 | 1.940 | 2.930 | 4.290 |
| 25 | 0.470 | 0.580 | 0.990 | 1.370 | 1.730 | 2.590 | 3.820 |
| 30 | 0.430 | 0.530 | 0.905 | 1.250 | 1.580 | 2.350 | 3.480 |
| 40 | 0.370 | 0.460 | 0.780 | 1.080 | 1.370 | 2.030 | 2.910 |
| 50 | 0.270 | 0.400 | 0.700 | 0.970 | 1.230 | 1.820 | 2.630 |
| 60 | 0.212 | 0.335 | 0.640 | 0.880 | 1.120 | 1.660 | 2.360 |
| 70 | 0.160 | 0.278 | 0.590 | 0.820 | 1.040 | 1.530 | 2.190 |
| 80 | 0.151 | 0.260 | 0.550 | 0.770 | 0.970 | 1.440 | 2.050 |
| 90 | 0.142 | 0.245 | 0.510 | 0.720 | 0.915 | 1.360 | 1.940 |
| 100 | 0.135 | 0.240 | 0.480 | 0.680 | 0.870 | 1.280 | 1.830 |

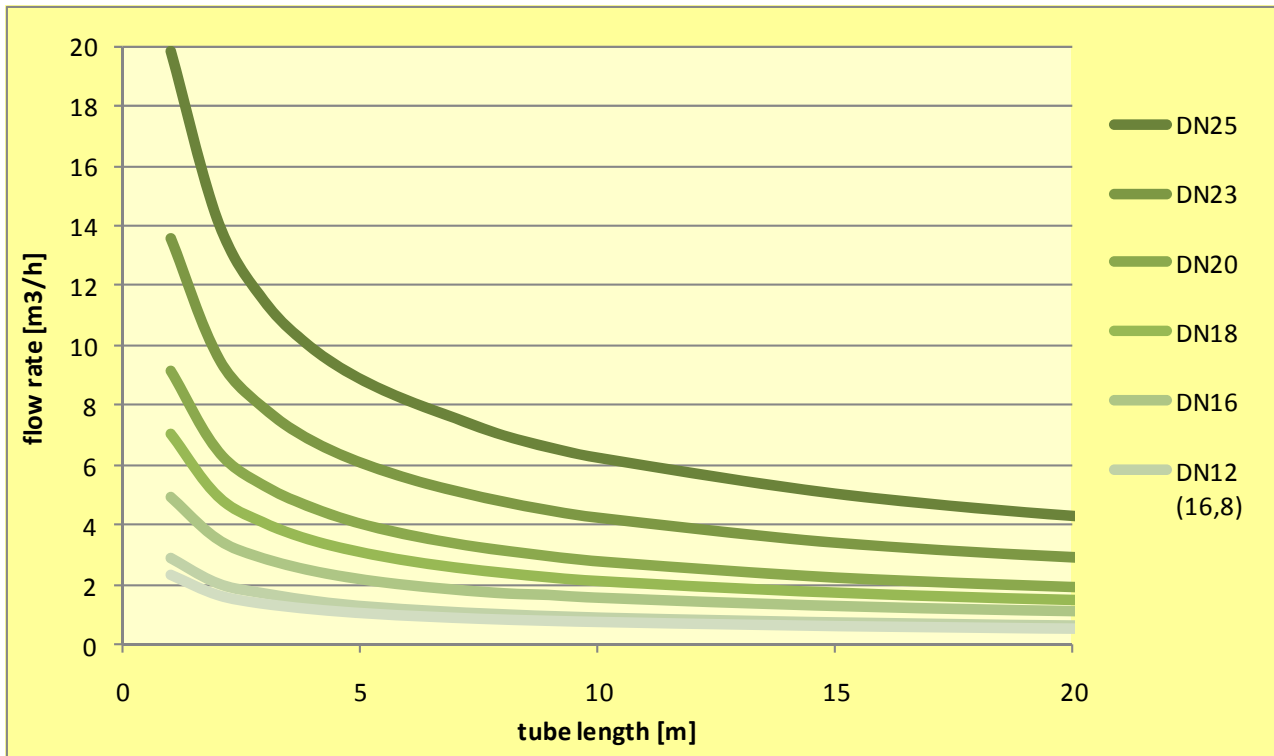
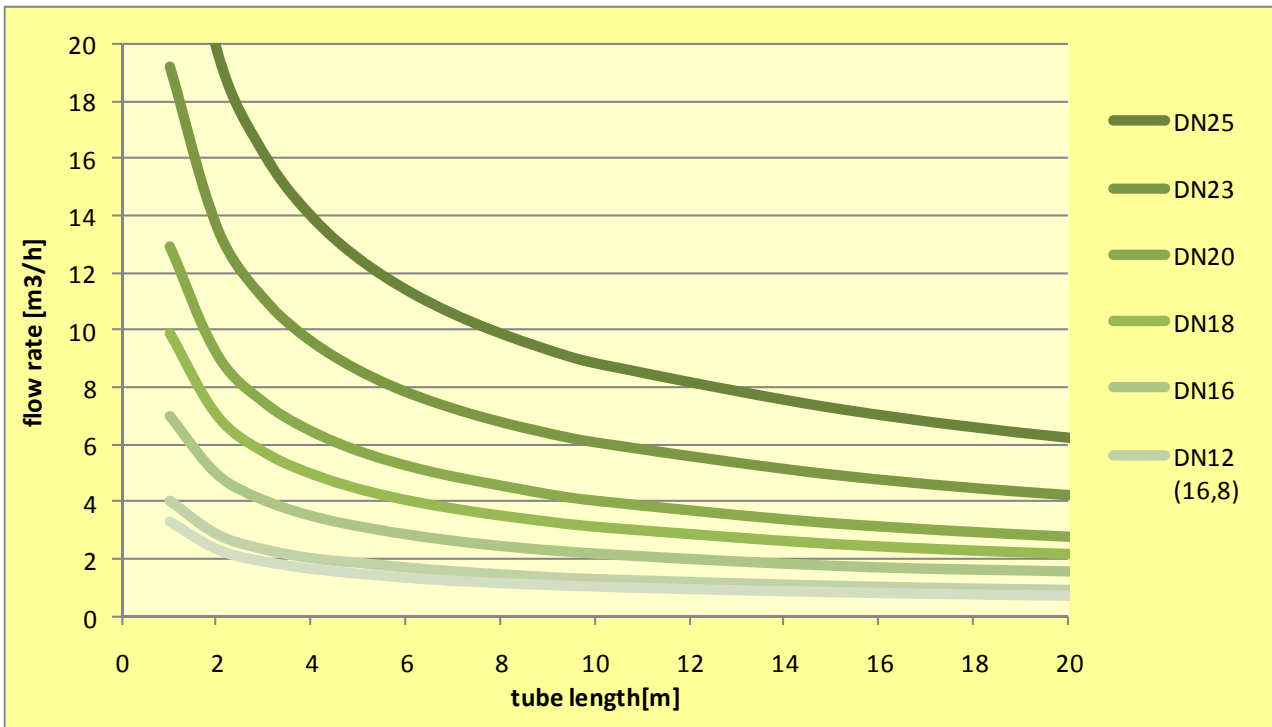


Table 6 – Natural gas flow rate at the pressure loss of 2 mbar

| Flow rate [in m ³ /h] at the achieved pressure loss Δp 200Pa (2mbar) – medium: methane (CH ₄) | | | | | | | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | DN 12 | DN 12 (16.8) | DN 16 | DN 18 | DN 20 | DN 23 | DN 25 |
| Length [m] | (ID 12.0 mm) | (ID 13.0 mm) | (ID 15.7 mm) | (ID 17.9 mm) | (ID 19.7 mm) | (ID 23.0 mm) | (ID 26.5 mm) |
| 1 | 3.320 | 4.055 | 6.990 | 9.920 | 12.910 | 19.250 | 27.980 |
| 2 | 2.350 | 2.867 | 4.950 | 7.020 | 9.140 | 13.620 | 19.780 |
| 3 | 1.920 | 2.340 | 4.040 | 5.730 | 7.460 | 11.110 | 16.150 |
| 4 | 1.682 | 2.029 | 3.495 | 4.970 | 6.460 | 9.630 | 13.980 |
| 5 | 1.498 | 1.867 | 3.125 | 4.440 | 5.770 | 8.620 | 12.500 |
| 6 | 1.363 | 1.696 | 2.850 | 4.050 | 5.270 | 7.860 | 11.420 |
| 7 | 1.260 | 1.565 | 2.623 | 3.750 | 4.880 | 7.290 | 10.570 |
| 8 | 1.180 | 1.458 | 2.445 | 3.500 | 4.570 | 6.810 | 9.890 |
| 9 | 1.112 | 1.360 | 2.300 | 3.290 | 4.270 | 6.420 | 9.320 |
| 10 | 1.055 | 1.289 | 2.175 | 3.110 | 4.040 | 6.100 | 8.850 |
| 15 | 0.861 | 1.052 | 1.750 | 2.505 | 3.255 | 4.970 | 7.290 |
| 20 | 0.746 | 0.911 | 1.555 | 2.150 | 2.790 | 4.260 | 6.240 |
| 25 | 0.667 | 0.815 | 1.390 | 1.930 | 2.480 | 3.780 | 5.550 |
| 30 | 0.609 | 0.744 | 1.270 | 1.760 | 2.245 | 3.425 | 5.020 |
| 40 | 0.527 | 0.645 | 1.100 | 1.525 | 1.937 | 2.930 | 4.300 |
| 50 | 0.472 | 0.577 | 0.983 | 1.364 | 1.733 | 2.590 | 3.810 |
| 60 | 0.431 | 0.526 | 0.898 | 1.245 | 1.580 | 2.345 | 3.450 |
| 70 | 0.399 | 0.487 | 0.831 | 1.153 | 1.465 | 2.170 | 3.170 |
| 80 | 0.367 | 0.456 | 0.777 | 1.078 | 1.370 | 2.030 | 2.940 |
| 90 | 0.316 | 0.429 | 0.732 | 1.017 | 1.292 | 1.913 | 2.730 |
| 100 | 0.300 | 0.401 | 0.695 | 0.965 | 1.225 | 1.815 | 2.590 |



4.2.4 Operating temperatures

Operating temperature:

| | |
|------------------|----------------|
| Pressed endings: | -40 to +200 °C |
| Brazed endings: | -20 to +250 °C |
| Welded endings: | -40 to +350 °C |

Should a tube with a coat or polypropylene protective hose be used, the maximum operating temperature is reduced to +100 °C.

Temperatures for tubes with endings provided by the manufacturer are specified in the operational manual supplied together with the product.

The operating temperature also depends on properties of the seal used for the specific medium and on the specific conditions. The sealing Klingersil C4400 supplied as the standard seal by the manufacturer is suitable for all media defined in the article 4.2.6 for temperatures up to +200 °C.

4.2.5 Fire resistance and reaction to fire

The Cats system tubes comply with the requirement of EN 1775:2008 – resistance to high temperatures (650 °C for 30 minutes).

Reaction to fire class:

| | |
|------------------------|------------|
| Tubes without coating: | A1 |
| Tubes with coating: | B – s2, d0 |

4.2.6 Media

- gas
- potable water (see art. 5.2)
- water (other)
- liquids for cooling and heating systems (liquids suitable for stainless steel pipework and used seal or, as the case may be, other components of the system)
- compressed air
- steam
- other media approved by the manufacturer

4.2.7 Component material specifications

For materials used for individual components see the Table 7.

Table 7 – Components and their material

| System component | Material |
|---|--|
| Tubes | Standard tubes: <ul style="list-style-type: none"> • Stainless steel grades 1.4301 (AISI 304), 1.4404 (AISI 316L) Materials supplied upon request: <ul style="list-style-type: none"> • Stainless steel grades 1.4571 (AISI 316Ti) |
| Ending elements (union nuts and union male threads) | Brass (CuZn39Pb3, CuZn40Pb2) |
| Reduction pieces and couplings | Brass (CuZn39Pb3, CuZn40Pb2), bronze (CuSn7Zn2Pb3, CuSn5Zn5Pb) |
| T-pieces | Stainless steel 1.4408 |
| Seal | Klingersil C4400 |

4.2.8 Identification and marking of system components

For the marking of Cats components and tubes with ending provided by the manufacturer see the Table 8.

Table 8 – Components and their marking

| System component | Marking |
|---|--|
| Cats tube | Two marking systems: „AZ WRO xxx yy PN15 DVGW Lzzzzzzz“ or „AZ - WRO xxx - yy - PN15 - DVGW“ |
| Cats-CE tube (to EN 15266, with yellow coating) | „AZ WR16-CE DN yy gas – MOP 0.5 – EN 15266 – Lzzzzzzz“ |
| Ending elements (nuts and union male threads) | Minimum marking: manufacturer’s mark „AZ“ thread dimension (e.g. „G3/4“) |
| Coupling pieces and reduction pieces | Minimum marking: manufacturer’s mark „AZ“ symbol of the fitness of the material for gas and potable water („G“= suitable for gaseous fuels, „GW“= suitable for gaseous fuels and potable water, see 5.2) |

where:

| | |
|-----------|--|
| AZ | = manufacturer’s mark |
| WRO | = type symbol |
| PN15 DVGW | = pressure class subject to the certificate issued by the German testing laboratory DVGW |
| xxx | = symbol of the tube material AISI (e.g. „304“, „316L“) |
| yy | = inner diameter DN (e.g. „20“) |
| zzzzzzz | = identification number of the batch or any other data of the manufacturer |

Tubes with ending provided by the manufacturer, equipped with pressed, brazed or welded endings are identified in addition to the standard marking of individual components by the manufacture date in the format „ww.yy“ („calendar week.year“ – mostly on one of the endings). Tubes with the welded or brazed endings provided by the manufacturer carry a quality control mark.

4.2.9 Service life and warranty

The service life of the tubes is not limited provided the conditions specified herein are complied with. The manufacturer provides a 3 years warranty unless other agreement in the written contract between the manufacturer and customer is.

4.3 Cats as an assembly system

The core idea of the Cats system is an easy and fast in site made-to-measure assembly of the distribution pipework.

The Cats assembly system consists of:

- tubes supplied in specified length
- presses and cutting devices for the separation and ending of the tube
- ending elements (union nuts and union male threads)
- seals
- coupling elements (reduction pieces, couplings, transition pieces and T-pieces)
- G-sleeves, M-sleeves and thermal insulation, shrinkage foil
- other accessories for special applications (fire sprinkler, solar, thermal and cooling systems)

If requested by the customer, the tubes may be supplied with a plastics coating 0.5-1.0 mm thick in various colours, similarly to tubes complying with EN 15266 that shall be supplied with coating.

4.3.1 Endings and seals

The ending is made by pressing three last corrugation waves by a Cats press. Prior to pressing, a union nut or male thread is slipped over the tube to act as an ending element. Such a connection is sealed with a suitable gasket. As a standard, the manufacturer supplies the system with the gasket Klingersil C4400 that

may be used for fuel gases, potable water (see 5.2) and most standard media. No additional means shall be used in combination with this seal (for instance lubricants).

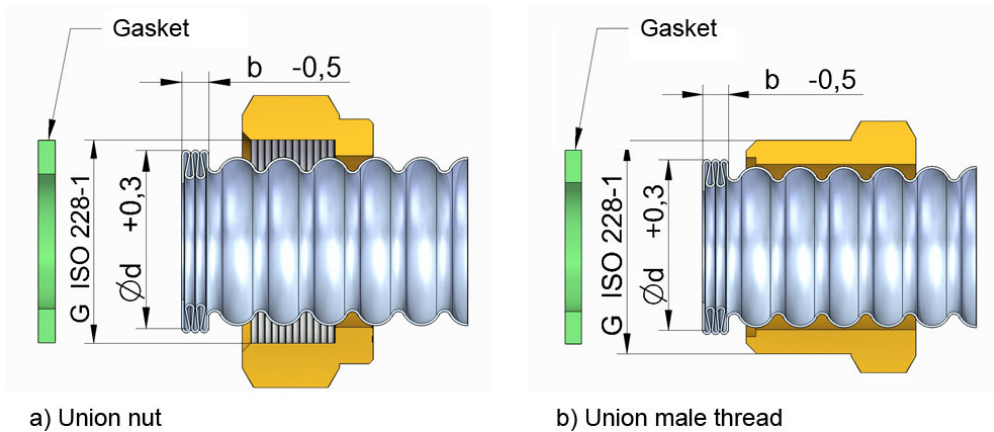


Figure 1– Tube with ending elements (union nut and union male thread)

A special type of ending with a clamping ring may be used as a special type of ending. For its description see 5.1.1.2.

4.3.2 Tools and their use

It is necessary to use the Cats cutter and the Cats press for the ending of the Cats tubes.

Presses:

- lever mechanical presses, series 100 (100, 110, 120)
- cordless presses, series 300

Cutters:

- Cats 250
- Cats 260 (only for the cordless press, up to DN 16)



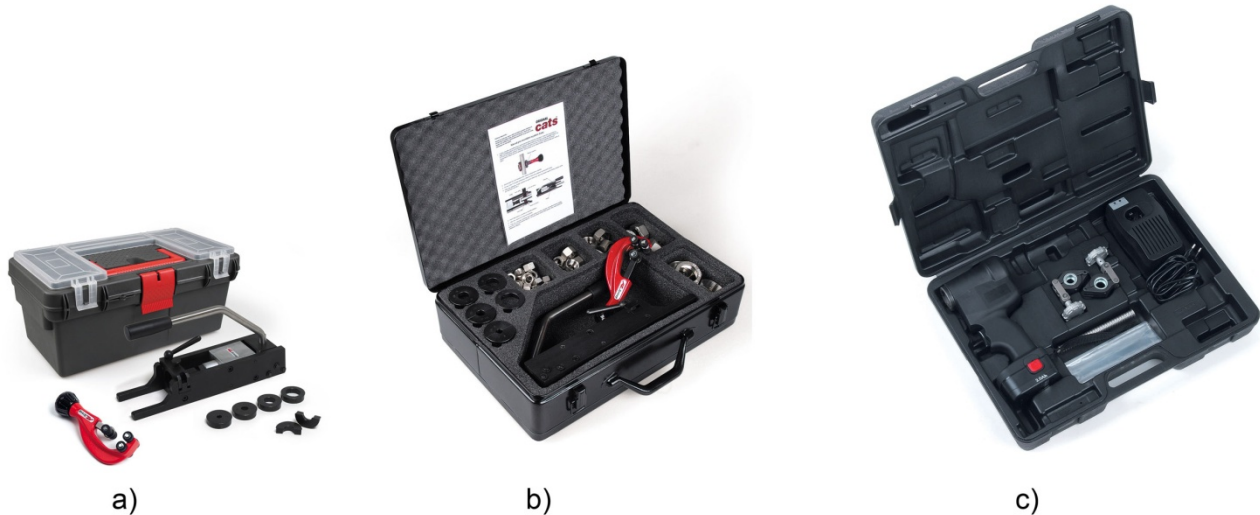
Key:

- a) Cutter Cats 250
- b) Press Cats 120 with jaws
- c) Cordless press Cats 300

Figure 2 – Cats tube ending tools

Normally, the manufacturer supplies the tools in the following sets:

- Profi set (press Cats 120 with jaws ²⁾ DN 8, DN 12, DN 16, DN 20 and DN 25, cutter Cats 250, metallic case, nuts and gaskets: 3/8"-10 pcs, 1/2"-20 pcs, 3/4"-20 pcs, 1"-10 pcs, 5/4"-6 pcs, manual)
- Standard set (press Cats 120 with jaws 3) DN 8, DN 12, DN 16, DN 20 and DN 25, cutter Cats 250, plastics crate, manual)
- Accu set (accumulator powered (cordless) press Cats 300, charger, tools for tubes DN 8, DN 12 a DN 16, cutter Cats 260, plastics case, manual)



Key:

- a) Standard set
- b) Profi set
- c) Accu set

Figure 3 - Tool sets

4.3.2.1 Tube ending procedure for the mechanical lever controlled press Cats 120

1. Cut the tube at the bottom of the wave (at the point of the least diameter) using the Cats 250 cutter so that you get the necessary length of the tube following the Fig 4. Keep in mind that the tube will get shorter after pressing (depending on the dimension of the tube approx. by 9 to 16 mm at both sides). Put the cutter onto the tube and gradually tighten the cutting wheel in small steps while cutting. The edge of the tube must remain smooth. Do not use any other cutter or saw! The plastics-coating may be removed before cutting. Do not damage the surface of the tube.

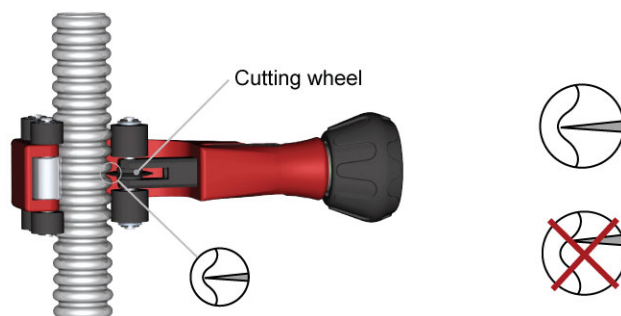


Figure 4 – Tube cutting

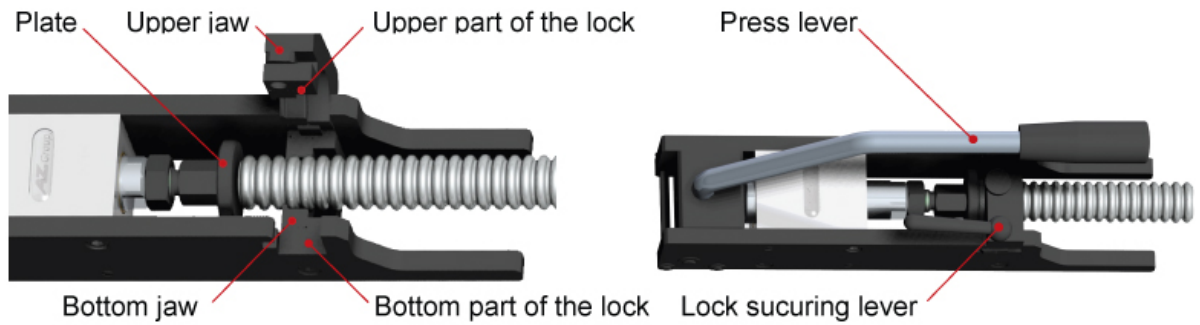
2. Check the cut at both sides of the tube for smoothness and absence of fray and file them off, if appropriate. Take care not to damage the tube.
3. If the tube is provided with a plastics coat, cut it away and put a union nut /union male thread on the tube. For the necessary cutting length see the Table 9.

²⁾ Other dimensions of the jaws (DN 12(16,8), DN 18 and DN 23) are available as optional items

Table 9 - Coat cutting

| Tube diameter | Number of waves cut |
|---------------------------|---------------------|
| DN 8, DN 12, DN 16, DN 18 | 8 |
| DN 20, DN 23, DN 25 | 9 |

- Put the respective divided jaws to the press Cats 120 depending on the diameter of the tube to be cut.
- Tilt away the press lever, put the tube to the bottom jaws so that the last three waves could remain free for pressing.



Key:

- a) prior to pressing
- b) after pressing

Figure 5 - Tube pressing procedure

- Close and lock the upper part of the lock by the lever.
- Put the press lever to its horizontal position.
- Tilt the press lever up, open the upper part of the lock and take out the tube. Check the quality of the created sealing surface. It must be flat and free of any depressions, dents etc. Its measures shall match those given in the Table 10:

Table 10 – Pressing dimensions

| Tube dimension | Ending dimension | d + 0.3 mm | b - 0.5 mm |
|----------------|------------------|------------|------------|
| DN 8 | G 3/8 | 13.0 | 2.1 |
| DN 12 | G 1/2 | 17.1 | 2.8 |
| DN 16 | G 3/4 | 21.7 | 2.8 |
| DN 18 | G 3/4 | 23.1 | 2.8 |
| DN 20 | G 1 | 26.7 | 3.1 |
| DN 23 | G 1 | 29.8 | 3.2 |
| DN 25 | G 5/4 | 35.1 | 3.2 |

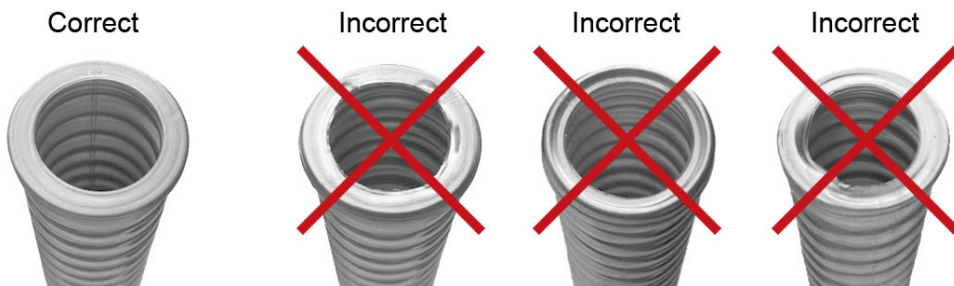
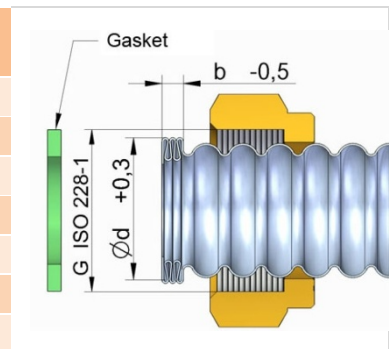


Figure 6 – Right and wrong pressing of the tube

9. Slip both union nuts /union male threads and a protective hose (G- or M-sleeve) or insulation over on the tube. Repeat items 2 through 8 for pressing the other side of the tube.
10. If the yellow coating was removed than may be covered after the assembly by a heat-shrinking coat tube or it may be wrapped up by a self-adhesive protective tape. A joint with a coupling element may be covered in the same manner. The tape shall not adversely affect the tube and the joint components.
11. The tube to be bent under the conditions specified in 4.5.1.

NOTE The press is preset by the manufacturer. When replacing the jaws for another dimension, do not change the setting.

After every approx. 100 pressing cycles, gauge the pressed joint and compare the obtained values to the values given in the Table 10. If there is any difference, the press shall be reset using the setting screw and counter-nut.

If any part of the press gets excessively worn, replace it for a new one or send the presser to the manufacturer for repair.

The tightening of gasket joints is carried out by recommended tightening torques. Prior to beginning the tightening operation, you should use a torque spanner to check the force necessary to achieve the required torque. If the joint is not tightened fully, it may leak. If the excessive torque is applied, the gasket may get damaged (crushed).

The tightening torques in the Table 11 are designed for the gasket Klingersil C4400 as delivered by the manufacturer. The joint may be re-tightened after the first pressurizing/loading of the pipework.

Table 11 – Tightening torques for Klingersil C4400 gaskets

| Tube diameter | Union nut | Tightening torque (Nm) |
|---------------|-----------|------------------------|
| DN 8 | G3/8 | 16 - 19 |
| DN 12 | G1/2 | 19 - 23 |
| DN 16 | G3/4 | 20 - 40 |
| DN 18 | G3/4 | 35 - 40 |
| DN 20 | G1 | 35 - 45 |
| DN 23 | G1 | 65 - 80 |
| DN 25 | G1 ¼ | 50 - 80 |

Important:

! A flat gasket sealed joint may be protected against loosening by applying a small quantity of a proper adhesive to the thread during the installation. The adhesive shall not get onto the gasket and the contact surfaces of the tube. Do not apply the adhesive on the thread of the tube ending element but on the thread of the counter-piece.

! The procedures for the older types of presses Cats 100 and Cats 110 are slightly different (see the relevant manuals as supplied with the presses). Do not interchange the jaws on various press types!

The main differences among types of pressers:

Cats 120: both parts of the jaw are fixed by a screw. Both parts of the jaw and the press (on the cube of the piston rod) are marked by the type symbol (120); available on the market since June 2009.

Cats 110: the bottom part of the jaw does not have any thread to be fixed in the press, it is only put on a pin. Both parts of the jaw and the press (on the cube of the piston rod) are marked by the type symbol 100); available on the market since 2005.

Cats 100: on changing the dimension of the pressed tube the jaws and also the squeezing plate has to be changed. The bottom part of the jaw does not have any thread to be fixed in the press, it is only put on a pin. The jaws and press do not have any type symbol marking. Spare parts are usually unavailable any more. We recommend sending the press to the manufacture for repair.

Important:

! Tube endings shall not be produced using tools of any other manufacturer..

4.3.2.2 Procedure for the ending of the tube for the cordless press series 300

In principle, the procedure for the cordless press is similar to the procedure used for the mechanical press. For specific features see the manual as supplied with every cordless press.

4.3.3 System connecting elements – couplings, transition pieces and T-pieces

The manufacturer supplies a wide range of original connecting elements - see the Table 12.

Table 12 – Original connecting elements

| Element description | Figure | Dimension | Article No. |
|---|--------|--------------|-------------|
| Couplings G-G both sides with the same cylindrical thread designed flat gasket sealing | | G3/8 – G3/8 | 14-040-301 |
| | | G1/2 – G1/2 | 14-040-302 |
| | | G3/4 – G3/4 | 14-040-303 |
| | | G1 – G1 | 14-040-304 |
| | | G5/4 – G5/4 | 14-040-305 |
| Couplings R-G One side with a cylindrical thread for flat gasket sealing, the other side with a tight-on-thread taper male thread (for thread sealing) | | R3/8 – G3-8 | 14-040-351 |
| | | R1/2 – G1/2 | 14-040-352 |
| | | R3/4 – G3/4 | 14-040-353 |
| | | R1 – G1 | 14-040-354 |
| | | R5/4 – G5/4 | 14-040-355 |
| Couplings G-Rp One side with a male cylindrical thread for flat gasket sealing, the other side with a female tight-on-thread | | Rp3/8 – G3-8 | 14-040-331 |
| | | Rp1/2 – G1/2 | 14-040-332 |
| | | Rp3/4 – G3/4 | 14-040-333 |
| | | Rp1 – G1 | 14-040-334 |
| | | Rp5/4 – G5/4 | 14-040-335 |
| Reduced coupling G-G Both sides with male cylindrical threads for flat gasket sealing, each side of the reduced coupling has a different dimension thread | | G1/4 – G3/8 | 14-040-311 |
| | | G3/8 – G1/2 | 14-040-312 |
| | | G1/2 – G3/4 | 14-040-313 |
| | | G3/4 – G1 | 14-040-314 |
| | | G1 – G5/4 | 14-040-315 |
| Transition pieces Cu/WR A copper socket with a union nut for flat gasket sealing | | G1/2 * 15 mm | 24-001-001 |
| | | G1/2 * 18 mm | 24-001-002 |
| | | G3/4 * 18 mm | 24-001-003 |
| | | G3/4 * 22 mm | 24-001-004 |
| | | G1 * 28 mm | 24-001-005 |
| | | G1 * 22 mm | 24-001-006 |
| | | G3/4 * 15 mm | 24-001-007 |
| T-pieces All sides provided with a male cylindrical threads for flat gasket sealing | | 3 * G3/8 | 14-040-321 |
| | | 3 * G1/2 | 14-040-322 |
| | | 3 * G3/4 | 14-040-323 |
| | | 3 * G1 | 14-040-324 |

NOTE Other accessories available on demand.

4.3.4 G-sleeves, M-sleeves and insulations

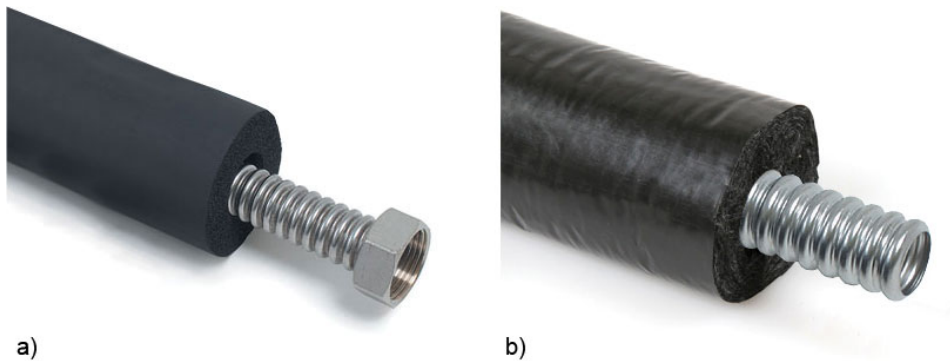
Prior to pressing, tubes may be protected by a polypropylene G-sleeve that may have several functions:

- basic protection of the corrugated tube (for instance against contamination with corrosive substances, effects of mechanical stress)
- coloured marking (for instance yellow for gas – the application of paints onto the tube surface is not recommended)

Protective hoses in yellow, blue and red colour are at disposal as a standard. Other colours are delivered on demand.

Tubes may be provided with thermal insulation– see the Figure 7. The tubes with two basic types of insulation are supplied on demand:

- black foamed EPDM insulation (synthetic rubber)
- fibrous PES (polyester) insulation with a polyethylene foil on a surface



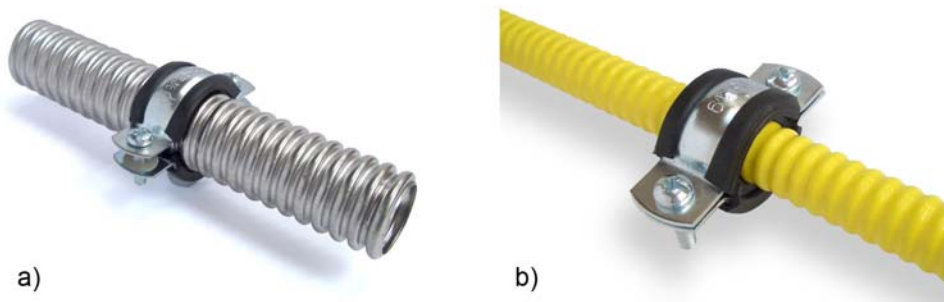
Key:

- a) EPDM – synthetic rubber
- b) PES – polyester with PE surface foil

Figure 7 - Types of thermal insulation of Cats tubes

4.3.5 Fixing clamps

The manufacturer recommends fixing the Cats tubes using zinc-plated steel closing clamps with a rubber lining as shown in the Figure 8. Other fixing system may damage or endanger the tube (contamination, electrical cell, damage a surface etc.) in other way.



Key:

- a) Closing fixing clamp for Cats tubes without coating
- b) Closing fixing clamp for Cats tubes provided with plastics coating

Figure 8 – Closing fixing clamps for Cats tubes

4.3.6 Counterpart – requirements

The compatibility of the counterparts is critical for connecting the Cats tubes to a non-system element of the distribution system (a fitting, other distribution pipework type etc.). When assessing the compatibility, the following requirements have to be taken into account in particular:

1. A male component with a corresponding cylindrical thread (EN ISO 228-1) and the suitable thread length shall be used as a counterpart to the Cats tube ended with a union nut or union male thread.
2. The joint is sealed using a flat gasket sealing, the sealing surface of the mating component shall be flat and correspond to the pressed end of the Cats tube both in terms of shape and dimension (the minimum overlap of the sealing surfaces shall be 80 %).
3. The mating component shall neither deform nor otherwise adversely affect the ending of the Cats tube during the installation and use of the system.

4.3.7 Possibilities of the use of components of other manufacturers

Should the installation of the system require the application of other than manufacturer-delivered coupling element (reduced coupling, coupling, transition coupling, T-piece), a coupling element of another manufacturer may be used under the conditions specified in 4.3.6.

In the event of the use of other than manufacturer-delivered gasket, the following principles shall be complied with:

1. Another gasket may be used only when the properties of the original gasket is not suitable for the intended application.
2. The gasket shall be designed for sealing of the respective medium to be transported.
3. The dimensions of the gasket shall be the same as those of the original one, the thickness may differ by $\pm 33\%$.
4. The temperature range of the gasket shall match the expected operational conditions.
5. The conditions of the manufacturer for the use of the gasket shall be complied with.
6. No metallic (copper, aluminium etc.) gasket is permitted to use.

Important:

! *The person responsible for the fitness of the use of another coupling element/gasket and for the properties and quality of the joint is person who chose such components subject to the above-referred to criteria. In such a case, the manufacturer cannot be liable for the properties and quality of such a joint.*

! *Any other gasket than manufacturer-delivered one cannot be used in the gas installation pipework.*

When using an other than the manufacturer-delivered insulation, it shall be taken into consideration the fitness of such insulation for its contact with stainless steel or any other possible conditions of the manufacturer of the insulation.

No endings may be brazed or welded to the tubes in site. This may be carried out exclusively by the manufacturer AZ - Pokorny, s.r.o. (see 4.4).

4.4 Cats tubes with endings provided by the manufacturer and customized solutions

Any pressed Cats system tubes (as a part of an assembly system) need not always comply with all intended requirements to their application in an installation. The reasons may include for instance:

- The customer needs a special ending of the tube (the assembly system does not include a proper ending, reduction coupling, coupling, transition piece or T-piece).
- The tube is to be used for a higher operating original pressure.
- The customer does not execute the pressing works on his own (for instance, he does not have proper tools or any qualified person).

In such cases, the manufacturer offers ending the tube exactly to measure subject to requirements of the customer and to deliver such a product fully completed.

The ending may be executed not only by pressing (as in the case of the assembly system) but also by welding or brazing of the ending.

Typical brazed or welded endings include:

- male or female threads or various dimensions
- copper and stainless steel sockets
- standard and special flanges
- endings subject to special standards or on any other demand

Important:

! Unless specified otherwise in the manual delivered with an ended tube, the principles specified in this standard shall be complied with when storing, installing and operating the system.

AZ – Pokorny offers customized solutions to the customers. Not only may the tubes be provided with almost any ending, for instance see the examples in the Figure 10, but they may be formed, insulated and coated on demand. Special products may be supplied both in small and large batches as well as individual products.

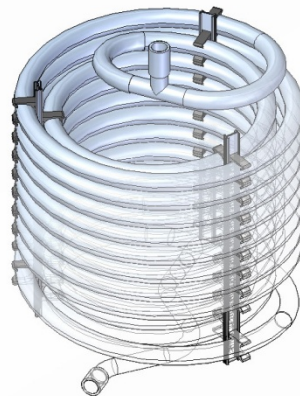
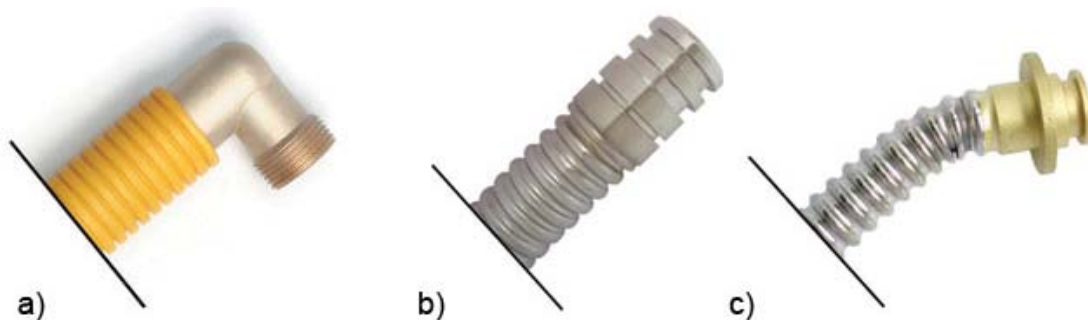


Figure 9 – An example of a made-to-measure product subject to requirements of the customer



Key:

- a) brazed threaded brass elbow
- b) welded stainless steel nipple for O-ring sealing
- c) brazed nipple for O-ring

Figure 10 – Examples of non-standard endings

4.5 Procedure conditions

4.5.1 Bending

One of the key properties of the tubes is their pliability. The tube may be easily bent to the required shape by hand. The following conditions shall be complied with when forming the tubes:

1. Bend the tubes to the minimum radius only as specified in the Table 13. The radius relates to the longitudinal axis of the tube.

Table 13 - Minimum bending radiuses

| Tube diameter | Minimum bending radius |
|---------------|------------------------|
| DN 8 | 16 mm |
| DN 12 | 25 mm |
| DN 16 | 25 mm |
| DN 18 | 30 mm |
| DN 20 | 30 mm |
| DN 23 | 45 mm |
| DN 25 | 45 mm |
| DN 32 | 60 mm |
| DN 40 | 80 mm |
| DN 50 | 100 mm |

2. Maximum five bending repairs are permitted at one place. Should there be need for the tube to be bent more often, use another type of connection line, for instance a corrugated stainless steel hose, type WS.
3. After bending, the tube shall not get broken or damaged in any other way or such an operation shall not be deformed or reduced its cross section.
4. Use your hand to bend the tube, the optimal way is to bend it over your thumbs. Do not use any metallic tools in order to avoid any damage and/or contamination of the surface of the tube.

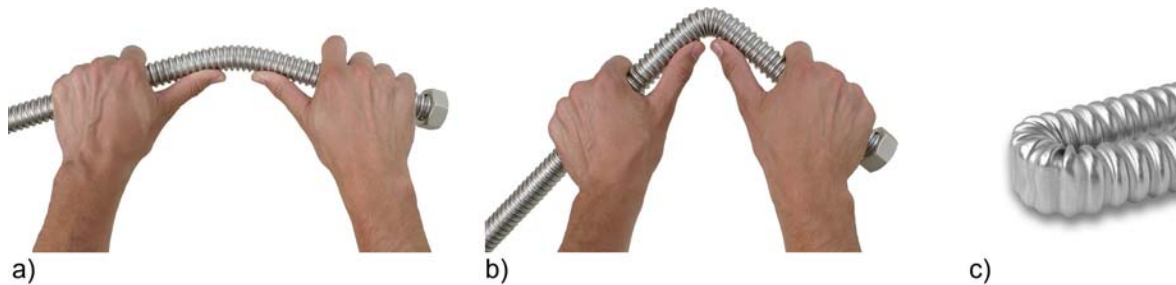


Figure 11 – Cats tube bending procedure (a, b) and an example of an inadmissible tube (c)

5. Whenever possible, bend the tubes prior to their installation into the distribution pipework. Where the tube has to be bent as late as after the connection of the ending, protect the connection point in a proper way against mechanical stress (for instance hold the tube immediately behind the ending using a proper tool). Special attention should be paid in particular to joints sealed with a flat gasket.
6. The tube shall be formed in a way the sealing surfaces of the tube and the mating component are parallel before the assembly and so that it was not necessary to align through the tightening of the joint (see Figure 12)

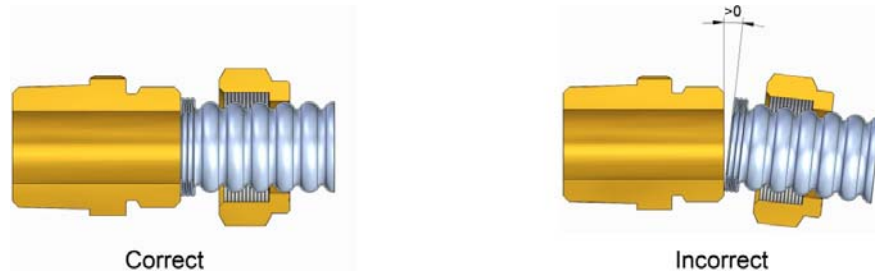


Figure 12 – Example of a right and wrong assembly of the tube and the mating component

7. Do not form the tube by twisting.

4.5.2 Protection of the distribution pipework, location of the pipeline onto and within the structures and outside buildings

Typically, Cats tube is located onto walls. The tubes located within the structures for instance within floors, walls or passing through them shall be located within a G-sleeve. For this purpose, the manufacturer supplies a polypropylene protective hose. Such a protective hose protects the tube against the direct contact with the masonry and prevents possible contamination of the surface of the tube. Threaded joints shall not be located within walls. Wherever the pipeline passes to another fire section, the respective void in the wall shall be provided with a fire rated seal that will get expanded in the event of fire and fill up the space of the pipeline, the fire rating of such material should be EI30. For the requirements to voids and routing of pipeline within structures see 5.1.5 a 5.1.6.

The fire rating of the pipeline made of the Cats pipes may be improved by the installation of coating, G-sleeves, protective pipes or other suitable methods. The Table 14 shows the minimum level of the protection of the pipeline with regard to the location of the distribution pipework.

Table 14 – Minimum requirements to the protection of the pipeline made of Cats tubes in installations (except for gas pipelines)

| Location | | Coating – see art. 2.11 | G-sleeve – see art. 2.18 (gas/waterproof protection) | Protective pipe – see art. 2.19 (mechanical protection) |
|---|--|-------------------------|--|---|
| Distribution pipework inside buildings | Underground | YES | YES | YES – for pipelines laid at the depth less than 600 mm |
| | Onto the surface of structures | YES | NO | NO |
| | Within structures (e.g. under the plaster) | YES | YES | NO |
| Distribution pipework outside buildings | Onto the surface of structures | NO | NO | NO |
| | Within structures (for instance within floors, ceilings, walls) | YES – or a G-sleeve | NO - for coated pipelines | NO |
| | In services ducts, shafts, ducts, suspended ceilings, behind wall lining and the like) | NO | NO YES – in the event of extension of tubes | NO |

Important:

! What shall be considered when designing and installing distribution pipework are risks resulting from corrosion and mechanical damage to Cats tubes and, if proper, the protection of the tubes shall be properly improved. Weather condition and UV radiation effects shall be taken into consideration for pipework located outside buildings; pipework shall be protected against them either by the selection of a proper location of the pipework or by implementing any other proper protective measure.

4.5.3 Fixing of pipework onto walls

Cats tubes are not self supporting. Fix the tube on longer distances. Never use any fixing elements where metallic parts would get in a direct contact with the stainless steel corrugated tube. The surface of tube may get damaged and its surface contaminated by other metals and their oxides or an electrical cell may be formed. Further details see in 4.3.5.

Proper location of fixing elements:

- Nearby ends of lines or joints
- Nearby bends
- On straight sections approx. after every 1.2 to 1.8 m (the bigger the dimension, the shorter the distance)

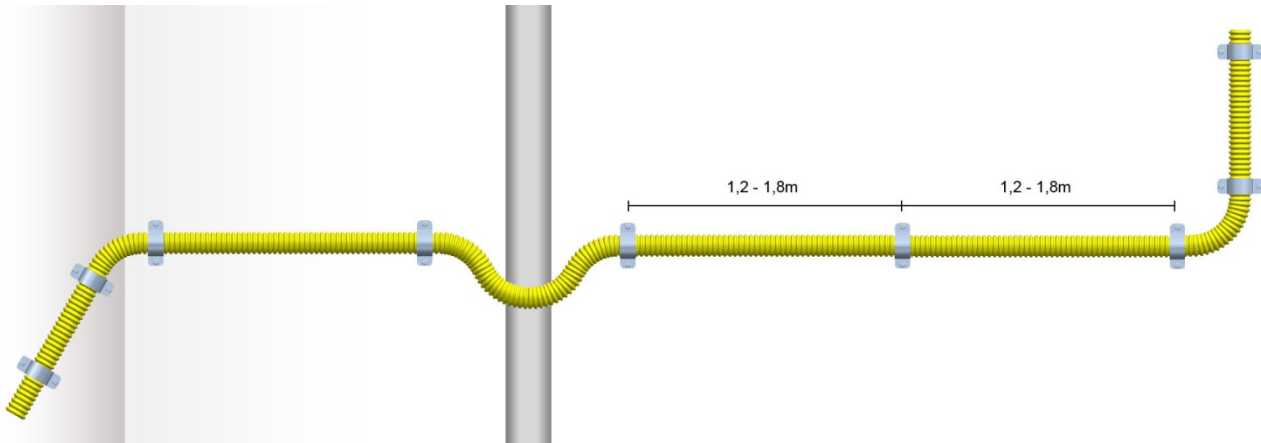


Figure 13 – Example of the location of fixing elements

4.5.4 Storage and shipment

Prior to distribution, the manufacturer packages finished tubes and system components (foil, cardboard boxes etc.). Avoid any damage to the packages and protect the products and components against risk specified first of all in the Annex A during shipment and storage.

4.6 Prohibited and non-recommended procedures

- Cats tubes shall not be concrete embedded.
- Only tubes provided by the manufacturer with plastics coating and located in a protective pipe (M-sleeve) complying with the mechanical resistance at least 450 N/20 cm may be buried. For the requirements to the location of gas pipelines in G- or M-sleeves see 5.1.2.

NOTE Use of corrugated double-coated tubes, for instance KOPOFLEX, as M-sleeves is recommended; when sealing rings are involved the ingress of moisture and flooding of joints is avoided.

- Tubes and other system component painting are prohibited (unless approved by the manufacturer).
- The tubes shall not be formed and/or exposed to torsion and tensile strength.
- The tubes shall not be used for elimination of "additional loads". For example, they shall not be used as a support of gas pipeline components (valves, means of isolation, regulators or meters) or components of other installations, systems etc.
- Before and during the installation, tubes shall be protected against any mechanical damage.
- Any damaged parts of the gas distribution pipeline shall be replaced in the following cases:
 - a tube is deformed, the surface is damaged and the like
 - the bending radius is smaller than permitted

4.7 Qualification for the assembly

Assembly of the Cats system shall only be performed by persons familiarized with the current version of this standard. Moreover, it is recommended to undergo a training provided by the authorised trainer or by the manufacturer.

4.8 Comparison to other systems – compatibility, specific features, differences

Various types of corrugated tubes/hoses of varying quality and for varying applications are available on the market. In general, they are not compatible with each other.

Never use Cats system tool to press tubes or hoses of other manufacturers, and vice-versa, never end Cats tubes using other manufacturers' tools. Never use any ending elements of other systems. Only coupling elements and sealing complying with 4.3.6 a 4.3.7 may be used.

Pay special attention to specific features of various systems. In particular the following properties are typical of the Cats system and differ from other systems:

- The ending is executed using a lever operated press (or, as the case may be, by tightening – one type of joint according to EN 15266)
- Just three waves of the tubes shall be pressed (never less and never more)
- All tubes, union nuts and union male threads are universal for all media mentioned in this standard (some other systems use different tube material and other ending elements for gas and water.)
- Gas tubes have not to be provided with a yellow coating, however, not concealed gas installation pipework shall be provided with yellow strips at suitable places. For other requirements to gas distribution systems see 5.1.

The above mentioned properties do not apply to the Cats-CE certified to EN 15266 (see the relevant clauses of this standard, especially 5.1.1).

5 Specific applications

5.1 Gas installations

The standard Cats system is also used for gas installations as well as for other media. Alternatively, a part of the Cats system complying to EN 15266 may be used for a gas pipework.

5.1.1 Cats System according to EN 15266 (Cats-CE)

The Cats-CE system is a special sub-set of the system. This sub-set complies with the requirements of EN 15266. It is designed exclusively for the distribution of fuel gases in building with operating pressure up to 0.5 bar.

Particular conditions and rules for this sub-set are specified in EN 15266. This clause only describes features that deviate from the standard system. Other rules and conditions are described in other clauses herein.

NOTE Ending and coupling elements of the Cats-CE system may be used for other media mentioned in this standard. However, the installation does not comply with requirements of EN 15266.

For the dimensions certified to EN 15266 see the Table 15.

Table 15 – Dimension of Cats tubes according to EN 15266

| Nominal diameter | Dimension / outer diameter without the coating | Dimension to EN 15266 |
|------------------|--|-----------------------|
| DN 12 | DN 12 / 15.8 mm | DN 12 |
| DN 12 | DN 12 / 16.8 mm | DN 12 |
| DN 16 | DN 16 / 20 mm | DN 15 |
| DN 18 | DN 18 / 21.6 mm | DN 15 |
| DN 20 | DN 20 / 25 mm | DN 20 |
| DN 23 | DN 23 / 28.1 mm | DN 20 |
| DN 25 | DN 25 / 33 mm | DN 25 |

Important:

! Based on requirements of EN 15266, tube dimension referred to as DN 16 and DN 18 are specified as DN 15. The dimensions DN 20 and DN 23 are referred to as DN 20. To distinguish the dimensions, the outer diameter of the tube (without the coating) is mentioned besides the DN.

The Cats-CE system consists of a corrugated tube that shall always be provided with a yellow coating (unlike the standard) and a reference to EN 15266 and of ending and coupling elements. First, the tube shall be cut to the required length. The coating may be removed at the place of the cut, prior to cutting. Doing so, prevent any damage to the surface of the tube.

The ending and coupling may be executed using two types of joints:

5.1.1.1 A-type joint – pressed with a union nut and gasket

Necessary tools:

- Cats press series 100
- Cats cutter series 200
- Flat spanners (size depending on nuts and couplings)

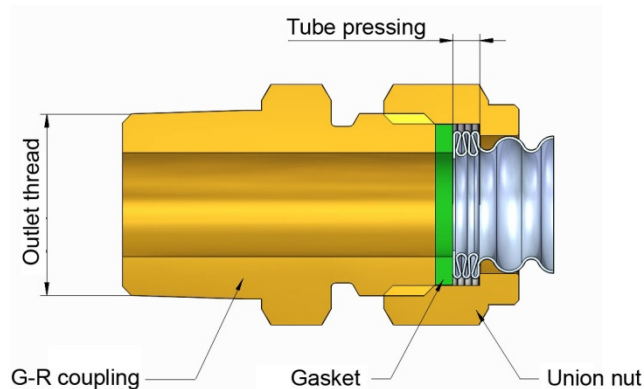


Figure 14 A type joint (with a flat gasket)

In this case, the tightness of the joint is achieved by standard pressing of three waves of the tube; by using a union nut and a flat gasket. The tube is drawn into and tightened to a threaded coupling.

Important:

! According to EN 15266, the threaded coupling is an obligatory component of the joint.

The A-type joint pressing method of the tube is identical to that of the standard application (see 4.3.2.1).

The outlet thread of the coupling used to connect the Cats system to another type of the gas installation pipework complies with EN 10226-1 (R taper male thread, Rp - parallel female thread, Rc - taper female thread). This side of the coupling shall always be sealed on the threads (for example using a Teflon tape or cord, sealing cement designed for gas distribution systems etc.).

First, install the coupling to the existing gas pipework and then connect the pliable stainless steel tube. The thread of the pliable tube coupling shall comply with EN ISO 228-1.

The place where the yellow coating was removed before pressing may be covered by heat-shrinking coat tube after the installation or, it may be wrapped by a self-adhesive protective tape. The joint including the coupling may be covered in the same way.

5.1.1.2 B-type joint – including a clamping ring

Necessary tools:

- Cats cutter series 200
- Flat spanners (size depending on nuts and couplings)

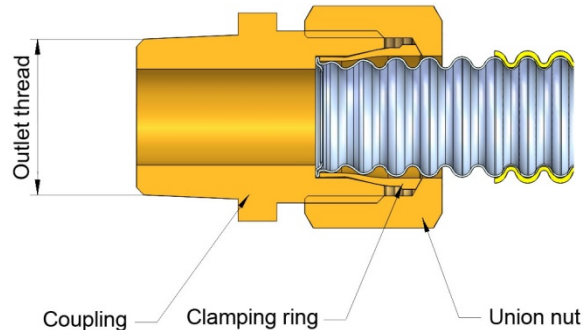


Figure 15 – B type joint (with a circular clamp)

The tightness of the joint is achieved by using a nut, clamping ring and tightening of them against a mating component (a coupling). The tightness is safeguarded without the application of a seal (metal to metal contact).

The outlet thread of the coupling used to connect the Cats system to another type of the gas installation pipework complies with EN 10226-1 (R - taper male thread, Rp - parallel female thread, Rc - taper female thread). This side of the coupling shall always be sealed to the thread (for example using a Teflon tape or cord, sealing cement designed for gas distribution systems .etc.).

First, install the coupling to the existing gas pipework and then connect the pliable stainless steel tube. The proper tightening torques necessary to join the pliable tube with a circular clamp are shown in the Table 16.

Procedure:

1. Cut the tube at the bottom of the wave (i.e. at the point of the least diameter of the tube) to the necessary length. Put the cutter onto the tube and tighten the cutter wheel gradually in small steps while cutting.

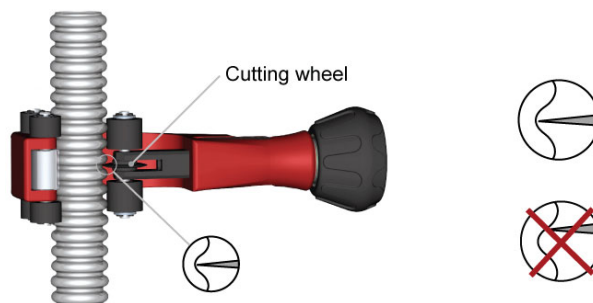


Figure 16 Tube cutting

2. Check the cut at both sides of the tube for frays. If necessary, remove them, for example using a file. Take care not to damage the tube.
3. Cut off the yellow coating (if not removed prior to cutting). For the necessary length of the removed coating see Table 8.
4. Put the nut and clamping ring on the tube as shown in Fig 17.

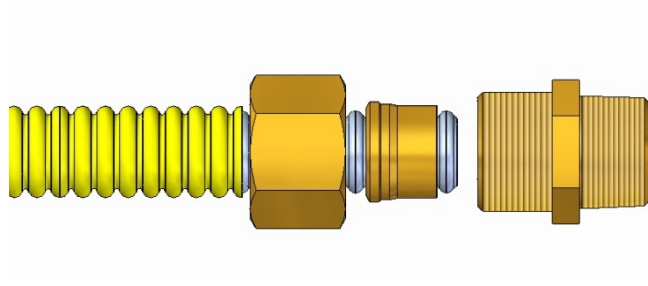


Figure 17 – B type joint at assembly

5. Insert the tube to the coupling as far as possible and tighten the nut. Make sure the tube is inserted in the coupling as much as possible even during the tightening.

Table 16 – Tightening torques for joints with circular clamps

| Tube dimension | Tightening torque (Nm) |
|----------------|------------------------|
| DN 12 | 50 |
| DN 15 | 75 |
| DN 20 | 130 |
| DN 25 | 150 |

6. Repeat items 2 through 5 to press the other side of the tube.
7. Requirements for performing bends on tubes are given in 4.5.1.
8. The place where the yellow coating was removed may be covered by heat-shrinking insulation tube after the installation or, it may be wrapped by a self-adhesive protective tape. The joint including the coupling may be covered in the same way. The tape shall not adversely affect the tube and the joint components.

5.1.2 Gas installations – basic requirements

5.1.2.1 The standard Cats system or plastics-coated tube system may be used for gas distribution installations. Tubes without any coating may be used only for surface installations where possible risks as may result from corrosion were dealt with – for instance by inserting of tubes in G-sleeves. For buried tubes without coating see 5.1.3, for installations within structures see 5.1.5.2.

5.1.2.2 Inspections, surveys and testing are executed in compliance with the national legislation/regulations.

5.1.2.3 The assembly of gas installation pipework shall be performed exclusively by persons with a specific training.

5.1.2.4 Any person who is responsible for the design and installation of gas pipework shall be a competent person.³⁾

5.1.2.5 The design of installation shall take into consideration the type of gas, operating pressure and environment of the installation, for instance the ambient temperature, corrosiveness of the environment etc.

5.1.2.6 The number of joints shall be kept to minimum (e.g. T-pieces, fittings and interconnecting elements to other gas distribution systems).

5.1.2.7 The routing and location of gas installation pipework shall comply with principles specified in EN 1775.

³ 3.7.4 EN 1775

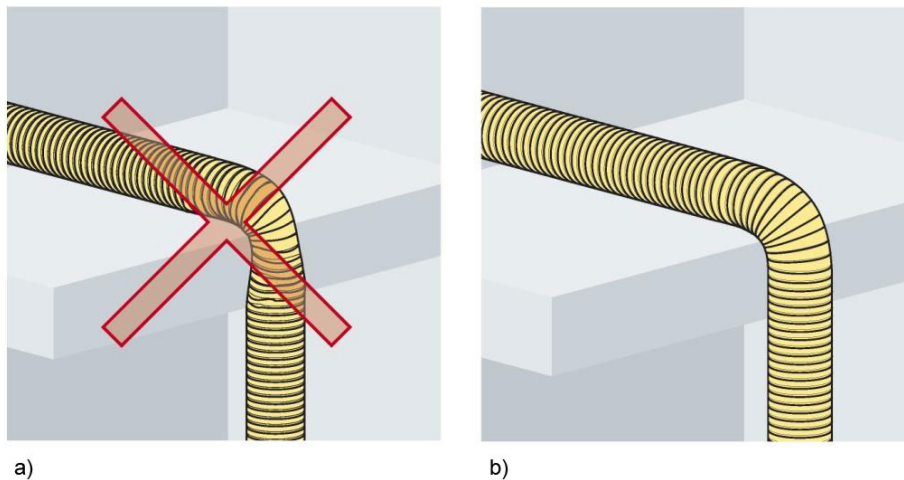
5.1.2.8 At places where there are mechanical effects likely affect the tubes such as for instance storages, premises where transporting mechanisms are operated etc., the tubes shall be protected against any such damages by covers, by locating at a height where such damage is excluded etc.

5.1.2.9 Requirements for installation of means of isolation:

- a) For surface installations – no specific requirements
- b) For buried installations – location in an accessible shaft etc.
- c) For enclosed installations – in an accessible box, niche etc.

5.1.2.10 An updated documentation shall be kept so that the route of the gas distribution pipework could be traced.

5.1.2.11 Tubes of gas installation pipework shall not be deformed when passing through structures, for instance by bending as shown in the Figure 18 a).



Key:

- a) Wrong
- b) Right

a) Figure 18 – Example of a right and wrong Cats gas distribution system assembly

5.1.2.12 The gas distribution system may be designed in follow ways:

- A. Outdoor gas pipelines
 - a) Gas pipeline under the ground level
 - b) Gas pipelines located onto the surface of structures (walls, fences etc.), fixed to stable structures resistant to high temperatures according to EN 1775
- B. Indoor gas pipelines
 - a) Gas pipelines located onto the surface of structures
 - b) Gas installation pipework concealed within structures, for instance within the wall under the plaster, within floors etc.
 - c) Gas installation pipework located in services ducts, in ducts, installation boxes, suspended ceilings, behind the wall lining, in shafts etc.

5.1.2.13 Minimum requirements to the protection of the Cats pipeline systems are specified for particular gas installation pipework (5.1.3, 5.1.4, 5.1.5 a 5.1.6). For a survey of the application of G-sleeves see Table 16.

Table16 – Minimum requirements to the protection of Cats tubes in gas pipelines

| Location | | Coating – see art. 2.11 | G-sleeve – see 2.18 (gastight, other protection) | M-sleeve - see art. 2.19 (mechanical protection) |
|----------------------|--|---------------------------------------|---|--|
| Outdoor gas pipework | Under the ground level | YES | YES | YES – for pipelines buried at a depth less than 600 mm |
| | On the surface of structures | YES (protection against UV radiation) | NO | YES |
| | Under the surface of structures (e.g. plaster) | YES | YES | NO |
| Indoor gas pipework | On the surface of structures | NO | NO | NO |
| | Within structures (for instance within floors, ceilings, walls) | YES (or a G-sleeve to be used) | NO - for coated tubes YES - for structures with cavities | NO YES – if located in ducts filled up with sand |
| | In services ducts, shafts, ducts, suspended ceilings, behind the wall lining etc.) | NO | NO YES – if located in hollow non-ventilated spaces | NO YES – in the event of pulling in tubes |

Important:

! *What shall be considered when designing and installing distribution pipework are risks resulting from corrosion and mechanical damage to Cats tubes and, if proper, the protection of the tubes shall be properly improved. Weather condition and UV radiation effects shall be taken into consideration for pipework located outside buildings; pipework shall be protected against them either by the selection of a proper location of the pipework or by implementing any other proper protective measure.*

5.1.3 Buried gas installation pipework (outdoor gas installation pipework)

5.1.3.1 Outdoor gas installation pipework may be placed in follow ways:

- a) in an underground shaft, duct etc.
- b) in a ditch with a bed and fill complying with the requirements to the gas distribution system given in EN 12007-1, EN 12007-2, EN 12007-3 and EN 12007-4

5.1.3.2 In the event of an installation under the ground level according to 5.1.3.1 a) and b), the tubes shall be inserted into a G-sleeve, one end of which is extended to the space (a box, niche etc.) to allow checking of gas leaks. What is a satisfactory solution is to expose one end of the G-sleeve and the other end to be sealed. The non-sealed end of the G-sleeve shall be waterproofed to prevent ingress of rainwater, for instance.

5.1.3.3 If a buried gas installation pipework includes joints or a connection of another distribution system, such a point shall be located in an underground box, shaft etc. Such a place shall be provided with a leak detection tube.

5.1.3.4 All buried gas installation pipework shall be provided with plastics warning films complying with EN 12613.

5.1.3.5 The buried gas installation pipework shall be placed at the minimum depth of 0,6 m.

5.1.3.6 The gas pipework located less than 0,6 m under the ground level shall be protected against excessive loads, for instance by means of M-sleeve.

5.1.3.7 Several gas pipelines may be located in one ditch. However, sufficient distances shall be kept between surfaces of respective tubes to allow repairs, replacement and maintenance.

5.1.3.8 Minimum distances shall be kept between the buried gas installation pipework and other underground installations. For details consult national legislation.

5.1.3.9 The following requirements shall be complied with in the event of an outdoor buried gas installation pipework:

- a) the gas pipeline is provided with a minimum number of dismantlable joints;
- b) the pipeline is laid in a bed of the height which after compacting is at least 0.1 m (see the Figure 19). The bottom of the ditch shall be solid and levelled so that pipeline could not be supported at certain points only after its installation;
- c) the ditch is filled up. The minimum height of the fill after compacting shall be at least 0.2 m above the surface of the pipeline. The minimum width of the fill measured from the external surface of the tube shall be 0.1 m (see Figure 19);
- d) excavated sand or other non-aggressive fine material free of any sharp edge grains, of the maximum grain size of 16 mm shall be used for the bed and fill;
- e) yellow plastics warning films shall be located at the distance of 0.3 m above the surface of the pipeline; The film shall overlap the gas pipeline at the both sides at least 5 cm;
- f) the gas pipeline enters the building by an underground (Figure 25) or above-ground void in the peripheral structure according to 5.1.6.2 – see the Figures 24 through 26;
- g) the gas pipeline may be extended to an above-ground cabinet with the building means of isolation; the vertical section of the gas pipeline is located in a M-sleeve – see Figure 26 (the use of PE tubes supplied in coils is not recommended);
- h) plastics coated tubes and elements that are corrosion-resistant or provided with anti-corrosion protective system has to be used for buried gas installation pipework. Requirements for the application of M-sleeves are given in 5.1.3.6.

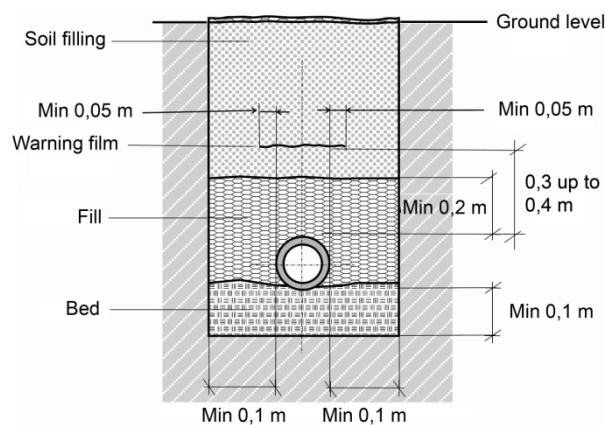


Figure 19 - Location of an outdoor buried gas installation pipework

5.1.4 Above-ground gas installation pipework (outdoor gas installation pipework)

5.1.4.1 An outdoor gas installation pipework may be located in masonry structures, shafts, ducts etc. It shall be protected against UV radiation (for tubes provided with a protective plastics coating), weather conditions, mechanical damage etc.

5.1.4.2 Should the pipework be installed under the plaster of an external wall, it shall be located in G-sleeves, i.e. for instance a corrugated tube. One end of the G-sleeve shall not be sealed and shall be extended to a place where tightness may be checked. It shall be waterproofed to protect against ingress of rainwater etc.

5.1.4.3 Shafts and ducts located in structures may be used for outdoor pipelines; no other distribution system and installation shall be placed in the same shaft or duct. The shafts and ducts may be either concealed or aligned with the surface or located onto the surface of external structures.

5.1.4.4 Tubes located in shafts, ducts etc. shall be straight; the minimum distance between the neighbouring parallel gas distribution systems is 2 cm; surfaces shall not get in contact in any crossing point.

5.1.4.5 Pipeline anchoring system consists of bushings designed for the Cats system – for details see 4.3.5.

5.1.4.6 Shafts and ducts shall be designed to allow easy checking of gas pipeline tightness at specified points, for instance after doors, lids, grids are opened/uncovered.

5.1.4.7 Any gas pipeline void in the structure of a shaft, duct etc., shall be sealed gastight to prevent any gas leak from the shaft/duct into the building.

5.1.4.8 Shafts, ducts etc. shall be fixed firmly to the structure.

5.1.4.9 Shafts, ducts etc. shall be designed in a way to prevent any leak of gas into the building through openings, cavities in civil structures etc. For this purpose, we recommend to apply a continuous layer of mortar, a separate slab structure etc.

5.1.4.10 Shafts and ducts shall be made of non-flammable, reaction to fire class A1 material according to EN 13501-1, resistant to weather conditions in the long term. The design shall prevent exposure to UV radiation and comply with requirements to mechanical resistance.

5.1.4.11 Shafts, ducts etc. shall be provided with ventilation openings that may also be used for detection of gas leaks. The lowest opening place has to be designed in a way to prevent accumulation of water.

5.1.4.12 Shafts designed for gases with the relative density higher than 0.8 (LPG) shall not enter into any spaces located under the level of the surrounding ground. An opening on the shaft, duct etc. shall comply with the following requirements:

- a) it shall be placed in the lowest part of the civil structure
- b) the distance of at least 1 m shall be kept from inflammable materials, electrical systems, openings in buildings, air intake opening, windows, doors etc.
- c) the distance of at least 2 m shall be kept from openings and entrances to underground premises, trap-doors into underground premises etc.

5.1.4.13 Should the ducts, shafts etc. be made of metallic materials, they shall be earthed.

5.1.4.14 In the event of outdoor building gas pipelines fixed to the peripheral structure of the building, the following requirements shall be met:

- a) the pipeline is located in the yellow coloured M-sleeve or with yellow strips (for instance a metallic corrugated tube);
- b) the M-sleeve shall be provided with a ventilation openings at its beginning and before the void in the external peripheral structure; the minimum diameter of such a ventilation openings is 10 mm; openings are designed to prevent ingress of rainwater - see Figure 24 detail B;
- c) there are no dismountable joints on the gas pipeline;
- d) the gas pipeline shall not be used as supporting structure;
- e) the gas pipeline shall comply with requirements of relevant national fire protection;
- f) the gas pipeline enters the building through an above-ground void in the peripheral structure – see 5.1.6.2.3 and Figures 24 through 26

5.1.4.15 The gas installation pipework located within the peripheral structure of the building at the outer side shall comply with the following requirements:

- a) the gas pipeline is not embedded in concrete, the masonry and plaster shall not contain any aggressive components (slag, ashes etc.);
- b) there are no dismountable joints on the pipeline;
- c) should there be any dismountable joints on the pipeline, they shall be placed in an accessible and ventilated area;

- d) an exact as-made drawing of the pipeline will be prepared after the completion of the installation works and it will be included to the as-made documentation dossier of the project;
- e) the gas pipeline enters the building through an above-ground void in the peripheral structure – see 5.1.6.2.3 and Figures 24 through 26

5.1.5 Indoor gas installation pipework

5.1.5.1 Gas pipelines attached to the surface of structures

5.1.5.1.1 The routing of gas installation pipework shall comply with principles specified in EN 1775. Gas installation pipework in circulating areas of residential buildings, in commercial and other buildings should be placed out of reach of people and means of transport (for instance at the height of more than 1.8 m) or located in enclosures.

5.1.5.1.2 Gas installation pipework located onto surface of constructions shall be straight, routed in vertical or horizontal direction. It shall be supported to avoid any pipeline sag due to the weight of the pipes.

5.1.5.1.3 The fixing elements shall be made of a non-flammable material except for the lining of bushings.

5.1.5.1.4 The gas installation pipework shall not be fixed to any other installations and non-stable structures or to any parts exposed to vibrations, thermal stress etc.; it shall not serve as a supporting structure.

5.1.5.1.5 Any part of the gas installation pipework with dismountable joints shall be located in ventilated spaces accessible for checks and maintenance.

5.1.5.1.6 The route of pipework shall have the number of dismountable joints kept to minimum (for instance for the connection of fittings). Dismountable joints shall be accessible.

5.1.5.1.7 The gas pipeline shall be located in a way to prevent effects of substances from other lines (condensed moisture, steam etc.).

5.1.5.2 Gas installation pipework located within structures (walls, ceilings, floors)

5.1.5.2.1 Gas installation pipework may be installed within walls, ceilings, floors in the horizontal or vertical direction (never in a skew direction in walls). Plastics coated tubes shall be used for such as installations; tubes without plastics coating shall be located in G- or M-sleeves.

5.1.5.2.2 An updated documentation shall be kept.

5.1.5.2.3 Should the gas pipeline be located in the floor, above the floor and in wall corners, the following distances should be kept:

- a) 20 mm from the ceiling
- b) 20 mm from the floor
- c) 20 mm from wall corners
- d) 200 mm from the door frame
- e) 20 mm from the wall if located in the floor

5.1.5.2.4 The gas installation pipework under plaster is placed in a cement mortar. Tubes shall be covered by at least 10 mm thick layer of mortar – see the Figure 20.

5.1.5.2.5 Should civil structures include any cavities (for instance rowlock cavity wall), the gas installation pipework shall be located in G-sleeves according to the Figure 21 (e.g. corrugated tubes) of which at least one end is extended to a ventilated area. The other end of the G-sleeve shall be sealed or ended in a ventilated area, too. The G-sleeve shall be covered with at least 10 mm thick layer of mortar.

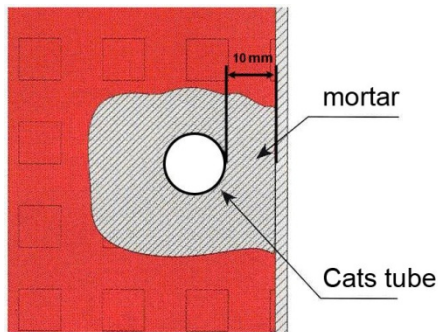


Figure 20 - Tube placed under plaster

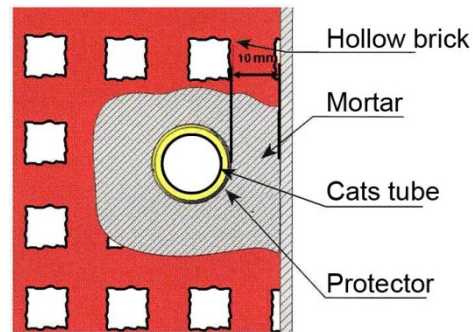


Figure 21 - Tube in the G-sleeve

5.1.5.2.6 Should a gas pipeline be placed under plaster, the following requirements shall be met:

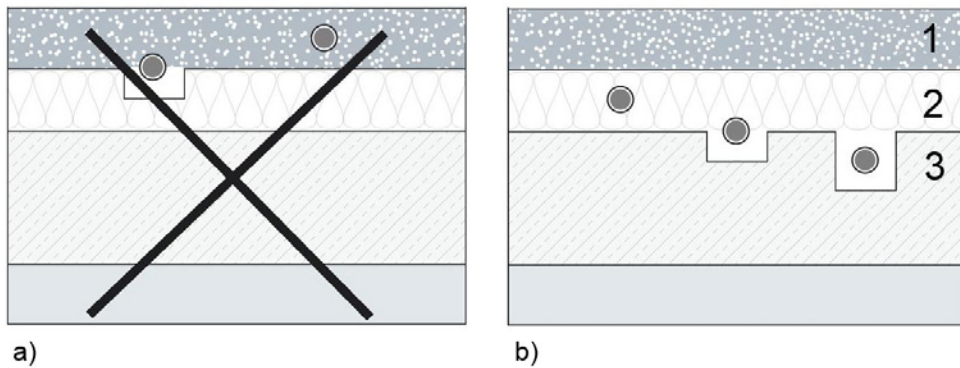
- the gas pipeline is not embedded in concrete, the masonry and plaster shall not contain any components aggressive to the tube surface;
- there are not any dismantlable joints or fittings on the pipeline; should any such joints or fittings be used on the pipeline, they shall be accessible for checks;
- an exact as-made drawing of the pipeline will be prepared after the completion of the installation works and it will be included to the as-made documentation dossier of the project.

5.1.5.2.7 The gas installation pipework with a coupling shaped piece shall not be located in any cavity; otherwise the pipeline shall be located in a G-sleeve with one non-sealed end extended in an area where possible gas leaks may be detected.

5.1.5.2.8 Should a pipeline be located in floors, the following requirements shall be complied with:

- the gas pipeline is to be designed in a way to be as short as possible and comply with requirements of 5.1.5.2.1;
- the gas pipeline is laid under the surface layer of the floor and impact or thermal insulation so that it is protected against mechanical stress because of load applied against the surface layer of the floor and any possible cavity as around the pipeline is filled with sand or a screed 20 mm thick along the entire perimeter. If sand is used as the fill, gas shall not get through to adjacent premises in an uncontrolled way and the duct shall be interconnected with an area where tightness may be checked or the entire line is located in G-sleeves;
- the section of the pipeline in the floor shall not contain any fittings, dismantlable joints and only a minimum number of non-dismantlable joints may be installed;
- the pipeline shall not be laid in an aggressive corrosive material;
- the distance of the gas pipeline from other concurrent conduits (pipelines) installed in the floor is at least 20 mm and at least 10 mm at crossing points; the gas pipeline does not get into contact with other systems in the floor;
- no other lines may be placed in the duct where the gas pipeline is located;
- after the completion of the installation works, the position of the gas pipeline will be surveyed and drawn in a schematic drawing. What is recommended to be prepared is a photo-documentation of the position of the gas pipeline.

5.1.5.2.9 The gas pipeline is to be laid in the floor under the surface layer of the floor, to a levelling layer or to a foundation concrete layer – see the Figure 22 b).

**Key:**

- a) Wrong way
- b) Right way
- 1. floor surface layer
- 2. levelling layer
- 3. concrete foundation layer

Figure 22 - Schematic drawing of the laying of the Cats gas pipeline in the floor

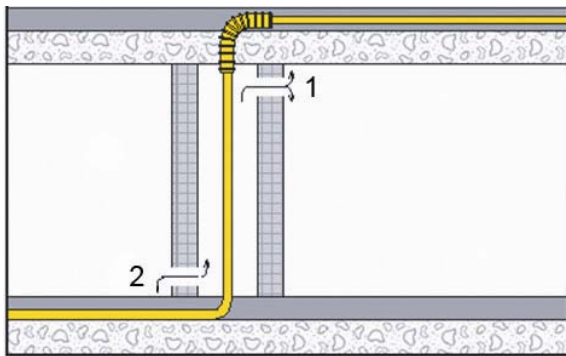
5.1.5.3 Gas installation pipework in Installation floors, ducts, installation boxes, suspended ceilings, behind wall lining, in shafts etc.

5.1.5.3.1 Wherever gas installation pipework is located in ducts, shafts and similar structures, principles specified for the installation of such pipelines as outdoor pipelines shall be complied with.

5.1.5.3.2 Dismountable joints with fittings and splitting devices may be located in installation boxes.

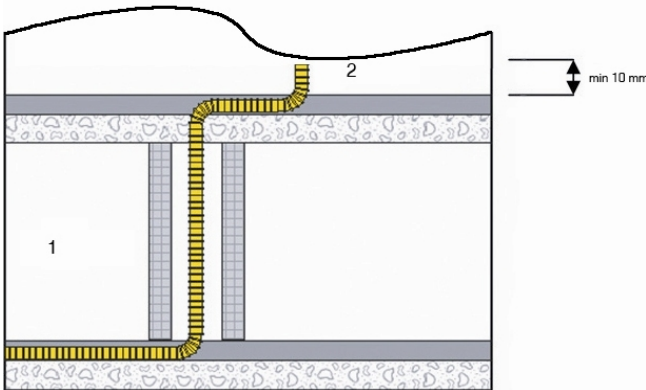
5.1.5.3.3 Should a gas pipeline be located in a services ducts, suspended ceilings, behind wall linings or in shafts (except for shafts where respective regulations prohibit so), the following requirements shall be met:

- a) The pipeline is accessible for tightness checks;
- b) The section of the gas pipeline that passes through this area does not include any fittings and dismountable joints;
- c) Nearby the places where the pipeline enters and exits the above area, there are ventilation openings, size 10 cm² - see Figure 23a). If ventilation opening cannot be provided, that part of the gas pipeline passing through any non-ventilated area shall be located in a G-sleeve that overlaps to a ventilated area at least 10 mm – see Figure 23b);
- d) when pulling pipes through premises where they could get damaged, M-sleeves shall be used;
- e) an exact as-made drawing of the pipeline will be prepared after the completion of the installation works and it will be included to the as-made documentation dossier of the project;
- f) the pipeline void leading to another fire section shall be provided with a fire-rated seal.



a) Gas pipeline provided in a G-sleeve in an area provided with ventilation openings

1. ventilation opening min. 10 cm²
2. ventilation opening min. 10 cm²



b) Gas pipeline in a non-ventilated area provided in a G-sleeve

1. non-ventilated area
2. ventilated area

Figure 23 - Gas pipeline void in installation floors, suspended ceilings, wall lining and

5.1.6 Specific requirements to gas installation pipework

5.1.6.1 Pipelines passing through cavities

5.1.6.1.1 Where gas pipelines pass through shafts, ducts and any hollow structures such as pipelines in suspended ceilings or behind wall lining, any place where a joint is provided has to have ventilation openings with the minimum size of 10 square centimetres each and such a line has to be located in a G-sleeve. The ventilation may be provided for by peripheral gaps or by diagonally positioned ventilation openings.

5.1.6.1.2 No ventilation system shall be installed, if shafts or ducts are filled with a material that will safely fill in cavities so that gas could not get accumulated in a closed space.

5.1.6.1.3 If a Cats gas installation pipework with an installed joint is not placed in a ventilated area, it shall be located in a G-sleeve.

5.1.6.1.4 The G-sleeve shall be sealed at one end and the other non-sealed end shall overlap to an accessible ventilated place. The G-sleeve shall be made of an integral piece of tube.

5.1.6.1.5 Wherever the pipeline enters another fire section, the place shall be provided with a fire-rated sealing using a material that will get expanded in the event of fire and will fill in the space of the void in the event of fire.

5.1.6.2 Voids in supporting structures and peripheral masonry

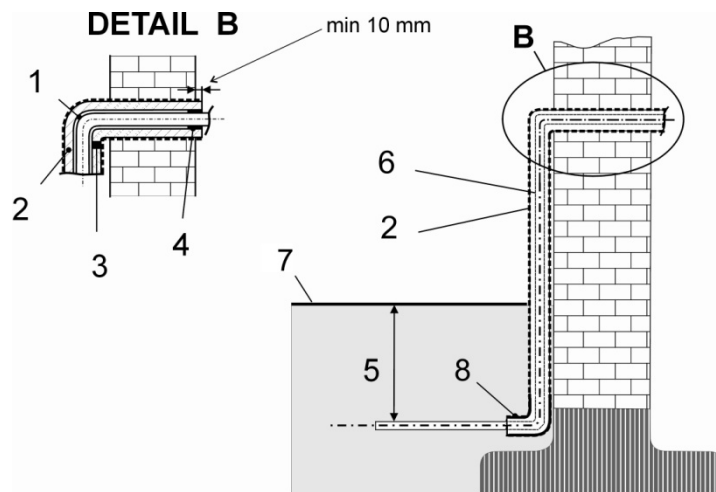
5.1.6.2.1 The gas installation pipework passing through any supporting peripheral masonry or any other supporting structure (free of any cavities, hollow bricks and prefabricated hollow structures) shall not include any shaped tubes, fittings and connections and it shall be located in a M-sleeve passing the void.

5.1.6.2.2 A gas pipeline void is to be executed as follows:

- a) an above-ground void – see the Figures 24 to 26
- b) a buried void – see to the Figure 25

5.1.6.2.3 A gas pipeline passing through a peripheral wall is to be located in a G-sleeve that works also as an M-sleeve. It shall comply with the following requirements:

- a) gas and moisture must not get through around the pipeline to the building – a sealing shall be used – see Figures 24, 25 and 26. What is to be used is a rubber or resin-based sealing. No masonry materials or sealing foam may be used, use of poly-butyl rubber seal is recommended;
- b) the structural function of the civil structure shall not be impaired;
- c) the G-sleeve shall be made of a material that is corrosion-resistant or it shall be provided with a suitable passive anti-corrosion protection system on both internal and external surface;
- d) the G-sleeve shall be tightly fixed to the civil structure with an overlap of at least 10 mm inside the building and its dimension shall be sufficient (the distances between the surfaces of the pipeline and the M-sleeve shall be at least 10 mm with regard to possible radial shifts of the gas pipeline);
- e) the gas pipeline shall be located in the G-sleeve concentrically and there shall be no joint on it;
- f) the ends of the G-sleeve shall be free of any sharp edges.



Key:

1 – gas pipeline bend, 2 – G-sleeve, 3 – ventilation opening, diameter 10 mm, 4 – seal, 5 – cover, 6 – gas connection line or outdoor gas installation pipework, 7 – ground level, 8 – elbow

Figure 24 - Ending of the outdoor gas installation pipework and the void for the pipeline above the level of the ground

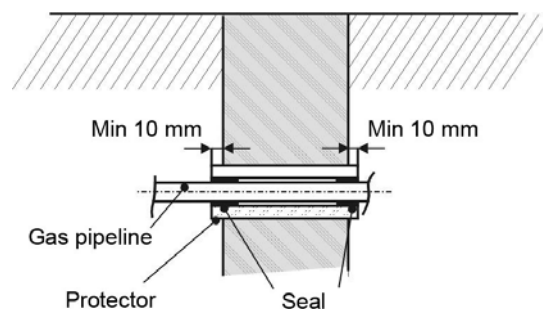
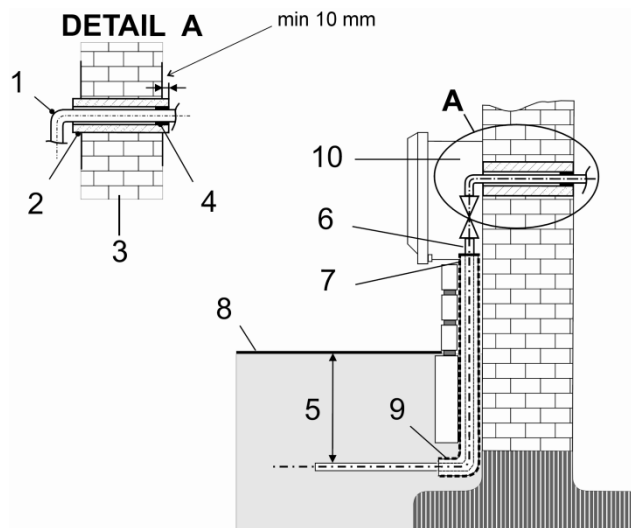


Figure 25 – Ending of the outdoor gas installation pipework and void of the pipeline to the building under the ground level



Key:

1 – gas pipeline bend, 2 – G-sleeve, 3 – peripheral wall, 4 – sealing, 5 – cover, 6 – gas connection line or outdoor gas installation pipework, 7 – M-sleeve, 8 – ground level, 9 – elbow, 10 – cabinet

Figure 26 – Ending of the gas pipeline in a main closing valve cabinet or main building closing valve and its void to the building above the ground level

5.1.7 Connection of appliances to the gas installation pipework

5.1.7.1 The connection of gas-fired appliances by Cats tubes are subject to the same principles as applied to metallic pipelines.

5.1.7.2 What is preferred for the connection of gas-fired appliances are gas connecting hoses.

5.1.7.3 Cats tubes may be used for the direct connection of appliances only in case of appliances that are fixedly anchored to civil structures.

5.1.7.4 Any appliances not fixed to civil structures shall be fixed at the appliance inlet connection.

5.1.7.5 Appliances subject to handling during their operation or not anchored to civil structures shall be connected by flexible elements only (hoses) (see 4.1.3).

5.1.8 Installation testing

Any installation testing is executed according to EN 1775.

5.1.9 Commissioning, operation, maintenance and repairs

The commissioning, operation, maintenance and repairs are executed in compliance with EN 1775.

5.2 Potable water (water intended for human consumption)

Requirements for materials intended to come into contact with water intended for human consumption are set only in national legislation for now. The union European acceptance scheme under abbreviation EAS (European Acceptance Scheme for construction product in contact with drinking water) has not been issued yet. The producer will provide more information after this document will be issued.

Important:

! *Until this Scheme is implemented shall all products be considered pursuant to the national regulations individually for each market.*

NOTE Cats system tubes made of materials AISI 304, AISI 316L and AISI 316Ti have been assessed from the point of view of requirements of the Czech national decree Nr. 409/2005 Coll. on public health requirements for products that intend to come in contact with water intend for human consumption. All materials fit these requirements. The Klingersil C4400 sealing can also be potentially used for potable water. As to couplings and reduction couplings supplied by the manufacturer, only those can potentially be used for potable water pipework that are marked with the symbol "GW" (see 4.2.8.). Tubes with manufacturer-brazed endings are not fit for water intend for human consumption.

Usage of Cats system components for potable water pipework shall always be consulted with manufacturer due to different national requirements and regulations.

5.3 Solar, heating and cooling systems

The manufacturer offers insulated tubes with accessories for the distribution of heated or chilled media. Of course, thermal insulation may be provided to tubes as late as during the final installation, too. Doing so, respect the rules as specified in 4.3.4.

The insulated tubes are supplied with so called "fixing set for solar applications" or, as the case may be, its individual components. It facilitates the fixing of pair conduits of insulated tubes together with power or control cables to walls or other places.

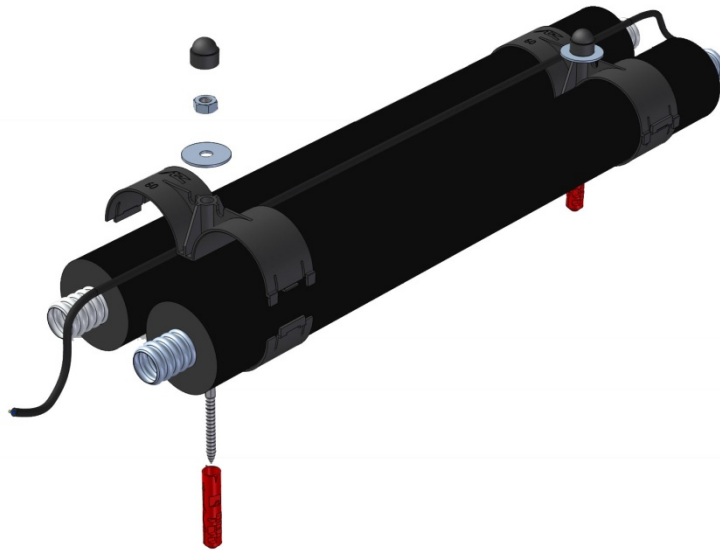


Figure 27 - Thermally insulated tube with fixing elements and cable

Technical parameters of the insulation supplied by the manufacturer of the system:

a) PES fibrous insulation

- temperature range of the medium: -60 to +200 °C (short-term up to +220 °C)
- ambience temperature range: -60 to +80 °C (short-term up to + 100 °C)
- thermal conductivity coefficient: $\lambda_{40\text{ °C}} = 0,037 \text{ Wm}^{-1}\text{K}^{-1}$
- improved resistance to UV radiation and weather condition effects

b) EPDM foam insulation

- temperature range: up to 116 °C
- thermal conductivity coefficient: $\lambda_{40\text{ °C}} = 0,040 \text{ Wm}^{-1}\text{K}^{-1}$

c) EPDM foam insulation (for solar systems)

- temperature range: up to 150 °C (up to 175 °C short-term)
- thermal conductivity coefficient: $\lambda_{40\text{ °C}} = 0,042 \text{ Wm}^{-1}\text{K}^{-1}$

Other insulation types are delivered on demand.

5.4 Fire sprinkler systems

The Cats system is certified for water sprinkler systems. The tubes are fit for the final connection of terminal systems – sprinkler heads – to the main distribution line. What is used as standard for this purpose are tubes DN 23. The tubes are pressed to measure at the place of the installation (an assembly system) or the manufacturer offers ended tubes with welded endings. What is available as a standard is an ending or reduction coupling for sprinklers 1/2".



Key:

a) nut and coupling Rp1/2, b) welded ending Rp1/2

Figure 28 – Ending of the tube at the side of the connection of the sprinkler 1/2"

5.4.1 Fixing types

Two types of manufacturer-supplied fixing elements may be used for the fixing of tubes and sprinklers to the suspended ceiling or plasterboard:

- Fixing by means of a bearing plate** – the tube is fixed directly to the suspended ceiling slab or plasterboard by a clamp, plate and bottom cover of the sprinkler. The surface of the plate provides for the distribution of the weight and fixing to a larger area of the suspended ceiling.

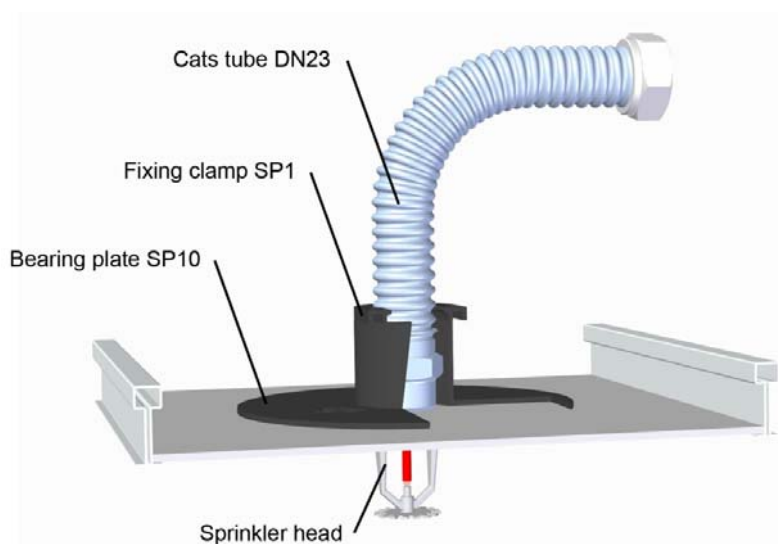


Figure 29 – Fixing of the pipe using the bearing plate

- Fixing using a load distribution frame** – the tube is fixed to the frame of the structure of suspended ceiling by means an accessory structure (fixing grid set).

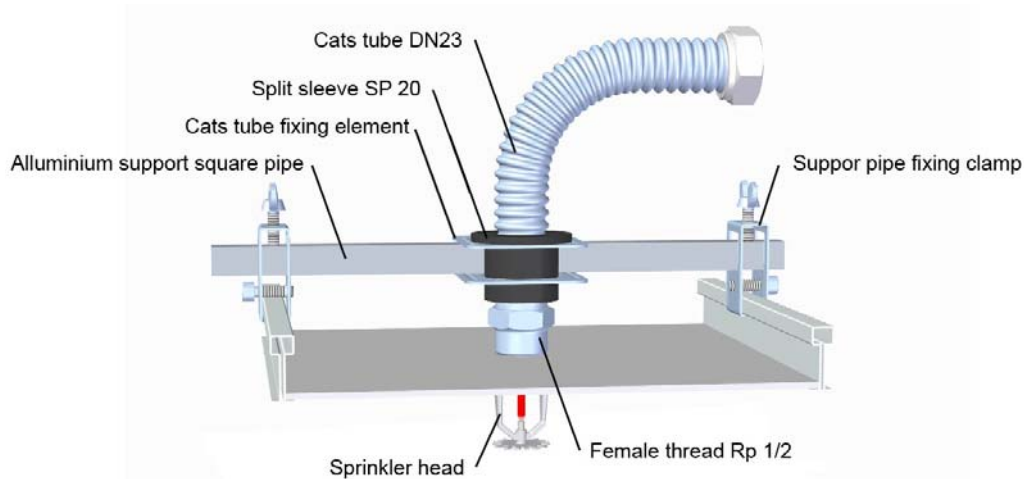


Figure 30 – Fixing of the tube using the load distributing frame

All plastics parts used in fixing systems have the size stability at least up to 150 °C.

NOTE AZ - Pokorný does not supply sprinklers and their accessories (for instance covers for suspended ceilings)

5.5 Other applications conditions

Should the system be used for other media or in any other way differing from the description as contained herein, it shall be consulted with the manufacturer who will assess the application under specified conditions. The producer informs the customer in writing about potential deviations in the way and conditions of usage that are different from those mentioned herein (for example by issuing a special Instruction sheet).

What is to be assessed are in particular the effects of the media and environment upon used materials, fitness of pressure and thermal load, fitness of individual type of joints and components.

For ready-made products the producer can also specify conditions deviate from mentioned herein. These conditions are part of a special Instruction sheet delivered with a product.

If the user executes such an installation without a consultation with the manufacturer or without manufacturer's written positive assessment, the manufacturer cannot be held responsible for the fitness of the application and quality and serviceability of the installation.

6 Cats from the point of view of legislation

The system CATS is the product within the scope of the (Council Directive (89/106/EEC) on the approximation of laws, regulations and administrative provisions of the Member States) relating to construction products. The fitness for use is certified according to the above mentioned Directive.

This document is based onto the scope of the certificate of SZU Brno No. B-30-00309-06-rev.2. Users of this document need to be aware that more detailed national standards and/or codes of practice may exist in the CEN member countries. This document is intended to be applied in association with these national standards and/or codes of practice setting out the above mentioned basic principles.

If the system CATS is used within the scope of any other certificate than this one mentioned above, the distributor/importer shall provide users with information concerning the deviations in the application, resulting from the scope of the other certificate.

7 Final provisions

Any activities and systems developed subject to this standard correspond the state of art and level of scientific knowledge, tests and experience of the manufacturer of the system. In the event of a deviation from these procedures and use of other components without a written consent (of the supplier), the manufacturer and supplier of the system cannot assume any liability pursuant to respective regulations.

8 Quoted and related regulations

8.1 Legal regulations

Council Directive 89/106/EEC on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products

8.2 Technical standards

- EN 45020 Standardization and related activities - General vocabulary
- EN 10226-1 Pipe threads where pressure tight joints are made on the threads - Part 1: Taper external threads and parallel internal threads - Dimensions, tolerances and designation
- EN 10226-2 Pipe threads where pressure tight joints are made on the threads - Part 2: Taper external threads and taper internal threads - Dimensions, tolerances and designation
- EN ISO 228-1 Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation
- ISO 7-1 Pipe threads where pressure-tight joints are made on the threads. Part 1: Dimensions, tolerances and designation
- EN 549 Rubber materials for seals and diaphragms for gas appliances and gas equipment
- EN 751-1 Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 1: Anaerobic jointing compounds
- EN 751-2 Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 2: non-hardening jointing compounds
- EN 751-3 Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 3: Unsintered PTFE tapes
- EN 437 Test gases - Test pressures - Appliance categories
- EN 15242 Ventilation for buildings - Calculation methods for the determination of air flow rates in buildings including infiltration
- EN 15266 Stainless steel pliable corrugated tubing kits in buildings for gas with an operating pressure up to 0,5 bar
- EN 14800 Corrugated safety metal hose assemblies for the connection domestic appliance using gaseous fuels
- EN 1775 Gas supply - Gas pipework for buildings - Maximum operating pressure less than or equal to 5 bar - Functional recommendations
- EN 14291 Foam producing solutions for leak detection on gas installations
- EN 12613 Plastics warning devices for underground cables and pipelines with visual characteristics
- EN 13501-1 Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests
- EN 13501-2 Fire classification of construction products and building elements - Part 2: Classification using test data from resistance fire tests, excluding ventilation services
- EN 13501-3 Fire classification of construction products and building elements - Part 3: Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers

9 Conclusion

Dear users,

AZ – Pokorný, s.r.o. keeps improving and amending the Cats system. What is a source of inspiration for us are often your comments and experience. If necessary, do not hesitate to contact and ask for consultation or to communicate your comments. Only a bilateral contact between us as the manufacturer of the system and you as the users will make it possible for us to keep developing the system in order to satisfy you as much as possible and to include new components, improve the support etc.

Let us wish a nice, fast and problem-free work with the Cats system.

AZ – Pokorný, s.r.o.
info@az-pokorny.cz

10 Annexes

The annexes as attached hereto are either informative or normative. The nature of every of the annexes is specified in each of them.

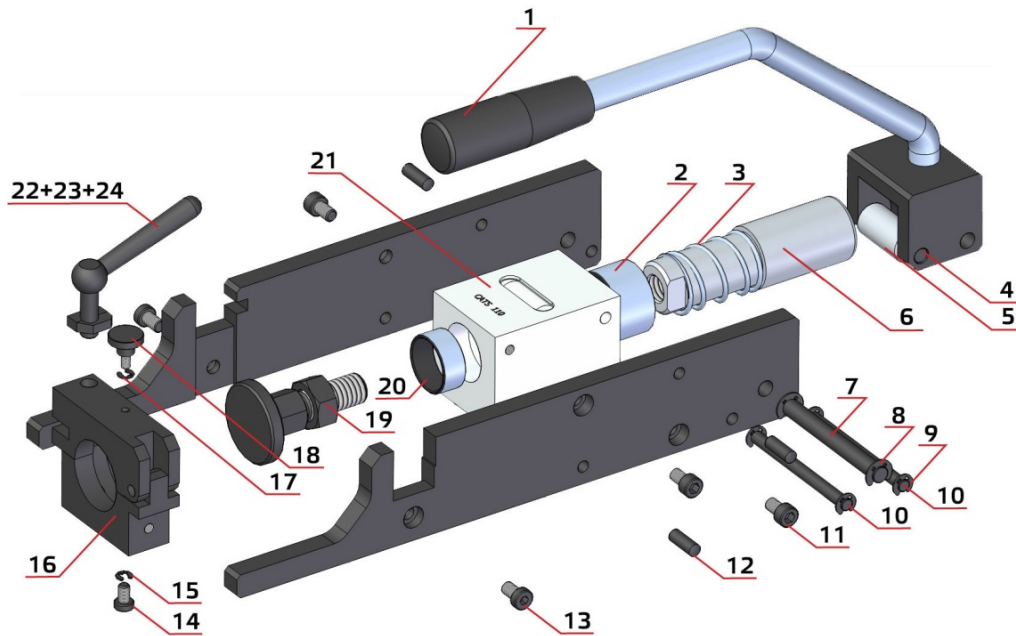
Annex A (normative)**Risks, protection, risk minimising**

| Procedures and risks | Protection and prevention |
|---|---|
| Damage to surface (damage during storage and shipment, tool and other object scratches) => they may contribute to corrosion | Don't use any metallic tool when handling the tube (for instance metallic jaw pliers to keep the tubes), avoid wear of the tubes during storage and handling, do not clean the tubes using metallic objects (metallic wire bushes, metallic scrapers etc.). |
| Surface contamination (non-alloyed steel grades and metallic oxides, particles of other metals, particles generated by welding,...) => it may contribute to corrosion | Do not admit the tubes to get in touch with non-alloyed steel grades (for instance fixing to steel bushings); if you weld or use a grinder nearby the tube, protect the tubes against contamination by flying away particles |
| Exposure to halogen effects (detergents, sea salt, salts, chlorine in water in concentrations exceeding 1mg/l, ...), exposure to effects of acids and hydroxides or other substances, as the case may be => it may contribute to corrosion | Avoid contact with substances that may damage the tube or other coupling elements, provide tubes with plastics or other suitable G-sleeve or use a coated tube supplied by the manufacturer, never use chemicals to clean tubes (mainly avoid any chlorine containing detergents), avoid contamination of tubes by soldering pastes, glues etc. |
| Electrical cell in contact with some metals subject to exposure to electrolyte (for instance copper => electrolysis may chemically damage the material and there may be loss of material in particular on the part of the less refined metal (copper etc.) as stainless steel is more resistant compared to other standard metals | Avoid long-term contact with other metals (for instance connection of copper grounding tapes), if any such a contact with other metallic parts is inevitable, do not connect immediately the tube but use an ending or coupling element, do not allow for the formation of electrolyte at the place of the contact of various metals (dewing etc...). |
| Coats and paints (containing aggressive substances) => they may trigger corrosion or impair the structure of the surface of the tube | The manufacturer does not recommend to paint tubes and other components. When applying paints and coats nearby the tubes, protect the tubes against contamination. |
| Vibrations – they may loosen threaded joints and cause fractures of tubes | Do not install the tubes to those parts of the distribution system where they may get exposed to vibrations. Use stainless steel corrugated hoses for such applications, for instance WS type. |
| The most risky is a combination of the above factors, for instance the occurrence of electrolyte and chlorine ions or damage to the surface and its contamination by a hazardous substance. | |

Annex B (informative)

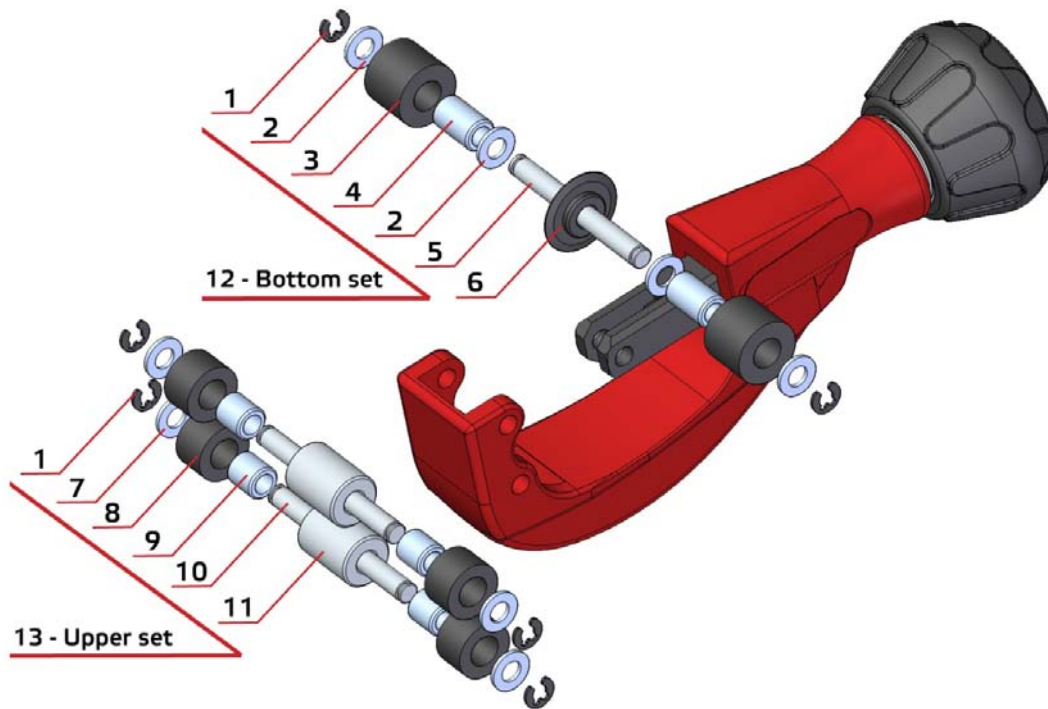
List of spare parts of the Cats press and cutter

Press Cats 120



| Position | Article No. | Name | Qty / press unit |
|----------|-------------|--|------------------|
| 1 | 15-023-011 | Grip PaB-I580/80 N-12 | 1 |
| 2 | 14-095-025 | Bushing 30*34*20 | 1 |
| 3 | 15-014-107 | Spring | 1 |
| 4 | 14-095-017 | Rolling element axis | 1 |
| 5 | 14-095-012 | Hardened rolling element + hardened chromium | 1 |
| 6 | 14-095-005 | Hardened piston + hardened chromium | 1 |
| 7 | 14-095-016 | Axis D8 | 1 |
| 8 | 15-014-404 | Retain ring 7 DIN 6799 | 2 |
| 9 | 15-014-403 | Retained ring 5 DIN 6799 | 4 |
| 10 | 14-095-015 | Axis D6 | 2 |
| 11 | 15-013-003 | Bolt M6*10 10.9 DIN 912 | 4 |
| 12 | 15-014-309 | Conic grooved pin 6*16 DIN 1472 | 4 |
| 13 | 15-013-002 | Bolt M6*10 8.8 DIN 7984 | 2 |
| 14 | 15-013-013 | Bolt M5*8 DIN 7984 | 1 |
| 15 | 15-014-405 | Retained ring 4 DIN 6799 | 1 |
| 16 | 33-501-010 | Basic lock assembly | 1 |
| 17 | 15-014-402 | Retained ring 3 DIN 6799 | 1 |
| 18 | 15-013-004 | Grooved head bolt M4*8 DIN 464 | 1 |
| 19 | 33-501-009 | Setting screw assembly | 1 |
| 20 | 14-095-026 | Bushing 25*28*12 | 1 |
| 21 | 14-095-004 | Cube (piston rod) | 1 |
| 22 | 14-095-097 | Pin lever | 1 |
| 23 | 14-095-019 | Securing latch | 1 |
| 24 | 15-014-304 | Flexible pin 2,5*12 | 1 |
| | 14-095-101 | Jaws DN 8 | 1 |
| | 14-095-102 | Jaws DN 12 | 1 |
| | 14-095-103 | Jaws DN 16 | 1 |
| | 14-095-105 | Jaws DN 20 | 1 |
| | 14-095-107 | Jaws DN 25 | 1 |

Cutter Cats 250



| Position | Article No. | Name | Qty / cutter unit |
|----------|-------------|--------------------------------|-------------------|
| 13* | 03-004-032 | Upper set for Cats 250 | 1 |
| 1 | 15-014-407 | Retained ring 5 DIN 471 1.4122 | 4 |
| 7 | 15-014-203 | Washer 10*5,3*0,5 mm SS | 4 |
| 8 | 14-080-052 | Driving wheel NBR 13,9*8,8 | 4 |
| 9 | 14-095-217 | Bushing 8,7mm Zn | 4 |
| 10 | 14-095-214 | Axis D5*49,5 Cr | 2 |
| 11 | 14-095-216 | Roller Cr | 2 |
| 12* | 03-004-033 | Bottom set for Cats 250 | 1 |
| 1 | 15-014-407 | Retained ring 5 DIN 471 1.4122 | 2 |
| 2 | 15-014-202 | Washer 10*5,3*1 mm steel Zn | 4 |
| 3 | 14-080-053 | Driving wheel NBR 15,8*13 | 2 |
| 4 | 14-095-218 | Bushing 13mm Zn | 2 |
| 5 | 14-095-215 | Axis D5*47 Cr | 1 |
| 6 | 14-095-203 | Cutting wheel | 1 |

* The sets include immersed items in the quantity as specified in the table. Separate components may be purchased.