4.0 Applications and Characteristics

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1.1 About us

Since completing the acquisition of the Mapress Group in January 2004, Geberit proudly introduces the Geberit Mapress presssfitting system. Geberit Mapress is one of the world's leading pressfitting systems having proven its performance over 30 years and comprises three different materials - stainless steel, carbon steel and copper - to suit a wide range of applications.

The Swedish engineer Gunnar Larsson invented the pressfitting method at the end of the 50s. It was slow to gain initial acceptance, since the trade was reluctant to trust a method of connection that did not involve heat. Soldered, welded and screwed pipe connections were accepted practice at the time.

In 1967 Kronprinz AG took up the matter in Germany. The experts at this Mannesmann subsidiary, one of the leading German manufacturers of welded precision steel pipes at the time, recognised the advantages of the technology. In 1969 the newly established Mannesmann Pressfitting GmbH (Mapress) in Langenfeld began manufacturing and marketing steel pressfittings and pipes.

In 1986 the certification of a stainless steel system of *mapress* pressfittings for installing water supply systems represented a decisive breakthrough for the company. This approval signalled the start of widespread use of the pressfitting system. It has now become established as one of the standard methods of connecting pipes.

With numerous international approvals, *mapress* systems are used not only for building services (plumbing, heating and air conditioning) but also in industry. Typical industrial applications of *mapress STAINLESS STEEL* include marine sprinkler systems, compressed air systems in mechanical engineering, process plant engineering and the car-making industry, and petrochemical pipework.

An extremely wide variety of **successful projects** demonstrate the capabilities of Mapress products and systems and the wealth of applications. Vienna's Millennium Tower and Bavaria's fairy-tale Neuschwanstein Castle have *mapress* system building services. The major car wash chain Mr. Wash also uses *mapress* pipe systems.

In The United Kingdom the entire range of *mapress* products is available through the nationwide **network of more than 300 distributors.** Expert **Sales Representatives** ensure a fast and professional local service.

From the Langenfeld production facility Geberit Mapress now supplies more than 30 countries throughout the world. The most important sales markets are Europe, the countries of the Arabian Gulf and the USA (for shipbuilding).

Figure 1.0-1 Aerial photograph of Geberit Mapress GmbH facilities

1.0 Introduction

1.2 History of the pressfitting

Gunnar Larsson, the inventor of the pressfitting method, was born in 1922 in Molkom, a village in the central Swedish province of Värmland. He always wanted to be an engineer, and eventually achieved his goal by studying at a technical college for three years and working in a design office. He continued his studies at the Technical University of Stockholm and the School of Home Economics. From the end of the 50s, Larsson was involved in developing a method of pressing stainless steel. At the end of 1958 he applied for a patent for the first pressfitting. Tests on steel, stainless steel, copper and aluminium versions followed, until in 1963 the first heating system using copper pressfittings was installed in a house in Sweden. In the same year he also gained approval to use the copper pressfitting system for installing water supply systems. In 1984 he sold all rights to the invention to the Swedish company AGA in Helsingborg. In the 70s Gunnar Larsson lived in Bochum, Cannes and Überlingen, where he died in 1985.

In 1967 Kronprinz AG in Solingen decided to develop the pressfitting method in Germany. Kronprinz, a subsidiary of the Mannesmann Group and at the time one of the leading German manufacturers of welded precision steel pipes,

Figure 1.0-2 Gunnar Larsson

recognised the advantages of the technology. After concluding a licensing agreement with AGA, Kronprinz started producing and selling unalloyed steel pressfittings.
In 1969 the newly established Mannesmann Pressfitting GmbH took over the manufacture and supply of the unalloyed steel pressfitting system. Production of *mapress CARBON STEEL* was originally limited to sizes (pipe ODs) from 12 to 28mm, but was widened to include 35 to 54mm in 1973. The Super Sizes (76.1 to 108.0mm) in stainless Cr-Ni steel for use in closed hot water heating systems were added to the range in 2000. April 2001 saw the introduction of externally galvanised *CARBON STEEL* pressfittings.

In 1983, after many years of testing, the German Gas Installation and Plumbing Association (DVGW) approved the company's Cr-Ni-Mo *STAINLESS STEEL* pressfitting system for installing water supply systems. Initially only available in sizes from 15 to 35mm, by 1988 the *STAINLESS STEEL* series of products had already been extended to include sizes up to 54mm. In 1994 the program was supplemented with sizes from 76.1

Figure 1.0-3 *mapress CARBON STEEL*

to 108mm to cater for major industrial projects.

Figure 1.0-4 *mapress STAINLESS STEEL*

Since August 1999 we have been supplying copper pressfittings (pipe ODs from 12 to 54mm) for heating and water supply systems.

Figure 1.0-5 ***mapress COPPER***

In 2000 the *mapress* product range was extended with *STAINLESS STEEL GAS* and in 2001 *COPPER GAS* was introduced in sizes from 15 to 54mm for installing gas systems. The *STAINLESS STEEL GAS* pressfitting system has been produced in sizes from 15 to 108mm since 2003. In 2002 we rounded off our range for building services with the *mapress EDELFLEX* floor distribution system.

Figure 1.0-6 ***mapress EDELFLEX***

To meet the increasingly stringent requirements imposed on pressfitting systems for installing drinking water supply systems, in 2003 the *mapress STAINLESS STEEL* range was supplemented with *mapress STAINLESS STEEL BALL VALVES*.

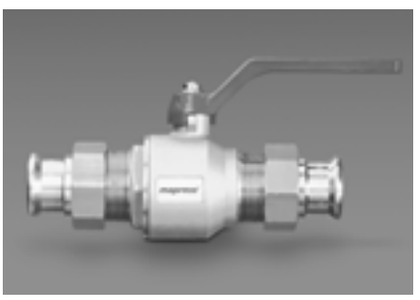


Figure 1.0-7 ***mapress STAINLESS STEEL BALL VALVE***

The *mapress* pressfitting system is now one of the standard methods of connecting pipes.

To supplement the *mapress* pressfitting system with sealing elements, which has been used in building services and industry for over 30 years, in 2003 a *mapress MAM* pressfitting connection with metal to metal seal (no seal rings) was developed specifically to meet the requirements of industrial pipework.

Figure 1.0-8 ***mapress MAM***

2.0 Technology

2.1 *mapress* system

The *mapress* pressfitting system is manufactured in:

stainless steel,
unalloyed steel,
copper and
copper-nickel-iron alloy,
and has the following components:

- ***mapress* pressfittings**
  - *STAINLESS STEEL*
  - *EDELFLEX*
  - *CARBON STEEL*
  - *COPPER*
  - *STAINLESS STEEL GAS*
  - *COPPER GAS*
  - *CUNIFE*

- ***mapress* valves**
  - *STAINLESS STEEL BALL VALVE*

- ***mapress* pipes**
  - *STAINLESS STEEL*
  - *EDELFLEX*
  - *CARBON STEEL*
  - *SUPER SIZE HEATING*
  - *CUNIFE*

- ***mapress* pressing tools**
  - MFP 2
  - EFP 2
  - ECO 1
  - ACO 1
  - ECO 3
  - ACO 3
  - HCPS
  - PFP 2-Ex

The system offers sizes (pipe ODs) ranging from 12 to 108mm depending on the material. For more than 30 years the type of connection involved has been used in building services, particularly for hot water heating systems (*CARBON STEEL*, *COPPER* and *SUPER SIZE HEATING*), and in water supply systems (*STAINLESS STEEL* and *COPPER*).

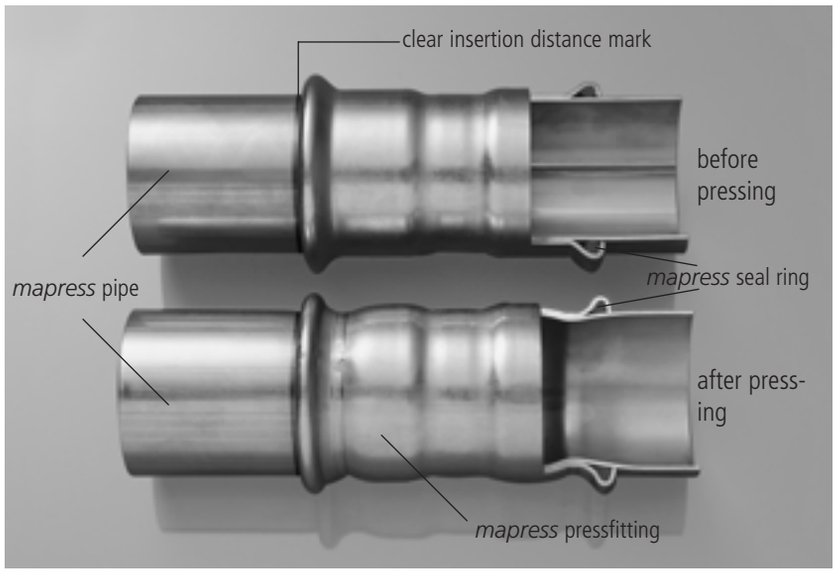


Figure 2.0-1 *mapress* pressfitting connection

The pressfitting system is characterised by the method of pressing fitting and pipe with the matching tool to form a permanent connection

This quick and easy, yet safe and reliable connection is a cost-effective technical alternative to solvent welding, soldering, brazing and metal welding. The fact that it is made cold eliminates the risk of fire.

The pressing profile and the distance the pipe is inserted into the fitting give the connection its mechanical strength. The sectional deformation of the seal rings fitted in the end beads ensures a permanently tight joint. The grade of seal material depends on the requirements of the fluid to be carried.

The connection is made by pushing the prepared pipe a defined distance into the pressfitting, then pressing pipe and fitting with the matching tool. This causes deformation in two planes. The deformation of pressfitting and pipe in the first plane provides mechanical strength, and the deformation of the section of the resilient seal ring in the second plane ensures a permanently tight joint.

The permanent nature of this positive and frictional connection also makes it suitable for laying under plaster.

Depending on its size, the connection is pressed with jaws or collars, which give different pressing profiles. The jaws for pipe ODs from 12 to 35mm produce hexagonal profiles. Pipe ODs from 42 to 108mm require the higher deformation forces that are produced by pressing collars giving a lemon-shaped profile.

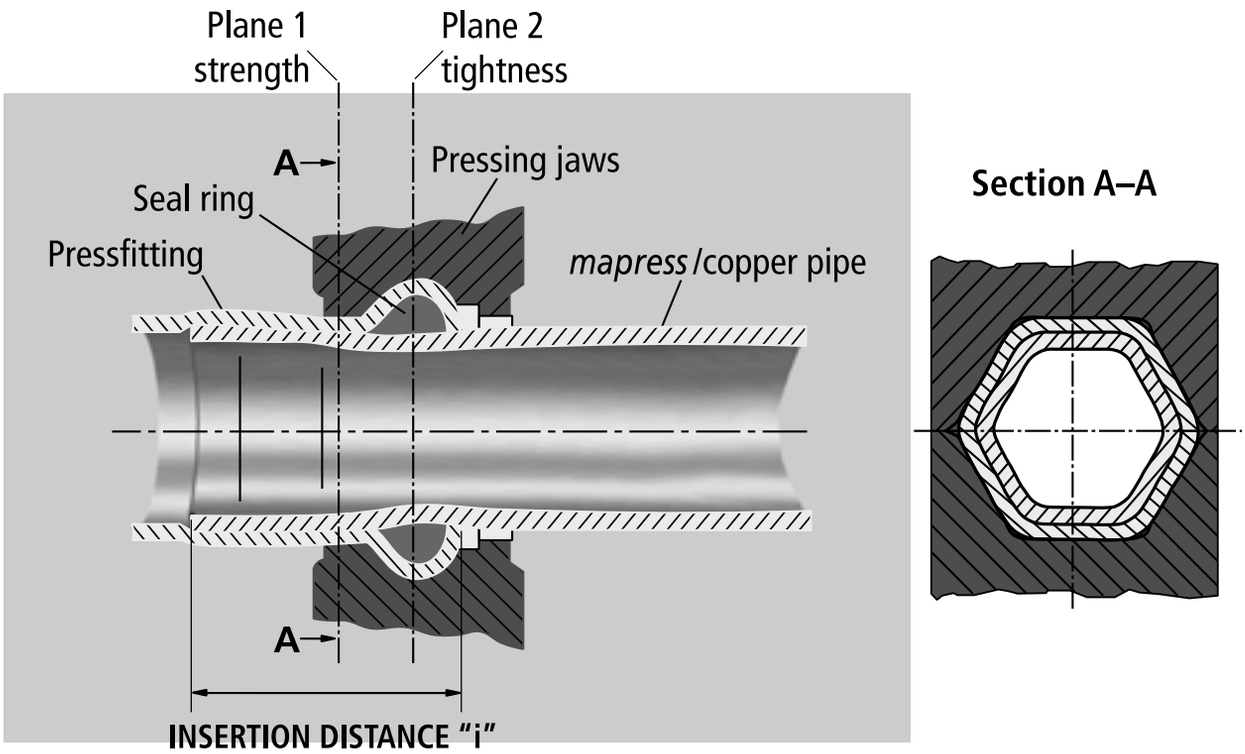


Figure 2.0-2 Section through a *mapress* pressfitting connection with jaws still in position.
Sizes (pipe ODs) 12-35mm pressed to hexagonal profile

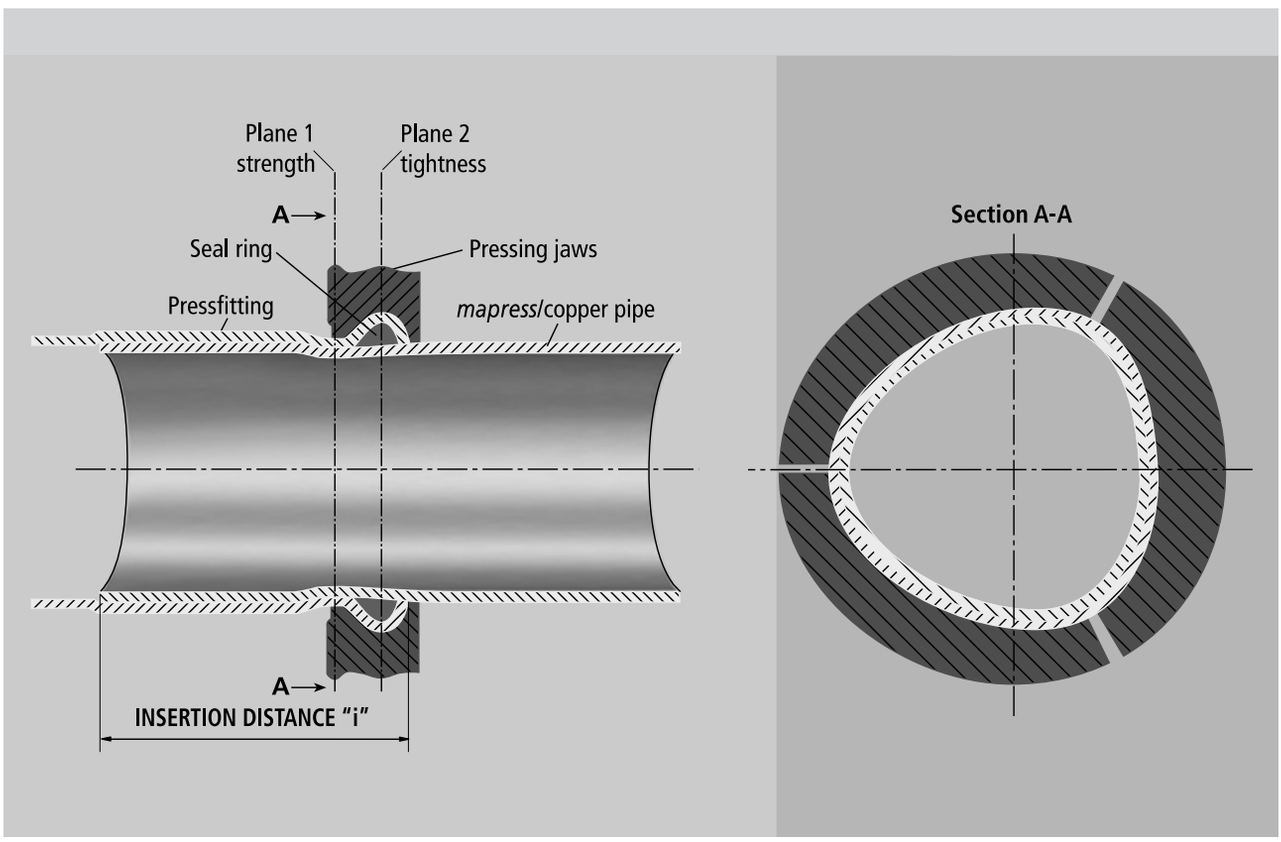


Figure 2.0-3 Section through a *mapress* pressfitting connection with collar still in position.
Sizes (pipe ODs) 42-108mm pressed to lemon-shaped profile

2.0 Technology

The reliability of the *mapress* pressfitting system has been tested, certified and approved worldwide on the basis of the DVGW guidelines.

The grade of seal ring material must meet the requirements of the fluid to be carried:

- **Black butyl rubber (CIIR)**

The standard seal ring for

working temperatures
from -30 to +120°C

working pressures
of up to 16 bar

Suitable for hot water heating systems, low pressure steam, water supply systems and treated water.

Depending on the pipe size, the test pressure for special cases is up to 40 bar.

- **Yellowish brown acrylonitrile butadiene rubber (NBR)**

A special seal ring for

continuous working
temperatures from -20 to +70°C

working pressures

- indoors of up to 1 bar (copper) to up to 5 bar (stainless steel)
- outdoors of up to 5 bar (copper and stainless steel)

Suitable for installing natural gas and liquefied gas (LPG) systems.

- **Green fluorocarbon rubber (FPM)**

A special seal ring for

working temperatures
from -30 to +180°C (+200°C)

working pressures
of up to 16 bar.

Suitable for solar systems at elevated temperatures of up to 180°C (200°C briefly) carrying a tested mixture of water and glycol. This special seal ring can also be used for extra light fuel oil supplies at ambient temperatures.

- **Red fluoropolymer (FPM)**

A special seal ring for

working temperatures
from -30 to +110°C
up to 180°C depending on fluids and manufacturer's approval
working pressures of up to 16 bar.

Depending on the pipe size, the test pressure for special cases is up to 40 bar.

Suitable for industrial applications such as fixed water fire extinguishing systems including sprinklers. This grade can also be used for process water, compressed air, condensate, coolant and chilled water.
Its use for other applications or fluids must be approved by Geberit Limited

The *mapress* pressfitting system has been certified to DIN EN ISO 9001. Declarations of conformity and approvals are available for the special building services and industrial applications. In Germany transferred liability agreements have been concluded for the use of the system with the Heating, Plumbing and Air Conditioning Federation (ZVSHK) and the Federal Association for Heating, Plumbing and Air Conditioning (BHKS), for the benefit of the tradespeople and installation contractors indirectly represented by these organisations. These provisions go beyond the statutory warranty obligations.

Our German and international customers are served by a network of technical advisers.

In our Information Centre we conduct seminars and training on all aspects of supply systems and building services.

Products are supplied through a comprehensive, three-stage distribution network.

For further information please contact

Geberit Ltd Technical Services on 01622 717811
E-Mail: technical@geberit.co.uk
or visit our website at www.geberit.co.uk

2.2 Applications

The *mapress* pressfitting system is innovative, cost-effective, safe and reliable. It offers a carefully thought out solution for all residential, office and industrial building applications and is ideal for special applications. In fact the range of possibilities is only limited by the choice of materials (unalloyed steel, copper or stainless steel) and the grade of seal ring. Unalloyed steel is all that is needed for closed hot water heating, solar and similar systems. Depending on the water quality, copper is also suitable for installing hot and cold water supply systems. There are no restrictions on stainless steel, which can be used for installing all hot and cold water supply, gas, process water, fixed fire extinguishing (incl. sprinklers), hot water heating and similar systems. Other types of system may also be possible by agreement with Mapress.

The *mapress* pressfitting system employs a quick and easy, yet safe and reliable, method of connection. As a cost-effective technical alternative to conventional solvent welding, soldering, brazing or metal welding, this pressfitting connection is particularly suitable for refurbishment. The fact it is made cold eliminates the risk of fire.

Building service and industrial applications are only limited by the European directives as implemented in the different national legislation, technical codes and standards.

Table 2.0-1 Advantages of the *mapress* pressfitting system

Fast	Labour costs approximately 25 to 40% lower than with conventional connection methods
Clean	Ideal for refurbishment of inhabited buildings
Safe	None of the fire risks involved in soldering, brazing or welding
Economical	Avoids bottle hire and consumable costs for gases including oxygen
Simple	Reduced danger of utilisation mistakes
Universal	Can be laid on or under plaster
Hygienic	Black butyl rubber (CIIR) seal ring meets the microbiological hygiene (eg in relation to Legionella) requirements of DVGW Code of Practice W 270
Tried and tested	Black butyl rubber (CIIR) seal ring is the only type used for pressfitting connections that has over 30 years' practical experience and testing behind it

2.0 Technology

2.3 Technical data for *mapress* pressfitting systems

Application		Water Supply	Heating	Gas	
Pressfitting connection		Positive and frictional pipe connection that remains permanently tight, made using *mapress* pressfittings with thin walled *mapress* pipes or DIN EN/DVGW copper pipes. Tested to DVGW Code of Practice W 534 / VP 639 GW (drinking water) and DVGW Test Guidelines VP 614 (gas).			
MATERIALS	**Pressfittings**	High alloy, austenitic, stainless chromium-nickel-molybdenum steel: **Cr-Ni-Mo steel,** material No 1.4401 (BS 316 S 33) material No 1.4571 (BS 320 S 31) to DIN EN 10088	Unalloyed **E 195** (RSt 34-2) steel, material No 1.0034 to DIN EN 10305 Externally galvanised to DIN 50961	High alloy, austenitic, stainless chromium-nickel-molybdenum steel: **Cr-Ni-Mo steel,** material No 1.4401 (BS 316 S 33) material No 1.4571 (BS 320 S 31) to DIN EN 10088	
			Stainless chromium-nickel steel: **Cr-Ni steel,** material No 1.4301 to DIN EN 10088 (BS 304 S 31)		
		DHP copper, material No CW 024A to DIN EN 1412/DVGW GW 392, red brass (Rg5), material No 2.1096 to DIN EN 1982 (CuSn5ZnPb)			
	***mapress* pipes**	High alloy, austenitic, stainless chromium-nickel-molybdenum steel: **Cr-Ni-Mo steel,** material No 1.4401 (BS 316 S 33) material No 1.4571 (BS 320 S 31) to DIN EN 10088 Pipe to DVGW W 541 VP 639 GW	Unalloyed **E 195** (RSt 34-2) steel, material No 1.0034 to DIN EN 10305 with white anticorrosion paint, polypropylene coating	High alloy, austenitic, stainless chromium-nickel-molybdenum steel: **Cr-Ni-Mo steel,** material No 1.4401 (BS 316 S 33) material No 1.4571 (BS 320 S 31) to DIN EN 10088 Pipe to DVGW W 541	
			Stainless chromium-nickel steel: **Cr-Ni steel,** material No 1.4301 to DIN EN 10088 (BS 304 S 31), pipe to DIN EN 10312		
	Copper pipes	DHP copper, material No CW 024A to DVGW GW 392 and DIN EN 1057			
	Seal rings	Black (CIIR)		Yellowish brown (NBR)	
			Green (FPM)		
Working temperatures		Black (CIIR): -30 to 120°C (150°C)[1]		- 20°C to 70°C	
			Green (FPM): -30 to 180°C (200°C)[2]		
Working pressures		up to 16 bar (safety test pressure up to 40 bar)		indoors with enhanced thermal capacity **ETC**[3]	outdoors (above ground)
				Stainless steel: up to **5** bar	Stainless steel: up to **5** bar
				Copper up to **1** bar	Copper up to **5** bar
Outside diameter (of pipe)		OD_{SS} = 15 – 108 mm $OD_{Edelflex}$ = 15 mm OD_{Cu} = 12 – 54 mm	$OD_{carbon\ st.}$ = 12 – 108 mm $OD_{Edelflex}$ = 15 mm OD_{Cu} = 12 – 54 mm OD_{SS} = 15 – 108 mm	OD_{SS} = 15 – 108 mm OD_{Cu} = 12 – 54 mm	

[1] Increase to maximum of 150°C for up to 1 hour permitted in event of malfunction
[2] Suitable for brief increase to 200°C
[3] See VP 614

2.4 Approvals

mapress (material)	Applications	Test guidelines, codes and standards	System and other test marks
mapress STAINLESS STEEL	- Water supply systems - Fire mains - Rainwater - Treated water - Hot water heating systems - Open/closed water circuits - Compressed air - Solar systems (green (FPM) seal ring) - Extra light fuel oil (green (FPM) seal ring)	DVGW-W 270 DVGW-W 534 SVGW W/TPW 132 TRbF 231	**DVGW:** DW-8501AT2552 SVGW 8503-1663 ÖVGW-W 1.088
mapress EDELFLEX	- Water supply systems - Rainwater - Treated water - Open/closed water circuits - Compressed air - Hot water heating systems	DVGW-W 270 DVGW-VP 639 GW DVGW-W 534	**DVGW:** DW-8501AT2552
mapress STAINLESS STEEL BALL VALVE	- Water supply systems - Rainwater - Treated water - Hot water heating systems - Open/closed water circuits	DIN 3433 DVGW-W 534	**DVGW:** NW-6102BN0672
mapress CARBON STEEL	- Closed hot water heating systems - Closed water circuits - Dehumidified compressed air - Extra light fuel oil (green (FPM) seal ring)	DVGW-W 534 TRbF 231	–
mapress COPPER (pressfittings)	- Hot water heating systems - Closed water circuits - Water supply systems - Compressed air - Solar systems (green (FPM) seal ring) - Extra light fuel oil (green (FPM) seal ring)	DVGW-W 534 DVGW-W 270 TRGF 231 (Part 1)	DVGW: DW-8501AU2013 ÖVGW-W 1.299
mapress STAINLESS STEEL GAS	- Gas systems Natural gas and liquefied gases	DVGW-VP 614 ÖVGW-G1-TR-Gas	DVGW: DG-4550BL0118 ÖVGW-G 2.663
mapress COPPER GAS (pressfittings)	- Gas systems Natural gas and liquefied gases	DVGW-VP 614 ÖVGW-G1-TR-Gas (A)	DVGW: DG-4550BL0161 ÖVGW-G 2.664

DVGW SVGW SSIGE ÖVGW GEPRÜFT kiwa Partner for progress

3.0 Components

3.1 *mapress* pressfittings

3.1.1 General

The basic element of the pressfitting connection is designed to deform plastically. It is available in the following versions:

- ***STAINLESS STEEL***
- ***EDELFLEX***
- ***CARBON STEEL***
- ***SUPER SIZE HEATING***
- ***COPPER***
- ***CUNIFE***
- ***STAINLESS STEEL GAS***
- ***COPPER GAS***

Seal rings (other than the green (FPM) version) are factory fitted in its end beads.

The *mapress* pressfitting with pipe inserted the specified distance is pressed with a suitable tool.

3.1.2 *STAINLESS STEEL*

The *mapress STAINLESS STEEL* pressfitting (available in sizes (pipe ODs) from 15 to 108mm) is manufactured from Cr-Ni-Mo steel (material No 1.4401 (BS 316 S 33)/1.4571 (BS 320 S 31)).

3.1.3 *EDELFLEX*

A stainless Cr-Ni-Mo steel with material No 1.4401 (BS 316 S 33)/1.4571 (BS 320 S 31) is used for the *mapress EDELFLEX* pressfitting. This pressfitting is used in conjunction with the 15 (OD) x 1.6mm *mapress EDELFLEX* pipe mainly to provide flexible floor distribution systems.

3.1.4 *CARBON STEEL*

The *mapress CARBON STEEL* pressfitting (available in sizes (pipe ODs) from 12 to 54mm) is manufactured from unalloyed steel (material No 1.0034) (E 195, formerly RSt. 34-2). To protect against corrosion it is externally galvanised (7 to 15 microns, Fe/Zn 8B, blue chromated). This galvanising provides protection equivalent to a hot dip galvanised steel pipe.

3.1.5 *SUPER SIZE HEATING*

The *mapress SUPER SIZE HEATING* pressfitting (available in sizes (pipe ODs) from 76.1 to 108mm) is manufactured from stainless Cr-Ni steel, material No 1.4301 (BS 304 S 31).

3.1.6 *COPPER*

A DHP copper, material No CW 024A, and red brass, material No 2.109, are used for the *mapress COPPER* pressfitting (available in sizes (pipe ODs) from 12 to 54mm). This pressfitting has factory-fitted black butyl rubber (CIIR) seal rings, and is suitable for installing closed hot water heating and water supply systems.

3.1.7 *CUNIFE*

The *mapress CUNIFE* pressfitting (available in sizes (pipe ODs) from 15 to 108mm) is manufactured from a Cu-Ni-Fe-Mn alloy with material No 1.1972.11. This pressfitting can be used for water with an elevated chloride content (eg sea water).

3.1.8 *STAINLESS STEEL GAS*

The *mapress STAINLESS STEEL GAS* pressfitting (available in sizes (pipe ODs) from 15 to 108mm) is manufactured from Cr-Ni-Mo steel (material No 1.4401 (BS 316 S 33) / 1.4571 (BS 320 S 31)). It is used for installing gas systems.

3.1.9 *COPPER GAS*

The *mapress COPPER GAS* pressfitting (available in sizes (pipe ODs)) from 12 to 54mm) consists of DHP copper, material No CW 024A, and red brass (material No 2.109). It is suitable for installing gas systems.

3.1.10 Substances hindering painting

All *mapress* pipes, all pressfittings with plain ends (eg some elbows) and all unalloyed steel and Cu-Ni-Fe-Mn alloy pressfittings are always supplied free from substances hindering painting.

- ***STAINLESS STEEL,***
- ***EDELFLEX***
- ***SUPER SIZE HEATING*** **and**
- ***COPPER***

pressfittings are not supplied free from substances hindering painting as standard.

Ordering and supplying silicone free components

STAINLESS STEEL and *SUPER SIZE HEATING* pressfittings are only supplied "free from substances hindering painting" when specifically ordered! The factory will then mark the packs "silicone free".

Silicone free products may be ordered by replacing the 1st digit (3 or 1) in the 5-digit *mapress* catalogue No with an 8.

Invitations to tender and orders must specify the required form as follows:

"*mapress* silicone free *STAINLESS STEEL*"
"*mapress* silicone free *SUPER SIZE HEATING*".

3.1.11 Markings

Name of pressfitting	Outside diameter (of pipe)	Marking	Explanation
mapress STAINLESS STEEL	OD = 15 to 108mm	**- DVGW** **- Ⓜ** **- 28** **- ◁ FM ▷** **- VdS**	- Approved (for pipe ODs from 15 to 54mm) - Mapress GmbH & Co. KG - Outside diameter of pipe (eg 28mm) - Approved (pipe ODs from 22 to 108.0mm) - Approved (pipe ODs from 22 to 108.0mm)
mapress **Silicone free** ***STAINLESS STEEL***	OD = 15 to 108mm	**- blue** colour coding **- DVGW** **- Ⓜ** **- 28** **- ◁ FM ▷** **- VdS**	- Silicone free - Approved (for pipe ODs from 15 to 54mm) - Mapress GmbH & Co. KG - Outside diameter of pipe (eg 28mm) - Approved (pipe ODs from 22 to 108.0mm) - Approved (pipe ODs from 22 to 108.0mm)
mapress EDELFLEX	OD = 12mm	**- DVGW** **- Ⓜ** **- Eflex**	- Approved - Mapress GmbH & Co. KG - *EDELFLEX* pressfitting
mapress CARBON STEEL	OD = 12 to 54mm	**- red** colour coding **- Ⓜ** **- 28** **- ◁ FM ▷**	- Galvanised form - Mapress GmbH & Co. KG - Outside diameter of pipe (eg 28mm) - Approved (pipe ODs from 22 to 54mm)
mapress SUPER SIZE HEATING	OD = 76.1 to 108mm	- ***mapress SUPER SIZE*** for heating **- Ⓜ** **- 76,1**	**- White** sticker with blue lettering - Mapress GmbH & Co. KG - Outside diameter of pipe (eg 76.1mm)
mapress COPPER	OD = 12 to 54mm	**- DVGW** **- Ⓜ** **- 28**	- Approved - Mapress GmbH & Co. KG - Outside diameter of pipe (eg 28mm)
mapress CUNIFE	OD = 15 to 108mm	**- Ⓜ** **- 28**	- Mapress GmbH & Co. KG - Outside diameter of pipe (eg 28mm)
mapress STAINLESS STEEL GAS	OD = 15 to 108mm	**- yellow** colour coding **- DVGW** **- Ⓜ** **- 28** **- GT/5** **- PN5**	- Suitable for installing gas systems only - Approved - Mapress GmbH & Co. KG - Outside diameter of pipe (eg 28mm) - ETC approval up to 5 bar - Maximum working pressure 5 bar
mapress COPPER GAS	OD = 15 to 54mm	**- yellow** colour coding **- DVGW** **- Ⓜ** **- 28** **- GT/1** **- PN5**	- Suitable for installing in gas systems only - Approved (pipe ODs from 15 to 54mm) - Mapress GmbH & Co. KG - Outside diameter of pipe (eg 28mm) - ETC approval up to 1 bar - Maximum working pressure 5 bar

3.2 *mapress* seal rings

The requirements of the fluid to be carried affect not only the choice of pressfitting and the system material, but also the grade of seal ring material.

- **Black butyl rubber (CIIR)**

The standard seal ring for

working temperatures
from -30 to +120°C

working pressures of up to 16 bar.

Depending on the size of the pipe, a working pressure of up to 40 bar is permitted in special cases

This seal ring conforms to the

- German KTW Recommendations for Synthetic Materials in Water Supply Systems

and has been tested and certified to

- DVGW Code of Practice W 270 (Propagation of Microorganisms on Materials for Water Supply Systems)

so that it is completely suitable for installing in water supply systems and fire mains.
Approval by the

- VdS (German insurer's association)

means the *mapress* pressfitting system with the black (CIIR) seal ring can also be used for wet sprinkler systems. Other applications for the seal ring include treated water, water with elevated chloride content (sea water), process water, hot water heating systems, condensate lines and low pressure steam.

- **Yellowish brown acrylonitrile butadiene rubber (NBR)**

A special seal ring for

working temperatures
vfrom -20 to +70°C

working pressures

- indoors of up to 1 bar (copper) to up to 5 bar (stainless steel)
- outdoors of up to 5 bar (copper and stainless steel)

Suitable for installing natural gas and liquefied gas (LPG) systems.

- **Green fluorocarbon rubber (FPM)**

A special seal ring for

working temperatures
from -30 to +180°C (+200°C)

working pressures of up to 16 bar.

The seal ring has been tested and certified by the DIBt (German institute whose responsibilities include construction products) in accordance with the

- WHG (German water resources legislation).

It is suitable for coolant and chilled water systems, and for solar systems at elevated temperature of up to 180°C (200°C briefly) carrying a tested mixture of water and glycol used as the solar fluid. This seal ring is therefore unsuitable for hot water and high pressure steam systems. This special seal ring can also be used for extra light fuel oil supplies at ambient temperatures.

- **Red fluoropolymer (FPM)**

A special seal ring for

working temperatures
from -30 to +120°C
up to 180°C depending on fluids and manufacturer's approval

working pressures of up to 16 bar.

Depending on the pipe size, a working pressure of up to 40 bar is permissible in special cases.

This seal ring has been tested and certified by the

- VdS (German insurers' association)

and can therefore be used for wet and dry sprinkler systems (see separate Installation Guidelines).
Its approval by the DIBt in accordance with the

- WHG (German water resources legislation)

means the *mapress* pressfitting connection with the red (FPM) seal ring can be used for mineral, used and unused oils tested and approved by Mapress. This particular combination of pressfitting and ring has also been approved by the

- VdTÜV

for special industrial applications. Other applications for the red (FPM) seal ring are process water (containing oil or with elevated chloride contents), compressed air, condensate, coolant/chilled water and shipbuilding.

Its use for other applications or fluids must be approved by Geberit Ltd.
The red (FPM) seal ring may only be used with silicone free pressfittings.

Table 3.0-1 Summary of *mapress* seal rings and applications

Name	Black (CIIR) seal ring	Yellowish brown (NBR) seal ring	Green (FPM) seal ring	Red (FPM) seal ring
Acronym	CIIR	NBR	FPM	FPM
Material	Butyl rubber	Acrylonitrile butadiene rubber	Fluoropolymer	Fluoropolymer
Colour	black	yellowish brown	green	red
Minimum working temperature	– 30°C	– 20°C	– 30°C	– 30°C
Maximum working temperature	120°C (150°C)[1]	70°C	180°C (200°C)[3]	120°C
Maximum working pressure	16 bar 40 bar[4]	1 – 5 bar	16 bar	16 bar 40 bar[4]
Recommendations	KTW			
Testing	**DVGW** Code of Practice W 270, VdS	ETC	DIBT	VdS, VdTÜV DIBt
***mapress* pressfitting system**	- *STAINLESS STEEL* - *EDELFLEX* - *CARBON STEEL* - *COPPER* - *CUNIFE*	- *STAINLESS STEEL GAS* - *COPPER GAS*	- has to be inserted into pressfitting by installer	- *STAINLESS STEEL* - *CARBON STEEL* - *CUNIFE*
Applications	- Water supply systems - Fire mains - Rainwater - Treated water - Hot water heating systems - Water circuits - Compressed air up to class 4 - Noncorrosive gases[5] (nontoxic and non explosive)	- Gas systems with natural and liquefied gases (LPG)	- Solar systems - Extra light fuel oil[2]	- Fixed fire extinguishing systems - Compressed air - Coolant and chilled water - Condensate - Process water - Industrial fluids - Fuels - Mineral oil
Other fluids or applications	on request	none	none	on request
Contacts	Application Advice Geberit Ltd.			

[1] Increase to maximum of 150°C for up to 1 hour permitted in event of malfunction.
[2] Only at ambient temperature.
[3] Suitable for brief increase to 200°C.
[4] Only with manufacturer's approval.
[5] Silicon free only.

3.3 *mapress* valves

3.3.1 General

The *mapress STAINLESS STEEL BALL VALVE* has been added to the range to supplement the *mapress STAINLESS STEEL* pressfitting system. This valve has been tested and approved by the DVGW for draining and servicing water supply systems. Its welded pressfitting connections at both ends, with factory-fitted black (CIIR) seal rings, allow the use of a suitable pressing tool to connect it directly to a *mapress* pipe inserted the specified distance. The threads also allow screw connections to *mapress* or other threaded pipes.
The polished surface of the ball and the PTFE seals used mean actuating forces are approximately 60% lower than the requirements of the test standard.

Figure 3.0-1 ***mapress STAINLESS STEEL BALL VALVE***

3.3.2 *STAINLESS STEEL BALL VALVE*

mapress STAINLESS STEEL BALL VALVES in nominal diameters from DN15 to DN50 are made of high alloy, austenitic, stainless Cr-Ni-Mo steel, material No 1.4408 to DIN EN 10088, and conform to the test standard DIN 3433.

These valves have been tested and certified by the DVGW and are marked with the following DVGW system test marks specifying the application:

- DN15-50
  NW-6102BN0672 (drinking water)

Table 3.0-2 Technical data for *mapress STAINLESS STEEL BALL VALVE*

Noise class	Max working pressure (bar)	Max working temperature (°C)
1	25	90

3.3.3 Markings

Valve name	Nominal size	Markings	Explanation
mapress STAINLESS STEEL BALL VALVE	DN15-50	- DVGW - *mapress* - DN25 - PNxx	- Approval (DN15-50) - Mapress GmbH & Co. KG - Nominal diameter - Working pressure

3.4 *mapress* pipes

3.4.1 General

The pipes are available in various forms to suit the particular application and sector:

- *mapress STAINLESS STEEL* pipes
- *mapress EDELFLEX* pipes
- *mapress CARBON STEEL* pipes (plastic coated)
- *mapress SUPER SIZE HEATING* pipes (1.4301/BS 304 S 31)
- *CUNIFE* pipes (CuNi10Fe1.6Mn)

All mapress pipes are tested and certified to DIN/DVGW.

A factory standard also imposes more stringent:

- weld
- accuracy
- finish
- bendability and
- corrosion resistance

requirements.
All *mapress* pipes are subjected to leak tests in the factory.

The stainless steel pipes are supplied with outside and bore:

- untarnished
- bright
- free from oil and grease
- free from substances that promote corrosion or impair hygiene

The factory plugs and specially packages the pipes to protect against dirt in transit and storage.

If required, *mapress STAINLESS STEEL, SUPER SIZE HEATING* and *CUNIFE* pipes may be primed or painted.

The *EDELFLEX* and *CARBON STEEL* pipes may be painted after application of a commercial primer suitable for plastics.

The *mapress SUPER SIZE HEATING* pipes for closed hot water heating systems are manufactured from a Cr-Ni steel. Commercial DIN EN/DVGW copper pipes are used for *mapress COPPER* and *mapress COPPER GAS*.

The *mapress STAINLESS STEEL* pipes are also used for *STAINLESS STEEL GAS* pressfittings.

3.4.2 Fire characteristics

INCOMBUSTIBLE PIPES made of German Class A1 building materials to DIN 4102-1:

- *mapress STAINLESS STEEL* pipes
- *mapress SUPER SIZE HEATING* pipes
- Bare copper pipes to DIN EN/DVGW
- *mapress CUNIFE* pipes

COMBUSTIBLE PIPES made of German Class B2 building materials to DIN 4102-1:

- *mapress EDELFLEX* pipes with 1.5mm thick plastic (polyethylene) coating
  THESE PIPES DRIP AS THEY BURN!
- *mapress CARBON STEEL* pipes with 1mm thick plastic (polypropylene) coating

THESE PIPES BURN WITHOUT DRIPPING!

and

- Coated copper pipes to DIN EN/DVGW

Under the German building regulations, metal pipes with a plastic coating up to 2mm thick are treated as "incombustible" where they pass through the structure!

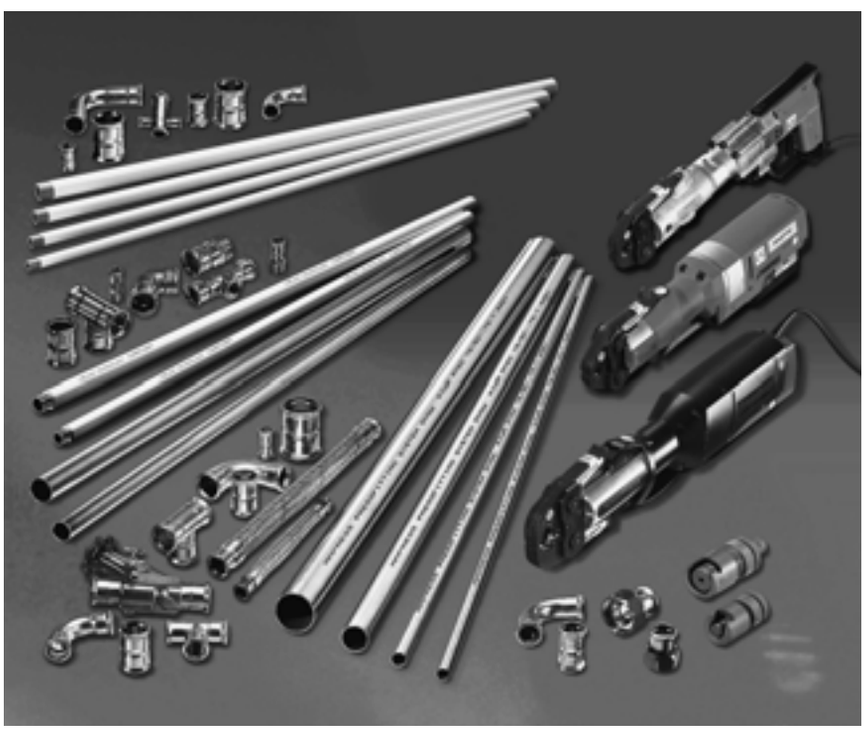


Figure 3.0-2 *mapress* pipes

3.0 Components

3.4.3 *STAINLESS STEEL*

mapress STAINLESS STEEL pipes (ODs from 15 to 108mm) to DVGW Code of Practice W 541 (which does not include 54 x 2.0mm) are welded, thin walled products. They are made of high alloy, austenitic, stainless Cr-Ni-Mo steel, material No 1.4401 to DIN EN 10088 (BS 316 S 33).

The different size ranges of the *mapress STAINLESS STEEL* pipes have been tested and certified by the DVGW and VdTÜV and bear the following DVGW system test marks according to application:

- OD = 15 to 108mm:
  DW-8501AT2552 (drinking water)
  DG-4550BL0118 (Gas)
  TÜV • AR • 271-02 (VdTÜV)

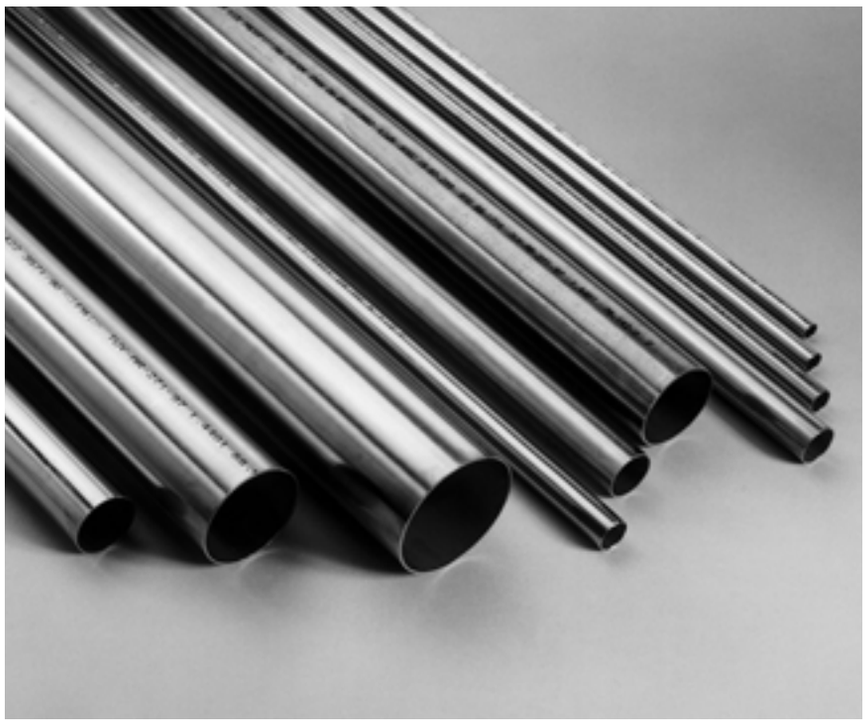


Figure 3.0-3 *mapress STAINLESS STEEL* pipes

Table 3.0-3 Technical data for *mapress STAINLESS STEEL* pipes

Nominal diameter DN	Nominal size OD x t [mm]	Weight [kg/m]	Capacity [litres/m]	Availability
12	15.0 x 1.0	0.35	0.133	6m lengths
15	18.0 x 1.0	0.42	0.201	6m lengths
20	22.0 x 1.2	0.62	0.302	6m lengths
25	28.0 x 1.2	0.80	0.514	6m lengths
32	35.0 x 1.5	1.26	0.804	6m lengths
40	42.0 x 1.5	1.52	1.194	6m lengths
50	54.0 x 1.5	1.97	2.042	6m lengths
50[2)]	54.0 x 2.0[2)]	2.63	1.964	6m lengths
Super Size				
65	76.1 x 2.0	3.71	4.083	6m lengths
80	88.9 x 2.0	4.35	5.661	6m lengths
100	108.0 x 2.0	5.31	8.495	6m lengths

Material	Tensile strength Rm [N/mm²]	Proof stress $Rp_{0.2}$ [N/mm²]	Elongation A_5 [%]	Recommended bending radius[1)] for OD up to 54mm
High alloy, austenitic, stainless **Cr-Ni-Mo steel** (material No **1.4401** to DIN EN 1088 (BS 316 S 33))	510 - 710	≥ 220	> 40	r ≥ 3.5D

[1)] With conventional tension benders.
[2)] Only use this size of pipe with *mapress MAM* pressfittings. It does not conform to DVGW Code of practice W 541.

3.4.4 *EDELFLEX*

The 15 x 1.6mm (outside diameter x wall thickness) *mapress EDELFLEX* pipe to DVGW Code of Practice VP 639 GW is a welded, thin walled, extremely easily bent pipe. It is made of high alloy, austenitic, stainless, Cr-Ni-Mo steel (material No 1.4571 to DIN EN 10088 (BS 320 S 31)). This *mapress* pipe is coated with high density polyethylene to make it easier to bend. The plastic coating has a smooth surface, good tensile and impact strength, and remains flexible at temperatures down to -10°C.

- OD x t = 15 x 1.6mm
  DW-8501AT2552 (drinking water)

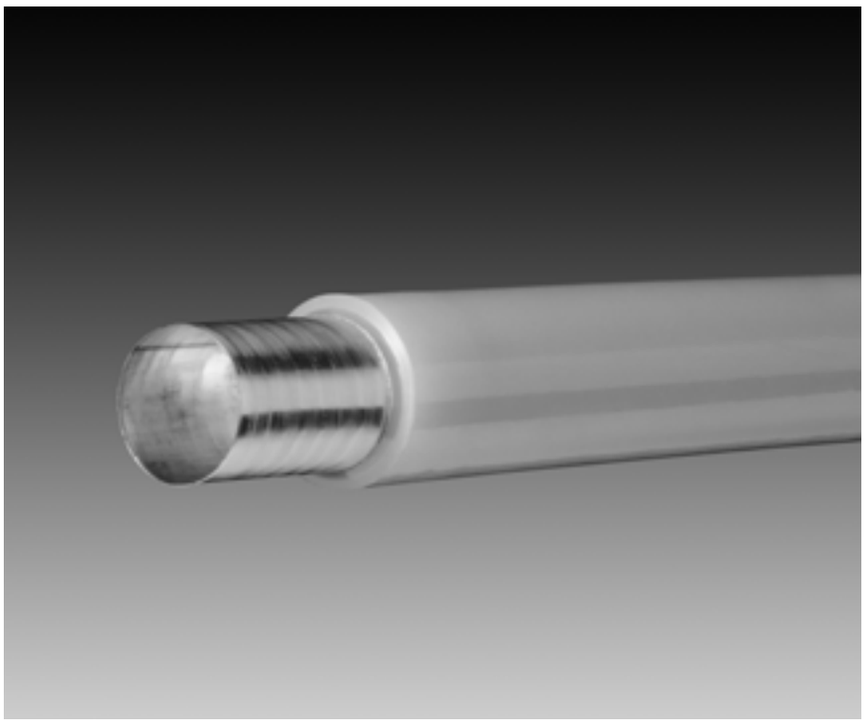


Figure 3.0-4 *mapress EDELFLEX* pipe

Table 3.0-4 Technical data for *mapress EDELFLEX* pipe

Nominal diameter DN	Nominal size OD x t [mm]		Weight [kg/m]	Capacity [litres/m]	Availability
12	15.0 x 1.6		0.09	0.109	50/100m coils
Material		**Tensile strength Rm [N/mm²]**	**Proof stress $Rp_{0.2}$ [N/mm²]**	**Elongation A_5 [%]**	**Recommended bending radius[1)]**
High alloy, austenitic, stainless **Cr-Ni-Mo steel** (material No **1.4571** to DIN EN 10088 (BS 320 S 31))		510 – 710	≥ 220	> 40	r ≥ 3.5D Bending moment M_B < 15N/m

Table 3.0-5 Technical data for plastic coating

Material	Density ρ [g/cm³]	Thermal conductivity λ [W/m*k]	Working temperature[2)] ϑ [°C]	Colour
High temperature stabilised, high density polypropylene	Approximately 0.95 nonporous, impervious	approximately 0.40	up to 120	grey

[1)] With conventional tension benders.
[2)] Increase to maximum of 150°C for up to 1 hour permitted in event of malfunction.

3.4.5 *CARBON STEEL*

mapress CARBON STEEL pipes (ODs from 12 to 54mm) are made of unalloyed E 195 (RSt 34-2) steel (material No 1.0034 to DIN EN 10305). They are welded, thin walled, precision products to DIN EN 10305. The unalloyed steel is a high purity material with a low carbon content, and can be brazed or welded if required.

To protect against external corrosion, the outside of these pipes is provided with a coat of white primer and a 1mm thick creamy white (RAL 9001) polypropylene coating. This plastic has a smooth surface, good tensile and impact strength, and remains flexible at temperatures down to -10°C.

- ODs from 12 to 54mm

Figure 3.0-5 *mapress CARBON STEEL* pipes

Table 3.0-6 Technical data for *mapress CARBON STEEL* pipes

Nominal diameter DN	Nominal size OD x t [mm]	Outside diameter with plastic coating [mm]	Weight [kg/m]	Capacity [litres/m]	Availability
10	12.0 x 1.2	14	0.338	0.072	6m lengths
12	15.0 x 1.2	17	0.434	0.125	6m lengths
15	18.0 x 1.2	20	0.536	0.192	6m lengths
20	22.0 x 1.5	24	0.824	0.284	6m lengths
25	28.0 x 1.5	30	1.052	0.491	6m lengths
32	35.0 x 1.5	37	1.320	0.804	6m lengths
40	42.0 x 1.5	44	1.620	1.195	6m lengths
50	54.0 x 1.5	56	2.098	2.043	6m lengths

Material		Tensile strength Rm [N/mm²]	Proof stress $R_{0.2}$ [N/mm²]	Elongation A_5 [%]	Recommended bending radius[1)]
Unalloyed steel, **E 195** (RSt 34-2), material No **1.0034,** to DIN EN 10305	OD < 28	310 – 410	≤ 260	≥ 30	r ≥ 3.5D
	OD ≥ 28	310 – 440	260 – 360	≥ 25	

Table 3.0-7 Technical data for plastic coating

Material	Density ρ [g/cm³]	Thermal conductivity λ [W/m*k]	Working temperature[2)] ϑ [°C]	Colour
High temperature stabilised, high density polypropylene	Approximately 0.91 nonporous, impervious	approximately 0.22	up to 120	creamy white RAL 9001

[1)] With conventional tension benders.
[2)] Increase to maximum of 150°C for up to 1 hour permitted in event of malfunction.

3.4.6 *SUPER SIZE HEATING*

mapress SUPER SIZE HEATING pipes (ODs from 76.1 to 108mm) are made of stainless Cr-Ni steel (material No 1.4301 to DIN EN 10088 (BS S 304 S 31)). They are welded, thin walled, precision products in sizes to DIN EN 10312.

SUPER SIZE HEATING pipes are not approved for installation in potable water supply systems!

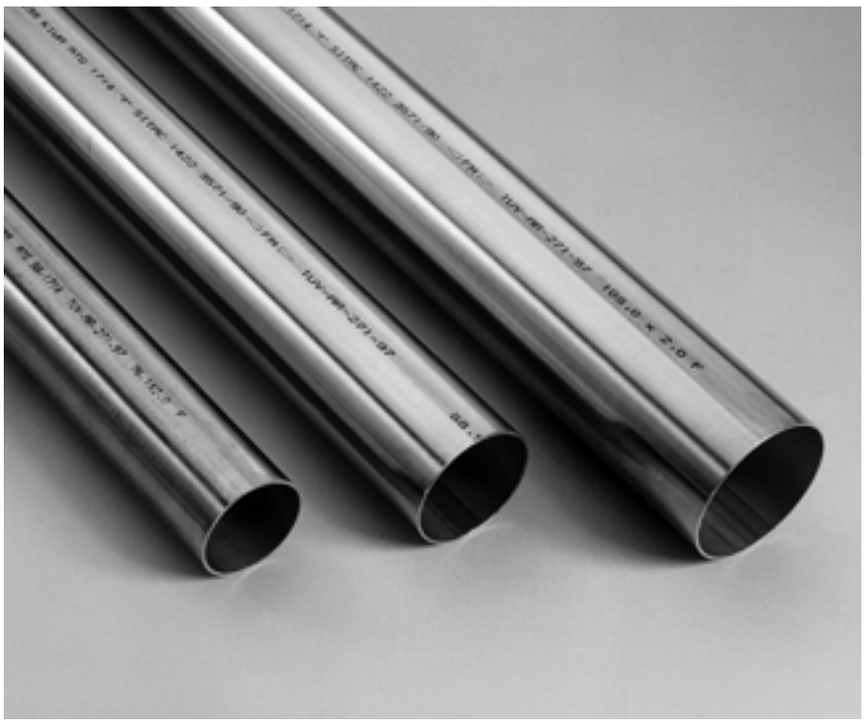


Figure 3.0-6 *mapress SUPER SIZE HEATING* pipes

Table 3.0-8 Technical data for *mapress SUPER SIZE HEATING* pipes

Nominal diameter DN	Nominal size OD x t [mm]	Weight [kg/m]	Capacity [litres/m]	Availability
65	76.1 x 1.5	2.78	4.197	6m lengths
80	88.9 x 1.5	3.25	5.795	6m lengths
100	108.0 x 2.0	5.26	8.495	6m lengths

Material	Tensile strength Rm [N/mm²]	Proof stress $Rp_{0.2}$ [N/mm²]	Elongation A_5 [%]
High alloy, austenitic, stainless **Cr-Ni-Mo steel** (material No **1.4301** to DIN EN 10088 (BS 304 S 31))	510 – 710	≥ 220	> 40

3.4.7 DIN EN/DVGW copper pipes

The *mapress COPPER* and *mapress COPPER GAS* pressfittings are used with quality copper pipes to DIN EN 1057 and DVGW GW 392. They are made of DHP copper (material No CW 024A to DIN EN 1412).

The copper pipes have been tested and certified by the DVGW according to application. The DVGW test marks for the different applications are:

- ODs from 12 to 54mm
  DW-8501AU2013 (drinking water)
  DG-4550BL0161 (gas)

We recommend SANCO®, WICU®, and cuprotherm® pipes manufactured by Wieland Werke AG, Ulm.

For further information on copper as a material please refer to the numerous publications and technical documentation of the German Copper Institute (DKI) and Wieland-Werke AG.

Table 3.0-9 Mechanical properties of copper pipes to DIN EN 1057

Grade designation/ description		Tensile strength $R_{m,\,min}$ [N/mm²]
to EN 1173	usual	
R 220	soft	220
R 250	semi-hard	250
R 290	hard	290
Elongation at rupture – A		
to EN 1173	Size OD [mm]	$A_{min.}$ [%]
R 220	12 – 22	40
R 250	12 – 28	30
R 290	12 – 54	3

Table 3.0-10 Technical data for copper pipes to DIN EN 1057 and DVGW GW 392

Nominal diameter DN	Nominal size Outside diameter x wall thickness OD x t [mm]	Weight [kg/m]	Capacity [litres/m]	Availability
SANCO®, blank				
10	12.0 x 1.0	0.308	0.079	up to 15 x 1mm
12	15.0 x 1.0	0.391	0.133	50m coils
12	15.0 x 1.5[1)]	0.569	0.113	
15	18.0 x 1.0	0.475	0.201	from 18 x 1mm
15	18.0 x 1.5[1)]	0.692	0.177	25m coils
20	22.0 x 1.0	0.587	0.314	5m lengths
20	22.0 x 1.5[1)]	0.860	0.284	
25	28.0 x 1.0[1)]	1.052	0.491	
25	28.0 x 1.5	1.110	0.491	5m lengths
32	35.0 x 1.5	1.410	0.804	
40	42.0 x 1.5	1.700	1.195	
50	54.0 x 2.0	1.963	2.910	

[1)] These sizes are not included in DVGW GW 392 and therefore do not bear the DVGW mark.

Table 3.0-10 Technical data for copper pipes to DIN EN 1057 and DVGW GW 392				
Nominal diameter DN	**Nominal size Outside diameter x wall thickness OD x t [mm]**	**Outside diameter with plastic coating [mm]**	**Capacity [litres/m]**	**Availability**
WICU® pipe, plastic coated				
10	12.0 x 1.0	16	0.079	25m or 50m coils
12	15.0 x 1.0	19	0.133	
15	18.0 x 1.0	23	0.201	5m lengths
20	22.0 x 1.0	27	0.314	
25	28.0 x 1.5	33	0.491	
32	35.0 x 1.5	40	0.804	
40	42.0 x 1.5	48	1.195	5m lengths
50	54.0 x 2.0	60	2.910	
WICU®-flex, lagged				
10	12.0 x 1.0	30	0.079	
12	15.0 x 1.0	33	0.133	25m coils
15	18.0 x 1.0	36	0.201	
20	22.0 x 1.0	40	0.314	
WICU®-extra, lagged				
10	12.0 x 1.0	26	0.079	
12	15.0 x 1.0	29	0.133	25m coils
15	18.0 x 1.0	32	0.201	
10	12.0 x 1.0	33	0.079	
12	15.0 x 1.0	37	0.133	5m lengths
15	18.0 x 1.0	41	0.201	
20	22.0 x 1.0	46	0.314	
25	28.0 x 1.5	64	0.491	
32	35.0 x 1.5	72	0.804	
40	42.0 x 1.5	91	1.195	
50	54.0 x 2.0	116	2.910	
cuprotherm® heating pipe, plastic coated[1)]				
10	12.0 x 1.0	26	0.079	50m coils

[1)] These copper pipes are commercially available in the following grades: coils – R 220 (soft), lengths – R 290 (hard), lengths ≤ 28mm - R 250 (semi-hard).

3.4.8 *CUNIFE*

mapress CUNIFE (*mapress* EUCARO) pipes in ODs from 15 to 108mm are seamlessly drawn, thin walled products to DIN 86019. They are made of a copper-nickel-iron alloy (CuNi10Fe1.6Mn) with material No 2.1972.11 to specification sheet WL. 2.197 of the BWB (German Federal Office of Defence Technology and Procurement).

- ODs from 15 to 108mm

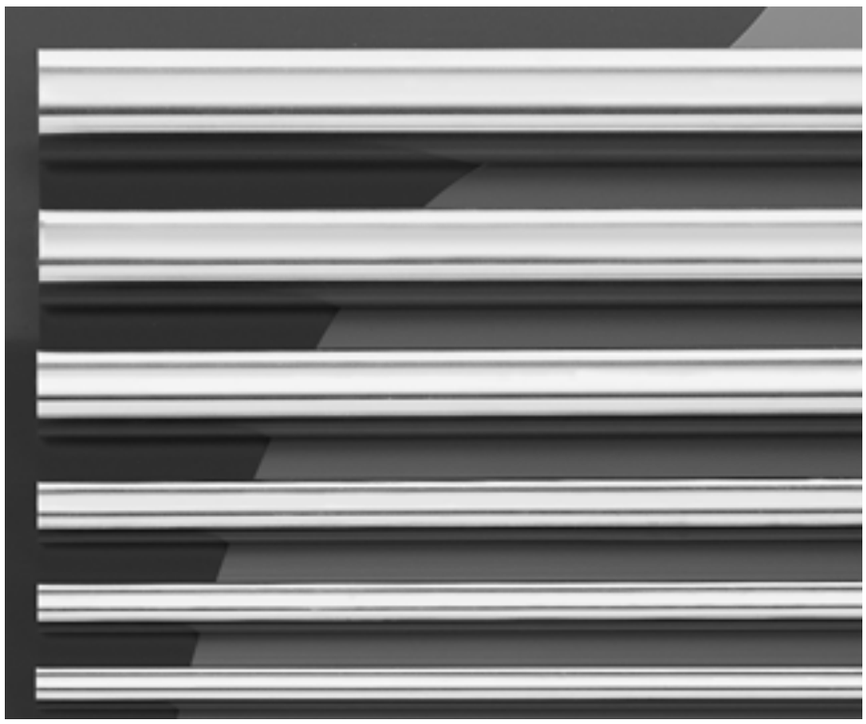


Figure 3.0-7 *mapress CUNIFE* pipes

Table 3.0-11 Technical data for *CUNIFE* pipes

Nominal diameter DN	Nominal size Outside diameter x wall thickness OD x t [mm]	Weight [kg/m]	Capacity [litres/m]	Availability
12	15.0 x 1.0	0.39	0.133	5-6m lengths
20	22.0 x 1.0	0.59	0.314	5-6m lengths
20	22.0 x 1.5	0.86	0.284	5-6m lengths
25	28.0 x 1.5	1.11	0.491	5-6m lengths
32	35.0 x 1.5	1.41	0.804	5-6m lengths
40	42.0 x 1.5	1.70	1.194	5-6m lengths
50	54.0 x 1.5	2.21	2.042	5-6m lengths
Super Size				
65	76.1 x 2.0	4.14	4.083	5-6m lengths
80	88.9 x 2.0	4.87	5.661	5-6m lengths
100	108.0 x 2.5	7.38	8.341	5-6m lengths

Material	Tensile strength Rm [N/mm²]	Proof stress $Rp_{0.2}$ [N/mm²]	Elongation A_5 [%]	Recommended bending radius[1)] for OD up to 54mm
Copper-nickel-iron alloy, material No **2.1972.11**, to material specification sheet WL. 2.1972	300 – 400	100 – 180	≥ 30	r ≥ 3.5D

[1)] With conventional tension benders.

3.4.9 Markings

Marking	Explanation
***mapress STAINLESS STEEL* pipe**	
***mapress STAINLESS STEEL* pipe**	Mapress GmbH & Co. KG product name
DVGW DW-8501AT2552 sanitary	DVGW test mark with registration No, OD = 15 – 54mm
DVGW DW-8501AT2552	DVGW test mark with registration No, OD = 76.1–108mm
DVGW DG-4550BL0118 GAS	DVGW test mark with registration No, OD = 15 – 108mm
MPA NRW	Monitoring body
TÜV • AR • 271-02	VdTÜV component identification
1.4401	Material No to DIN EN 10088
22 x 1.2	Outside diameter x wall thickness, eg 22 x 1.2mm
PN 40	Nominal pressure depending on size, OD = 12 – 22mm
PN 16	Nominal pressure depending on size, OD = 28 to 108mm
ÖVGW W 1.088 – 16 bar/95 °C – TW	ÖVGW test mark with registration No
KIWA	KIWA mark (Holland)
ATG 2495	ATG mark (Belgium)
◀ FM ▶	FM mark (USA), OD = 22 to 108mm
CSTBat 67 – 240 ATEC 15/97 – 239	CSTB and ATEC marks (France)
SITAC 1422 3571/90	SITEC mark (Sweden)
***mapress EDELFLEX* pipe**	
xxxxx m	Metre run
mapress EDELFLEX	Mapress GmbH & Co. KG product name
DVGW DW-8501AT2552	DVGW test mark with registration No
STAINLESS STEEL PE-HD	Polyethylen - High Density
15 x 1.6	Outside diameter x wall thickness
***mapress CARBON STEEL* pipe**	
Creamy white plastic coating	PP - plastic coating RAL 9001
White primer	RAL 9001
***mapress SUPER SIZE HEATING* pipe**	
Red longitudinal stripe	**Not suitable for installing water supply systems!**
Mapress	Mapress GmbH & Co. KG
1.4301	Material No to DIN EN 10088
76.1 x 1.5	Outside diameter x wall thickness, eg 76.1 x 1.5mm
HEIZUNG CHAUFFAGE HEATING	Heating
CSTBat 67 – 240 ATEC 15/97 – 239	CSTB and ATEC marks (France)
DIN EN/DVGW copper pipe	
Hersteller	Name of manufacturer
SANCO®	Brand name
15 x 1	Outside diameter x wall thickness, eg 22 x 1.2mm
EN 1057	European DIN standard
⊙	Simplified RAL quality mark
DVGW CU ...	DVGW test mark with registration No
Herstellerland	Country of manufacture
DIN 4102 – B2	Building material class (only on plastic coated and lagged pipes)
EN EG – 1/1 – 0.035	Lagged in accordance with German energy saving legislation
***mapress CUNIFE* pipe**	
EUCARO *mapress*	Mapress GmbH & Co. KG product name
CuNi10Fe1,6Mn	Alloy composition
DIN 86019	Standard for material composition and dimensions with tolerances
54	Pipe size (eg outside diameter x wall thickness = 54 x 1.5mm)

3.5 *mapress* pressing tools

3.5.1 General

The *mapress* pressfitting system is pressed with the matching *mapress* pressing tools. The same tool is used for stainless steel, unalloyed steel and copper. The pressing profiles of the jaws and collars exactly match the pressfitting geometry.

The pressing tools consist of a pressing unit and matching jaws or collars including adapters.

There are different types of pressing unit, with matching jaws and collars including adapters, to meet the requirements of each particular application. The different designs are categorised in terms of the method of actuation:

- Electromechanical pressing units
  Models: EFP 2 and ECO 1
  (ODs from 12 to 54mm)
  ECO 3
  (ODs from 12 to 108mm)
- Cordless electromechanical pressing units
  Models: ACO 1 and ACO 3
  (ODs from 12 to 54mm)
- Electrohydraulic pressing unit
  Model: HCPS (Super Size)
  (ODs from 76.1 to 108mm)
- Manual pressing unit
  Model: MPF 2
  (ODs from 12 to 54mm)
- Pneumatic pressing unit
  Model: PFP 2 – Ex
  (ODs from 12 to 54mm)

3.5.2 Pressing jaws and collars with adapters

Each pressing unit has matching quick-change jaws and collars for the different pipe ODs.

- Jaws
  ODs from 12 to 35mm
- Jaws (lemon-shaped pressing profile for special industrial applications)
  OD = 28mm
- Collars with adapter (lemon-shaped pressing profile for special industrial applications)

  OD = 35mm
- Collars with adapters
  ODs from 42 to 108mm
- Collars with adapters
  ODs from 42 to 108mm

IMPORTANT!

The design of the jaws, collars and adapters means they can only be used with the matching pressing units.

The reliability of the *mapress* pressfitting connections has been tested and certified with *mapress* pressing jaws and collars (including adapters) to

DVGW Code of Practice W 534,
DVGW Test Guidelines VP 614,
ÖVGW G1-TR-GAS (Austria) and
SVGW-W/TPW 132 (Switzerland).

We have not tested other makes of pressing jaws for compatibility with the *mapress* pressfitting system.

3.5.3 Compatibility of pressing units

In the interests of the trade, and at the suggestion of the ZVSHK (German Heating, Plumbing and Air Conditioning Federation), the models supplied by some leading pressing system manufacturers have been designed to ensure interchangeability.

The compatibility declaration lists the following *mapress* pressing units:

MFP 2,
EFP 2,
ECO 1 and
ACO 1

The design of the pressing units

EFP 3,
ECO 3,
AFP 3 and
ACO 3

means they may only be used for the *mapress* pressfitting system.

To ensure the reliability of the *mapress* pressfitting system and avoid installation defects, we recommend staying within the system and only using its components.

3.5.4 Maintenance and servicing of pressing tools

The pressing profiles of the jaws and collars must be free from dirt and deposits. Clean with an agent such as methylated spirit.

Follow the manufacturer's operating instructions and service the pressing tools regularly.

To avoid invalidating the warranty and ensure a reliable pressfitting connection, the pressing tools have to be regularly checked and maintained. This is described in detail in the operating instructions for the tools under Safety, Maintenance and Repairs. The customer receives a service record to certify that this work has been carried out, and an annual service sticker with the next service date is affixed to the pressing tools.

3.5.5 MFP 2 pressing unit

Pipes with ODs from 12 to 54mm are pressed with the MFP 2 manual hydraulic pressing unit.

- Sizes:

ODs from 12 to 35mm with jaws
ODs from 42 to 54mm with collars and ZB 201 adapter

- Head can be turned in any direction

- Safe and easy handling, including rapid changing of adapters

- Safe, manual, mechanical locking of jaws and adapters with pins

- For use in hazardous areas

Figure 3.0-8 MFP 2 pressing unit

Technical data for MFP 2 manual hydraulic pressing unit

Year of manufacture	since 1996
Weight of pressing unit	approximately 4.5kg
Outside diameter of pipe (OD)	12 to 54mm
Maximum piston force	32kN
Piston stroke	40mm
Maximum pressing force	approximately 100kN (10t)

3.5.6 EFP 2 pressing unit

Pipes with ODs from 12 to 54mm are pressed with the proven EFP 2 electro-mechanical pressing unit.

- Sizes:

ODs from 12 to 35mm with jaws
ODs from 42 to 54mm with collars and ZB 201 adapter

- Head can be turned in any direction

- Pistol grip with metal guard

- Safe and easy handling, including rapid changing of adapters

- Safe, manual, mechanical locking of jaws and adapters with pins

- Automatic action always ensures complete pressing with the maximum required pressing force. The safety coupling will then reverse the roller drive for the jaws or collar.

Figure 3.0-9 EFP 2 pressing unit

Technical data for EFP 2 manual hydraulic pressing unit

Year of manufacture	since 1996
Weight of pressing unit	approximately 5.9kg
Outside diameter of pipe (OD)	12 to 54mm
Maximum piston force	32kN
Piston stroke	40mm
Maximum pressing force	approximately 100kN (10t)
Power supply[1)]	110V
Power consumption	380W
Protection	IP20
Protection class	2
Approximate dimensions (LxWxH)	450 x 80 x 190mm

[1)] Other voltages and frequencies available on request.

3.5.7 PFP 2-Ex pressing unit

This pneumatic pressing unit is based on the proven electromechanical EFP 2. It makes it possible to work in the following hazardous areas:

- Zone1 / Ex II,
- 2G gas group II B and
- Temperature class T4.

It is used to press pipes with ODs from 12 to 54mm.

- Sizes:

ODs from 12 to 35mm with jaws
ODs from 42 to 54mm with collars and ZB 201 adapter

- Head can be turned in any direction

- Pistol grip

- Safe and easy handling, including rapid changing of adapters

- Safe, manual, mechanical locking of jaws and adapters with pins

- Automatic action always ensures complete pressing with the maximum required pressing force. The safety coupling will then reverse the roller drive for the jaws or collar.

- Operation with lubricated compressed air

Figure 3.0-10 PFP 2-Ex pressing unit

Technical data for PFP 2-Ex pneumatic pressing unit

Year of manufacture	since 1996
Weight of pressing unit	approximately 5.9kg
Outside diameter of pipe (OD)	12 to 54mm
Maximum piston force	32kN
Piston stroke	40mm
Maximum pressing force	approximately 100kN (10t)
Minimum working pressure	6 bar
Maximum working pressure	8 bar
Air consumption	12 litres/sec
Approximate dimensions (LxWxH)	470 x 85 x 190mm

3.0 Components

3.5.8 ECO 1 pressing unit

The ergonomic electromechanical ECO 1 pressing unit is a development of the EFP 2 with self monitoring diagnostic functions. It is used to press pipes with ODs from 12 to 54mm.

- Sizes:

ODs from 12 to 35mm with jaws
ODs from 42 to 54mm with collars and ZB 201 adapter

- Electronically monitored locking pin system

- Electronic monitoring of entire pressing operation with fault indication

- Electronically controlled reversal when maximum pressing force reached

- Memory for last 170 pressing operations

- Acoustic signal (since 2002) in event of malfunction only (six beeps)

Figure 3.0-11 ECO 1 pressing unit

Technical data for ECO 1 electromechanical pressing unit

Year of manufacture	since 2000
Weight of pressing unit	4.7kg
Outside diameter of pipe (OD)	12 to 54mm
Maximum piston force	32kN
Piston stroke	40mm
Maximum pressing force	approximately 100kN (10t)
Power supply[1)]	110V
Power consumption	400W
Protection	IP20
Protection class	2
Approximate dimensions (LxWxH)	465 x 85 x 115mm

[1)] Other voltages and frequencies available on request.

3.5.9 ACO 1 ergonomic cordless pressing unit

The cordless, electromechanical ACO 1 pressing unit has self monitoring diagnostic functions and presses pipes with ODs from 12 to 54mm.

- Sizes:

ODs from 12 to 35mm with jaws
ODs from 42 to 54mm with collars and ZB 201 adapter

- No mains supply needed

- Electronically monitored locking pin system

- Electronic monitoring of entire pressing operation with fault indication

- Electronically controlled reversal when maximum pressing force reached

- Memory for last 170 pressing operations

- Acoustic signal (since 2002) in event of malfunction only (six beeps)

Figure 3.0-12 ACO 1 pressing unit

Technical data for ACO 1 electromechanical pressing unit

Year of manufacture	since 2000
Weight of pressing unit	4.4kg
Outside diameter of pipe (OD)	12 to 54mm
Maximum piston force	32kN
Piston stroke	40mm
Maximum pressing force	approximately 100kN (10t)
Power consumption	277W
Battery	12V; 2Ah
Battery charging time	approximately 17 min
Approximate dimensions (LxWxH)	450 x 85 x 115mm

3.5.10 Pressmax ECO 3 cordless pressing unit

The new, Pressmax ECO 3 pressing unit is a development of the EFP 3, with electronic function monitoring. It presses pipes with ODs from 12 to 108mm. The ECO 3 is only suitable for a maximum working pressure of 16 bar.

The ECO 3 pressing unit is not suitable for working pressures in excess of 16 bar and installations requiring acceptance testing and involving pipe ODs from 76.1 to 108mm.

- Sizes:

ODs from 12 to 35mm with jaws
ODs from 42 to 54mm with collars and ZB 302 adapter
ODs from 76.1 to 88.9 with collars with ZB 321 adapter
ODs from 108.0mm with collars with ZB 321 and ZB 322 adapters

- Safe and easy one-hand operation

- Electronically monitored locking pin system and reversal when maximum pressing force reached

- Memory for last 170 pressing operations

- Fully electronic monitoring of entire pressing operation with fault indication

- Adaptive, optimised control of the pressing force according to nominal diameter, with monitoring of pressing jaws or collars with closure sensor **(CS)**

- Pressing as above, but without closure sensor, up to OD of 35mm

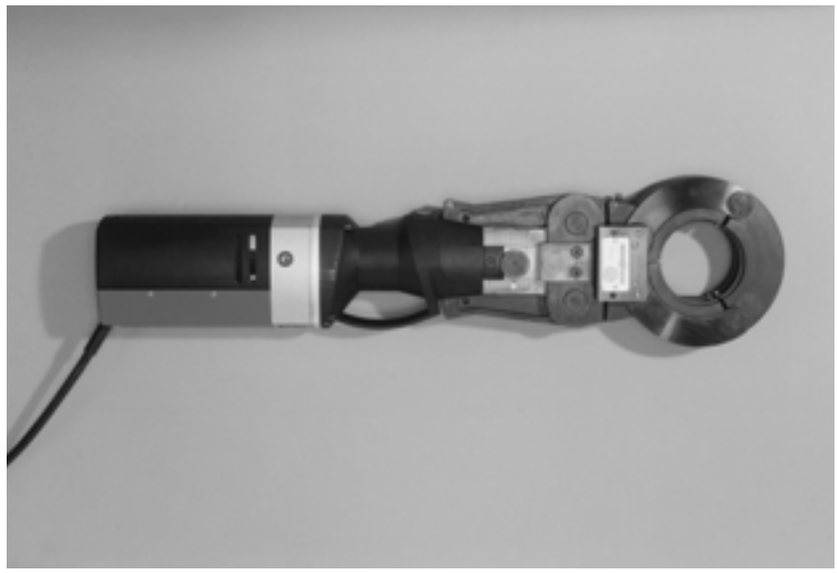


Figure 3.0-13 ECO 3 pressing unit

Technical data for ECO 3 electromechanical pressing unit

Year of manufacture	since 2001
Weight of pressing unit	5.0kg
Outside diameter of pipe (OD)	12 to 108mm
Maximum piston force	45kN
Piston stroke	45mm
Maximum pressing force	approximately 140kN (14t)
Power supply[1)]	110V
Power consumption	400W
Protection	IP20
Protection class	1
Approximate dimensions (LxWxH)	420 x 85 x 110mm

[1)] Other voltages and frequencies available on request.

- Acoustic signal (since 2002) after successful completion of pressing (single beep) and in event of malfunction (six beeps)

3.5.11 Pressmax ACO 3 cordless pressing unit

The ACO 3 cordless electromechanical pressing unit is the successor to the AFP 3 and has electronic function monitoring. It presses pipes with ODs from 12 to 54mm.

- Sizes:

ODs from 12 to 35mm with jaws
ODs from 42 to 54mm with collars with ZB 302 adapter

- No mains supply needed

- Safe and easy one-hand operation

- Electronically monitored locking pin system and reversal when maximum pressing force reached

- Memory for last 170 pressing operations

- Fully electronic monitoring of entire pressing operation with fault indication

- Adaptive, optimised control of the pressing force required for particular nominal diameter, with monitoring of pressing jaws or collar with closure sensor **(CS)**

- Pressing as above, but without closure sensor, up to OD of 35mm

- Acoustic signal (since 2002) after successful completion of pressing (single beep) and in event of malfunction (six beeps)

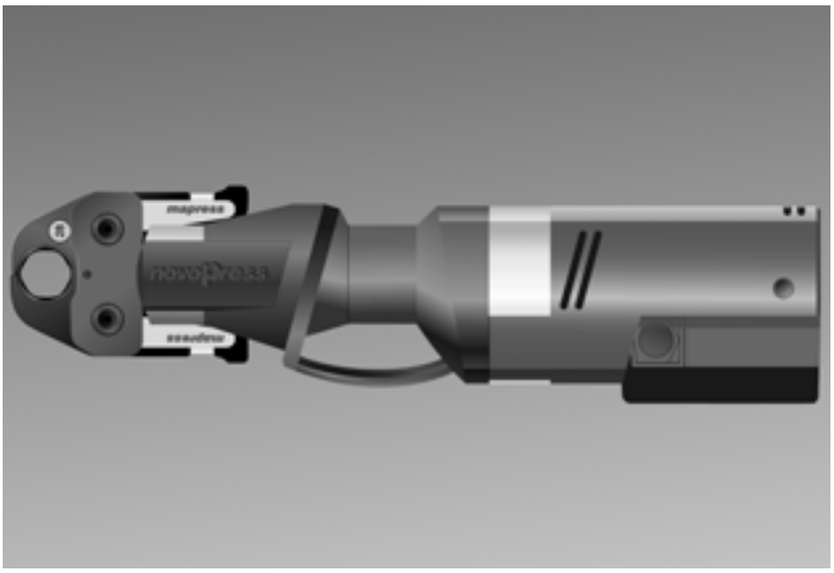


Figure 3.0-14 ACO 3 cordless pressing unit

Technical data for ACO 3 cordless electromechanical pressing unit

Year of manufacture	since 2001
Weight of pressing unit	4.5kg
Outside diameter of pipe (OD)	12 to 54mm
Maximum piston force	36kN
Piston stroke	45mm
Maximum pressing force	approximately 100kN (10t)
Power consumption	277W
Battery	12V; 2Ah
Battery charging time	approximately 17 min
Approximate dimensions (LxWxH)	450 x 85 x 115mm

3.0 Components

3.5.12 HCPS pressing unit

The HCPS electrohydraulic pressing unit is used for pressing SUPER SIZEs with pipe ODs from 76.1 to 108mm with collars (Figure 11). The collars are laid around the bead of the pressfitting, then tightened by the hydraulic cylinder.

The HCPS is suitable for test pressures of up to 40 bar and fixed fire extinguishing systems including sprinklers to VdS guidelines.

- Sizes:

ODs from 76.1 to 108mm with pressing collars

- Pressing unit consists of HCP hydraulic cylinder and HA 5 hydraulic power pack

- Hydraulic power pack has automatic pressing action

- Easily assembled with quick-action coupling with nonreturn valve

- Hydraulic hose may be extended up to 10m

Pressing must not be carried out without pressfitting and mapress pipe, as this would risk damaging the collar and the hydraulic cylinder!

Figure 3.0-15 HCPS pressing unit

Technical data for HCPS pressing unit

Year of manufacture	since 1993
Weight of pressing unit	14kg (HCP) + 16kg (HA 5)
Outside diameter of pipe (OD)	76.1 to 108mm
Working pressure	180 bar
Piston stroke	63mm
Maximum pressing force	approximately 190kN (19t)
Power supply[1)]	110V
Power consumption	800W
Protection	IP44
Protection class	1
Approximate dimensions (LxWxH) HCP hydraulic cylinder HA 5 hydraulic power pack	 750 x 150 x 270mm 490 x 280 x 310mm

[1)] Other voltages and frequencies available on request.

3.5.13 Charger and battery

The charger and one battery are supplied as standard with the ACO 1 and ACO 3 cordless electromechanical pressing units.
An LED on the cordless units indicates whether the battery is sufficiently charged. The battery has sufficient capacity for pressing sizes (pipe ODs) from 12 to 54mm.

Figure 3.0-16 Battery and charger

Technical data for battery	
Voltage	12V
Capacity	2Ah
Charging time	17 min
Weight	approximately 0.70kg
Approximate dimensions (LxWxH)	120 x 60 x 67mm

Technical data for quick charger	
Power supply[1)]	230 to 240V; 50/60Hz
Output voltage	7.2 to 12V
Charging current during quick charging	5.8A
Charging time	17 min
Approximate weight	0.60kg
Approximate dimensions (LxWxH)	180 x 135 x 82mm

[1)] Other voltages and frequencies available on request.

MINIMUM NUMBER „n_{min}" of *STAINLESS STEEL, CARBON STEEL, CUNIFE* or *COPPER* press-fitting connections with a fully charged 2Ah battery in as new condition

Outside diameter	*STAINLESS STEEL / CUNIFE*	*CARBON STEEL*	*COPPER*
12 / 15 / 18	80	90	90
22 / 28 / 35	70	85	85
42 / 54	40	55	55

3.5.14 Technical data for adapters for mutually compatible *mapress* pressing units

The pressing jaws may only be used with the matching pressing units.

Figure 3.0-17 Pressing jaws/collars with adapter

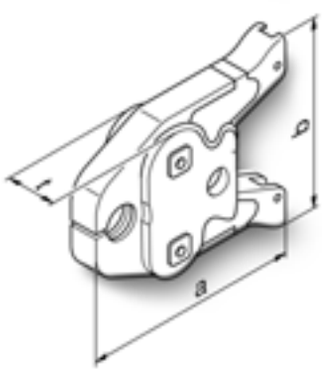


Figure 3.0-18 Dimensions of pressing jaws for sizes (pipe ODs) from 12 to 35mm

Figure 3.0-19 Dimensions of pressing collars for sizes (pipe ODs) from 42 to 54mm

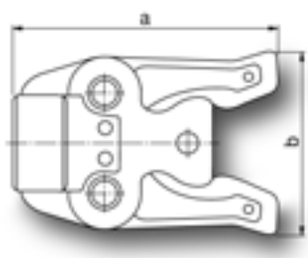


Figure 3.0-20 Dimensions of ZB 201 adapter

Technical data for pressing jaws, collars and ZB 201 adapter for
- **EFP 2, ECO 1 and ACO 1 electromechanical pressing units,**
- **PFP 2-Ex pneumatic pressing unit and**
- **MFP 2 manual hydraulic pressing unit**

	Pressing jaws[1)]				Pressing collars			ZB 201 adapter			
OD [mm]	a [mm]	b [mm]	t [mm]	Weight [kg]	D [mm]	t [mm]	Weight [kg]	a [mm]	b [mm]	t [mm]	Weight [kg]
12	145	110	40	1.7							
15	145	110	40	1.7							
18	145	110	40	1.7							
22	145	110	40	1.8							
28	145	110	40	1.8							
35	160	130	40	2.0							
42	(200	180	65	5.5)	120	50	1.9	145	140	60	2.5
54	(200	180	65	5.5)	130	50	2.2	145	140	60	2.5

[1)] 42 and 54mm have not been available since 1997

3.5.15 Technical data for adapters for non mutually compatible *mapress* pressing units

The pressing jaws may only be used with the matching pressing units.

Figure 3.0-21 Pressing jaws/collars with adapter

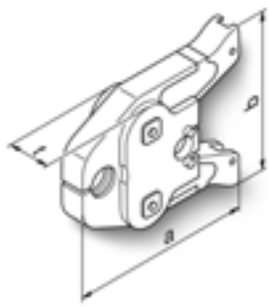


Figure 3.0-22 Dimensions of pressing jaws for sizes (pipe ODs) from 12 to 35mm

Figure 3.0-23 Dimensions of pressing collars for sizes (pipe ODs) from 42 to 54mm

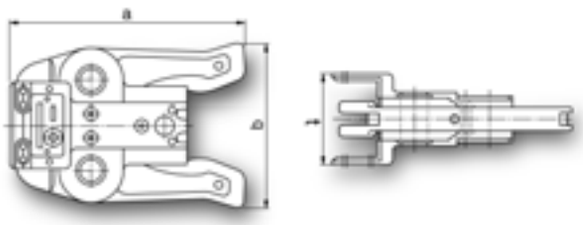


Figure 3.0-24 Dimensions of ZB 302 adapter

Technical data for pressing jaws, collars and ZB 302, ZB 321 and ZB 322 adapters for
- **PRESSMAX ECO 3 and ACO 3 electromechanical pressing units (applies to sizes (pipe ODs) from 12 to 54mm in the case of the ACO 3)**

	Pressing jaws[1]				Pressing collars[2]			ZB 302 adapter			
OD [mm]	a [mm]	b [mm]	t [mm]	Weight [kg]	D [mm]	t [mm]	Weight [kg]	a [mm]	b [mm]	t [mm]	Weight [kg]
12	145	130	40	1.9							
15	145	130	40	1.9							
18	145	130	40	1.9							
22	145	130	40	2.0							
28	145	130	40	2.0							
28	145	141	40	2.8							
35	160	130	40	2.2	120	50	2.0	145	140	60	2.5
42					120	50	1.9	145	140	60	2.5
54					130	50	2.2	145	140	60	2.5
76.1					175	70	3.7	200	140	77	4.3
88.9					200	70	4.9	200	140	77	4.3
108.0					225	70	5.2	200	140	77	4.3

[1] 28mm pressing jaws with lemon-shaped pressing profile for special industrial applications.
[2] 35mm pressing collar with lemon-shaped pressing profile for special industrial applications.

3.5.16 Technical data for adapters for the *mapress* HCPS pressing unit

Figure 3.0-25 Pressing collars

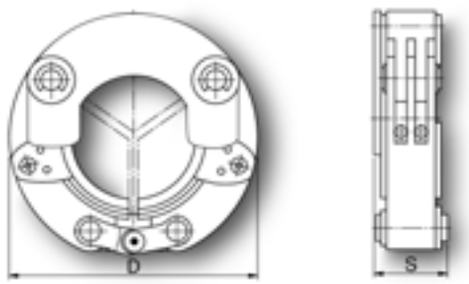


Figure 3.0-26 Dimensions of pressing collars for sizes (pipe ODs) 76.1 to 108mm

Technical data for collars for
- **HCPS electrohydraulic pressing unit**

Pressing collars

OD [mm]	D [mm]	s [mm]	Weight [kg]
76.1	175	70	3.7
88.9	200	70	4.9
108.0	225	70	5.2

3.5.17 Summary of *mapress* pressing tools with jaws, collars and adapters

Name / Technical data	Compatible *mapress* pressing units					*mapress* pressing units not compatible with other makes			
	MFP 2	PFP 2-Ex	EFP 2	ECO 1	ACO 1	EFP 3 (PRESSMAX)	ACO 3 (PRESSMAX)	ECO 3 (PRESSMAX)	HCPS
Year of manufacture	since 1996	since 1996	since 1996	since 2000		1998–2001	since 2001	since middle of 2001	since 1993
Pipe outside diameter OD [mm]	12–54					12–54 76.1–108[2]	12–54	12–108	76.1–108
Piston force	32kN					max. 36kN		max. 45kN	
Piston stroke	40mm					45mm			63mm
Maximum pressing force	approx 100kN					approx 100kN		approx 140kN	approx 190kN
	Automatic action always ensures complete pressing with the maximum required pressing force					Adaptive, optimised control of pressing force required for the nominal diameter, with monitoring of pressing jaws or collar with closure sensor **(CS)**.		**12** to **35**mm pressing jaws with **CS** (like EPF 3)	
								12 to **35**mm pressing jaws **without CS**	
								42 to **108**mm pressing jaws with adapter with **CS**	
Weight of pressing units	4.5kg	5.9kg		4.7kg	4.4kg	4.5kg	4.5kg + battery	4.5kg	14kg (PCP) + 16kg (HA 5)
Air supply		6–8 bar							
Power supply[3]			230–240V; 50Hz		12V; 2Ah	230–240V; 50Hz	12V; 2Ah	230–240V; 50Hz	230–240V; 50Hz
Power consumption			380W	400W		400W		400W	800W
Protection			IP20			IP20		IP20	IP44
Protection class			2			1		1	1
Battery charging time					≈ 17 min		≈ 17 min		
Pressing jaws (pipe OD) [mm]	12–54[1]					12–35[4]			
Pressing collars (pipe OD) [mm]	42–54					42–54			76.1–108
with adapter	ZB 201					ZB 302 (old ZB 301)			without
Pressing collars (pipe OD) [mm]						76.1–88,9[2]	108[2]	76.1–88.9	108
with adapters						ZB 321	ZB 321 + ZB 322	ZB 321	ZB 321 + ZB 322

[1] Pressing jaws for sizes (pipe ODs) 42 and 54mm have not been available since 1997.
[2] ODs from 76.1 to 108mm only after conversion of EFP 3 pressing unit to provide a piston force of 45kN.
[3] Other frequencies and voltage available on request.
[4] 28mm pressing jaws and 35mm pressing collar with lemon-shaped pressing profile for special industrial applications.

3.5.18 Summary of other approved makes of pressing unit

Pressing units for *mapress* jaws, collars and adapters

The tabulated pressing units are designed for use with *mapress* pressing collars and adapters. The reliability of the *mapress* pressfitting system with *mapress* pressfittings, *mapress* pipes / DIN DVGW copper pipes and *mapress* pressing units with *mapress* pressing jaws / pressing collars with adapters has been tested in accordance with DVGW W 534/VP 614 guidelines and certified by the DVGW with its system test mark. The matching *mapress* pressing jaws and collars with adapters for the approved pressing units are indicated with bullets in the table.

SYSTEM SUPPLIER	**MAPRESS**									**GEBERIT**				
Pressing unit make	**Novopress**										**Novopress**			
Pressing unit model / *mapress* pressing jaws, pressing collars and adapters	**PFP 2-Ex**	**EFP 2**	**MFP 2**	**ECO 1 / ACO 1**	**EFP 3**	**AFP 3**	**ECO 3**	**ACO 3**	**HCPS**	**PWH 75**	**Typ N**			
	since 1996	since 1996	since 1996	between 1996 and 2001	between 1998 and 2001	since 1998	since 2001	since 2001	since 1993	to 2002	since 2002			
12 to 35mm pressing jaws	•	•	•	•						•	•			
42 to 54mm pressing collars with ZB 201 adapter	•	•	•	•						•	•			
12 to 35mm pressing jaws with **CS**[2]					•	•	•	•						
12 to 35mm pressing jaws without **CS**[2]						•		•						
42 to 54mm pressing collars with ZB 301 and ZB 302 adapters					•	•	•	•						
76.1 to 108mm pressing collars with ZB 321 and ZB 322 adapters					•[1]		•							
76.1 to 108mm pressing collars									•					

[1] ODs from 76.1 to 108mm only after converting the EFP 3 pressing unit

[2] **CS**: jaw closure sensor

4.1 Installing water supply systems

4.1.1 General

• Planning and design

Water supply systems must be planned, designed, installed and operated in accordance current regulations, codes and standards.

- Requirements for drinking water and choice of materials

The quality of drinking water must conform to EU Directive 98 relating to the quality of water for human consumption, the German Drinking Water Regulations (TrinkwV) and/or local byelaws.

Choose the materials on the basis of a current analysis of the water in accordance with the new provisional standard prEN 12502 (Corrosion Avoidance), the German residual standard 50930-6 and/or local byelaws.

4.1.2 *STAINLESS STEEL / EDELFLEX*

mapress STAINLESS STEEL and *mapress EDELFLEX* are completely suitable for any drinking water.

Their applications include:

- Cold water pipes
- Hot water pipes (85°C) to DIN 1988
- Circulation pipes
- Fire mains to Part 6 of DIN 1988, and DIN 14462: **- wet**
  - wet/dry
  - dry

• Hygiene

mapress STAINLESS STEEL / EDELFLEX does not change the quality of the drinking water.

The system does not cause any heavy metal contamination of the water and cannot cause nickel allergy. Nickel migration is comfortably below the permissible limit in EU Directive 98 of 0.02mg/l. The approvals and hygiene tests of the *mapress* pressfitting connections also cover the pressfitting gap and the black butyl rubber (CIIR) seal ring. The seal ring meets the German KTW Recommendations (for synthetic materials in drinking water supply systems) and the hygiene requirements of the German DVGW Code of Practice W 270.

Fire mains

The *mapress STAINLESS STEEL* pressfitting system meets the requirements of Part 6 of DIN 1988.

4.1.3 *COPPER*

When installing *mapress COPPER* pressfittings with DIN EN/DVGW copper pipes in water supply systems, the water must not exceed the limits for copper imposed by prEn 12502-2, EU Drinking Water Directive 98, Part 6 of the residual standard DIN 50930 and local byelaws.

Chemical limits for use of copper in contact with drinking water:

pH-value > 7.4

or:

7·0 ≤ pH-value ≤ 7.4
and TOC ≤ 1.5g/m³
(total organic carbon)

Moreover, to ensure corrosion protection, the salt contents of drinking water must be limited in accordance with the above standards and regulations:

Sulphate ions	**<**	**240mg/l**
Nitrate ions	**<**	**50mg/l**
Sodium ions	**<**	**150mg/l**

4.1.4 Disinfecting drinking water

STAINLESS STEEL / EDELFLEX and *COPPER* pressfitting systems are also suitable for drinking water that is continuously chlorinated for disinfection purposes. The German Water Regulations allow dosing with up to 1.2mg/l (6mg/l under exceptional circumstances, eg high or increased microbacterial contamination) of free chlorine in the disinfectant solution, provided a limit of 0.3mg/l (0.6mg/l) of free (active) chlorine is not exceeded in the drinking water.

4.1.5 Drinking water treatment

Stainless steel (material No 1.4401 (BS 316 S 33)/1.4571 (BS 320 S 31)) and copper are suitable for all approved drinking water treatments. Stainless Cr-Ni-Mo steel does not require any additional corrosion protection.

4.1.6 Treated water

mapress STAINLESS STEEL with the black butyl rubber (CIIR) seal ring is suitable for softened, decarbonised or fully demineralised (also termed deionised or distilled) water, through to high purity water with a conductivity of 0.1µS/cm, and is completely corrosion resistant.

Any method of water treatment, eg ion exchange or reverse osmosis, etc, may be used.

Our pressfitting systems are not suitable for high purity water, pharmaceutical water, etc, subject to more stringent purity requirements than drinking water, eg:

- TOC < 500ppb
- < 10 CFU
- smooth pipe surfaces roughness R < 0.8µm
- gap-free pipe connections.

4.1.7 Electric trace heating

Our

- *mapress CARBON STEEL* and
- *mapress COPPER*

pressfitting systems may be used with electric trace heating systems.

Where electric trace heating systems are used in conjunction with the

- *mapress STAINLESS STEEL*

and

- *mapress EDELFLEX*

pressfitting systems, ensure the pipe bore does not exceed a continuous temperature of 60°C.
This limit may be increased to 70°C briefly (1h/day) for thermal disinfection purposes.

Trace heating

Avoid heating isolated sections of pipework, as this could cause excessive pressures! When using a general protection system in drinking water supply systems, fit protection devices such as safety valves in the pipework.

4.0 Applications and Characteristics

4.2 Installing floor water supply distribution systems with *EDELFLEX*

4.2.1 General

The drinking water supply is distributed from the risers to draw-off points on each floor. Floor manifolds downstream of the stopcock for a particular storey are an effective means of distribution and allow several different configurations.

Increasingly stringent hygiene, corrosion resistance, heat conservation and noise insulation requirements for pipework mean designers and contractors have to choose the right layout. Pipe runs are routed over the structural slab or within modular elements.

Conventional tee connections are replaced with runs using a single size of continuously flexible pipe, which is uninterrupted by intermediate connections.

A suitable configuration ensures excellent distribution and allows the conditions necessary to reduce the growth of legionella to be achieved. Even with long runs, the small bore generally keeps the capacity of floor and spur pipes without circulation below the permitted limit of 3 litres.
The low capacity of the *mapress EDELFLEX* pressfitting system always ensures perfect hygiene, as the drinking water is changed rapidly after the stagnation phases.

4.2.2 Pipe configurations

The size (outside diameter x wall thickness = 15 x 1.6mm) of an individual *mapress EDELFLEX* pipe allows a flow rate of up to 0.53 litres of water/sec with low loss floor stopcocks. The flow velocity is then about 4.8m/s.

To arrive at the configuration, the following factors have to be known or specified:

- Pipe runs
- Type of modular system
- Laid under plaster in conventional wall chases
- Location, type and number of draw-off points
- Form and frequency of draw-off

The configuration taking account of the technical standards, regulations, codes of practice, etc, must:

- Fully exploit the pressure available for the pipe
- Keep the flow velocity high
- Ensure water continually flows throughout the entire pipe system
- Ensure hygiene (rapid water change after stagnation phase) by utilising a ring system to avoid stagnation if certain draw-off points are rarely used

To ensure a cost-effective floor system, it is advisable to adopt one of the following pipe configurations:

- Spur
- Series
- Ring or
- Combination of the above

mapress EDELFLEX also allows customisation.

Less hygienic configurations, such as those using tees or even spur pipes, should only be chosen if the last draw-off point is used every day.

Series and ring configurations are the most cost-effective and hygienic. The higher flow velocities, with even pressure and heat distribution, and greater draw-off rates achieved, even with smaller bore pipework, give a ring circuit advantages over all of the other options.

The designer can choose the most suitable layout for the requirements from those shown and described on the following pages.

4.2.3 Spur system

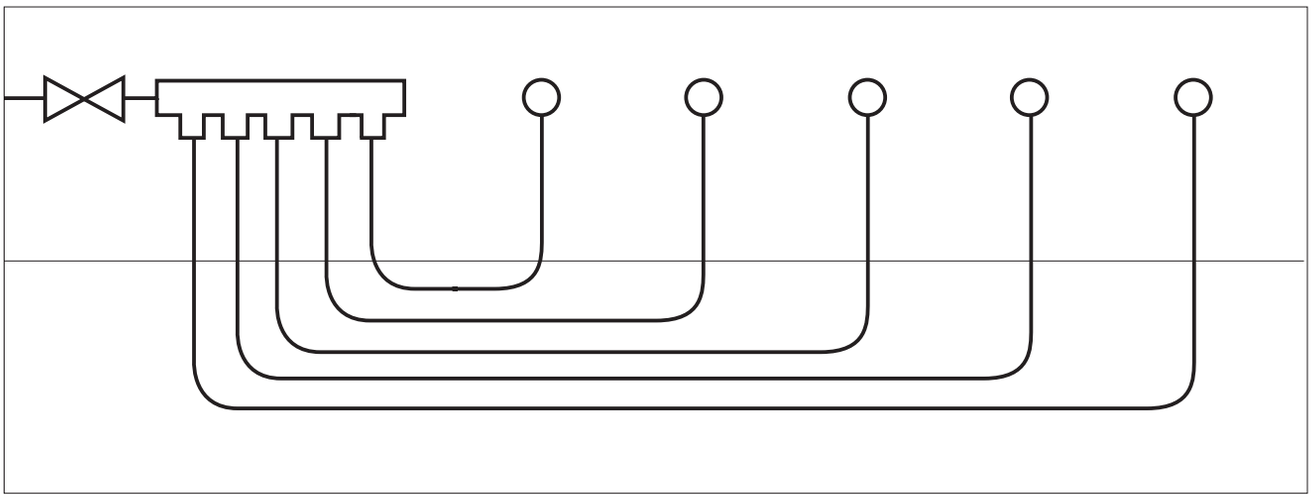


Figure 4.0-1 Spur configuration

Each draw-off point is connected to the floor manifold with a separate pipe. This arrangement is generally chosen if the pipes between manifold and draw-off points are short, the available pressure is low, and the draw-off points cannot be assembled in groups with a series or ring configuration.

Advantages

+ Small bore pipes
+ Low water capacities
+ Minimised pressure drops
+ Individual connection for higher water demand
+ Lower design costs
+ Quick and easy installation

Disadvantages

– Longer stagnation phases
– Draw-off points have to be regularly used
– More space required for pipework and floor manifold

4.2.4 Series system

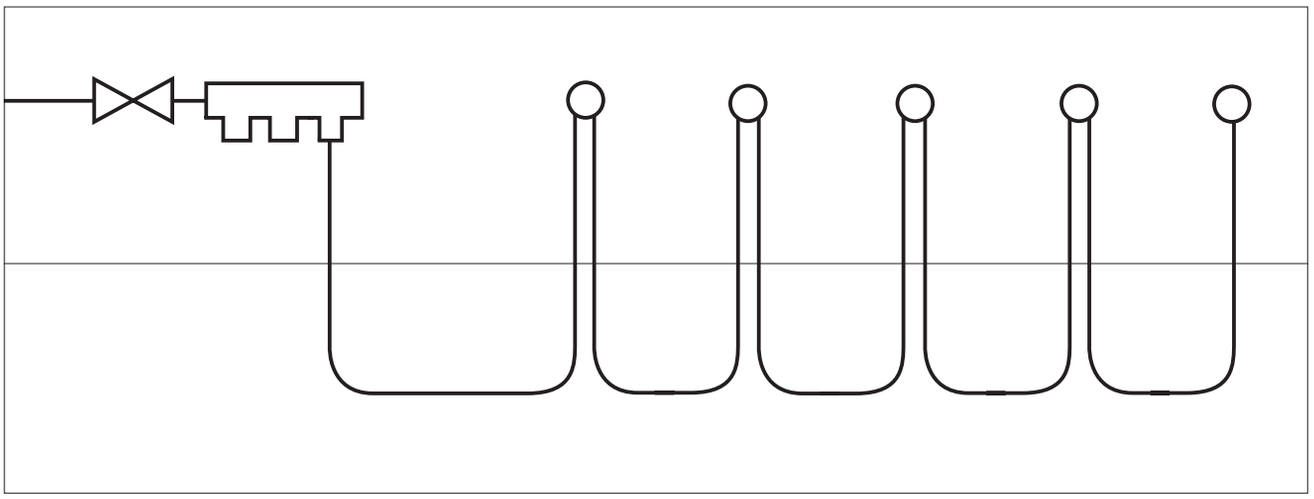


Figure 4.0-2 Series configuration

The pipe is continued directly from one draw-off point to the next, with twin connections. Draw-off points are grouped and several supplied by a common pipe.

Advantages

+ Simple configuration
+ Short total length of pipe used
+ Quick installation
+ More compact floor manifold
+ Low volume of stagnant water
+ Stagnation avoided by water being changed rapidly
+ Perfect hygiene if frequently used draw-off point at end of line

Disadvantage

– Increased pressure drop means highest draw-off has to be at start of line if possible

4.2.5 Ring system

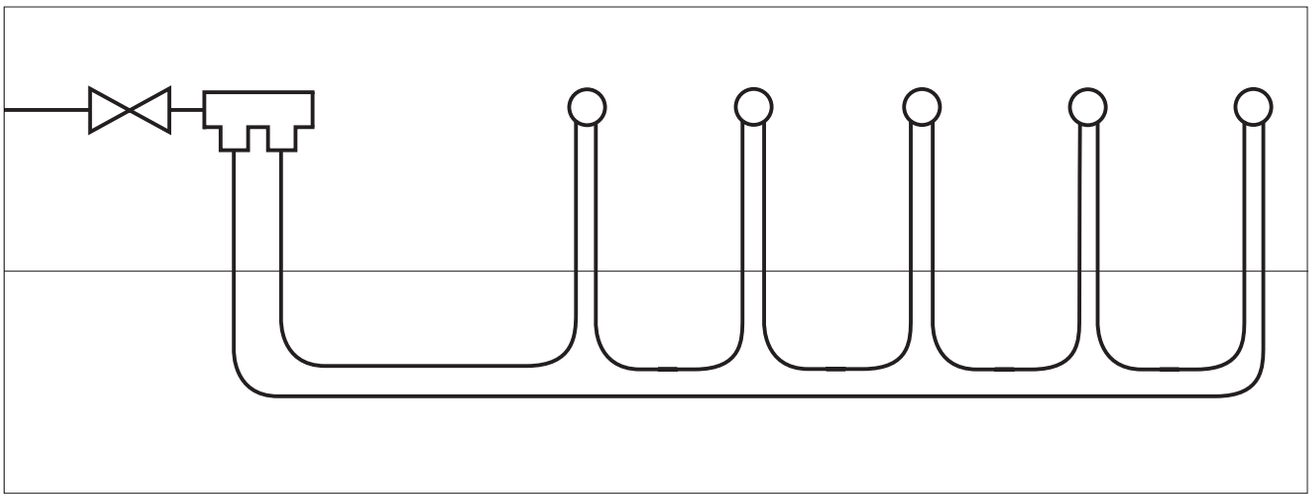


Figure 4.0-3 Ring configuration

As with a series configuration, twin connections are used to connect all draw-off points in turn to a loop of pipe, with a return from the last point to the floor manifold. Each draw-off point can be supplied with water from two sides. This allows high draw-off rates, with low pressure drops and smaller bore pipework. Ring systems also offer the best hygiene.

Advantages

+ Low pressure drops allow high draw-off rates and significantly more draw-off points with same pipe bore
+ Pressure drops are about 30% less than with series system and 50% less than systems using conventional tee connections
+ Various draw-off points can be connected further away from the floor manifolds and risers
+ More compact floor manifolds, since depending on the number of draw-off points they only need 2 connections
+ Uniform pressure and heat distribution
+ Optimum water changing
+ Short stagnation periods, since the water is changed even if only one draw-off point is used. This is therefore also the most hygienic configuration, even with rarely used draw-off points.

4.2.6 Combined ring system

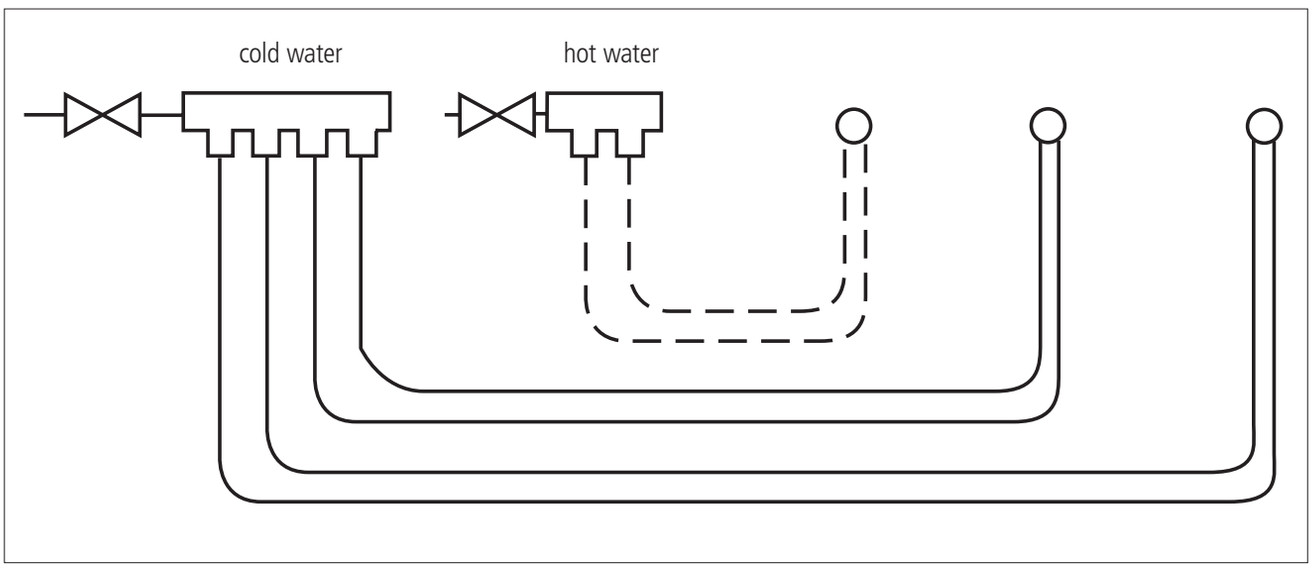


Figure 4.0-4 Combined ring configuration

This is a configuration for higher water usage. A separate ring pipe can be used to connect each individual draw-off with a flow rate ≤ 0.4 litres/s.

Advantages

+ Effective water delivery where supply pressure low
+ Pressure drops about 30% less than with spur system

4.2.7 Combination system

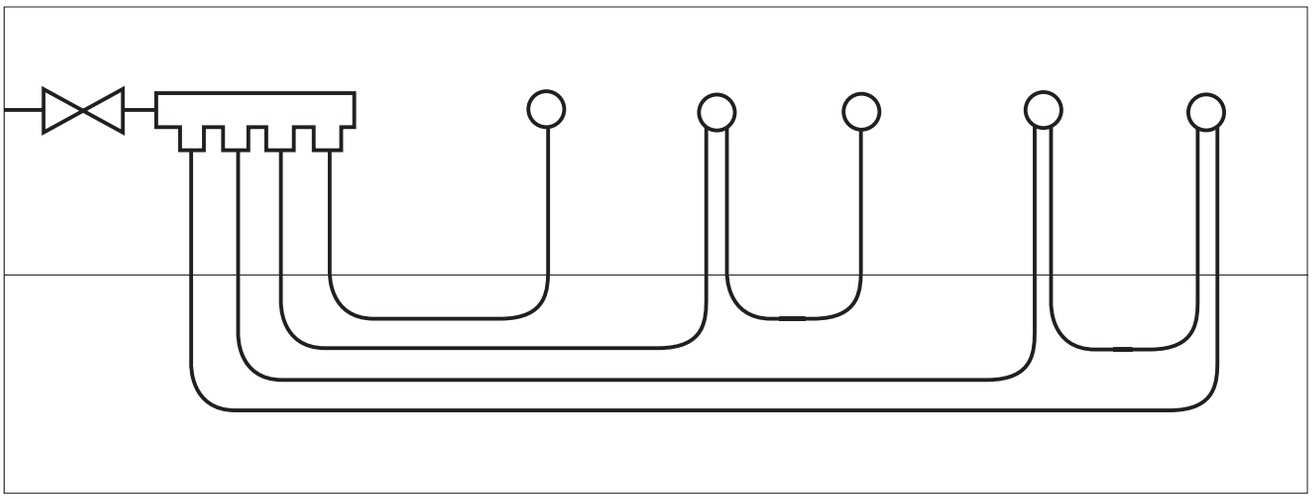


Figure 4.0-5 Combination configuration

The spur, series and ring configurations can be combined.

Typical installation for a luxury apartment:

Individual pipe
WC

Series pipe
Twin basin vanity unit

Ring pipe
Kitchen with dishwasher and washing machine

Ring pipe
High-consumption shower and bath

Advantages

+ Customised pipe configuration
+ Small bore pipe even caters for high usage at individual draw-off points
+ Low pressure drops together with even pressure and heat distribution
+ Little stagnation
+ Most efficient changing of water at rarely used draw-off points

4.2.8 Combined system

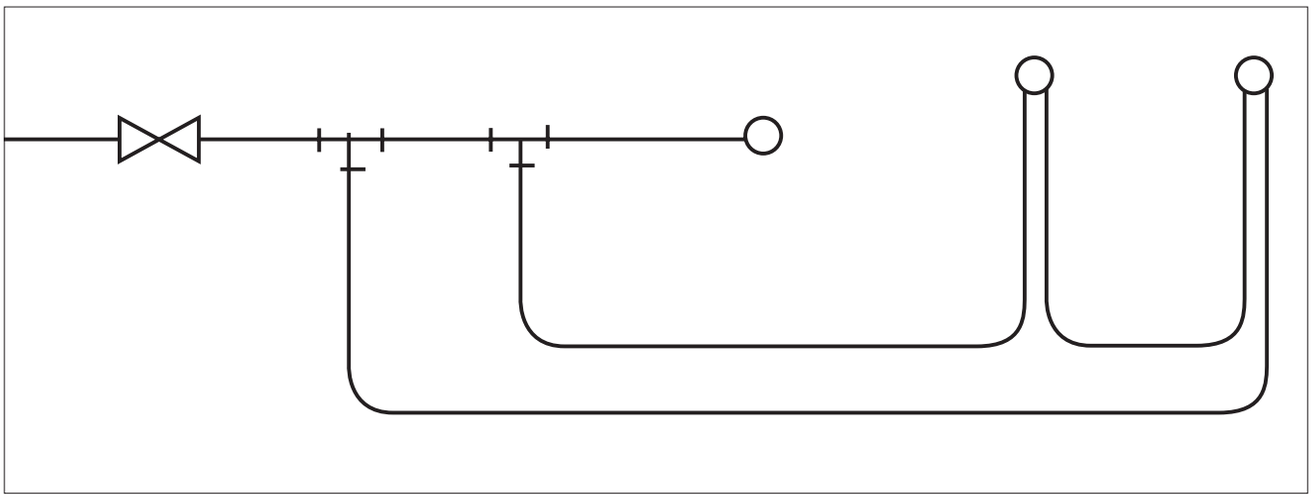


Figure 4.0-6 Combined configuration using tees

Configuration combining spur and ring system, with tee distribution to the draw-off points.

This allows connection of draw-off points with different pipe configurations.

- WC ➔ Spur pipe
- Higher draw-offs than ring configuration

4.2.9 Group system

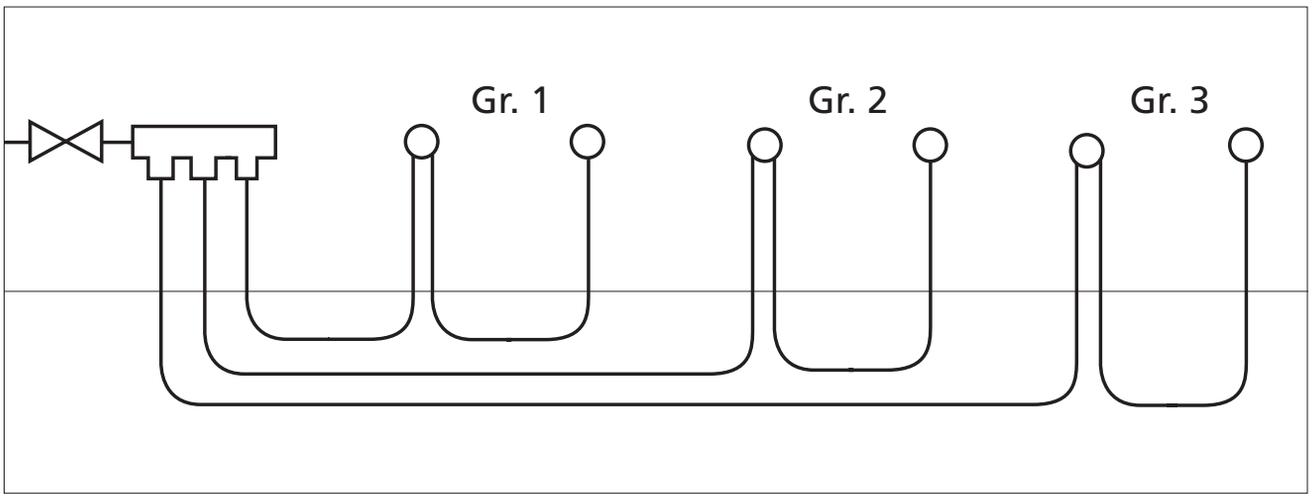


Figure 4.0-7 Group configuration

A common floor manifold accommodates pipes in series supplying groups of single or twin connections for related sanitary-ware, such as bath & shower, WC & bidet or double vanity units.

Advantages

+ Shorter pipe runs
+ More compact floor manifold

4.0 Applications and Characteristics

4.2.10 Luxury group system

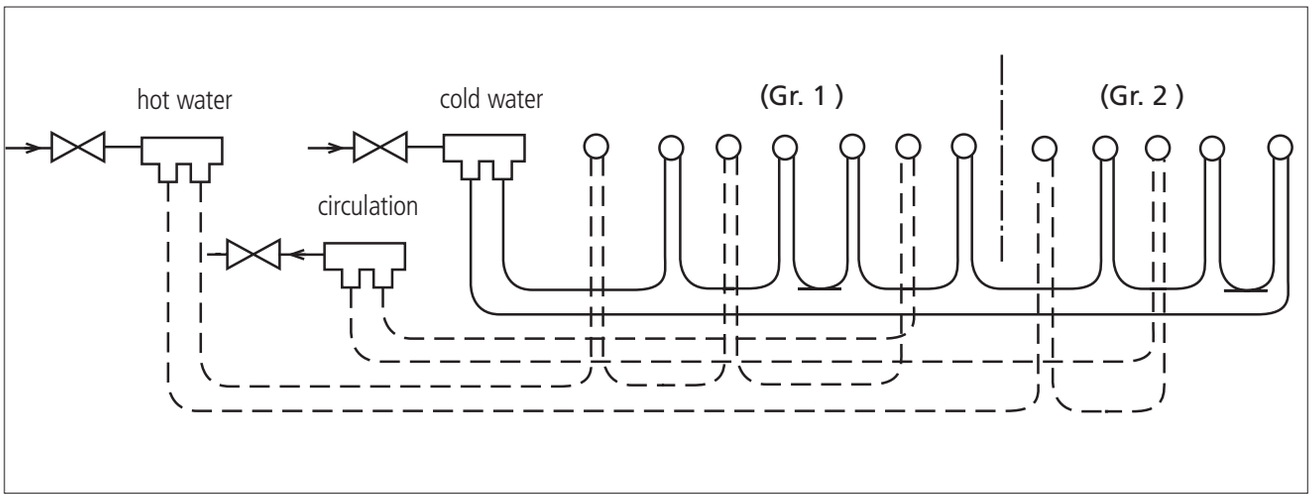


Figure 4.0-8 Luxury group configuration

A ring configuration is used for the cold water supply. The hot water pipe from the hot water floor manifold is connected to the individual draw-off points of each group in series. A circulation pipe returns from the last point to the floor circulation manifold.

Advantages

+ No stagnation, optimum changing and distribution of water (due to ring configuration for cold)
+ Series configuration with circulation for all hot water draw-off points
+ Method of operation prevents growth of legionella
+ Circulation manifold ensures even distribution of hot water temperature

Disadvantage

- More space required for floor and circulation manifolds

4.3 Installing gas systems

4.3.1 General

The *mapress* pressfitting systems for installing gas systems have been tested and certified to the requirements of the test guidelines:

- DVGW VP 614 and
- ÖVGW G1-TR-Gas (Austria).

The following pressfitting systems are available:

- *mapress STAINLESS STEEL GAS*
  bearing
  DVGW DG-4550BL0118
  ÖVGW G 2.663
  SVGW 00-08506 (project approval)
  system test marks
- *mapress COPPER GAS*
  bearing
  DVGW DG-4550BL0161
  ÖVGW G 2.664 test marks

These certified pressfitting systems are installed indoors (with ETC) and outdoors (without ETC) above ground (burying not permitted).

ETC: enhanced **t**hermal **c**apacity (connection leak tested for 30 min at 650°C and PN5/PN1)

Our GAS pressfittings have been approved and certified for

➔ Natural gas

➔ Liquefied gases

The GAS pressfittings are fitted with yellowish brown acrylonitrile butadiene rubber (NBR) seal rings in the factory. These retain their yellow colour and are marked as follows depending on the material:

- GT 1/5 for enhanced thermal capacity
- PN 5 working pressure up to 5 bar
- Ⓜ *mapress*
- DVGW DVGW registered/certified
- 22 size (eg for pipe OD of 22mm in this case)

***mapress GAS sizes*:**

$OD_{STAINLESS\ STEEL\ GAS}$ = 15 to 108 mm
$OD_{COPPER\ GAS}$ = 15 to 54 mm

mapress pressing jaws or collars are used for these sizes.

The reliability of the *mapress GAS* pressfitting system has been tested and certified for the following pipe ODs

- **ODs from 12 to 35 mm with pressing jaws**
- **ODs from 42 to 108mm with pressing collars**

The **42** and **54mm** pipe sizes must not be pressed with jaws when installing gas systems!

- **Connection to valves, components and non-*mapress* systems**

Threaded or flanged *mapress* pressfittings are used as adapters to connect to commercial red brass, brass, diecast aluminium or ductile grey cast iron gas valves and components.

mapress GAS used for repairs may connected to DIN EN/DVGW approved stainless steel or copper pipes with *mapress GAS* pressfitting adapters made of the correct material, or commercial adapters (eg GEBO adapters for gas).

Such a connection to a non-*mapress* system must be made with great care, ensuring in particular that the outside surfaces of the pipes are in perfect, undamaged condition. The DVGW has only tested and certified the stainless steel and copper versions of the *mapress GAS* pressfitting systems separately. Installation in mixed new systems of *mapress STAINLESS STEEL GAS* and *COPPER GAS* pipes and fittings is therefore not permitted (see *COPPER GAS* for exception).

4.3.2 *STAINLESS STEEL GAS*

The *mapress STAINLESS STEEL GAS* pressfitting system has the following components:

- ➔ *mapress STAINLESS STEEL GAS* pressfittings
- ➔ *mapress STAINLESS STEEL* pipe with the DVGW system test mark DG-4550BLl0118 (G)

The system has been ETC tested ($p_{ETC,max}$ = 5 bar) and may therefore be laid on or under plaster. Outdoors these pipes may only be laid above ground. Thanks to the excellent corrosion resistance of stainless steel, additional corrosion protection is not necessary when laying under plaster.

4.3.3 *COPPER GAS*

The *mapress COPPER GAS* pressfitting system has the following components:

- ➔ *mapress COPPER GAS* pressfittings
- ➔ DIN EN / DVGW copper pipes (to DVGW Code of Practice GW 392)

This system has been tested and is certified with the DVGW test mark

- DG-4550BL0161 (G).

This DVGW test mark with the technical parameters of *mapress COPPER GAS* also applies to connection of the *mapress COPPER GAS* pressfitting system with the following *mapress STAINLESS STEEL GAS* pressfittings:

- flanged adapter
  ODs from 22 to 54mm
- female elbow with wall plate
  ODs from 15 to 22mm
- adapter for liquefied gases
  ODs from 15 to 18mm

The fact that this system has been ETC tested ($p_{ETC,max}$ = 1 bar) means it is suitable for laying both on and under plaster. Outdoors these pipes may only be laid above ground.

The properties of the copper mean that additional corrosion protection may be necessary when laying under plaster and building materials containing gypsum, ammonia or nitrite.

4.4 Installing heating systems

4.4.1 General

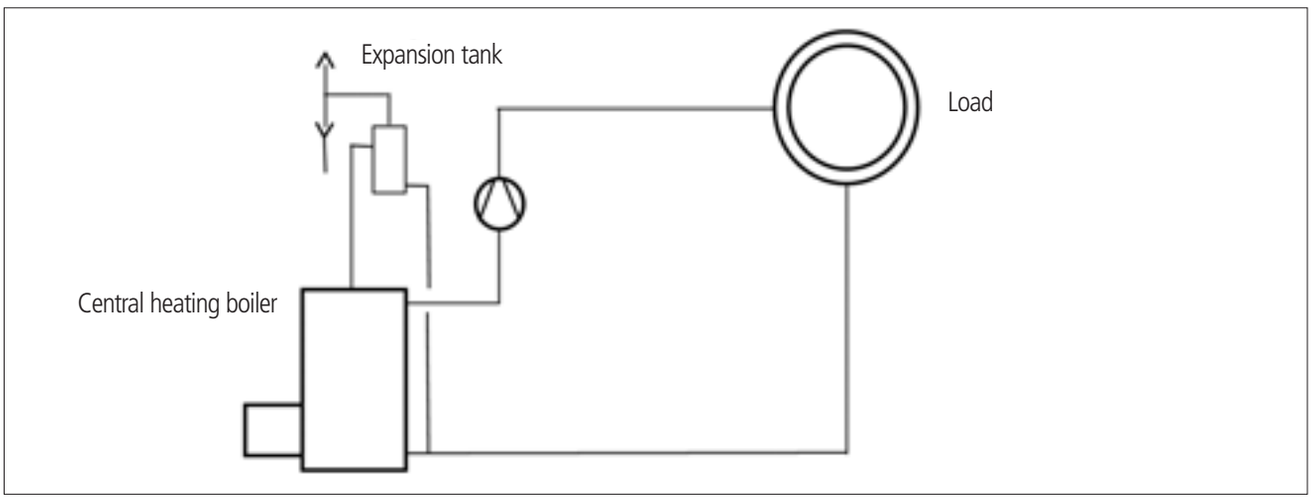


Figure 4.0-9 Open hot water heating system

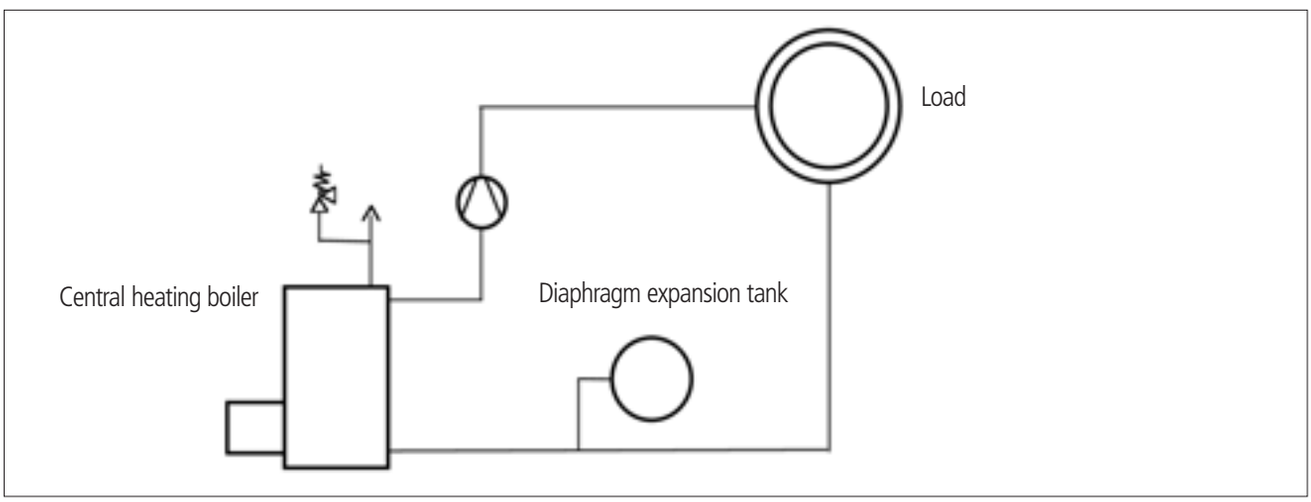


Figure 4.0-10 Closed hot water heating system

Hot water heating systems are used to create a comfortable atmosphere in the rooms in which people live and work. The water used as heat transfer medium is limited to a maximum temperature of 120°C by safety devices.

Hot water heating installations may be divided into:

- Open and closed systems (depending on whether pipe system is vented to atmosphere)
- Gravity and pumped systems (method of circulation)
- Single and two pipe systems (pipe configuration)
- District heating systems
- Local heating systems
- Steam/condensate lines
- Systems using distribution from upper and lower floor

The closed pumped version is the most widespread central heating system in Germany. Gravity and open heating systems are extremely rare, and will therefore not be considered in greater detail.

4.0 Applications and Characteristics

4.4.2 *CARBON STEEL/ SUPER SIZE HEATING*

The *mapress CARBON STEEL* pressfitting system (pipe ODs from 12 to 54mm) made of unalloyed steel may be used in closed hot water heating systems with a (continuous) flow temperature of up to 120°C. Atmospheric oxygen must not be allowed to get into the heating water.

Because of its thin walls and the high ingress of oxygen, *mapress CARBON STEEL* is not suitable for open systems.

The *mapress SUPER SIZE HEATING* pressfitting system with material No 1.4301/BS 304 S 31 (ODs from 76.1 to 108mm) is used for open and closed hot water heating systems with a working temperature of up to 120°C.

4.4.3 *STAINLESS STEEL*

The *mapress STAINLESS STEEL* pressfitting system with material number 1.4401 (BS 316 S 33) (ODs from 15 to 108mm) is completely suitable for used in all open and closed heating systems with a working temperature of up to 120°C.

4.4.4 *EDELFLEX*

The *mapress EDELFLEX* pressfitting system with material No 1.4571 (BS 304 S 31) (outside diameter x wall thickness = 15 x 1.6mm) is suitable all for open or closed heating systems with a working temperature of up to 120°C.

The flexibility of the *EDELFLEX* pipe allows it to be used for floor distribution and radiator connection pipes.

4.4.5 *COPPER*

mapress COPPER pressfittings can be used with copper pipes to DIN EN 1057 in open and closed hot water heating systems with a working temperature of up to 120°C.

Install pipes and pressfittings with lagging and noise insulation.

Footfall insulation should also be considered when laying under the screed.

Additives in the heating water must be checked for compatibility with the black (CIIR) seal ring and approved by Geberit. Follow the manufacturer's instructions for use.

Table 4.0-1 Tested and approved corrosion inhibitors[1] for *STAINLESS STEEL/EDELFLEX/ CARBON STEEL* and *SUPER SIZE HEATING* Suitability with black butyl rubber (CIIR) seal ring

Fluid	Use	Manufacturer[2]
DEWT-NC	0.4%	Drew Ameroid, Hamburg
DIFFUSAN-C	Oxygen inhibitor	REDUKS, Duisburg
GENO-Typ FKK	0.5%	Grünbeck, Höchstädt
HELAMIN 190 H	30 – 100mg/l	VOGEL, Waiblingen
Hydrazine/Levoxine	Oxygen inhibitor	Bayer
Sodium sulphite	Na_2SO_3 surplus	Various
Thermodos JTH-L	1%	JUDO, Winnenden
Trisodium phosphate	(Na_3PO_4.) alkalisation	Various
VARIDOS OXIGARD K-20A	200 – 500 mg/l	Schilling-Chemie

[1] Oxygen inhibitors
[2] Follow manufacturer's instructions for use

4.4.6 Local and district heating pipes

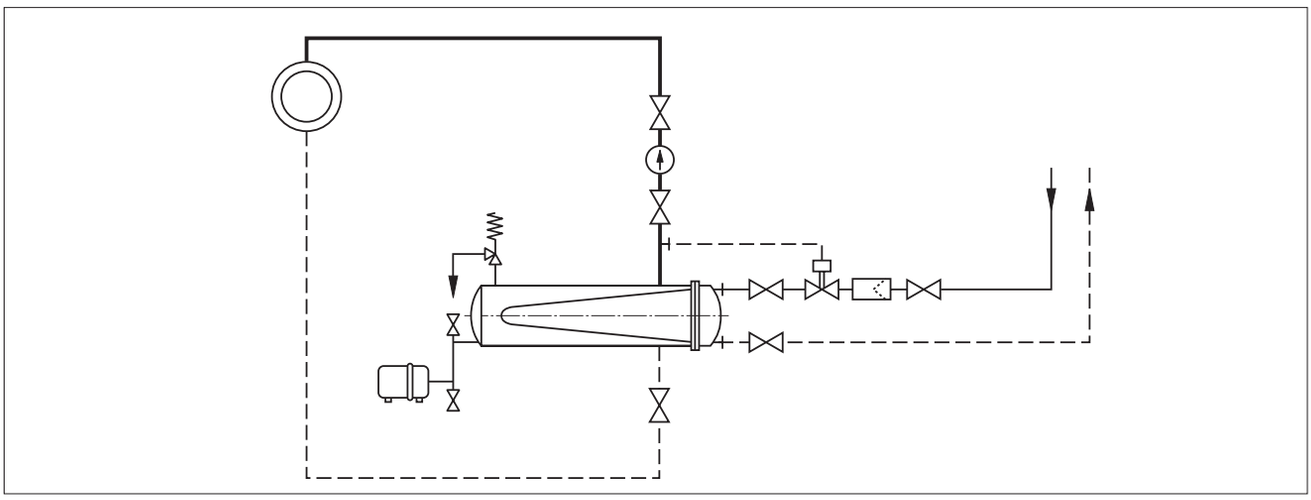


Figure 4.0-11 Substation for buildings with indirect connection of heating system to district heating mains

A district heating mains is a pipe that uses hot water to transport generated heat over a considerable distance from a central plant to the loads.

A local heating mains is characterised by short pipe runs between the heating plant and the loads.

Both local and district heating pipes may be divided into

- Primary and
- Secondary circuit.

The primary circuit is the pipework between the heating station and the substation for the buildings forming the load. The mains pipework within the buildings is called the secondary circuit.

The secondary circuits may be connected to the primary circuits of the local or district heating system

- directly or
- indirectly.

The *mapress*

- *mapress STAINLESS STEEL*
- *mapress EDELFLEX*
- *mapress CARBON STEEL*
- *mapress SUPER SIZE HEATING* and
- *mapress COPPER*

pressfitting systems may only be used in the secondary circuit.

Our pressfitting system with the black (CIIR) seal ring is suitable for local and district heating mains at a continuous temperature of up of 130°C. This particular seal ring can be subjected to a working temperature of up to 140°C for 200 hours a year. The temperature may be increased to a maximum of 150°C for up to 1 hour in the event of a malfunction.

4.0 Applications and Characteristics

4.4.7 Pipe configurations

• Single pipe heating system

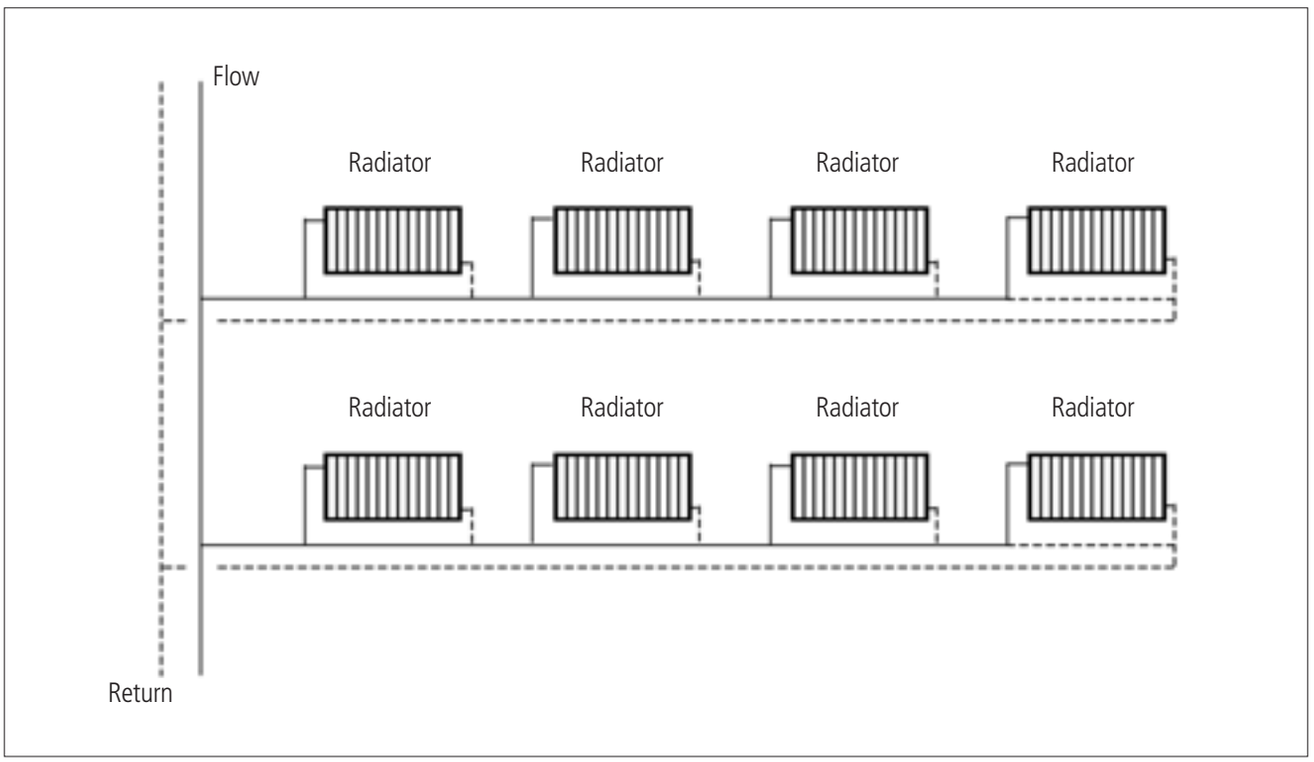


Figure 4.0-12 Single pipe heating system

The first hot water heating systems using a single pipe had radiators connected in series, but this did not allow individual control of radiator output. The level of control was improved by the addition of a bypass with suction nozzle or a special control valve.

The flow of water divides at the flow pipe of an individual radiator and recombines at its return pipe. The water supplying the next radiator in the direction of flow is at a lower temperature, since the flow through the first radiator has dissipated part of the heat energy. This progressive drop in temperature means the radiators have to be larger to heat the room properly.

Advantages

+ Fewer holes in slabs
+ Ease of installation
+ Easier heat measurement
+ Control and isolation of individual storeys

Disadvantages

– Isolation of individual radiators affects the others
– Larger radiators required for same heat output in direction of flow
– Bypass has to be accurately balanced

• Two pipe heating system

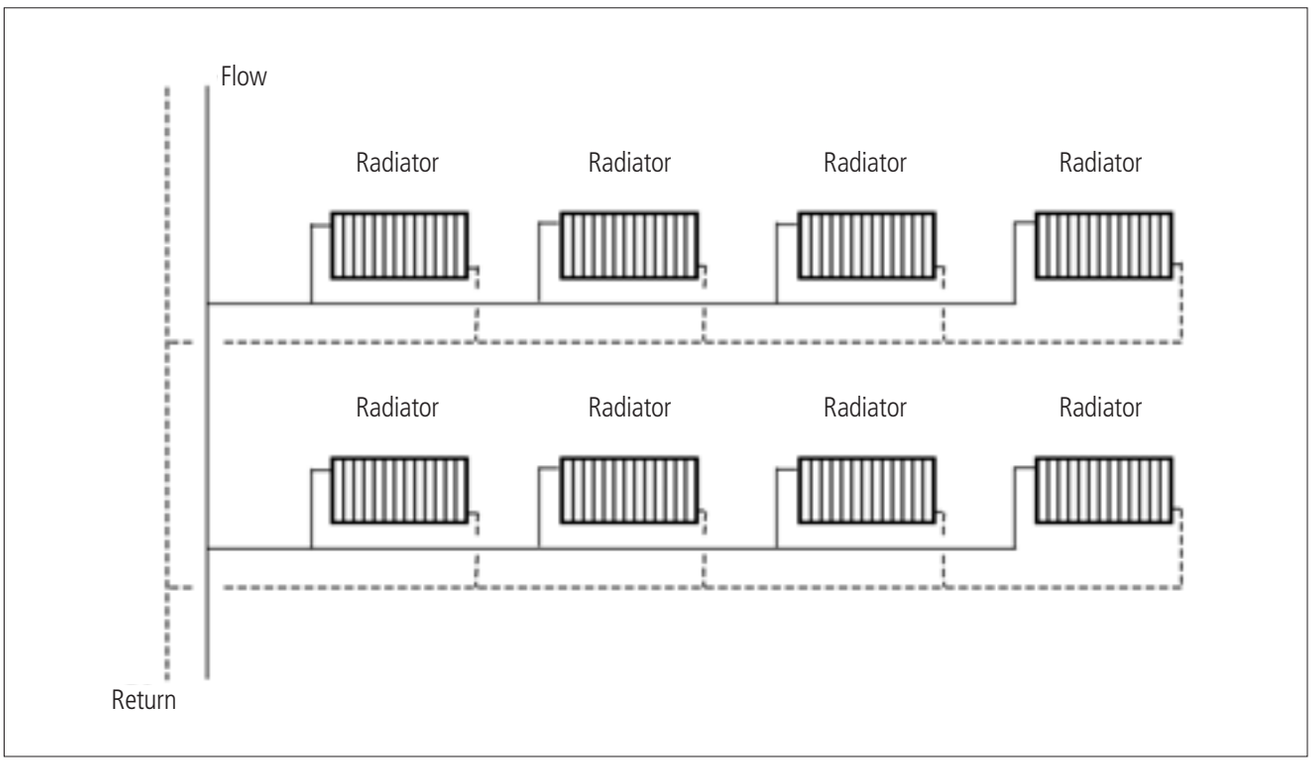


Figure 4.0-13 Two pipe heating system

This is the most commonly used heating system. All of the radiators are in parallel (separately connected to flow and return). The flow to each radiator is therefore at approximately the same temperature. The heat output and radiator balancing are controlled by restricting the flow rate of the water with a valve.

Advantages

+ Smaller radiators for same heat output
+ Turning off individual radiators has little affect on the others
+ Essentially uniform flow temperature

Disadvantages

– Subsequent extension of heating system more difficult
– Radiators have to be carefully balanced

4.0 Applications and Characteristics

• Two pipe heating system utilising Tichelmann configuration

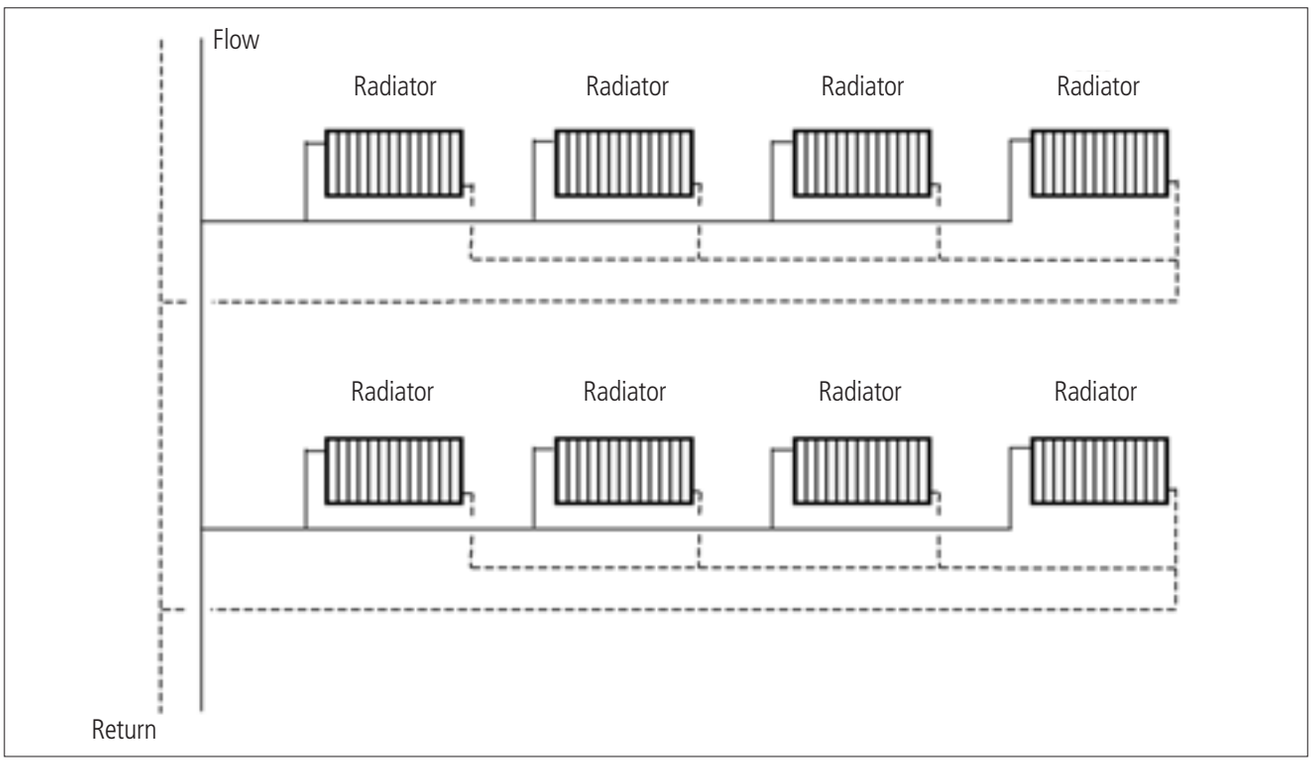


Figure 4.0-14 Tichelmann system

One special type of two pipe heating system utilises the Tichelmann ring configuration. This ensures the combined length of flow and return from the heating plant, and hence the pressure drop due to friction in the ring circuit, is the same at all points.
The need for this configuration arose out of the lack of valves for balancing the radiators and controlling water heaters and multiple boiler systems. In recent years the introduction of suitable valves has reduced the number of applications for this configuration.

Advantages
+ Ease of design
+ Same pressure drop due to friction at each radiator
+ Radiator balancing valves can be omitted
+ Approximately uniform flow temperature

Disadvantage
– Higher materials costs

• **Distribution from upper floor**

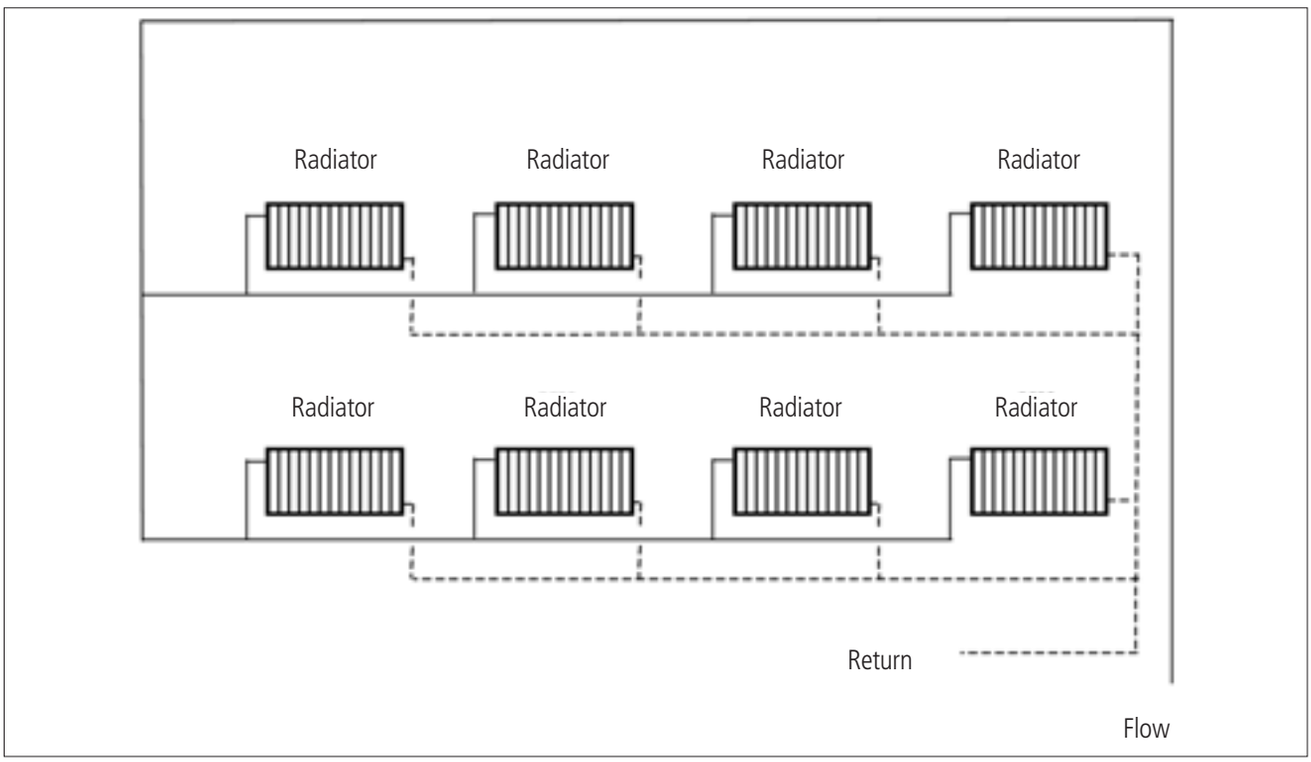


Figure 4.0-15 Two pipe heating system with distribution from upper floor

With this configuration, the hot water is pumped up to an upper floor (loft or attic), and then distributed to the connected radiators via drop-pipes. The hot water is returned to the heating plant via the return manifolds in the basement. The heating system is vented centrally at the highest point in the upper floor. The configuration can be used for single or two pipe heating systems.

Advantages

+ Heating system easily vented and drained
+ Requires little space in the basement
+ Easily controlled

Disadvantages

– Higher materials costs
– Heat losses in upper floor

4.0 Applications and Characteristics

• Distribution from lower floor

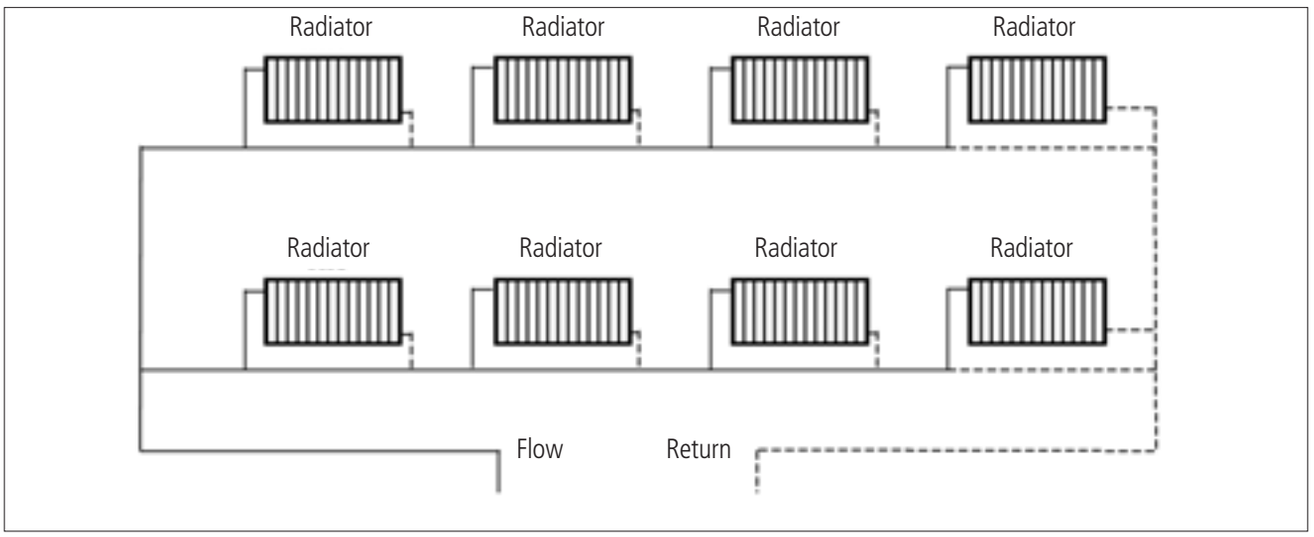


Figure 4.0-16 Single pipe heating system with distribution from lower floor

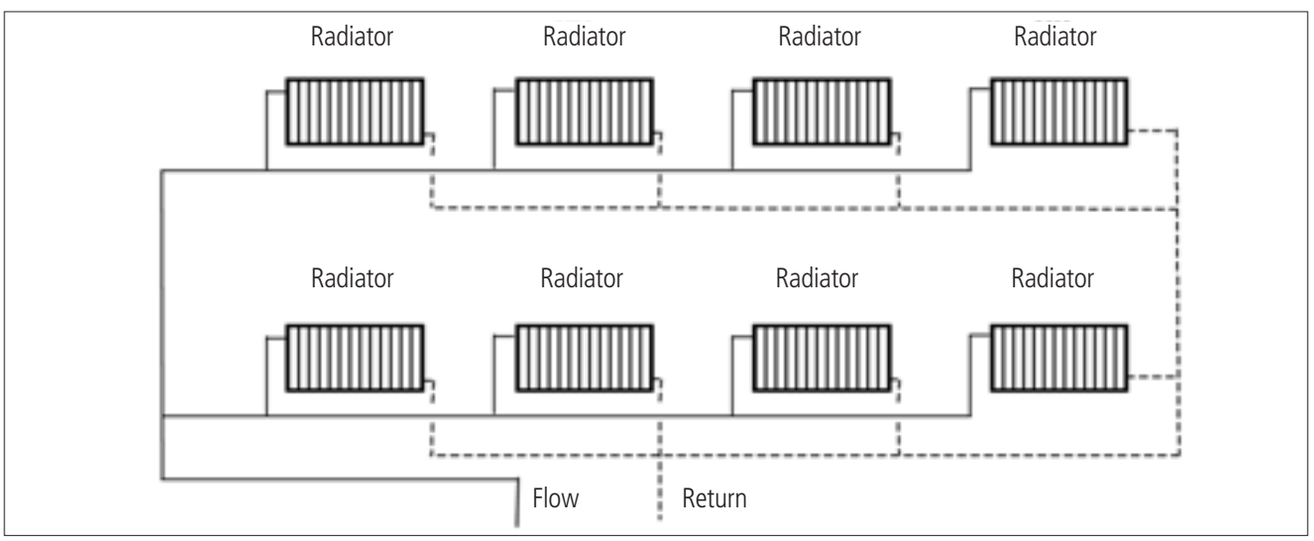


Figure 4.0-17 Two pipe heating system with distribution from lower floor

With this configuration the distribution circuit is on a lower floor (generally basement), from where the hot water is pumped via the individual risers to the radiators. The hot water is returned to the heating plant via drop-pipes and the manifold in the basement. The heating system is vented at the different radiators or using a central valve. This configuration can be used for single or two pipe heating systems.

Advantages

+ Lower material costs
+ Heat loss in basement

Disadvantages

– More difficult to vent and drain in multiple occupancy dwellings
– Slower response to call for heat

4.5 Heat pump systems

4.5.1 General

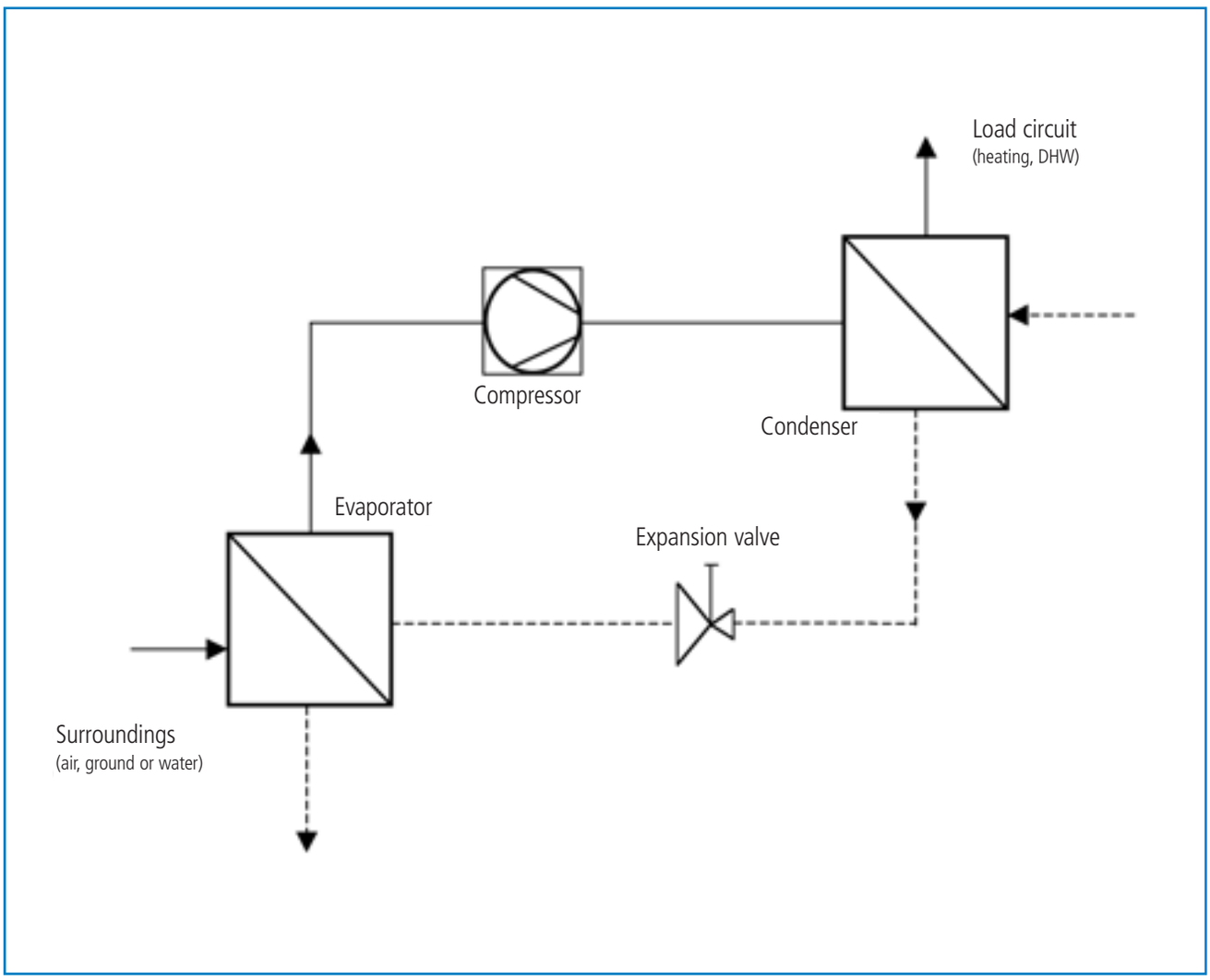


Figure 4.0-18 Principle of heat pump

The most important fuels for hot water heating systems and water heating (DHW) systems are fuel oil and gas. The oil crisis in the early 70s lent fresh impetus to the search for viable alternative sources of energy, with the emphasis on exploiting the temperature of the air, ground or water. These natural sources contain an inexhaustible amount of energy, which is continuously renewed by even diffuse solar radiation. Their relatively low temperature prevents them being used directly for the above-mentioned types of heating system. The heat pump exploits the laws of thermodynamics to raise this low temperature to a level at which the heat can be used. It operates on a reverse principle to that of the refrigerator. The evaporation (expansion) of a working fluid extracts the heat energy from the source (air, ground or water). In the compressor the temperature of the evaporated fluid is increased by compression. The heat produced is transferred to the heating circuit in the condenser.

Building services mainly use the following types of heat pump:

- air to water
- water to water

The amount of heat available from the different sources is reflected in the efficiency of the heat pump (ratio of heat output to electrical power consumption). The usable temperature levels are achieved by using different control systems to operating the heat pumps in different modes, eg

- monovalent
- bivalent-parallel
- bivalent-part-parallel
- bivalent-alternative.

4.5.2 *STAINLESS STEEL/ EDELFLEX*

mapress STAINLESS STEEL / EDELFLEX (material No 1.4401 (BS 316 S 33)/1.4571 (BS S 320 S 31)) is suitable for installing in the circuits of heat pump systems up to a maximum working temperature of 120°C. These stainless steel pressfitting systems can also be used to connect to or actually form the ground collectors.
Brine can also be circulated through these pipes laid as a heat exchanger coil to extract stored solar energy from the ground, or in fences and other free-standing concrete absorbers to extract it from the air.

4.5.3 *CARBON STEEL/ SUPER SIZE HEATING*

The *mapress CARBON STEEL* pressfitting system made of unalloyed steel and *mapress SUPER SIZE HEATING* (material No 1.4301 / BS 304 S 31) may be used in closed heat pump systems with a working temperature of up to 120°C. Continuous ingress of atmospheric oxygen into the working fluid must be avoided.

4.5.4 *COPPER*

mapress COPPER pressfittings may be used with copper pipes to DIN EN 1057 in closed circuits of heat pump systems at a working temperature of up to 120°C.

Additives in the heating water must be checked for compatibility with the black (CIIR) seal ring and approved by Geberit. Follow the manufacturer's instructions for use.

Table 4.0-3 Tested and approved antifreezes including corrosion and other inhibitors for *STAINLESS STEEL, EDELFLEX, CARBON STEEL* and *SUPER SIZE HEATING* Suitability with black butyl rubber (CIIR) seal ring

Fluid	Use	Manufacturer[1)]
Antifrogen N and L	Antifreeze	Hoechst
Antifreeze	Antifreeze	Aral
Ethylene glycol (antifreeze base)	Max 100 (without inhibitors)	Various
Frost-Ex 100	Antifreeze	TEGEE Chemie Bremen
Glykosol	Antifreeze	Prokühlsole
Propylene glycol (antifreeze base)	Max 100 (without inhibitors)	Various
Tyfocor L	Antifreeze	Tyforop-Chemie

[1)] Follow manufacturer's instructions for use

4.6 Installing coolant and chilled water systems

4.6.1 General

Chilled water systems are used to create a comfortable atmosphere in the rooms in which people live and work. Coolant systems are used to ensure components and machinery such as engines and turbines operate reliably. For commercial reasons water of extremely widely varying quality (eg groundwater, surface or brackish water) is used as heat transfer medium in these systems.
Coolant and chilled water systems may be divided into:

- open and
- closed systems.

The largest possible temperature differential between flow and return should be chosen in order to achieve maximum heat dissipation with minimum water circulation. The most cost-effective spread of temperature throughout a building's air conditioning system is 9K. This involves a flow temperature of between +4 and +6°C and a return temperature of 12 to +15°C. However, this spread is always determined by the application.

4.6.2 *STAINLESS STEEL/ EDELFLEX*

The *mapress STAINLESS STEEL* and *EDELFLEX* pressfitting system (material No 1.4401 (BS 316 S 33)/1.4571 (BS 320 S 31)) with the black (CIIR) seal ring is completely suitable for use in all open and closed coolant and chilled water systems with a working temperature of -30 to +120°C. The water soluble chloride ion content of the coolant or chilled water must not exceed 250mg/l.

4.6.3 *CARBON STEEL/ SUPER SIZE HEATING*

mapress (unalloyed) *CARBON STEEL* may be used for closed coolant or chilled water circuits with a flow temperature from -30 to +120°C.
The thin walls of the unalloyed steel and the high ingress of oxygen make unalloyed steel unsuitable for open coolant or chilled water systems.
mapress SUPER SIZE HEATING may be used for open and closed coolant or chilled water systems at a working temperature of -30 to +120°C.

4.6.4 *COPPER*

mapress COPPER pressfittings may be used with copper pipes to DIN EN 1057 in closed coolant and chilled water systems at a working temperature of -30 to +120°C.

4.6.5 *CUNIFE*

The *mapress CUNIFE* pressfitting system (material No 2.1972.11) with the black (CIIR) seal ring is completely suitable for use in open and closed coolant and chilled water systems at a working temperature from -30 to +120°C. The coolant or chilled water may also have an elevated chloride content (sea water resistant).

Ready to use antifreezes based on glycol always contain other additives. All additives must be checked for compatibility with the seal rings and approved by Geberit. Follow the manufacturer's instructions for use of additives.

Table 4.0-4 Tested and approved antifreezes including corrosion and other inhibitors for *STAINLESS STEEL, EDELFLEX, CARBON STEEL, SUPER SIZE HEATING* and *CUNIFE* Suitability with black butyl rubber (CIIR) seal ring

Fluid	Use	Manufacturer[1)]
Antifrogen N or L	Antifreeze	Hoechst
Antifreeze	Antifreeze	Aral
Ethylene glycol (antifreeze base)	Max 100 (without inhibitors)	Various
Frost-Ex 100	Antifreeze	TEGEE Chemie Bremen
Glykosol	Antifreeze	Prokühlsole
Pekasol 2000	Cooling brine	Prokühlsole
Pekasol L	Cooling brine	Prokühlsole
Propylene glycol (antifreeze base)	Max 100 (without inhibitors)	Various
Tyfocor L	Antifreeze/Cooling brine	Tyforop-Chemie

[1)] Follow manufacturer's instructions for use

4.7 Installing solar systems

4.7.1 General

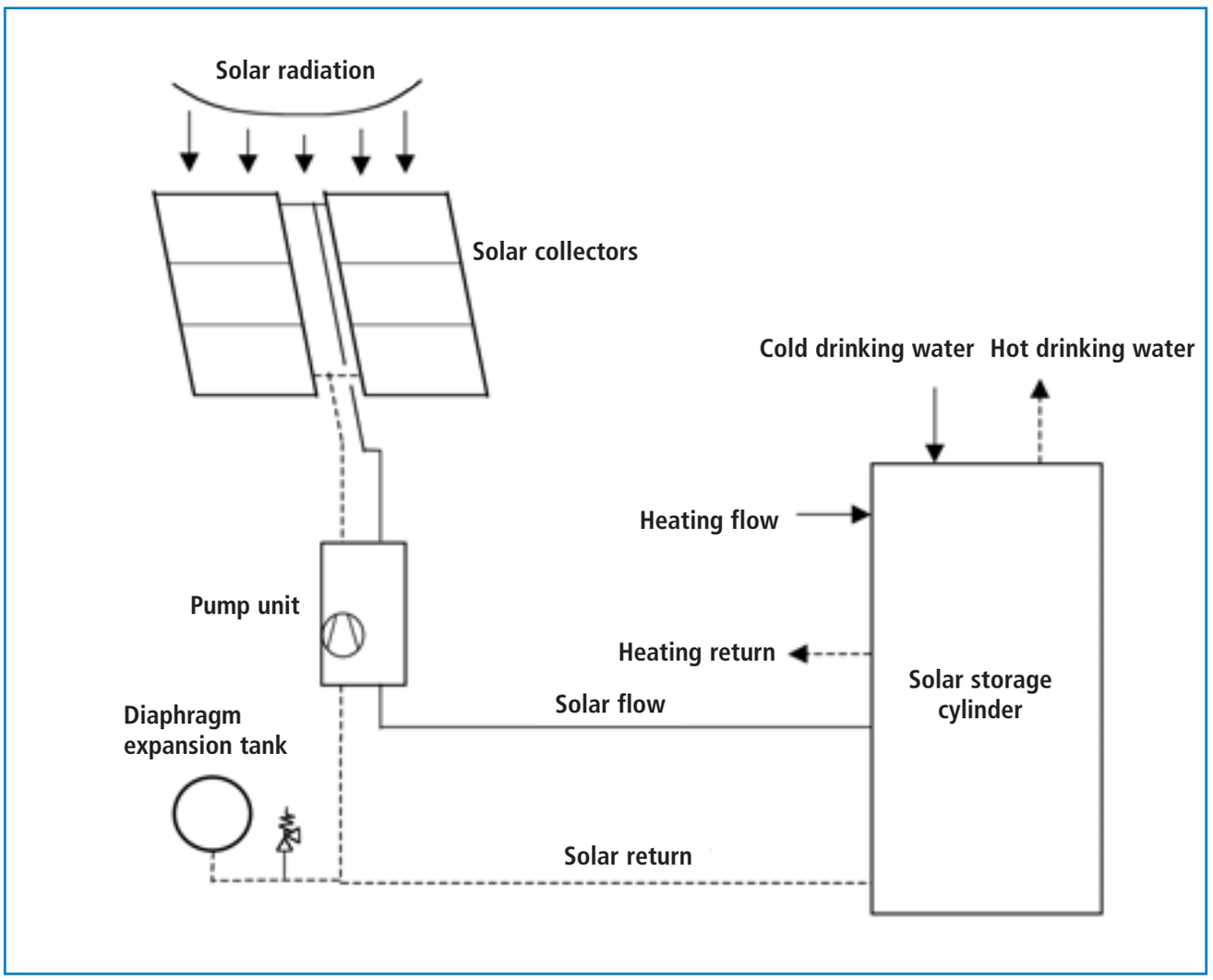


Figure 4.0-19 Solar system

A solar heating system obtains heat from solar energy. The surfaces of its collectors will absorb even diffuse solar energy. A solar fluid (water with antifreeze) conveys the heat energy to the storage cylinder. The main application is preheating water (DHW) heated by a boiler.

The relatively small amount of solar energy available over the winter months means this system is only of limited use for space heating. However a combination cylinder can be used, with prioritisation of water heating and diversion of excess heat to space heating once a preset hot water temperature is reached. This arrangement can also be used for heating a swimming pool.

4.7.2 *mapress* pressfitting systems

The following pressfitting systems:

- *mapress STAINLESS STEEL*
- *mapress EDELFLEX*
- *mapress CARBON STEEL*
- *mapress SUPER SIZE HEATING*
- *mapress COPPER*

are suitable for closed solar systems. The heat resistance of the plastic coating makes *mapress CARBON* (unalloyed) *STEEL* and *mapress EDELFLEX* suitable for working temperatures of up to 120°C.

The factory-fitted black (CIIR) seal rings are suitable for working temperatures of -30 to +120°C (up to 150°C for 1 hour in event of malfunction). The green fluorocarbon rubber (FPM) seal ring (pipe ODs from 15 to 54mm) may be used for solar systems at elevated continuous temperatures of 180°C (200°C briefly). This seal ring is supplied separately on request, and the installer must use it to replace the factory-fitted black (CIIR) seal ring on site.

The green seal ring will only withstand these higher temperatures in water with antifreeze (solar fluid). It is therefore not suitable for use with other fluids at elevated temperatures (eg high pressure steam).

Ready to use antifreezes based on glycol always contain other additives. All additives must be checked for compatibility with the seal rings and approved by Geberit. Follow the manufacturer's instructions for use of additives.

Table 4.0-5 Tested and approved antifreezes, including corrosion and other inhibitors for *STAINLESS STEEL/EDELFLEX*[2], *CARBON STEEL*[2] and *SUPER SIZE HEATING* Suitability with black butyl rubber (CIIR) seal ring and green fluorocarbon rubber (FPM) seal ring

Fluid	Use	Manufacturer[1]
Antifrogen N or L	Antifreeze	Hoechst
Antifreeze	Antifreeze	Aral
Ethylene glycol (antifreeze base)	Max 100 (without inhibitors)	Various
Frost-Ex 100	Antifreeze	TEGEE Chemie Bremen
GLYCOSHELL	Antifreeze	Shell Chemicals
Glykosol	Antifreeze	Prokühlsole
Glysantin Alu Protect	Antifreeze	BASF
Glythermin NF	Antifreeze	BASF
Pekasol 2000	Cooling brine	Prokühlsole
Pekasol L	Cooling brine	Prokühlsole
Propylene glycol (antifreeze base)	Max 100 (without inhibitors)	Various
Tyfocor	Antifreeze/Cooling brine	Tyforop-Chemie

[1] Follow manufacturer's instructions for use
[2] Maximum working temperature 120°C

4.0 Applications and Characteristics

4.8 Oil supply systems

4.8.1 General

Mineral oil is now used as both a fuel and a lubricant. Its versatility has generated a high demand for this material as a source of energy for industrial, commercial and domestic applications, and as a lubricant and starting material for the chemical industry. Dwindling reserves have prompted a search for alternatives. Alongside the renewable solid fuels (eg wood and grain), one option is vegetable oil, primarily from rapeseed and sunflowers. Today's main applications are in the carmaking and chemical industries.

4.8.2 Fuel oils

Extra light fuel oil is used a domestic heating fuel. A heavy grade is also available for large systems. The high viscosity of the latter means it has to be heated in order to flow between the oil tank and the boiler or boilers. The following supply configurations are used:

- single pipe system
- two pipe system and
- ring system for systems with several boilers

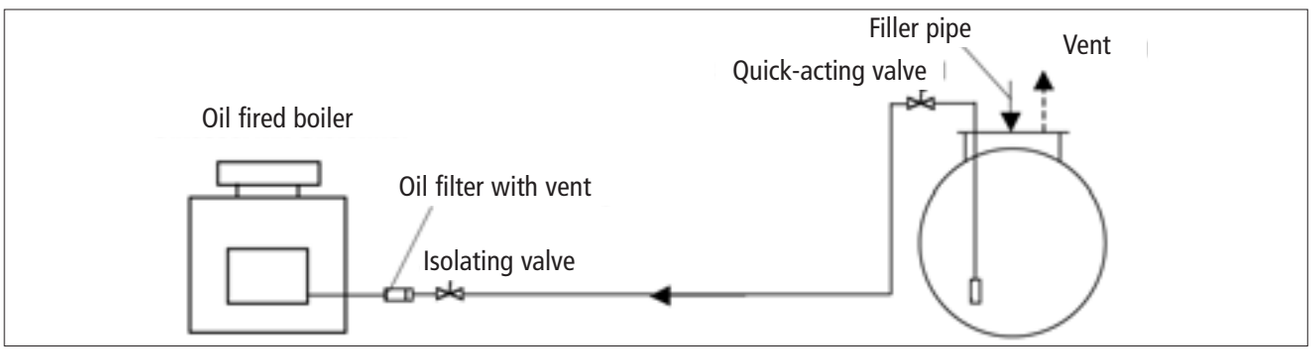


Figure 4.0-20 Extra light oil supply using single pipe system

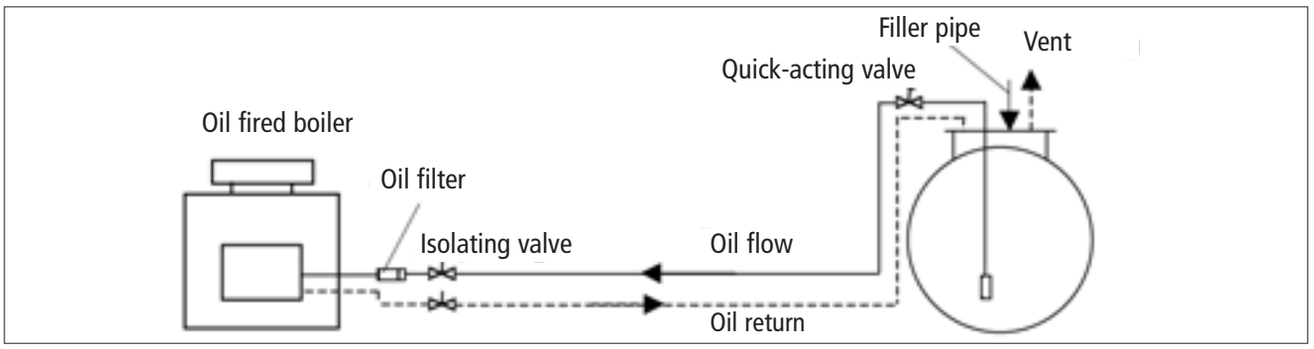


Figure 4.0-21 Extra light oil supply using two pipe system

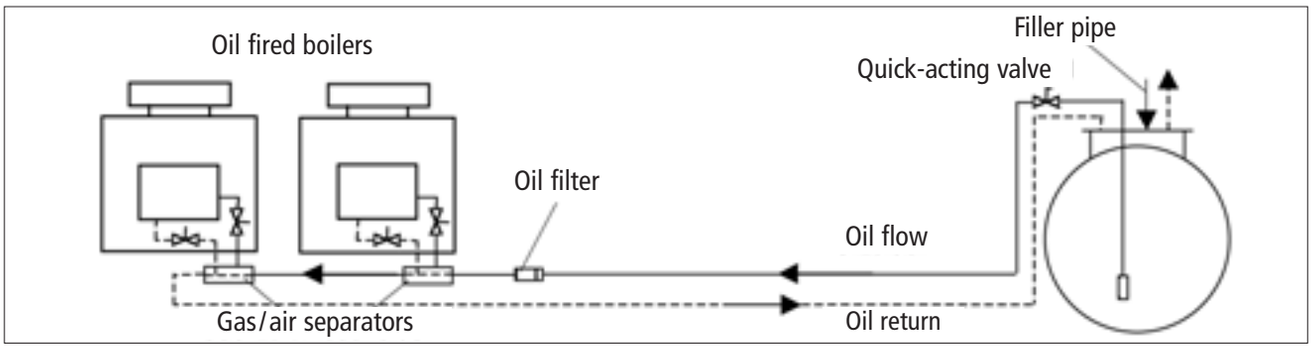


Figure 4.0-22 Extra light oil supply using ring system

The TÜV has tested and approved the *mapress* pressfitting systems

- *STAINLESS STEEL / EDELFLEX*
- *CARBON STEEL* and
- *COPPER*

with green fluorocarbon rubber (FPM) seal rings for use in light fuel oil supply systems. They are suitable for carrying potential pollutants as defined under German water resources legislation. The constituent metals are completely suitable for this application.
Soldered fittings must not be used with the *mapress COPPER* system.
The factory-fitted black (CIIR) seal ring is not suitable for use in oil supply systems. The approved green fluorocarbon rubber (FPM) seal ring (pipe ODs from 15 to 54mm) is supplied separately for this application. The fitter is responsible for replacing the factory-fitted black (CIIR) seal ring with this green seal ring on site.
The *mapress* pressfitting systems

- *STAINLESS STEEL* and
- *CARBON STEEL*

may be used with the factory-fitted red fluorocarbon rubber (FPM) seal rings in extra light fuel oil supply systems. The *mapress* pressfitting connection has also been tested and approved by the TÜV for this application.

4.8.3 Danger class A III fuels and oils

The *mapress* pressfitting systems

- *STAINLESS STEEL* and
- *CARBON STEEL*

with factory-fitted red fluorocarbon rubber (FPM) seal rings are suitable for carrying danger class A III fuels, engine and gearbox oils.

4.9 Installing compressed air systems

4.9.1 General

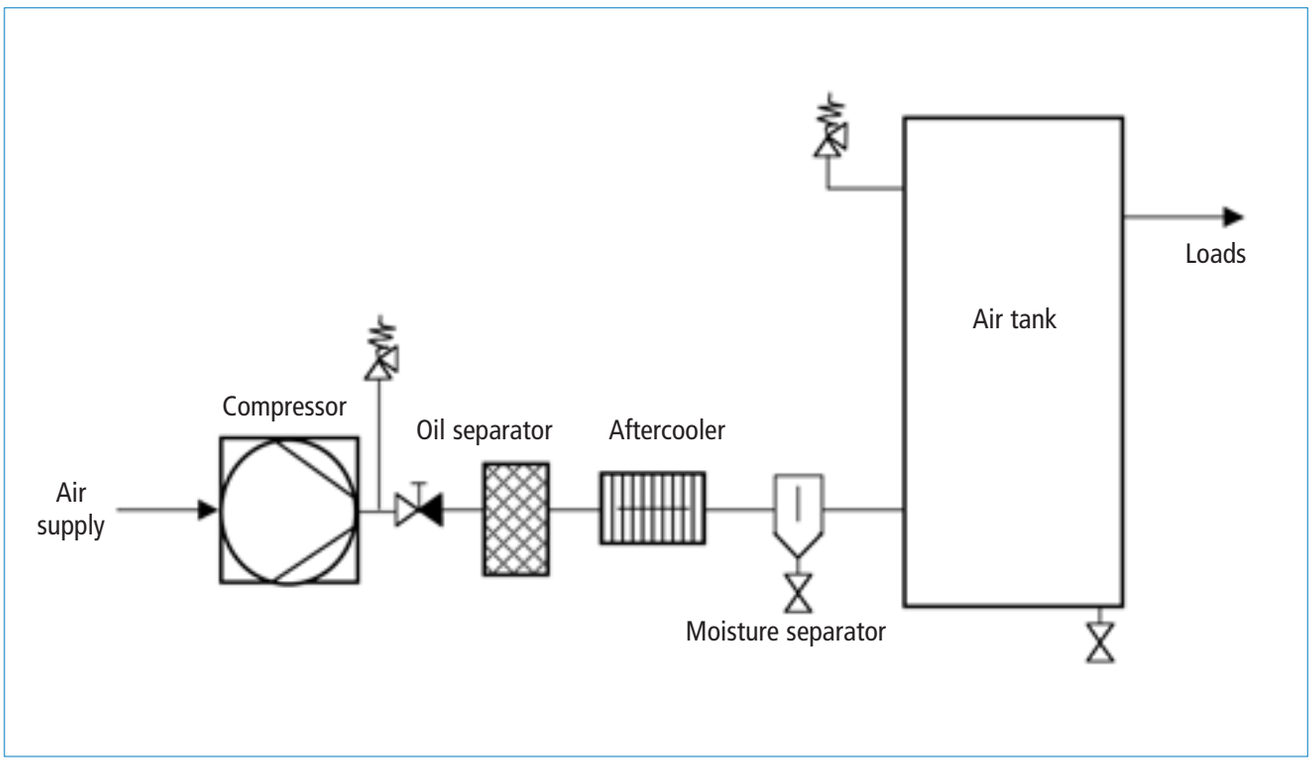


Figure 4.0-23 Compressed air system

Compressed air is used for a wide range of applications virtually throughout the manufacturing and processing industries. Although compressed air supply systems operate at pressures of up to 10 bar, tools and machinery often only require a maximum of 6 bar. Special high-pressure safety requirements and the substantial energy costs involved in producing and storing compressed air make it necessary to choose sufficiently low working pressures.

The residual oil, moisture content and purity requirements depend on the particular application. Compressed air may contain oil to lubricate downstream loads. Dehumidifiers and oil separators are used to meet more stringent purity specifications. Such design requirements must be clarified before the materials and systems can be chosen.

4.9.2 Installing compressed air systems

The *mapress* pressfitting systems

- *STAINLESS STEEL / EDELFLEX*
- *CARBON STEEL*
- *SUPER SIZE HEATING* and
- *COPPER*

are suitable for installing compressed air systems up to a working pressure of 16 bar (working temperature of -30 to +120°C).
It is particular important to ensure the specified pipe insertion distance is achieved when making pressfitting connections. To lubricate the seal ring and achieve the best possible seal for compressed air, we recommend moistening the seal rings in the *CARBON STEEL* pressfitting system with plain or soapy water before assembly. To avoid the possibility of moisture and oxygen in the system leading to corrosion, *mapress CARBON STEEL* should only be used in dehumidified compressed air systems.

mapress pressfitting systems are also suitable for noncorrosive (nonexplosive and nontoxic) gases, such as nitrogen, argon and carbon dioxide.

4.9.3 Classification of compressed air (residual oil content)

Compressed air is divided into 5 classes reflecting the oil that remains in most systems. The black (CIIR) and red (FPM) seal rings may be used for classes 1 to 4. Only the red (FPM) seal ring is permitted for class 5.

Table 4.0-6 *mapress* seal rings suitable for air lines with residual oil contents to DIN ISO 8573-1

Compressed air class to DIN ISO 8573-1	Maximum residual oil [mg/m³]	*mapress* seal ring
1	0.01	black (CIIR) / red (FPM)
2	0.10	black (CIIR) / red (FPM)
3	1.00	black (CIIR) / red (FPM)
4	5.00	black (CIIR) / red (FPM)
5	25.00	red (FPM)

4.0 Applications and Characteristics

4.10 Special applications

4.10.1 Concrete core activation

Concrete core activation is used as a method of air conditioning buildings. It exploits the storage capacity of the structural members (walls, slabs, etc), by circulating water through embedded pipes. The pipework can be used for heating or cooling.
The water circulation causes a continuous exchange of thermal energy between the rooms and the concrete, which depends on the temperature differential. The capacity of the concrete makes core activation relatively slow, and it is not possible to control the temperature of individual rooms or achieve rapid changes. This sluggish response means it is best to use the system for night storage, so that sufficient energy is available for space heating or cooling during the main hours of use.
To protect the structure and pipe system, a concrete core activation system must be designed to avoid the temperature falling below the dew-point.

The *mapress* pressfitting systems
- *STAINLESS STEEL/EDELFLEX*
- *CARBON STEEL*
- *SUPER SIZE HEATING* and
- *COPPER*

are suitable as pipe systems for concrete core activation. Account must be taken of the working temperature range of -30 to +120°C and maximum working pressure of 16 bar.

4.10.2 Drain for condensing boiler

In addition to the heat energy in the flue gas, a condensing boiler exploits the evaporation enthalpy of the water vapour from combustion which this gas contains. Condensing boilers fired by gas (dew-point approximately 55°C) are often used for heating and hot water. The condensate must be taken through a condensate drain into the building drains. The pH-value of this condensed water vapour is between 3.5 and 5.2. There are also condensing boilers fired by extra light fuel oil (dew-point approximately 50°C). The condensate in this case has a pH-value of 2.5 to 3.5 and can contain sulphurous acid.
The condensate from the condensing boilers only has a low concentration of fluorocarbons. If there is a source of fluorocarbon emissions in the immediate vicinity, the installation location and the supply of combustion air for the condensing boiler must be chosen so that these pollutants cannot get into the condensate via the combustion air. Fluorocarbons promote corrosion in the boiler's heat exchanger, flue and condensate drain.

• Gas fired condensing boiler

The *mapress* pressfitting systems
- *STAINLESS STEEL*

made of stainless Cr-Ni-Mo steel (material No 1.4401/BS 316 S 33) and
- *CUNIFE*

made of the copper-nickel-iron alloy with material No 1.1972.11 are suitable for use as condensate drains, and will withstand the condensate produced by a gas fired condensing boiler.

• Oil fired condensing boiler

The *mapress* pressfitting system
- *CUNIFE*

made of the copper-nickel-iron alloy with material No 2.1972.11 is suitable for condensate drains, and will withstand the condensate of the oil fired condensing boiler. The stainless Cr-Ni-Mo steel with material No 1. 4401/BS 316 S 33 is not suitable for this application.

4.10.3 Vacuum line

The *mapress* pressfitting system meets the requirements of the vacuum test of DVGW Code of Practice W 54 "Pipe Connectors and Pipe Connections for Installing Water Supply Systems".

This means that the pipe connections of the *mapress* systems
- *STAINLESS STEEL/EDELFLEX*
- *CARBON STEEL*
- *SUPER SIZE HEATING* and
- *COPPER*

have withstood the vacuum test at 200 mbar absolute
(813 mbar reduction from atmospheric pressure of 1013 mbar).

4.11 Other fluids

4.11.1 General

The *mapress* pressfitting systems were initially developed for conventional building services. However, the opening up of new industrial applications means our systems are increasingly being used for fluids not usually encountered in this original application. The black (CIIR) seal ring is therefore replaced with the red (FPM) alternative for certain special industrial applications.

The resistance of the pipe and seal ring materials has to be checked before using the *mapress* pressfitting system for these industrial fluids.

The effect of the solvents, industrial liquids, gases and starting materials for chemical processes on the seal ring always necessitates practical testing and approval by Geberit.
These tests are carried out under the working conditions of the system

- temperature
- concentration
- pressure and
- fluid test

and with reference to the

- product and safety data sheets for the fluid.

4.11.2 Disinfectant solutions

mapress STAINLESS STEEL with the black (CIIR) seal ring is used for carrying solutions for disinfecting surfaces and preventing athlete's foot in swimming pools and hospitals.

Following the manufacturer's instructions for use when employing disinfectant solutions.

Table 4.0-7 Disinfectant solutions tested and approved for *STAINLESS STEEL* Suitability with black butyl rubber (CIIR) seal ring

Fluid	Used at concentration	Manufacturer[1)]
BAKTTONIUM	0.5 to 2%	Witty Chemie
NÜSCOSEPT	0.5 to 2%	Dr. Nüsken-Chemie GmbH
HEXAQUART S	0.5 to 3%	B. Braun & Melsungen AG
MULTIDOR	0.25 to 1%	Henkel Hygiene
MYXAL S	0.1 to 2%	Physioderm GmbH
QUATAMON MED	1.0 to 2%	S & M Schülke & Mayr GmbH
TERRALIN	0.25 to 2%	S & M Schülke & Mayr GmbH
XEROCID	0.5 to 2%	MFH Marienfelde GmbH

[1)] 1Follow manufacturer's instructions for use

5.0 Corrosion Characteristics and Protection

5.1 Resistance to internal corrosion

5.1.1 When installed in water supply systems

- ***mapress STAINLESS STEEL / mapress EDELFLEX***

Neither the quality nor the hygiene of drinking water are affected by stainless Cr-Ni-Mo steels (material No 1.4401 (BS 316 S 33) / 1.4571 (BS 320 S 31))

- Suitable for any drinking water
- No surface corrosion
- No pitting or contact corrosion
- No corrosion promoted by foreign matter
- No bimetallic corrosion (formerly called contact corrosion)
- Resists corrosion in contact with any treated water
- Suitable for installation in any mixed system.

In contact with drinking water, their protective layer of chromium oxide gives stainless Cr-Ni-Mo steels passive characteristics. *mapress STAINLESS STEEL / EDELFLEX* is completely suitable for any drinking water. It resists corrosion and maintains the quality of the water.
Local damage, such as pitting and crevice corrosion, can only arise in drinking or similar water with an impermissible, ie very high, chloride content.

- ***mapress COPPER***

Copper can affect the quality of certain types of drinking water. Corrosion damage can arise if the water composition is unfavourable.

When using copper, the limits imposed on this material by the Drinking Water Directive must therefore be observed. Provided this is done, and the drinking water is not changed, copper is suitable for installing in water supply systems.

The pH range over which copper is suitable for use in contact with drinking water is:

pH-value $\geq$ 7.4

or

pH-value: 7.0 $\leq$ pH < 7.4 and TOC $\leq$ 1.5 g/m³
(TOC ➔ total organic carbon)

To protect against corrosion, the German Drinking Water Regulations limit the salt contents as follows:

Sulphate ions	**<**	**240mg/l**
Nitrate ions	**<**	**50mg/l**
Sodium ions	**<**	**150mg/l**

5.1.2 Treated and process water

- ***mapress STAINLESS STEEL / mapress EDELFLEX***

The pressfitting system made of stainless Cr-Ni-Mo steel with material No 1.4401 / BS 316 S 33 is suitable and corrosion resistant for use in contact with treated water such as softened (decarbonised) and fully demineralised (deionised, distilled and pure condensates), through to high-purity water with a conductivity of less than 0.1 µS/cm. *mapress STAINLESS STEEL* cannot be used for high purity (eg pharmaceutical) water with purity requirements that are more stringent than for drinking water (eg smooth walls with roughness (R) < 0.8 µm and pipe connections free from gaps, etc).

5.1.3 When installed in heating and coolant or chilled water systems

- ***mapress CARBON STEEL***

The ingress of free atmospheric oxygen promotes corrosion of unalloyed steel. This arises in open hot water heating and coolant or chilled water systems. Atmospheric oxygen is virtually completely excluded from closed systems. Oxygen inhibitors or corrosion inhibitors may be added to the water in the system as a preventive measure.

The addition of oxygen inhibitors to the circulating water checks corrosion. They work by establishing the pH-value of 8.5 to 9.5 required to prevent corrosion of the carbon steel.

Only the corrosion inhibitors and antifreezes tested and approved by Geberit may be added to the water. Strictly follow the manufacturer's instructions for use.

The low oxygen content introduced with the water used to fill the system is harmless (no risk of corrosion). The oxygen reacts with the entire bore of the steel pipework to form iron oxides. Moreover, the oxygen released by the heated water is removed by venting the heating system.

- ***mapress STAINLESS STEEL/***
- ***mapress EDELFLEX***
- ***mapress SUPER SIZE HEATING***

The stainless Cr-Ni-Mo steels and the Cr-Ni steel are suitable for all open and closed hot water heating and coolant or chilled water systems.

- ***mapress COPPER***

Copper is suitable for closed hot water heating and coolant or chilled water systems.

5.2 Resistance to bimetallic corrosion (when installed in mixed systems)

5.2.1 When installed in water supply systems

- ***mapress STAINLESS STEEL/ mapress EDELFLEX***

Installing stainless steel in a mixed system does not affect its corrosion characteristics, whatever the direction of flow of the water (no flow rule).
Discoloration due to deposits of foreign corrosion products is no indication that the material is at risk of corrosion.
Stainless steel can be combined with any nonferrous metal (red brass, copper and possibly brass) in a mixed system, without running the risk of bimetallic (contact) corrosion.
Galvanised steel pipes suffer from bimetallic corrosion if directly connected to stainless steel.
The risk becomes negligible if nonferrous valves or spacers at least 50mm long are interposed between the two systems.

- ***mapress COPPER***

To avoid problems caused by the different properties of the materials, when combining *mapress COPPER* with galvanised steel pipes in water supply systems or open water systems, follow the rule governing the direction of water flow.

Flow rule:
Always install copper downstream of galvanised steel components.

5.2.2 When installed in heating and coolant or chilled water systems

- ***mapress STAINLESS STEEL/***
- ***mapress EDELFLEX***
- ***mapress COPPER***
- ***mapress CUNIFE***

All of these materials may be installed in any order whatsoever in closed hot water heating systems and water circuits, without risking corrosion.

In these cases, for example *mapress STAINLESS STEEL* can be combined with *CARBON STEEL, COPPER* or *CUNIFE*. The sizes of the *mapress* components are matched so that they can be pressed directly with one another.

5.0 Corrosion Characteristics and Protection

5.3 Resistance to external corrosion

Buildings constructed in accordance with the regulations do not contain any media liable to promote external corrosion. However, unexpected ingress of precipitation, damp, etc, can sometimes give rise to damage after prolonged exposure. Such risks can only be avoided in the long term through suitable corrosion protection.

Pipes should not be laid in areas involving a corrosion risk, such as laundries or rooms that are damp or not protected by cellars. However, this is unavoidable, they must be provided with suitable protection.

The use of closed cell lagging materials and sleeves has proven effective, provided cuts and joints are carefully sealed during installation to ensure watertightness.

Protection against external corrosion must be watertight!

The designer and installer are responsible for the design and workmanship of the corrosion protection.

Coatings or suitable primers or paints can be applied to metals as the minimum protection against external corrosion.

- ***mapress CARBON STEEL***

Prolonged exposure of unalloyed steels to moisture must be avoided.

The plastic (polypropylene) coating applied to *mapress CARBON STEEL* pipes offers very good corrosion protection.
The *mapress CARBON STEEL* pressfittings are externally galvanised. This offers protection against external corrosion equivalent to that of hot dip galvanised steels. This is sufficient to protect against corrosion caused by brief condensation.

mapress CARBON STEEL pressfittings laid under plaster or screed must be provided with suitable additional corrosion protection.

In addition to watertight anticorrosion tapes that resist heat and ageing, closed cell lagging materials or sleeves, whose joints and longitudinal seams have to be sealed to ensure they are watertight, have also proven effective.

- ***mapress STAINLESS STEEL/***
- ***mapress EDELFLEX/***
- ***mapress SUPER SIZE HEATING***

External corrosion can only be caused by the following factors if:

- Stainless steel pipework carrying hot water (≥ 50°C) comes into contact with building or lagging materials containing chlorides, in the presence of moisture.
- Moisture comes into contact with stainless steel hot water pipes and evaporation gives rise to local chloride enrichment
- Stainless steel pipework (including cold water pipes) comes into contact with chlorine gas, salt water, brine or oxygen saturated water with a high chloride content.

Such corrosion can be avoided with a watertight anticorrosion layer. It must be thick, nonporous and undamaged, and sufficiently resistant to heat and ageing (eg anticorrosion tapes).
Closed cell lagging materials or sleeves, whose joints and longitudinal seams have to be sealed to ensure they are watertight, have proven effective. It is advisable to lay on top of the plaster, or protect appropriately against corrosion, any pipework near building materials likely to suffer prolonged saturation with water with a high chloride content.

- ***mapress STAINLESS STEEL GAS***

The properties of the stainless Cr-Ni-Mo steel with material No 1.4401 (BS 316 S 33)/1.4571 (BS 320 S 31) mean it does not require any corrosion protection when installed in gas systems.

The same applies when it is laid under plaster or screed.

- ***mapress COPPER/***
- ***mapress COPPER GAS***

The properties of copper mean is does not require any special protection against external corrosion.

External corrosion protection is, however, necessary if the surroundings of the copper pipe contain sulphides, nitrites or ammonia (piggeries, concrete, plaster).

Copper pipes laid under plaster or screed must be protected against external corrosion.

The minimum corrosion protection requirements can be met by applying a coat of paint or epoxy resin or a plastic coating.

5.4 Effect of design, installation and service conditions

Damaging corrosion can also be promoted if the pipework is incorrectly installed or used.

- **Increased risk of pitting**

A pipe is normally subjected to a water pressure test after installation. The water used may lie stagnant in the pipe for some time before the system is commissioned.

"All metal pipework must be left completely full over this period when the water carried is stagnant. If partially or complete emptying, or partially refilling, after the water pressure test leaves water in the pipes, which now also contain air, there will be an increased risk of pitting. Particularly if the pipe system is not completely closed. This increased risk is due to the evaporation of the water, which leads to an increase in the chloride ion content of the remaining liquid phase."

If the pipework is to be emptied again after a water pressure test, we would recommend carrying out the pressure test with air!

A water pressure test and flushing is then carried out immediately prior to commissioning the pipework.

- **Temperature**

The likelihood of pitting and crevice corrosion increases with increasing water temperature. Pitting is also more likely where external heat (eg from trace heating) passes through the wall of the pipe into the water. This heat transfer and elevated temperatures allow deposits to form on the pipe bore. Chloride ion enrichment under these deposits can reach critical levels that cause pitting.
Stress cracking corrosion as a result of, for example, pitting or crevice corrosion is not to be expected in the case of stainless steels and temperatures below approximately 50°C.

- **Electric trace heating systems**

Electric trace heating systems may be used with *STAINLESS STEEL / EDELFLEX,* provided the pipe bore does not exceed a continuous temperature of 60°C. This limit may be increased to 70°C briefly (1 hour/day) for thermal disinfection purposes.

- **Bending stainless steel pipes**

Do not bend stainless steel pipes hot. The resultant sensitisation would cause a change in the structure of the material that could lead to intercrystalline corrosion.

The pipes (with ODs up to 54mm) may be bent cold with commercial bending tools.

- **Sealants**

Sealants that could release chloride ions into the water, or give rise to local chloride enrichment, are not permitted.

Do not use PTFE sealing tapes containing chloride ions!

PTFE sealing tapes and sealants that contain water-soluble chloride ions are not suitable for sealing threaded stainless steel connections!

They can lead to crevice corrosion in water supply pipes. Plastic sealing tapes (eg PARALIQ PM 35) are a possible alternative to hemp.

- **Laying in concrete**

For special applications (sprinkler systems), stainless Cr-Ni-Mo steel pipes (material No 1.4401/S 316 S 33) are laid without having to meet lagging and noise insulation requirements.
mapress STAINLESS STEEL is not liable to be corroded by (chloride-free) concrete. However, the pipe must be fully embedded in the concrete without forming cavities. As stainless steel and concrete have almost exactly the same coefficient of expansion, experience has shown that no stresses in the concrete or pipe are to be expected.

Concrete completely surrounding the stainless steel pipe provides the best corrosion protection!

5.0 Corrosion Characteristics and Protection

5.5 Effect of lagging materials

Lagging materials and sleeves can promote corrosion on pipework.

- ***mapress STAINLESS STEEL/***
- ***mapress EDELFLEX/***
- ***mapress SUPER SIZE HEATING***

Materials or sleeves used to lag stainless steel pipes must not have a water soluble chloride ion content exceeding 0.05% by weight.

AS grade lagging materials and sleeves to AGI Q 135 are comfortably below this limit and therefore particularly suitable for stainless steels.

- ***mapress COPPER***

Lagging materials for copper must be free from nitrites and their ammonia content ≤ 0.02% by weight.

5.6 Soldering, brazing and welding of stainless steel pipes

Due to the risk of knife-line corrosion, it is not advisable to connect stainless steel pipes for aqueous liquids by soldering or brazing.

Inert gas welding on site of stainless steel pipes installed in water supply systems is not to be recommended! Even with expert TIG welding it is impossible to prevent pipes tarnishing (developing layers of oxide) in the vicinity of welds. Even straw-yellow discoloration leads to corrosion.

Because of the possibility of corrosion damage from soldering, brazing or welding, stainless steel water supply pipework connections should only be made on site with pressfittings.

6.1 Fire protection (Pipework Fire Protection Guidelines)

6.1.1 General

In Germany the Model Building Regulations (MBO), State Building Regulations (LBO) and Special Building Regulations (SBO) specify the requirement profiles for building pipework. Each state introduces them separately in its detailed Implementation Regulations (AVO), Administrative Regulations (VV) or Harmonised Building Regulations (ETB).

The special requirements for building services pipework are covered by the current Pipework Fire Protection Guidelines (LAR 03/2000), which are introduced in all states within the framework of the ETBs.

6.1.2 Holes in walls and slabs

- **Incombustible pipes**
  OD ≤ 160mm including pipes with combustible coatings up to 2mm thick and combustible pipes with OD ≤ 32mm:

➔ **Several individual incombustible pipes without insulation in common holes**

The pipes are laid alongside each other in the hole and can be mortared in. The gap between them must be at least the plain diameter of the largest pipe.

➔ **Individual incombustible pipes without insulation in own holes or conventionally or core drilled holes:**

EOnly one pipe may be passed through each conventionally or core drilled hole and mortared in. The gap between the pipe and other incombustible pipes in their own core drilled holes must equal to at least the plain diameter of the largest pipe. The remaining toroidal space can be filled with mortar[1)] or, provided it does not exceed 15mm in thickness, continuously sealed with intumescent building materials[2)].

Alternatively the remaining toroidal space not exceeding 50mm in thickness can be sealed with Rockwool with a melting point in excess of 1000°C.

It must be ensured that the method of filling the space provides the smoketightness achieved with, for example, a Rockwool density greater than 120kg/m³.

➔ **Individual pipes with insulation in common holes or individual conventionally or core drilled holes:**

Rockwool insulation with a melting point in excess of 1000°C may be used for the holes in F90 walls and slabs. The length of this insulation must be equal to the thickness of the wall or slab. If there is no continuing insulation, the gap between the pipes must be equal to at least the plain diameter of the largest incombustible pipe.

If continuing incombustible A1/A2 insulation is used, the gap a must be ≥ 50mm between the hole insulation. This also applies to combustible pipes with ODs up to 32mm

- **Combustible pipes**
  OD > 32 mm
  Only tested and approved R90 rated systems may be installed.
  R90 approval is documented by the German General Building Control Test Certificate (ABP) or Building Control Approval (ABZ).

6.1.3 Laying on escape routes

Incombustible pipes with combustible coating up to 2mm thick, or combustible pipes with ODs up to 160mm, may only be laid exposed with continuous incombustible insulating materials with a melting point in excess of 1000°C and thickness of at least 30mm (Report No 3076.7740-Mer of 10/01/00 by the Brunswick IBMB).

All combustible and incombustible pipes with combustible insulating materials may only be laid using F30 suspended ceilings or in F30 ducts.

Further information is available in the following publications:

"*mapress* Brandschutzpraxis"
Mapress notes on fire protection, available in German only
(technical@geberit.co.uk)

and

"Brand-, Schall und Wärmeschutz bei Rohrleitungssystemen der Technische Gebäudeausrüstung (Fire, acoustic and thermal insulation of building service pipes, available in German only)"
(Info@LiComTec.de).

[1)] The gap cannot be sealed with mortar or intumescent building materials if simultaneous fire, acoustic and thermal insulation is specified.

[2)] Intumescent building materials require a general building control approval.

6.0 Fire Protection and Noise Insulation

6.2 *mapress* fire mains and fire protection pipework

The fire extinguishing and protection systems are used for preventive purposes, such as:

- rescuing and protecting people
- preventing the spread of fire

The water used does not have to be of drinking quality.

Such systems include:

- Outdoor hydrant systems
- Systems with open nozzles, water spray fire extinguishing systems and tank spray systems
- Systems with closed nozzles and sprinkler systems
- Fire mains

• Fire mains

Are fixed pipes with fire hose connections with shut-off valves (wall hydrants for use by occupants and fire brigade).

They are divided into:

- wet fire mains ("wet" riser, always full of drinking water)
- dry fire mains ("dry" riser, filled with non-drinking water and used by the fire brigade when needed) and
- wet/dry fire mains ("dry" riser, filled with water from the water mains supply and operated by remote actuation of valves when needed)

As fire mains form part of the water supply system (Part 6 of DIN 1988), they do not require separately approval.

- *mapress STAINLESS STEEL*
  DVGW system test mark
  DW-8501AT2552

and

- *mapress COPPER*
  DVGW system test mark
  DW-8501AU2013

with the black (CIIR) seal ring may be used for fire mains carrying water.

• Fixed fire extinguishing systems

These are permanently installed fire extinguishing and protection systems that automatically detect and signal a fire, and start the extinguishing system. They include:

- Systems with open nozzles, eg water spray fire extinguishing systems and tank spray systems
- Systems with closed nozzles, eg sprinkler systems.

These systems are subject to the approval requirements of the VdS (German insurer's association).

- *mapress STAINLESS STEEL*
  DVGW system test mark
  DW-8501AT2552

with the black (CIIR) seal ring is VdS certified for wet sprinkler systems. This pressfitting system (material No 1.4401/ BS 316 S 33) with the special red (FPM) seal ring has been tested and approved by the VdS for wet and dry sprinkler systems.

Contact for queries relating to fixed fire extinguishing systems:

- Geberit Ltd.
  tel 01622 717811
  fax 01622 716920

Further information on fixed fire extinguishing systems is available in the separate installation guidelines:

- "Fixed Fire Extinguishing Systems"

or on our homepage:

- www.geberit.co.uk

6.3 Noise insulation

Pipework does not generally represent an additional source of noise. However, it can easily transmit structure borne noise from other sources, such as equipment and valves, and must therefore be laid with noise insulation.

According to DIN 4109, the sound pressure level of water supply systems must not exceed a value of 30dB(A). The following specific levels also apply:

- 30dB(A)
  Standard noise insulation in residential buildings
- 27dB(A)
  Enhanced noise insulation in residential buildings
- 24dB(A)
  Luxury noise insulation in residential buildings

We recommend involving an acoustic engineer or commissioning a noise insulation report to ensure water supply systems do not exceed the required sound pressure level.

7.1 Installation situations

7.1.1 Providing room for expansion

A distinction is drawn between pipes that are

- laid on top of plaster or in ducts
- plastered over or
- laid beneath a floating screed.

In the first case there is already enough space for expansion.

Pipes that are plastered over must be embedded in a flexible cushion of fibrous insulating material, such as glass fibre or Rockwool, or a closed cell foam material. This also meets noise insulation requirements.

Pipework under a floating screed is laid in the footfall noise insulation layer, and can therefore expand freely. Pipes emerging vertically from the screed call for special attention. Provide such branches with flexible sleeves.

The same applies to pipes passing through holes in walls and slabs, where cushioning allows freedom of movement in all directions

7.1.2 Laying under screeds

The *mapress* pressfitting system may be laid on a structural concrete slab, within the insulating layer of a floating screed. This does not significantly reduce the insulation value of the screed.

The footfall insulation of a slab incorporating pipework within the insulating layer under a floating screed still provides the enhanced noise insulation required in residential buildings.

Extract from DIN 18560:
- Construction Screeds

"Pipework laid on the structural slab must be fixed. Level the surface to take the insulating layer – or at least the footfall noise insulation. The structural slab level must allow for this. Loose fills of natural sand or crushed stone fines must not be used for levelling."

7.1.3 Laying under mastic asphalt floors

The heat of a layer of asphalt under which the *mapress* pressfitting system is laid may impair strength and overstress the seal ring.

Hot asphalt can however be placed, provided the pipework is protected by:

- Allowing cooling water to flow through it
- Covering the entire pipe system with roofing felt, corrugated cardboard or a similar material, with the pipes often embedded in loose fill insulating material.

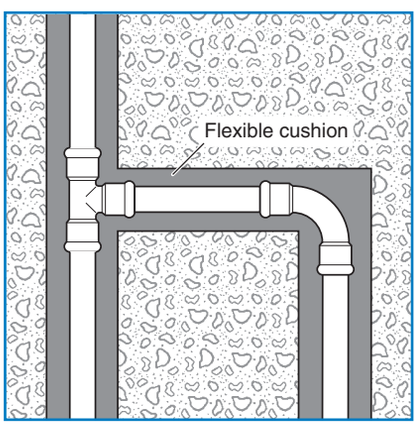


Figure 7.0-1 Pipes laid under plaster

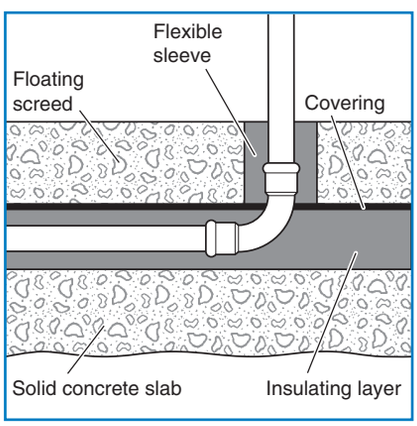


Figure 7.0-2 Pipes under floating screed

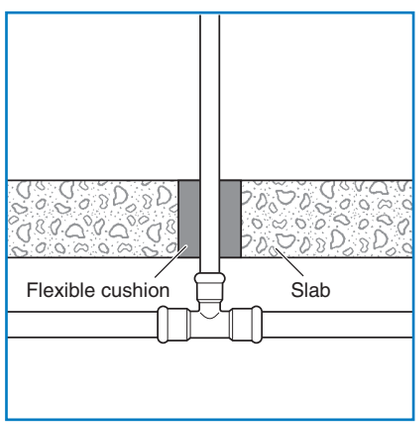


Figure 7.0-3 Pipes under holes in slab

7.2 Compensation for expansion

7.2.1 General

The amount of thermal expansion depends on the pipe material. This must be taken into account when laying by:

- Providing room for expansion
- Installing expansion compensators
- Locating fixed and sliding supports correctly

The linear expansion of the *mapress* pressfitting system is comparable with that of other metal pipes used for building services.

Provided account is taken of the following stipulations, the bending and torsional stresses in pipework in use will be taken safely.

Slight increases in the length of pipework can be accommodated by providing room for expansion, or absorbed through the flexibility of the system. In larger pipe systems, expansion compensators must be fitted. These may take the form of axial, Z-, T- or U-shaped expansion compensators.

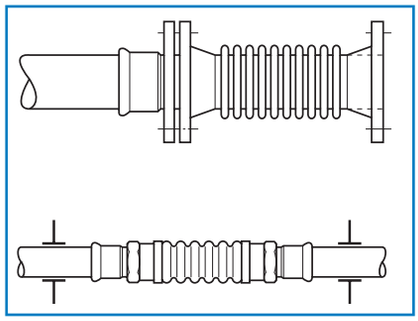


Figure 7.0-4 Commercial axial compensator with female thread, pressfitting adapters, flanged connections and *mapress* pressfitting connections

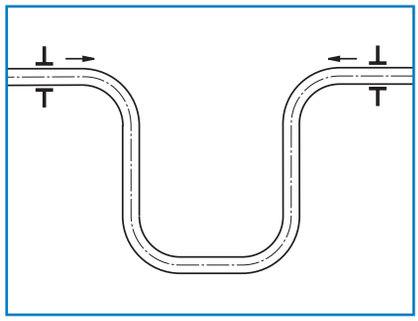


Figure 7.0-6 U-shaped expansion compensator

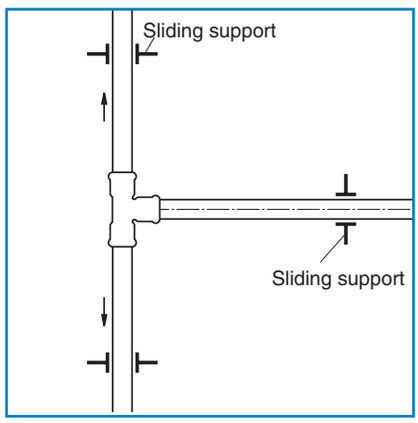


Figure 7.0-5 T-shaped expansion compensator (branch)

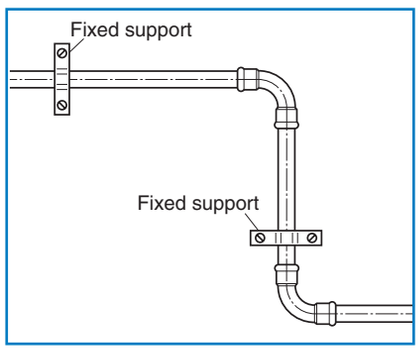


Figure 7.0-7 Z-shaped expansion compensator

Formula:

$$\Delta l = l_0 \bullet \alpha \bullet \Delta\vartheta$$

Table 7.0-1 Change in length Δl [mm] (20°C to 100°C) as a result of thermal expansion

Pipes made of different materials	Coefficient of thermal expansion α [10^{-6} K^{-1}]	Pipe length 10m Δϑ = 50K Δl [mm]
Stainless steel pipes: ***mapress STAINLESS STEEL*** **pipe** ***mapress EDELFLEX*** **pipe** ***mapress SUPER SIZE HEATING*** **pipe**	**16.5**	**8.3**
Steel pipes: ***mapress CARBON STEEL*** **pipe**	**12.0**	**6.0**
CuNi10Fe1.6Mn pipes: ***mapress CUNIFE*** **pipe**	**17.0**	**8.5**
Copper pipes	16.6	8.3
Composite pipes	26.0	13.0
Plastic pipes (depending on particular plastic)	80 – 180	40 – 90

7.2.2 *STAINLESS STEEL, EDELFLEX, SUPER SIZE HEATING* and *CUNIFE*

Table 7.0-2 Change in length Δl [mm] for *STAINLESS STEEL, EDELFLEX, SUPER SIZE HEATING* and *CUNIFE*

Pipe length	Δl [mm]									
	Δϑ: temperature differential [K]									
[m]	10	20	30	40	50	60	70	80	90	100
1	0.16	0.33	0.50	0.66	0.82	1.00	1.16	1.30	1.45	1.60
2	0.33	0.66	1.00	1.30	1.60	2.00	2.30	2.60	2.90	3.20
3	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
4	0.66	1.30	2.00	2.60	3.30	4.00	4.60	5.20	5.90	6.60
5	0.82	1.60	2.50	3.30	4.10	5.00	5.80	6.60	7.40	8.20
6	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.40	10.80
7	1.16	2.30	3.50	4.60	5.70	7.00	8.20	9.00	10.20	11.40
8	1.32	2.60	4.00	5.30	6.50	8.00	9.30	10.40	11.70	13.00
9	1.48	3.00	4.50	6.00	7.40	9.00	10.50	11.70	13.30	14.80
10	1.65	3.30	5.00	6.60	8.30	10.00	11.60	13.20	14.90	16.60

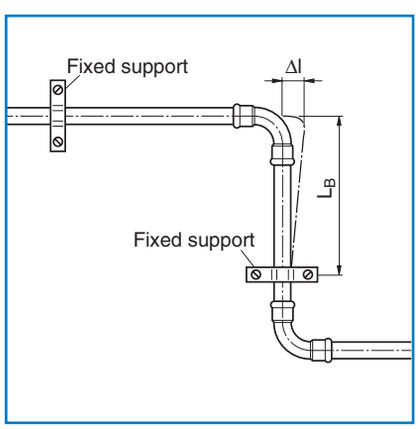


Figure 7.0-8 Z-shaped expansion compensator

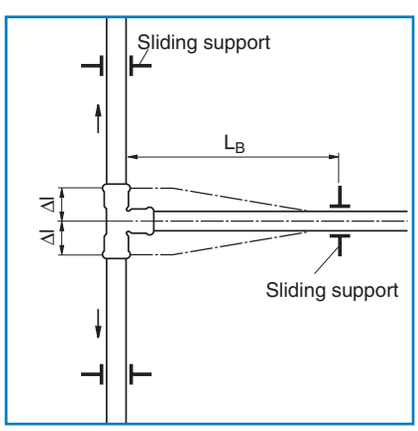
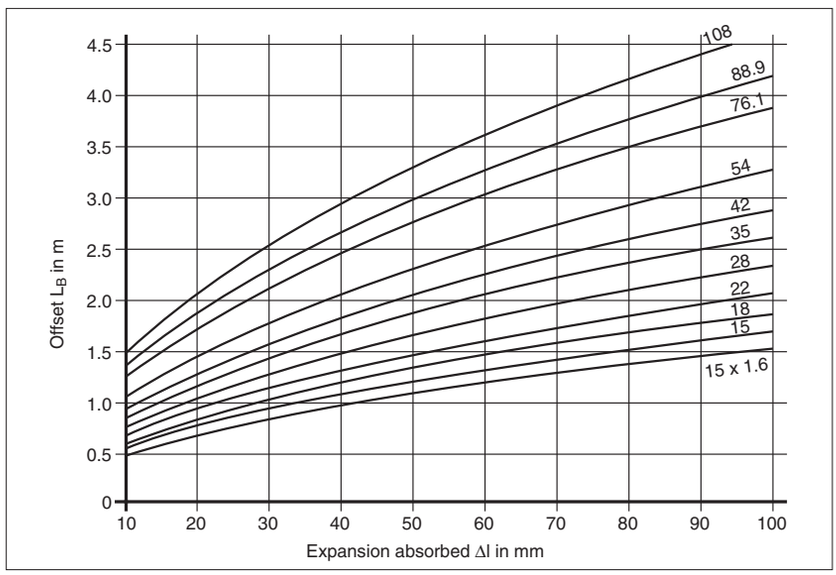


Figure 7.0-9 T-shaped expansion compensator (branch)

Diagram 7.0-1 Determining offset L_B for Z- and T-shaped compensators



Formula:

$L_B = 0.045 \bullet \sqrt{OD \bullet \Delta l}$ (m)

(OD and Δl in mm)

7.0 Laying

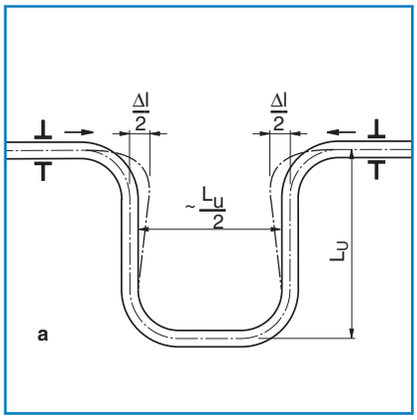


Figure 7.0-10 U-shaped expansion compensator made by bending a pipe

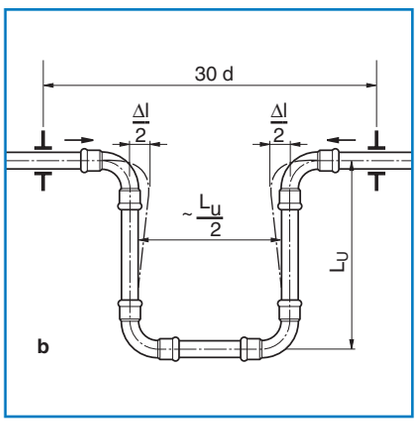
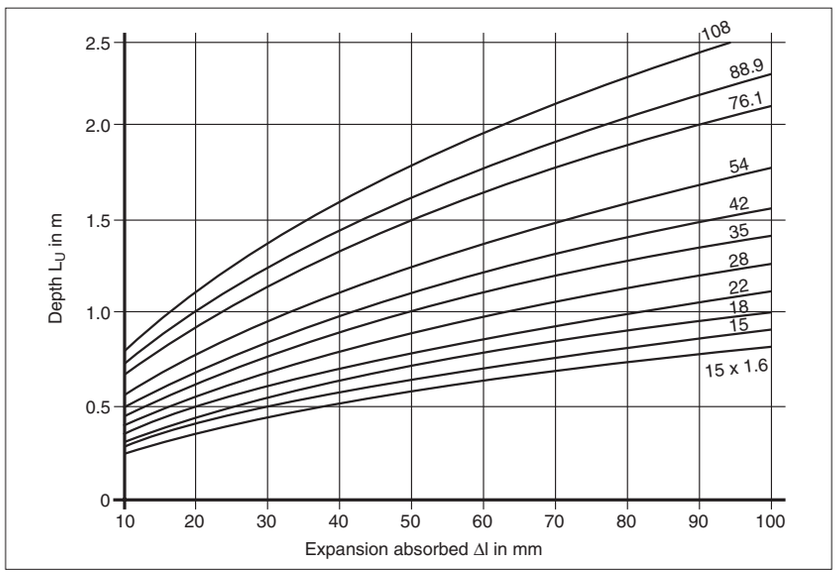


Figure 7.0-11 U-shaped expansion compensator assembled with pressfittings

Diagram 7.0-2 Determining depth L_U for U-shaped expansion compensators



Formula:

$L_U = 0.025 \cdot \sqrt{OD \cdot \Delta l}$ (m)
(OD and Δl in mm)

7.2.3 *CARBON STEEL*

Table 7.0-3 Change in length Δl [mm] for *CARBON STEEL*

Pipe length	Δl [mm]									
	Δϑ: temperature differential [K]									
[m]	10	20	30	40	50	60	70	80	90	100
1	0.12	0.24	0.36	0.48	0.60	0.72	0.84	0.96	1.08	1.20
2	0.24	0.48	0.72	0.96	1.20	1.44	1.68	1.92	2.16	2.40
3	0.36	0.72	1.08	1.44	1.80	2.16	2.52	2.88	3.24	3.60
4	0.48	0.96	1.44	1.92	2.40	2.88	3.36	3.84	4.32	4.80
5	0.55	1.10	1.65	2.40	3.00	3.50	4.20	4.80	5.40	6.00
6	0.72	1.44	2.16	2.88	3.60	4.32	5.04	5.76	6.48	7.20
7	0.84	1.68	2.52	3.36	4.20	5.04	5.88	6.72	7.56	8.40
8	0.96	1.92	2.88	3.84	4.80	5.76	6.72	7.88	8.64	9.60
9	1.08	2.16	3.24	4.32	5.40	6.48	7.56	8.64	9.72	10.80
10	1.20	2.40	3.60	4.80	6.00	7.20	8.40	9.60	10.80	12.00

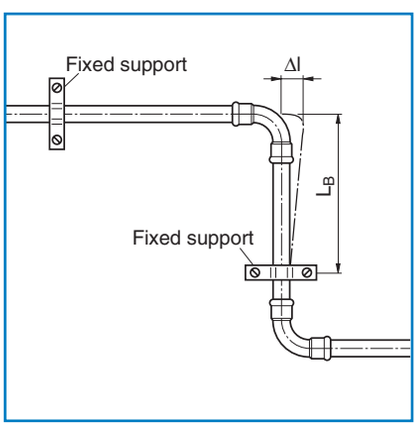


Figure 7.0-12 Z-shaped expansion compensator

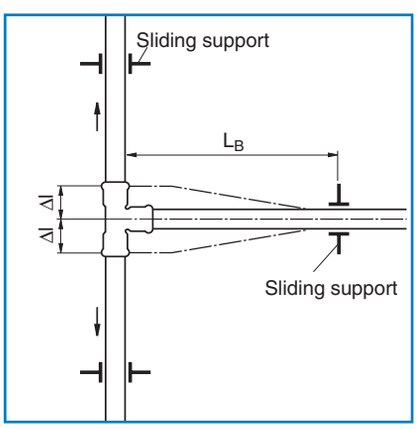
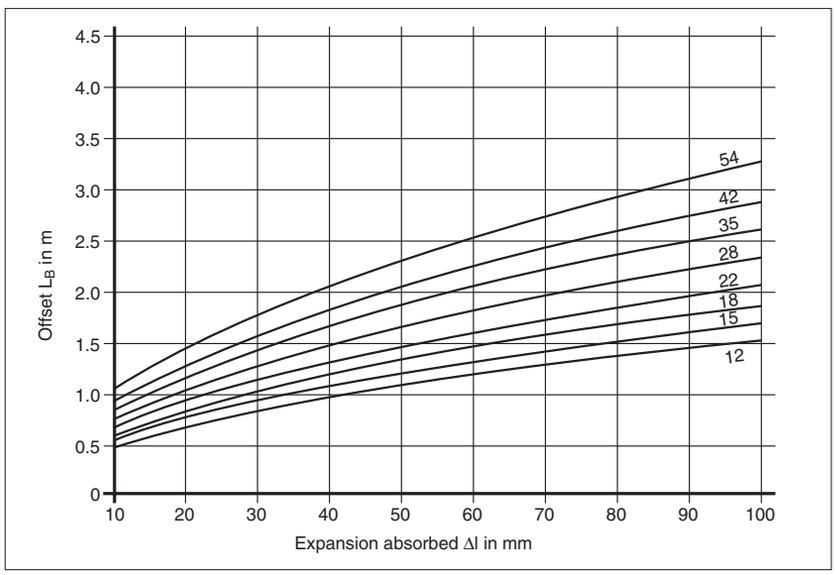


Figure 7.0-13 T-shaped expansion compensator (branch)

Diagram 7.0-3 Determining offset L_B for Z- and T-shaped compensators



Formula:

$$L_B = 0.045 \cdot \sqrt{OD \cdot \Delta l}\ (m)$$

(OD and Δl in mm)

7.0 Laying

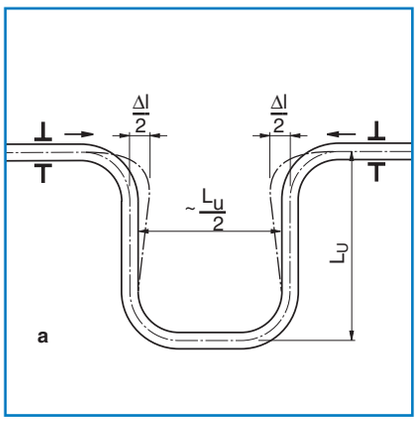


Figure 7.0-14 U-shaped expansion compensator made by bending a pipe

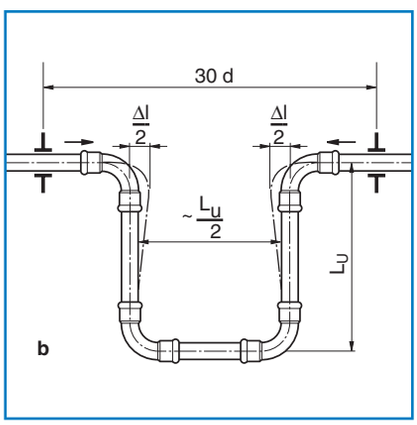
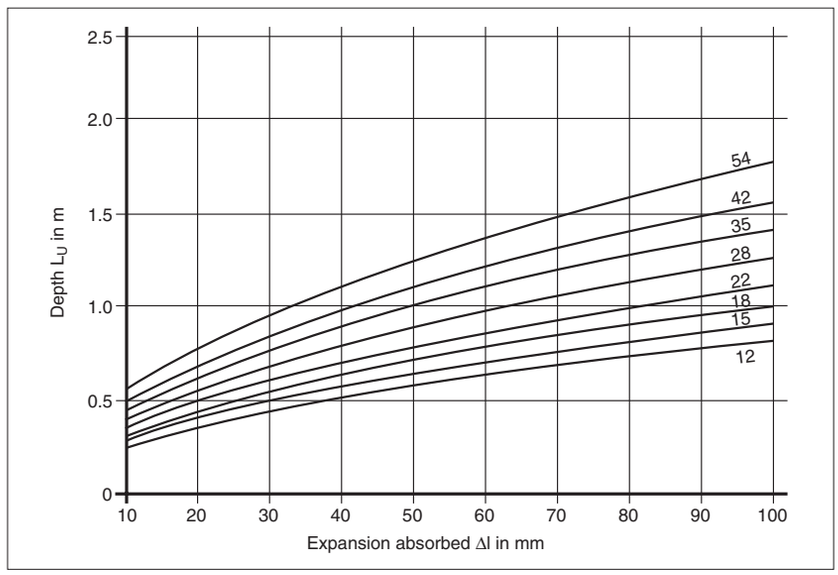


Figure 7.0-15 U-shaped expansion compensator assembled with pressfittings

Diagram 7.0-4 Determining depth L_U for U-shaped expansion compensators



Formula:

$$L_U = 0.025 \cdot \sqrt{OD \cdot \Delta l}\ (m)$$

(OD and Δl in mm)

7.2.4 *COPPER*

Table 7.0-4 Change in length Δl [mm] for *COPPER*

Pipe length	Δl [mm]									
	Δϑ: temperature differential [K]									
[m]	10	20	30	40	50	60	70	80	90	100
1	0.16	0.33	0.50	0.66	0.82	1.00	1.16	1.30	1.45	1.60
2	0.33	0.66	1.00	1.30	1.60	2.00	2.30	2.60	2.90	3.20
3	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
4	0.66	1.30	2.00	2.60	3.30	4.00	4.60	5.20	5.90	6.60
5	0.82	1.60	2.50	3.30	4.10	5.00	5.80	6.60	7.40	8.20
6	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.40	10.80
7	1.16	2.30	3.50	4.60	5.70	7.00	8.20	9.00	10.20	11.40
8	1.32	2.60	4.00	5.30	6.50	8.00	9.30	10.40	11.70	13.00
9	1.48	3.00	4.50	6.00	7.40	9.00	10.50	11.70	13.30	14.80
10	1.65	3.30	5.00	6.60	8.30	10.00	11.60	13.20	14.90	16.60

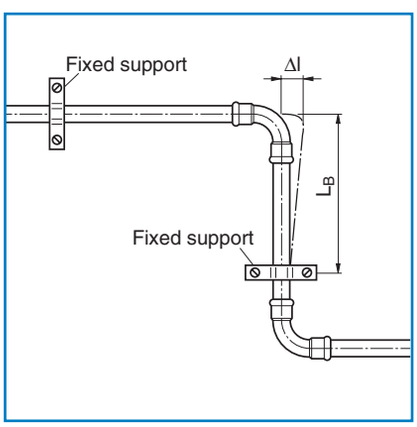


Figure 7.0-16 Z-shaped expansion compensator

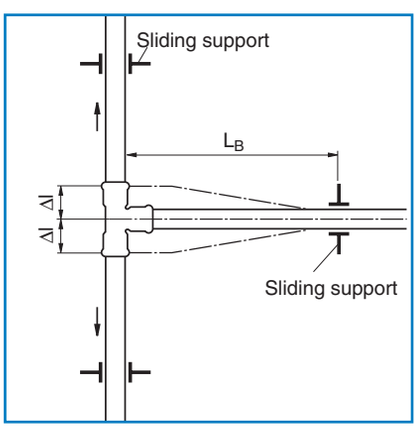
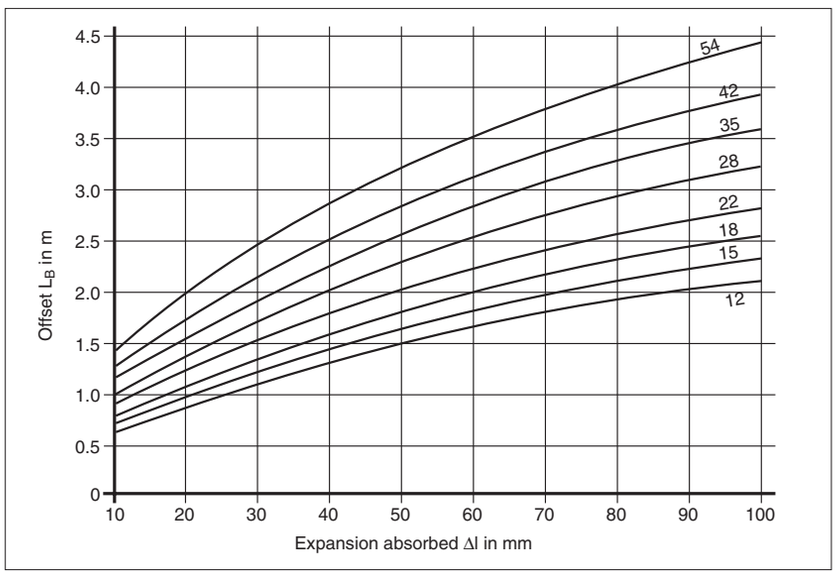


Figure 7.0-17 T-shaped expansion compensator (branch)

Diagram 7.0-5 Determining offset L_B for Z- and T-shaped compensators



Formula:

$$L_B = 0.061 \bullet \sqrt{OD \bullet \Delta l}\ (m)$$

(OD and Δl in mm)

7.0 Laying

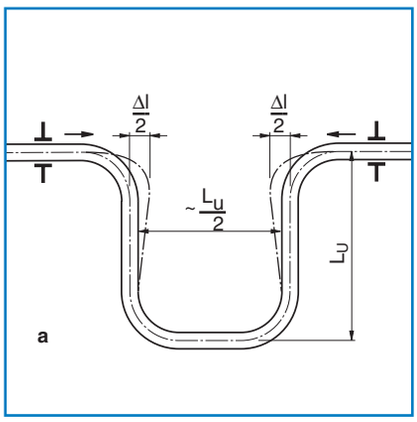


Figure 7.0-18 U-shaped expansion compensator made by bending a pipe

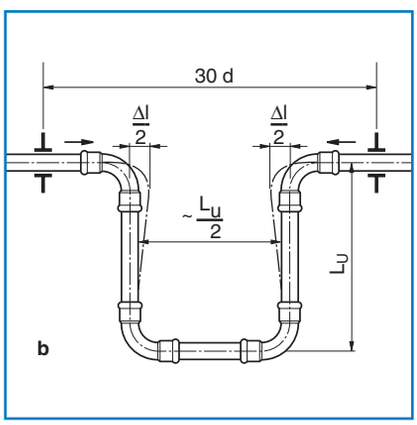
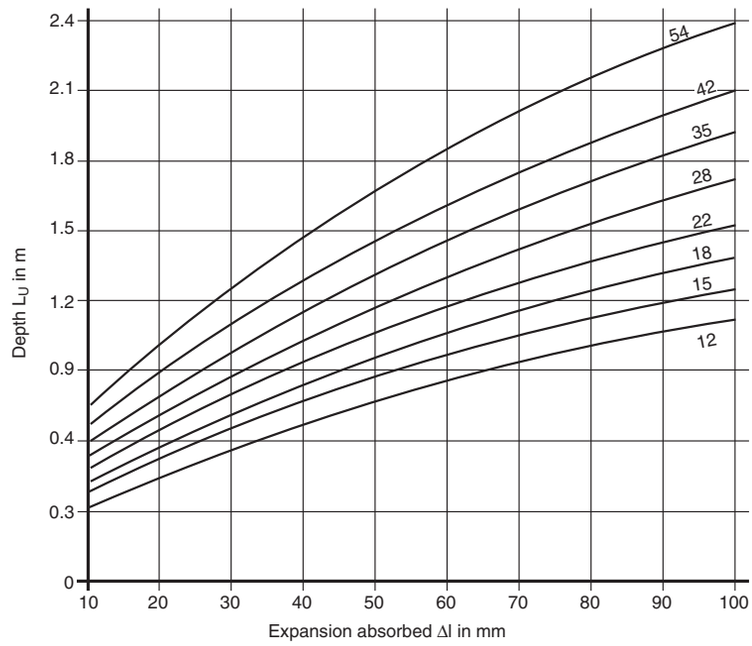


Figure 7.0-19 U-shaped expansion compensator assembled with pressfittings

Diagram 7.0-6 Determining offset L_U for U-shaped expansion compensators



Formula:

$$L_U = 0.032 \bullet \sqrt{OD \bullet \Delta l}\ (m)$$

(OD and Δl in mm)

7.3 Pipe supports

7.3.1 General

Fixed supports serve various functions. In addition to carrying the pipe system, they provide the required constraints on the direction of changes in length due to temperature. Depending on their function, pipe supports are divided into

- fixed supports (which hold a pipe rigid) and
- sliding supports (which allow axial movement).

Sliding supports must be located where they cannot inadvertently restrain the pipe in use. Both fixed and sliding supports must never be positioned on pressfittings.

The first sliding support after a branch or change in direction must be positioned at least the minimum distance L_B/L_U away from the compensator formed.

Any pipe run not interrupted by a change in direction or an expansion compensator may have only one fixed support. Long runs should have this fixed support in the middle to allow the expansion to take place in two directions. This is a typical situation with multistorey risers without any expansion compensator.

Fixing the riser to the building in the middle allows thermal expansion to take place in two directions. This reduces the stress on the branches.

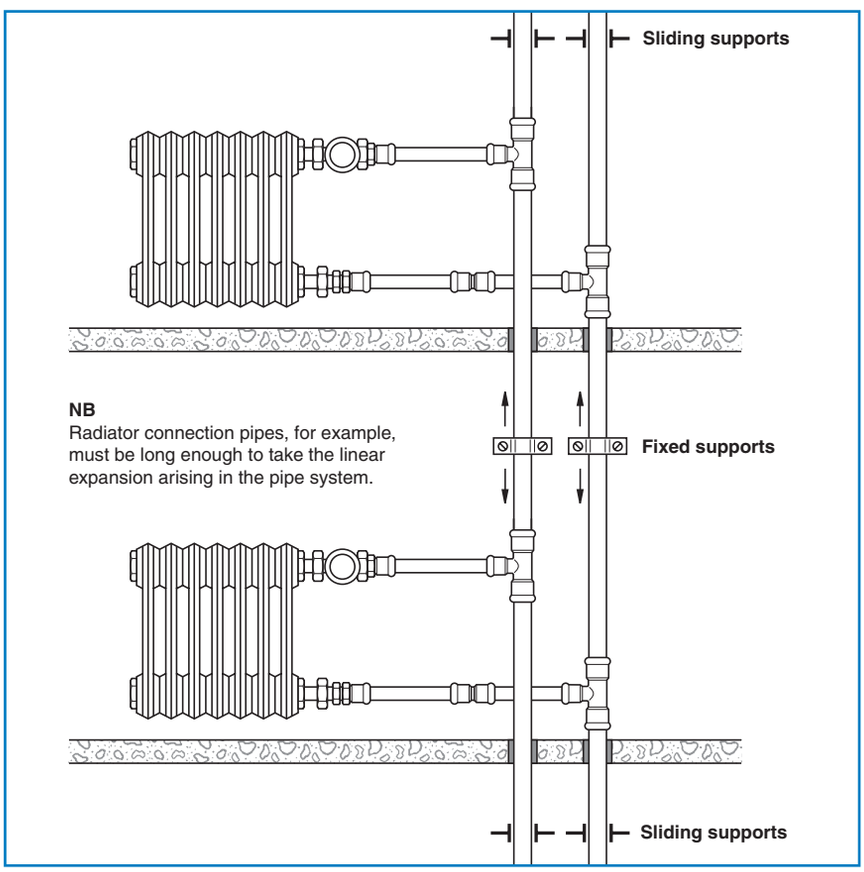


Figure 7.0-20 Securing long continuous pipe runs

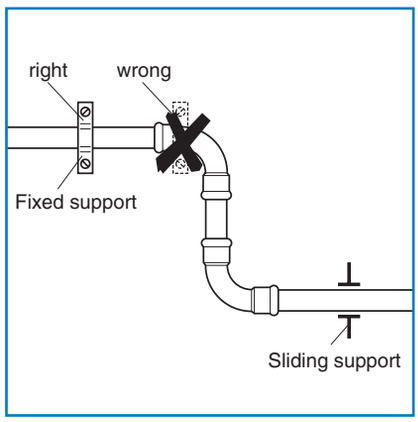


Figure 7.0-21 Positioning fixed supports on pipe rather than pressfitting

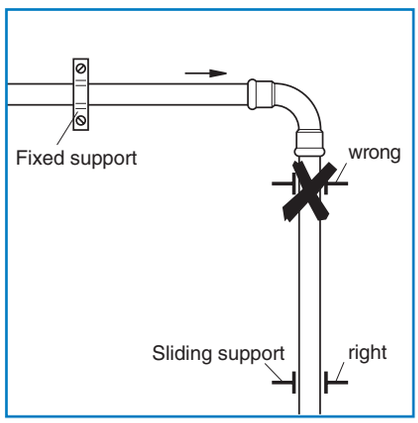


Figure 7.0-22 Incorrectly positioned sliding support prevents horizontal pipe expanding freely

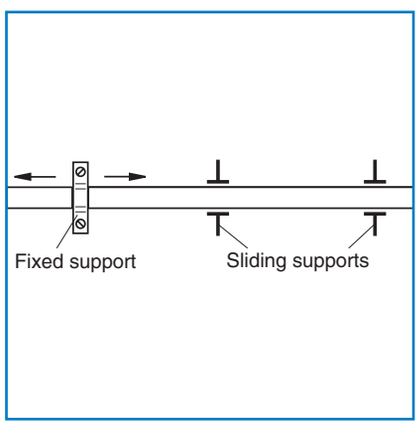


Figure 7.0-23 Securing continuous pipes with just one fixed support

7.3.2 Pipe clip spacing

Commercial pipe clips can be used at the spacings (pipe spans) tabulated below. Use clips with rubber inserts to insulate the pipe from the structure in order to avoid structure-borne noise.

Table 7.0-5 Pipe clips spacings/pipe spans to Part 2 of DIN 1988

1. *mapress STAINLESS STEEL* pipe (DVGW W 541)

2. *mapress EDELFLEX* pipe (DVGW VP 639 GW)

3. *mapress CARBON STEEL* pipe (DIN EN 10305)

4. *mapress SUPER SIZE HEATING* (DIN EN 10312)

5. *mapress CUNIFE* pipe (DIN 86019)

6. Copper pipes (DIN EN 1057/DVGW GW 392)

										(Super Size)		
DN		10	12	15	20	25	32	40	50	65	80	100
Nom	**1.**		15x1.0	18x1.0	22x1.2	28x1.2	35x1.5	42x1.5	54x1.5	76.1x2.0	88.9x2.0	108x2.0
size:	**2.**		15x1.6									
OD x t	**3.**	12x1.2	15x1.2	18x1.2	22x1.2	28x1.5	35x1.5	42x1.5	54x1.5			
[mm]	**4.**									76.1x1.5	88.9x1.5	108x2.0
	5.		15x1.0		22x1/1.5	28x1.5	35x1.5	42x1.5	54x1.5	76.1x2.0	88.9x2.0	108x2.5
	6.	12x0.7/1	15x0.8/1	18x0.8/1	22x1/1.5	28x1/1.5	35x1.5	42x1.5	54x2.0			
SPAN		**1.25**	**1.25**	**1.50**	**2.00**	**2.25**	**2.75**	**3.00**	**3.50**	**4.25**	**4.75**	**5.00**
[m]		**1.50[1)]**			**2.50[1)]**		**3.50[1)]**			**5.00[1)]**		

[1)] **Mapress recommendations**

7.4 Pipework heat losses

7.4.1 General

As well as carrying the heat transfer medium (water or steam), pipes lose heat to their surroundings. Since this effect is reversible, pipes can be used to output (underfloor heating, heating slabs and heating walls) or absorb heat (coolant or chilled water systems, concrete core activation, geothermal heat pumps etc).

Pipework heat losses can be calculated with the following formulae:

- Heat flow for one metre pipe [W/m]

$$\dot{Q}_p = (\vartheta_i - \vartheta_o) \bullet k_p$$

- The heat transmission coefficient (k) for the pipe [W/m•K]

$$k_p = \frac{\pi}{\frac{1}{\alpha_i \bullet ID} + \frac{1}{2 \bullet \lambda} \bullet \ln\left(\frac{OD}{ID}\right) + \frac{1}{\alpha_o \bullet OD}}$$

7.4.2 *STAINLESS STEEL*

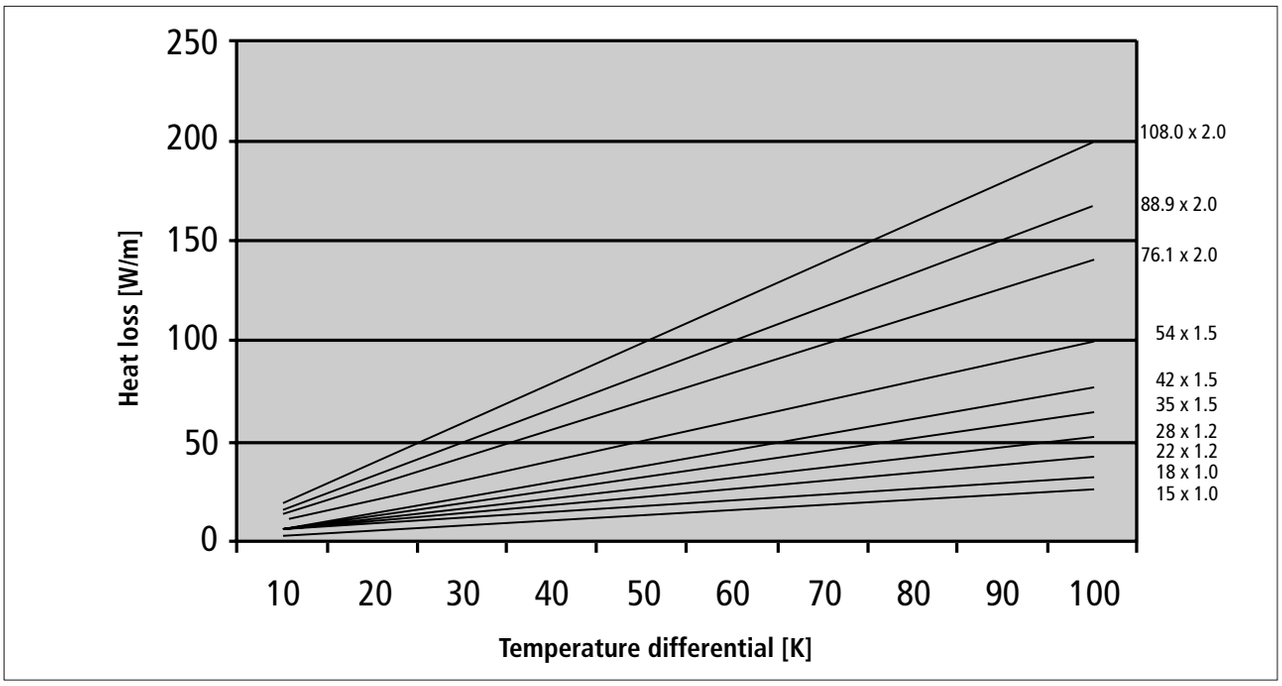
Values for calculating *STAINLESS STEEL* heat losses

ϑ_i = temperature of water in pipe
ϑ_o = room temperature
α_o = 8.1W/m²•K
α_i = 23.2W/m²•K
λ_{SS} = 15W/m•K

Table 7.0-6 Heat loss [W/m] from *mapress STAINLESS STEEL* pipe (material No 1.4401/BS 316 S 33) (laid exposed)

OD x t [mm]	$\Delta\vartheta$: temperature differential [K]									
	10	20	30	40	50	60	70	80	90	100
15 x 1.0	2.72	5.44	8.16	10.88	13.60	16.32	19.04	21.76	24.48	27.20
18 x 1.0	3.29	6.57	9.86	13.15	16.44	19.72	23.01	26.30	29.59	32.87
22 x 1.2	4.02	8.04	12.06	16.08	20.10	24.12	28.14	32.16	36.18	40.20
28 x 1.2	5.15	10.31	15.46	20.61	25.77	30.92	36.08	41.23	46.38	51.54
35 x 1.5	6.44	12.88	19.32	25.76	32.21	38.65	45.09	51.53	57.97	64.41
42 x 1.5	7.76	15.53	23.29	31.05	38.81	46.58	54.34	62.10	69.86	77.63
54 x 1.5	10.03	20.05	30.08	40.11	50.13	60.16	70.19	80.21	90.24	100.26
76.1 x 2.0	14.14	28.28	42.42	56.56	70.70	84.83	98.97	113.11	148.97	141.39
88.9 x 2.0	16.55	33.11	49.66	66.21	82.76	99.32	115.87	132.42	148.97	165.53
108 x 2.0	20.15	40.31	60.46	80.61	100.77	120.92	141.70	161.23	181.38	201.53

Diagram 7.0-7 Heat loss [W/m] from *mapress STAINLESS STEEL* pipe (material No 1.4401/BS 316 S 33) (laid exposed)



7.4.3 *EDELFLEX*

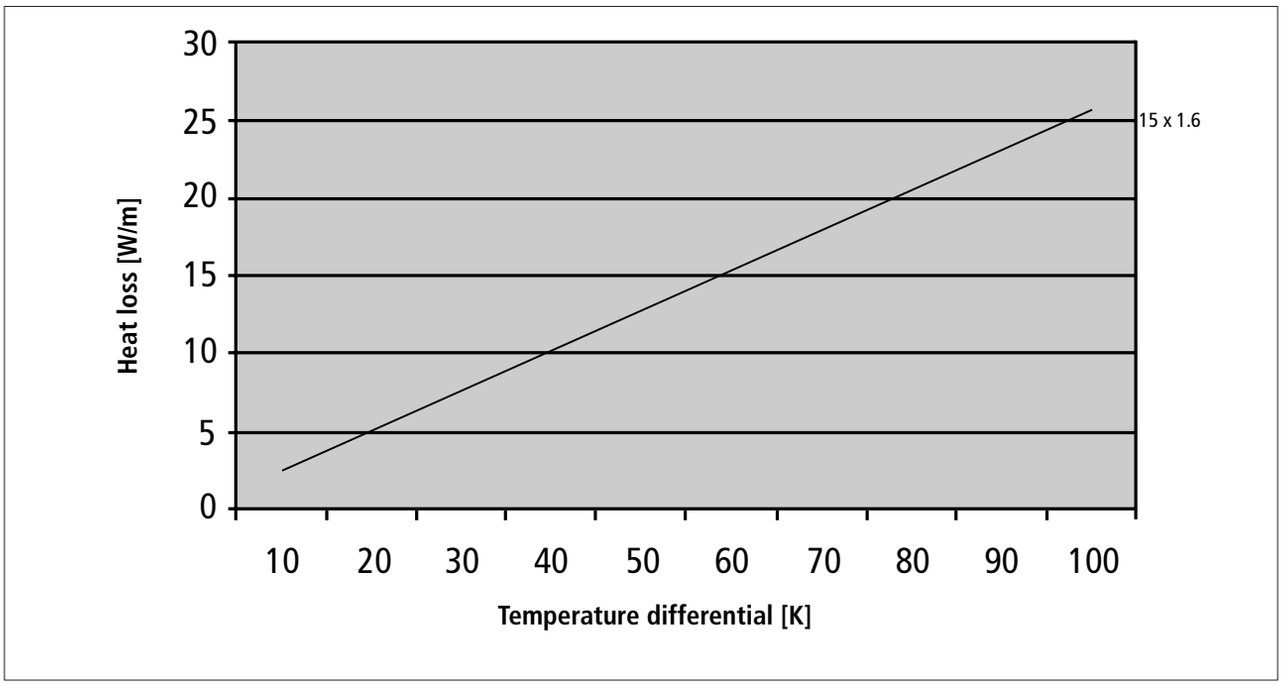
Values for calculating *EDELFLEX* heat losses

ϑ_i = Wassertemperatur im Rohr
ϑ_o = Raumtemperatur
α_o = 8.1W/m²•K
α_i = 23.2W/m²•K
λ_{SS} = 15W/m•K
λ_{PE} = 0.4W/m•K

Table 7.0-7 Heat loss [W/m] from *mapress EDELFLEX* pipe (material No 1.4572/BS 320 S 31) (laid exposed)

OD x t [mm]	$\Delta\vartheta$: temperature differential [K]									
	10	20	30	40	50	60	70	80	90	100
15 x 1.6	2.58	5.17	7.75	10.33	12.92	15.50	18.08	20.67	23.25	25.83

Diagram 7.0-8 Heat loss [W/m] from *mapress EDELFLEX* pipe (laid exposed)



7.4.4 *CARBON STEEL/SUPER SIZE HEATING*

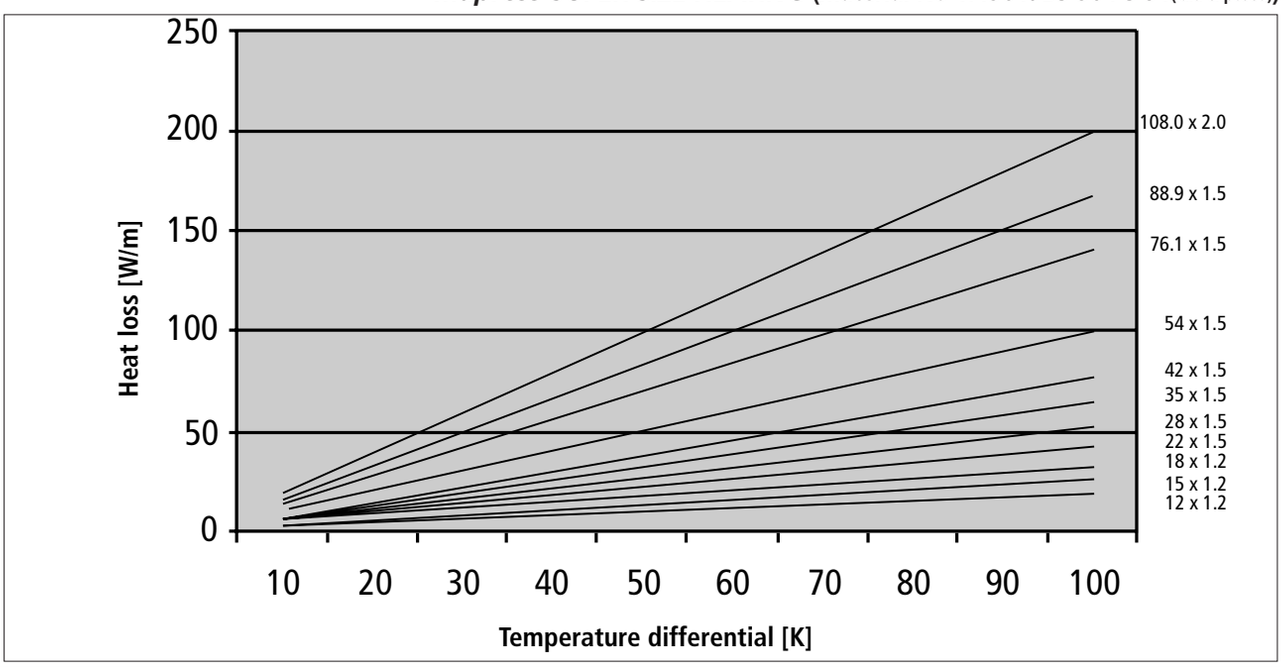
Values for calculating *CARBON STEEL/SUPER SIZE HEATING* heat losses

ϑ_i = temperature of water in pipe
ϑ_o = room temperature
α_o = 8.1W/m²•K
α_i = 23.2W/m²•K
λ_{SS} = 15W/m•K
λ_{ST} = 60W/m•K
λ_{PP} = 0.22W/m•K

Table 7.0-8 Heat loss [W/m] from *mapress CARBON STEEL* pipe (material No 1.0034) *mapress SUPER SIZE HEATING* pipe (material No 1.4301/BS 304 S 31) (laid exposed)

OD x t	$\Delta\vartheta$: temperature differential [K]									
[mm]	10	20	30	40	50	60	70	80	90	100
12 x 1.2	2.30	4.60	6.90	9.20	11.50	13.80	16.10	18.40	20.70	23.00
15 x 1.2	2.86	5.73	8.59	11.46	14.32	17.18	20.05	22.91	25.78	28.64
18 x 1.2	3.42	6.85	10.27	13.69	17.12	20.54	23.96	27.39	30.81	34.24
22 x 1.5	4.13	8.25	12.38	16.51	20.64	24.76	28.89	33.02	37.15	41.27
28 x 1.5	5.24	10.48	15.72	20.95	26.19	31.43	36.67	41.91	47.15	52.39
35 x 1.5	6.53	13.06	19.59	26.19	32.65	39.18	45.71	52.24	58.77	65.30
42 x 1.5	7.82	15.64	23.46	31.28	39.10	46.92	54.74	62.56	70.38	78.20
54 x 1.5	10.03	20.06	30.08	40.11	50.14	60.17	70.19	80.22	90.25	100.28
76.1 x 1.5	14.19	28.39	42.58	56.78	70.97	85.17	99.36	113.55	127.75	141.94
88.9 x 1.5	16.61	33.22	49.82	66.43	83.04	99.65	116.25	132.86	149.47	166.08
108 x 2.0	20.15	40.31	60.46	80.61	100.77	120.92	141.70	161.23	181.38	201.53

Diagram 7.0-9 Heat loss [W/m] from *mapress CARBON STEEL* pipe (material No 1.0034) *mapress SUPER SIZE HEATING* (material No 1.4301/BS 304 S 31(laid exposed))



7.4.5 *COPPER* (bare)

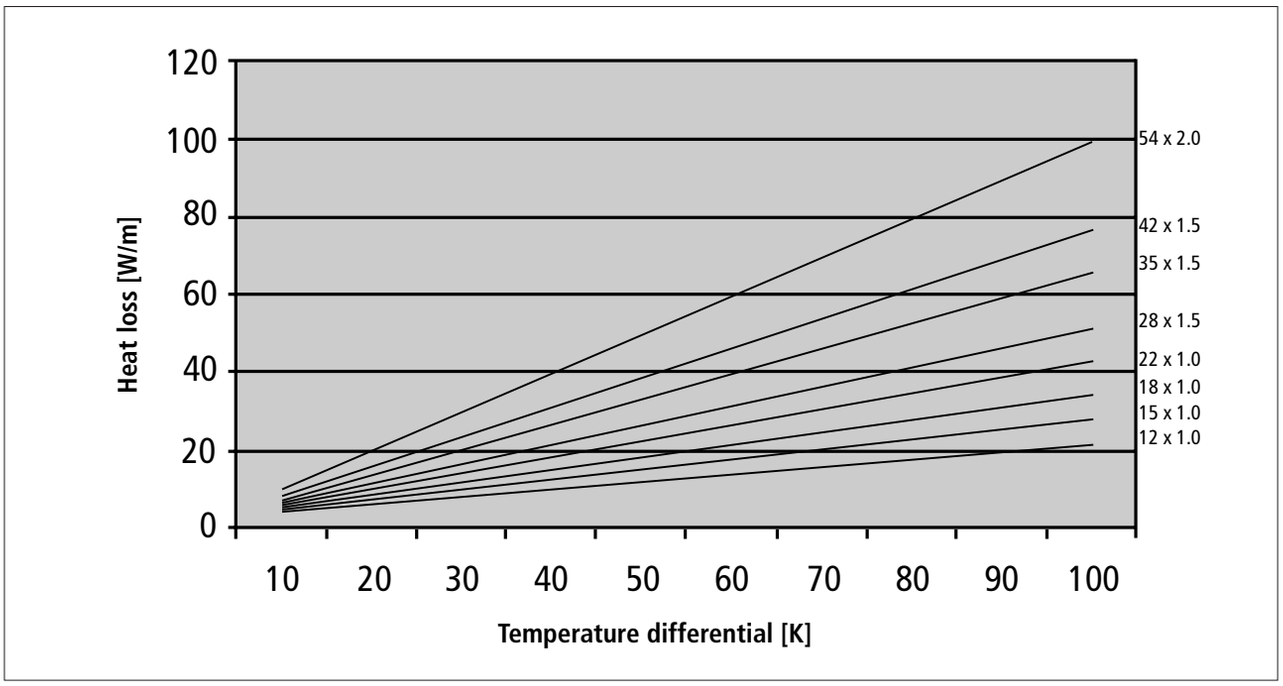
Values for calculating heat loss from bare *COPPER*

ϑ_i = temperature of water in pipe
ϑ_o = room temperature
α_o = 8.1W/m²•K
α_i = 23.2W/m²•K
λ_{CU} = 10W/m•K

Table 7.0-9 Heat loss [W/m] from copper pipes (laid exposed)

OD x t [mm]	$\Delta\vartheta$: temperature differential [K]									
	10	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
12 x 1.0	2.15	4.30	6.45	8.60	10.75	12.90	15.05	17.21	19.36	21.51
15 x 1.0	2.72	5.44	8.16	10.88	13.60	16.32	19.03	21.75	24.47	27.19
18 x 1.0	3.29	6.57	9.86	13.15	16.43	19.72	23.01	26.29	29.58	32.87
22 x 1.0	4.04	8.08	12.13	16.17	20.21	24.25	28.30	32.34	36.38	40.42
28 x 1.5	5.12	10.23	15.35	20.47	25.59	30.70	35.82	40.94	46.06	51.17
35 x 1.5	6.44	12.88	19.32	25.76	32.20	38.64	45.07	51.51	57.95	64.39
42 x 1.5	7.76	15.52	23.28	31.04	38.80	46.56	54.32	62.08	69.84	76.60
54 x 2.0	9.97	19.93	29.90	39.87	49.83	59.80	69.70	79.73	89.70	99.66

Diagram 7.0-10 Heat loss [W/m] from copper pipes (laid exposed)



7.4.6 *CUNIFE*

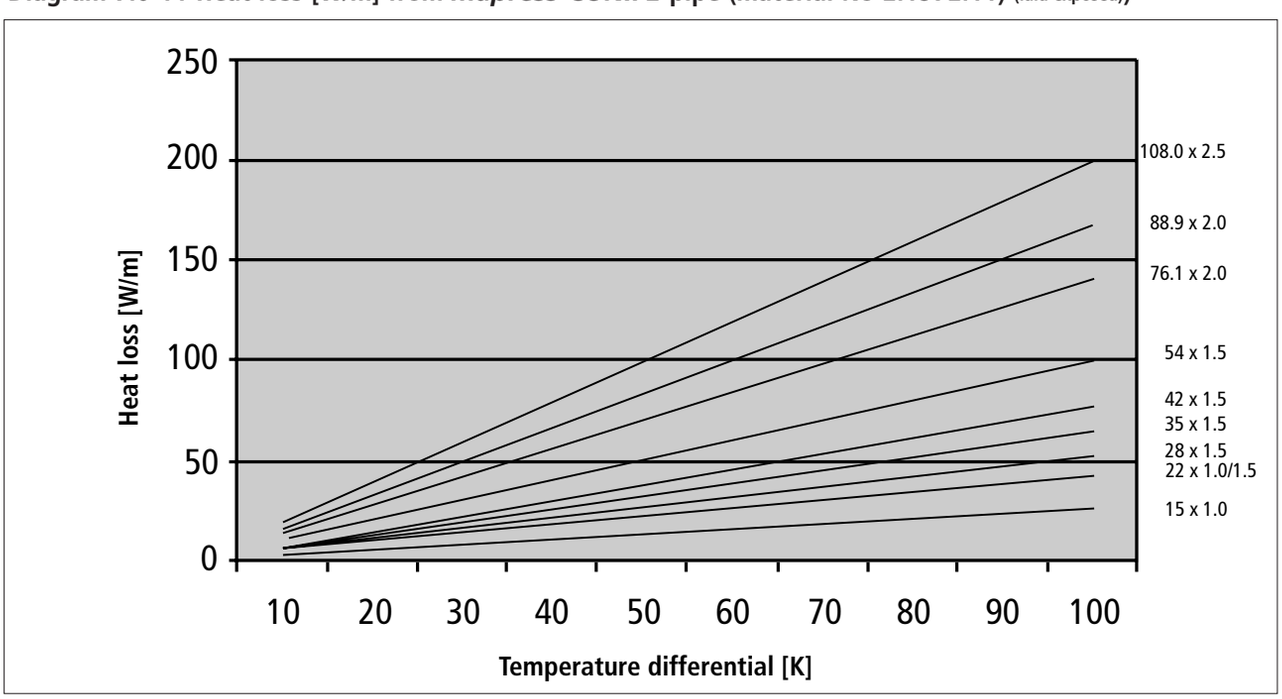
Values for calculating heat losses from CuNi10Fe1.6Mn

ϑ_i = temperature of water in pipe
ϑ_o = room temperature
α_o = 8.1W/m²•K
α_i = 23.2W/m²•K
λ_{CUNIFE} = 46W/m•K

Table 7.0-10 Heat loss [W/m] from *mapress CUNIFE* pipe (material No 2.1972.11)

OD x t [mm]	$\Delta\vartheta$: temperature differential [K]									
	10	20	30	40	50	60	70	80	90	100
15 x 1.0	2.72	5.44	8.16	10.88	13.60	16.32	19.04	21.76	24.48	27.21
22 x 1.0	4.04	8.09	12.13	16.18	20.22	24.27	28.31	32.35	36.40	40.44
22 x 1.5	3.99	7.97	11.96	15.94	19.93	23.92	27.90	31.89	35.87	39.86
28 x 1.5	5.12	10.24	15.36	20.48	25.61	30.73	35.85	40.97	46.09	51.21
35 x 1.5	6.44	12.89	19.33	25.78	32.22	38.66	45.11	51.55	58.00	64.44
42 x 1.5	7.77	15.53	23.30	31.06	38.83	46.59	54.36	62.13	69.89	77.66
54 x 1.5	10.03	20.06	30.09	40.12	50.15	60.18	70.21	80.24	90.27	100.31
76.1 x 2.0	14.15	28.29	42.44	56.59	70.73	84.88	99.03	113.17	127.32	141.47
88.9 x 2.0	16.56	33.12	49.68	66.25	82.81	99.37	115.93	132.49	149.05	165.62
108 x 2.5	20.11	40.22	60.33	80.44	100.56	120.67	140.78	160.89	181.00	201.11

Diagram 7.0-11 Heat loss [W/m] from *mapress CUNIFE* pipe (material No 2.1972.11) (laid exposed))



8.0 Handling and Installation

8.1 *mapress STAINLESS STEEL, STAINLESS STEEL GAS, SUPER SIZE HEATING* and *CUNIFE*

8.1.1 Transportation and storage

mapress STAINLESS STEEL, STAINLESS STEEL GAS, SUPER SIZE HEATING and *CUNIFE* pipes, and *mapress* stainless steel and copper-nickel-iron alloy pressfittings, must be protected against dirt and damage in transit and while being stored. *mapress* pipes are factory sealed with plugs. The pressfittings are packed in practical plastic bags in the factory.

8.1.2 Cutting to length

The required pipe lengths can be determined using the z-dimension method and must take account of the insertion distance "i" specified for the pressfitting. The dimensions involved are specified on the data sheet "z-dimensions of the *mapress* pressfitting system".

After being marked, the pipes may be cut to the required lengths with

- fine-toothed hacksaws

Figure 8.0-1 Cutting to length with fine-toothed hacksaw

- pipe cutters or

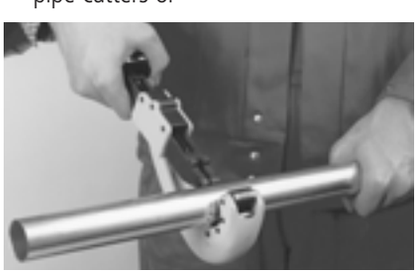


Figure 8.0-2 Cutting to length with pipe cutter

- electric saws

Figure 8.0-3 Cutting to length with electric saw

Figure 8.0-4 Cutting to length with electric saw

The tools must be suitable for stainless steel!

Stainless steel must not be tarnished!

Do not used oil cooled saws, abrasive wheels or flame cutting!

The use of abrasive wheels or flame cutting leads to sensitisation of stainless steel due to uncontrolled local heating. This increases the likelihood of corrosion.

When sawing *STAINLESS STEEL* pipes to length, cut right through properly rather than breaking them off beforehand, otherwise there will be a risk of corrosion.

8.1.3 Deburring

Deburr the outside and inside of the ends of the pipes after cutting to length. This must be done carefully to avoid the seal rings being damaged when the pipes are pushed into the pressfittings.

Externally deburring and chamfering of the ends of the pipes cut to length may be carried out with

- a commercial hand deburrer suitable for stainless steel
  or

Figure 8.0-5 External deburring with hand deburrer

- the RE1 electric pipe deburrer.

Figure 8.0-6 External deburring with RE1 electric pipe deburrer

8.1.4 Marking insertion distance

To ensure a reliable, properly made pressfitting connection, before being assembled with the fittings the pipes must be marked with the specified insertion distance "i"

Figure 8.0-7 Marking insertion distance

This can be carried out with the insertion distance gauge and felt-tip pen, or with the M1 marking tool.

Figure 8.0-8 Marking insertion distance

The mechanical strength of the connection will only be achieved if the pipes are pushed the specified insertion distance "i" into the pressfitting.

The marked insertion distance must remain visible on the pipes after they have been pushed into the pressfittings and the connection pressed!

• Marking pressfittings

Pressfittings with plain ends, such as reducers, reducing sleeves, preformed pipe bridges, some elbows and plugs, must be marked with the specified insertion distance "i" before assembly!

Figure 8.0-9 Pressfitting with plain end and insertion distance 'i' mark

• Shortening pressfittings

The legs of pressfittings with plain ends, such as some elbows, may only be shortened to the specified minimum permissible length.

8.1.5 Checking seal rings

Check that the pressfitting is fitted with seal rings before assembling with the pipes. Remove any foreign matter on the rings that might impair the seal.

Figure 8.0-10 Checking seal ring

Figure 8.0-11 Checking seal ring

8.1.6 Pushing pipe into pressfitting

Remove the factory-fitted plugs from the *mapress* pipe before pushing it into the pressfitting. Before pressing, push the pipe into the pressfitting axially the marked insertion distance "i", turning slightly at the same time.

Push slip couplings (which do not have a stop) onto the pipes until at least the marked insertion distance "i" is reached.

Avoid introducing the pipe into the pressfitting at an angle, as this risks damaging the seal ring.

Figure 8.0-12 Pushing *mapress* pipe into pressfitting

Figure 8.0-13 Pushing pressfitting and *mapress* pipe together

The permissible dimensional tolerances of the *mapress STAINLESS STEEL* system could make the pipe difficult to push into the pressfitting so the seal ring could be damaged.

8.0 Handling and Installation

The pipes and prefabricated assemblies must be aligned before the fittings are pressed. The movement that normally occurs when pipes are lifted after pressing is however permissible.

Any alignment necessary after pressing must not stress the connections.

To avoid stressing the pressfitting connection, threaded joints must be sealed before pressing is carried out.

8.1.7 Assembly clamp for Super Size (ODs from 76.1 to 108mm)

It is advisable to secure *mapress* Super Size pipes and pressfittings with the assembly clamp before pressing. Clamp the inserted pipes on both sides of the pressfitting with the jaws of the assembly clamp to prevent them slipping.

Figure 8.0-14 Putting pressing collar on

Figure 8.0-15 Secure assembly for straight pipe runs

8.2 *mapress EDELFLEX*

8.2.1 Transportation and storage

mapress EDELFLEX pipes and the matching pressfittings have to be protected against dirt and damage in transit and while being stored. The factory plugs the ends and packs the pipes in cardboard. The pressfittings are packed in practical plastic bags in the factory.

8.2.2 Cutting to length

After measuring and marking, cut the pipes to the required length with the *mapress EDELFLEX* pipe cutter. Open the cutter, position the blades on the mark, then turn the tool two or three times around the circumference of the pipe while exerting slight pressure. Take care not to injure yourself on the sharp burr produced!

Figure 8.0-16 Cutting to length

8.2.3 Sizing

After the pipe has been cut to length, its end has to be sized with the aid of the *mapress* sizing mandrel. Use the stripping tool to drive the head of the mandrel home into the cut end of the pipe.

Figure 8.0-17 Stripping tool and calibrating mandrel

Push the shank of the mandrel into the guide on the back of the stripping tool beforehand.

Figure 8.0-18 Using stripping tool to introduce sizing mandrel

Once the mandrel has been inserted, remove the stripping tool again.

Figure 8.0-19 *EDELFLEX* pipe with sizing mandrel driven in (plastic coating yet to be removed)

8.2.4 Marking insertion distance

To enable the pressfitting connection to be made, before being assembled with the reinforcing sleeve and the pressfitting, the end of the pipe must have its plastic coating removed over the insertion distance. To achieve this slip the *mapress* stripping tool onto the guide shank of the sizing mandrel, then turn clockwise on the *mapress EDELFLEX* pipe. The stripping tool is set to the insertion distance "i" in the factory.

Figure 8.0-20 Stripping plastic coating over insertion distance

After stripping, use the stripping tool to remove the sizing mandrel from the end of the pipe. The edging action of the pipe cutter and subsequent sizing avoid any need to deburr the ends of the pipe.

IMPORTANT!
Take care not to cut yourself on the thin wall of the pipe!

The mechanical strength of the connection is only achieved if the specified insertion distance "i" is observed and the reinforcing sleeve introduced.

The insertion distance 'i' mark must remain visible on the pipe after it has been pushed into the pressfitting and the connection pressed!

8.0 Handling and Installation

• Marking pressfittings

Pressfittings with plain ends, such as reducers, reducing sleeves, plugs, etc, must be marked with the specified insertion distance "i" before assembly!

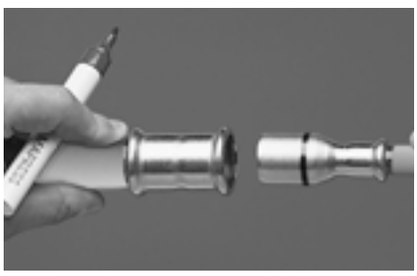


Figure 8.0-21 Pressfitting with plain end and insertion distance 'i' mark

8.2.5 Introducing reinforcing sleeve

After removing the sizing mandrel, push the supplied reinforcing sleeve home into the end of the pipe with the aid of the *mapress EDELFLEX* insertion tool before pushing the pressfitting on.

Figure 8.0-22 Introducing reinforcing sleeve

8.2.6 Checking seal rings

Before assembling it with the pipes, check the pressfitting is fitted with seal rings. Remove from the rings any foreign matter that might impair the seal.

Figure 8.0-23 Checking seal ring

8.2.7 Pushing pipe into pressfitting

Remove the factory-fitted plugs from the *mapress* pipe before pushing it into the pressfitting. Before pressing, push the pipe into the pressfitting axially the marked insertion distance "i", turning slightly at the same time.

Avoid introducing the pipe into the pressfitting at an angle, as this risks damaging the seal ring.

The permissible dimensional tolerances of the *mapress EDELFLEX* system could make the pipe difficult to push into the pressfitting so the seal ring could be damaged.

The pipes and prefabricated assemblies must be aligned before the fittings are pressed. The movement that normally occurs when pipes are lifted after pressing is however permissible.

Any alignment necessary after pressing must not impair the strength of the connections.
To avoid overstressing the pressfitting connection, threaded joints must be sealed before pressing is carried out.

Figure 8.0-24 Pushing *EDELFLEX* pipe into pressfitting

Figure 8.0-25 *EDELFLEX* pipe pushed into pressfitting

8.3 *mapress CARBON STEEL*

8.3.1 Transportation and storage

mapress CARBON STEEL pipes and *mapress* pressfittings must be protected against dirt and damage in transit and while being stored. *mapress* pipes are factory sealed with plugs. The pressfittings are packed in practical plastic bags in the factory.

8.3.2 Cutting to length

The required pipe lengths can be determined using the z-dimension method and must take account of the insertion distance "i" specified for the pressfitting. The dimensions involved are specified on the data sheet "z-dimensions of the *mapress* pressfitting system".

After being marked, the pipes may be cut to the required lengths with

- saws or
- pipe cutters

Figure 8.0-26 Cutting to length with pipe cutter

8.3.3 Marking insertion distance

To ensure a reliable pressfitting connection, before the *CARBON STEEL* pipe is assembled with the fittings its plastic coating must be removed from the ends.

Use the *mapress* stripping tool for this. This tool is set to the insertion distance "i" in the factory.

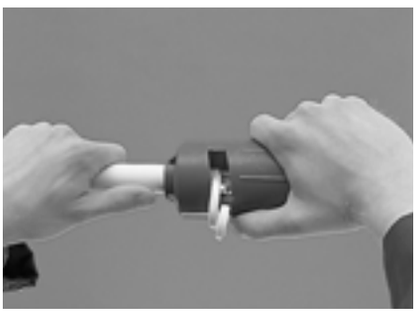


Figure 8.0-27 Stripping the plastic coating over the insertion distance

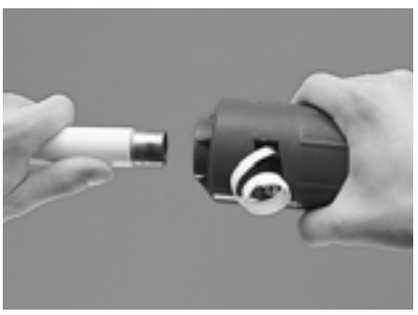


Figure 8.0-28 Stripped *mapress CARBON STEEL* pipe

Plastic-coated pipes must be stripped over a correspondingly greater distance when slip couplings are used.

The mechanical strength of the connection will only be achieved if the pipes are pushed the specified insertion distance "i" into the pressfitting.

The marked insertion distance must remain visible on the pipes after they have been pushed into the pressfittings and the connection pressed!

• Marking pressfittings

Pressfittings with plain ends, such as reducers, reducing sleeves, preformed pipe bridges, some elbows and plugs, must be marked with the specified insertion distance "i" before assembly!

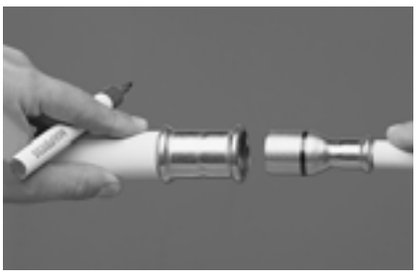


Figure 8.0-29 Pressfitting with plain end and insertion distance 'i' mark

• Shortening pressfittings

The legs of pressfittings with plain ends, such as some elbows, may only be shortened to the specified minimum permissible length!

8.3.4 Deburring

Deburr the outside and inside of the ends of the pipes after cutting to length. This must be done carefully to avoid the seal rings being damaged when the pipes are introduced into the pressfittings.

Externally deburring and chamfering of the ends of the pipes cut to length may be carried out with

- a commercial hand deburrer suitable for *CARBON STEEL*

or

Figure 8.0-30 External and internal deburring with hand deburrer

- the RE1 electric pipe deburrer.

8.0 Handling and Installation

8.3.5 Checking seal rings

Check that the pressfitting is fitted with seal rings before assembling with the pipes. Remove any foreign matter on the rings that might impair the seal.

Figure 8.0-31 Checking seal ring

8.3.6 Pushing pipe into pressfitting

Remove the factory-fitted plugs from the *mapress* pipe before pushing it into the pressfitting. Before pressing, push the pipe into the pressfitting axially the marked insertion distance "i", turning slightly at the same time.

Figure 8.0-32 Marking insertion distance 'i'

Push slip couplings (which do not have a stop) onto the pipes until at least the insertion distance 'i' marked on the pipes is reached.

Figure 8.0-33 Pushing *CARBON STEEL* pipe into pressfitting

Avoid introducing the pipe into the pressfitting at an angle, as this risks damaging the seal ring.

The permissible dimensional tolerances of the *mapress CARBON STEEL* pressfitting system could make the pipe difficult to push into the pressfitting so the seal ring could be damaged.

The pipes and prefabricated assemblies must be aligned before the fittings are pressed. The movement that normally occurs when the pipes are lifted is however permissible.

Any alignment necessary after pressing must not stress the connections.

To avoid stressing the pressfitting connection, threaded joints must be sealed before pressing is carried out.

For the pressure test with air, we recommend moistening the seal rings in the *CARBON STEEL* pressfittings before assembly.

8.4 *mapress COPPER/ COPPER GAS* pressfittings with bare DIN EN/DVGW copper pipes

8.4.1 Transportation and storage

Bare *mapress* DIN EN/DVGW copper pipes and *mapress COPPER* pressfittings must be protected against dirt and damage in transit and while being stored. The pressfittings are packed in practical plastic bags in the factory.

8.4.2 Cutting to length

The required pipe lengths can be determined using the z-dimension method and must take account of the insertion distance "i" specified for the pressfitting. The dimensions involved are specified on the data sheet "z-dimensions of the mapress pressfitting system".

After being marked, the pipes may be cut to the required lengths with

- fine-toothed hacksaws or
- pipe cutters

Figure 8.0-34 Cutting to length with pipe cutter

8.4.3 Deburring

Deburr the outside and inside of the ends of the pipes after cutting to length. This must be done carefully to avoid the seal rings being damaged when the pipes are pushed into the pressfittings. Externally deburring and chamfering of the ends of the pipes cut to length may be carried out with

- a commercial hand deburrer suitable for copper
  or
- the RE1 electric pipe deburrer

Figure 8.0-35 External deburring with hand deburrer

8.4.4 Sizing

The ends of soft copper pipes that have been cut to length must always be sized. Drive sizing ring onto the end of the pipe before driving sizing mandrel in.

Figure 8.0-36 Sizing ring and sizing mandrel

8.4.5 Marking insertion distance

To ensure a reliable, properly made pressfitting connection, before being assembled with the fittings the pipes must be marked with the specified insertion distance "i".

Figure 8.0-37 Marking insertion distance

The mechanical strength of the connection will only be achieved if the pipes are pushed the specified insertion distance "i" into the pressfitting.

The marked insertion distance "i" must remain visible on the pipes after they have been pushed into the pressfittings and the connection pressed!

• Marking pressfittings

The legs of pressfittings with plain ends, such as reducers, reducing sleeves, preformed pipe bridges, some elbows and plugs, must be marked with the specified insertion distance "i" before assembly!

Figure 8.0-38 Pressfitting with plain end and insertion distance 'i' mark

• Shortening pressfittings

The legs of pressfittings with plain ends, such as some elbows, may only be shortened to the specified minimum permissible length.

8.4.6 Checking seal rings

Check that the pressfitting is fitted with seal rings before assembling with the pipes. Remove any foreign matter on the rings that might impair the seal.

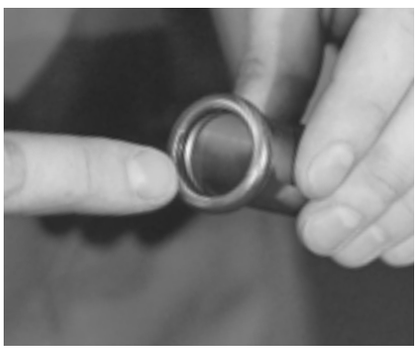


Figure 8.0-39 Checking seal ring

8.4.7 Pushing pipe into pressfitting

Remove the plugs fitted by the manufacturer from the copper pipe before pushing it into the pressfitting. Before pressing, push the pipe into the pressfitting axially the marked insertion distance "i", turning slightly at the same time.

Push slip couplings (which do not have a stop) onto the pipes until at least the insertion distance "i" marked on the pipes is reached.

Avoid introducing the pipe into the pressfitting at an angle, as this risks damaging the seal ring.

Figure 8.0-40 Pushing copper pipe and pressfitting together

The permissible dimensional tolerances of the DIN EN/DVGW copper pipes and the *mapress* pressfittings could make the pipe difficult to push into the pressfitting so the seal ring could be damaged.

The pipes and prefabricated assemblies must be aligned before the fittings are pressed. The movement that normally occurs when pipes are lifted after pressing is, however, permissible.

Any alignment necessary after pressing must not stress the connections.
To avoid stressing the pressfitting connection, threaded joints must be sealed before pressing is carried out.

8.5 *mapress COPPER/ COPPER GAS* pressfittings with coated DIN EN/DVGW copper pipes

8.5.1 Transportation and storage

Coated DIN EN/DVGW copper pipes and *mapress COPPER* pressfittings must be protected against dirt and damage in transit and while being stored. The pressfittings are packed in practical plastic bags in the factory.

8.5.2 Cutting to length

The required pipe lengths can be determined using the z-dimension method and must take account of the insertion distance "i" specified for the pressfitting. The dimensions involved are specified on the data sheet "z-dimensions of the *mapress* pressfitting system".

After being marked, the pipes may be cut to the required lengths with

- fine-toothed hacksaws or
- pipe cutters

Figure 8.0-41 Cutting to length with pipe cutter

8.5.3 Marking insertion distance

To ensure a reliable pressfitting connection, before the copper pipes are assembled with the pressfitting their ends must have their plastic coating stripped over the insertion distance. This is achieved with the

- *mapress* stripping tool 1 for copper (ODs from 12 to 28mm)

Figure 8.0-42 Stripping tool 1

or the

- *mapress* stripping tool 2 for copper (ODs from 35 to 54mm)

Figure 8.0-43 Stripping tool 2

This tool is set to the insertion distance "i" in the factory.

Coated pipes must be stripped over a correspondingly greater distance when slip couplings are used.

The mechanical strength of the connection will only be achieved if the pipes are pushed the specified insertion distance "i" into the pressfitting.

The marked insertion distance 'i' must remain visible on the pipe after it has been pushed into the pressfitting and the connection pressed!

• Marking pressfittings

Pressfittings with plain ends, such as reducers, reducing sleeves, preformed pipe bridges, some elbows and plugs, etc, must be marked with the specified insertion distance "i" before assembly!

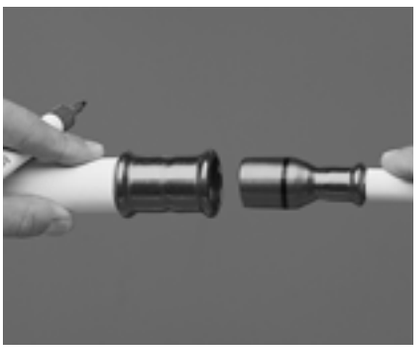


Figure 8.0-44 Pressfitting with plain end and insertion distance 'i' mark

• Shortening pressfittings

The legs of pressfittings with plain ends, such as some elbows, may only be shortened to the specified minimum permissible length!

8.5.4 Deburring

Deburr the outside and inside of the ends of the pipes after cutting to length. This must be done carefully to avoid the seal rings being damaged when the pipes are pushed into the pressfittings.
Externally deburring and chamfering of the ends of the pipes cut to length may be carried out with

- a commercial hand deburrer suitable for copper
  or
- the RE1 electric hand deburrer

8.0 Handling and Installation

Figure 8.0-45 External and internal deburring with hand deburrer

8.5.5 Sizing

The ends of soft copper pipes cut to length must always be sized. Drive sizing ring onto the end of the pipe before driving sizing mandrel in.

Figure 8.0-46 Sizing ring and sizing mandrel

8.5.6 Checking seal rings

Check that the pressfitting is fitted with seal rings before assembling with the pipes. Remove any foreign matter on the rings that might impair the seal.

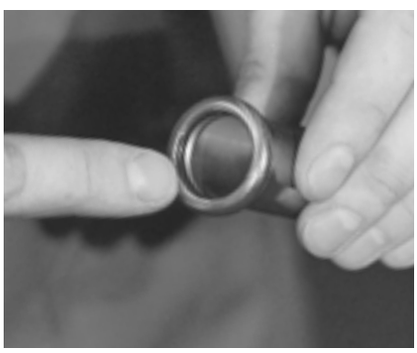


Figure 8.0-47 Checking seal ring

8.5.7 Pushing pipe into pressfitting

Remove the plugs fitted by the manufacturer from the copper pipe before pushing it into the pressfitting. Before pressing, push the pipe into the pressfitting axially the insertion distance 'i' marked by stripping, turning slightly at the same time.

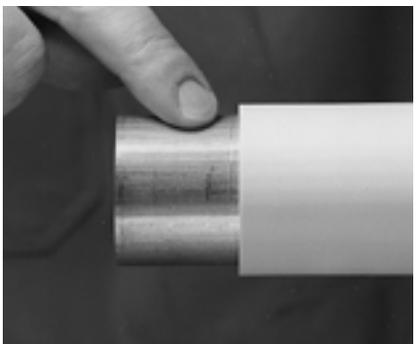


Figure 8.0-48 Marked insertion distance 'i'

Push slip couplings (which do not have a stop) onto the pipes until at least the marked insertion distance 'i' is reached. Avoid introducing the pipe into the pressfitting at an angle, as this risks damaging the seal ring.

Figure 8.0-49 Pushing DIN EN/DVGW copper pipe into pressfitting

The permissible dimensional tolerances of the DIN EN/DVGW copper pipes and the *mapress* pressfittings could make the pipe difficult to push into the pressfitting so the seal ring could be damaged.

The pipes and prefabricated assemblies must be aligned before the fittings are pressed. The movement that normally occurs when pipes are lifted after pressing is, however, permissible.

Any alignment necessary after pressing must not stress the connections.

To avoid stressing the pressfitting connection, threaded joints must be sealed before pressing is carried out.

8.6 Pressing

8.6.1 Pressing with the EFP 2, ECO 1, ACO 1 or ECO 3/ ACO 3 electromechanical tools

In addition to the pressing units, the *mapress* pressfitting system includes the matching pressing jaws or collars. The following individual quick-change pressing jaws and collars with adapters are available for the different pipe ODs:

- **Pressing jaws**
  for pipe ODs from 12 to 35mm
  EFP 2, ECO 1, ACO 1, ECO 3
  and ACO 3
- **Pressing collars with adapters**
  for pipe ODs from 42 to 54mm
  EFP 2, ECO 1, ACO 1, ECO 3
  and ACO 3
- **Pressing collars with adapters**
  for pipe ODs from 76.1 to 108mm
  ECO 3

Please note only the jaws, collars and adapters matching the pressure units may be used.

The groove in the jaws or collars must grasp the fitting's bead to make a proper pressfitting connection.

The automatic action always ensures that, once started, pressing is completed and the required maximum pressing force applied.

Figure 8.0-50 Pressing (ODs from 12 to 35mm)

Figure 8.0-51 Pressing (ODs from 42 to 108mm)

Follow the pressing tool manufacturer's operating instructions and service the tools regularly.

8.6.2 Pressing with HCPS electro-hydraulic pressing tool

• Positioning pressing collars

Open the closed pressing collar (OD 76.1 – 88.9 – 108mm) by withdrawing the pin. Lay the collar over the bead of the pressfitting. The groove in the collar must grasp the bead of the pressfitting. The stationary centring plate of the collar must always point towards the *mapress* pipe, otherwise it will not be possible to close the collar or it will be damaged.
Close the positioned collar with the pin, then turn it to the pressing position to allow the jaws of the HCP hydraulic cylinder to engage in the slots of the collar.

Figure 8.0-52 Positioning collar

Figure 8.0-53 Positioned collar

• Pressing

Then push the hydraulic cylinder further towards the collar to engage the collar's two pins fully in the cylinder's jaws. Only then can pressing be initiated by simultaneously pressing the safety button and squeezing the trigger.

Figure 8.0-54 Pressing (ODs from 76.1 to 108mm)

The hydraulic power pack has a system that automatically ensures the maximum pressing force is always achieved. For safety reasons this system does not switch itself on until about 20% of this force is achieved. Pressing can be interrupted at any time within this safety range.

8.0 Handling and Installation

Follow the pressing tool manufacturer's operating instructions and service the tools regularly.

8.6.3 Re-pressing SUPER SIZE (ODs from 76.1 to 108mm)

Connections that have only been particularly pressed, due, for example, to a power cut, must be re-pressed.

The partially pressed fitting is smaller than its original size. A re-pressing clamp makes it easier to lay a collar around a partially pressed joint correctly. Push this clamp onto the middle link D of the collar as shown, and tighten with the knurled screw A. The back N of the clamp must lie against the link.

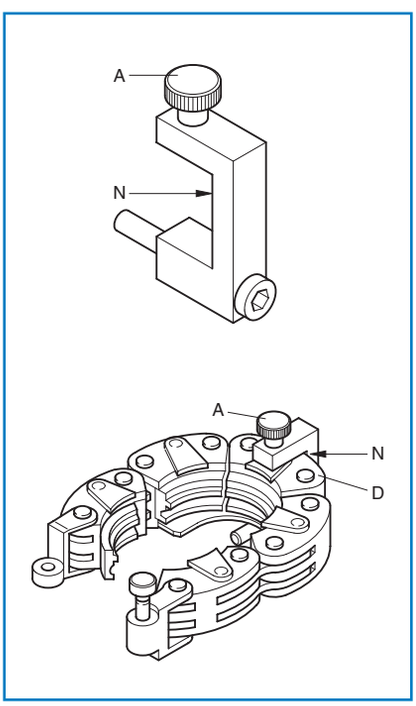


Figure 8.0-55 Re-pressing clamp for SUPER SIZE with pressing collar

8.7 Pipe bending

Both *mapress* and DIN EN/DVGW copper pipes can be bent cold using commercial tools (hand, hydraulic or electric).

The tool manufacturer is responsible for specifying the bending radii and whether the tool is suitable. All *mapress* and DIN EN/DVGW copper pipes must be bent to the normal radii r ≥ 3.5D

- Bending radius by hand
  r ≥ 5D

- Bending radius with tension bender
  r ≥ 3 to 3.5D

Table 8.0-1
Bending radii for copper pipes to DIN EN 1057 and DVGW GW 392

Outside diameter of pipe OD [mm]	Bending radius r [mm]	
	Hard	Semi-hard[1)]
12	45	45
15	55	55
18	70	70
22	-	77
28	-	114

[1)] Semi-hard available up to OD = 28mm

Because of the risk of reducing corrosion resistance, mapress stainless steel pipes must not be bent hot.

8.8 Adapter connections

Threaded adapters for equipment and valves are available. *mapress STAINLESS STEEL* can also be connected to commercial DIN flanges (PN10/16) with *mapress* flanged adapters.

Threaded adapters, female elbows with wall plates and wall sleeves must be properly secured to prevent any torsional or bending forces being transferred to the pressfitting connection.

Only commercial chloride free sealant may be used to seal stainless steel threads.

PTFE tape must not be used for stainless steel threads in water supply systems!
Plastic sealing tapes such as PARALIQ PM 35 are suitable.

8.9 Minimum spacing and clearances for *mapress* pressfitting systems

The design of the pressing jaws and collars means a certain amount of space is needed to install the pressfitting system.

The following tables contain these values for the different pipe ODs and the required jaws and collars.

Table 8.0-2 Minimum space required for 12 to 108mm (pipe OD) *mapress* pressfitting connections and *mapress* electromechanical pressing tools

Outside diameter of pipe [mm]	A [mm]	B [mm]
Pressing jaws		
12 – 15	20	56
18	20	60
22	25	65
28	25	75
35	30	75
42 – 54	60	140
Pressing collars		
42	75	115
54	85	120
76.1	110	140
88.9	120	150
108	140	170

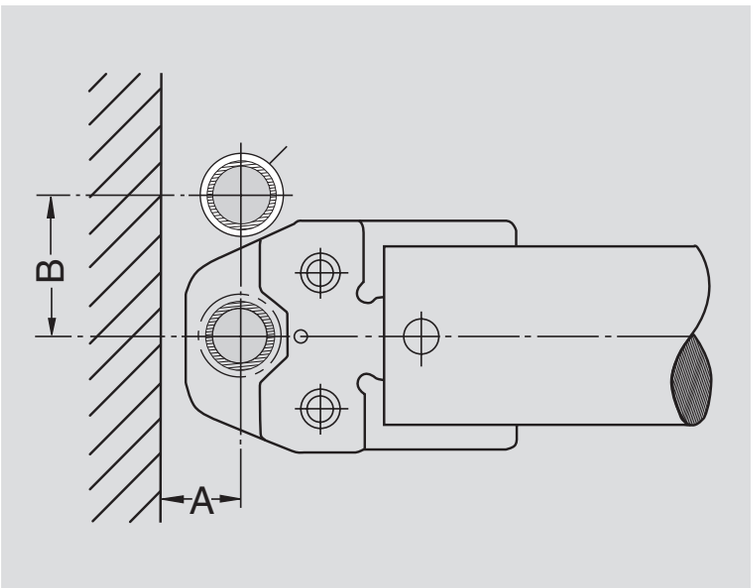


Figure 8.0-56 Minimum space required for pressing

8.0 Handling and Installation

Table 8.0-3 Minimum space required for 12 to 108mm (pipe OD) *mapress* pressfitting connections and *mapress* electromechanical pressing tools

Outside diameter of pipe [mm]	C [mm]	D [mm]	E [mm]
Pressing jaws			
12 – 15	20	28	75
18	25	28	75
22 – 28	31	35	80
35	31	44	80
42 – 54	60	110	140
Pressing collars			
42	75	75	115
54	85	85	120
76.1	110	110	140
88.9	120	120	150
108	140	140	170

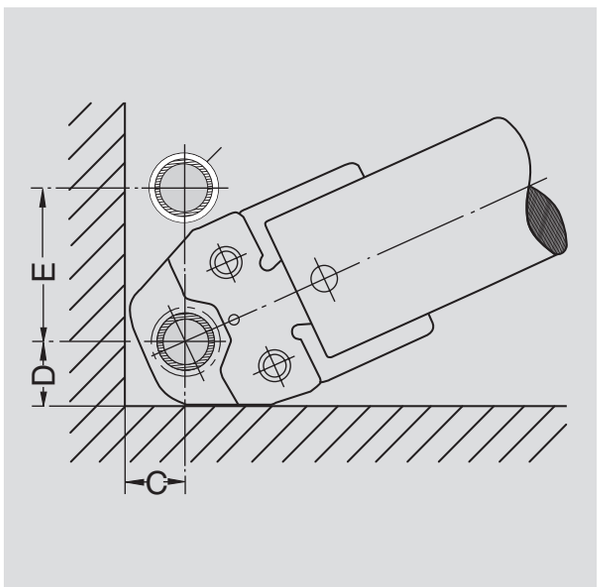


Figure 8.0-57 Minimum space required for pressing

Table 8.0-4 Minimum space required for 12 to 108mm (pipe OD) *mapress* pressfitting connections and *mapress* electromechanical pressing tools

Outside diameter of pipe [mm]	C [mm]	E [mm]	F [mm]
Pressing jaws			
12 – 15	20	75	131
18	25	75	131
22 – 28	31	80	150
35	31	80	170
42 – 54	60	140	360
Pressing collars			
42	75	115	265
54	85	120	290
76.1	110	140	350
88.9	120	150	390
108	140	170	450

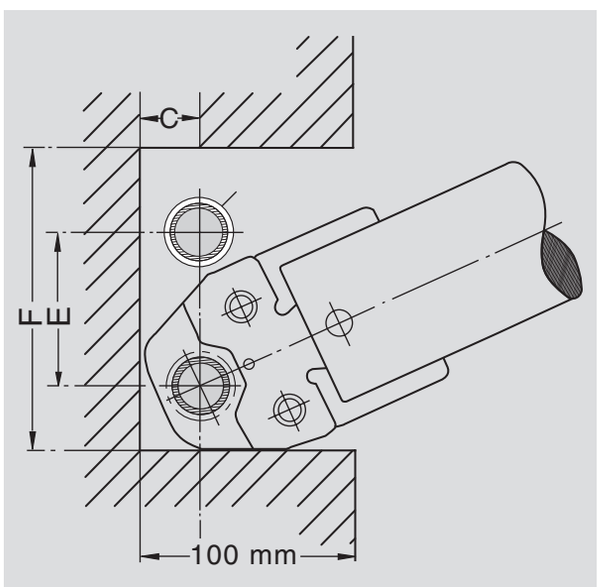


Figure 8.0-58 Minimum space required for pressing

Table 8.0-5 Minimum space required for 76.1 to 108mm (pipe OD) *mapress* SUPER SIZE pressfitting connections and *mapress* HCPS electrohydraulic pressing tool

Outside diameter of pipe [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]
76.1	110	200	220	220	160	160	300
88.9	120	200	220	220	160	180	320
108	130	200	230	230	160	200	340

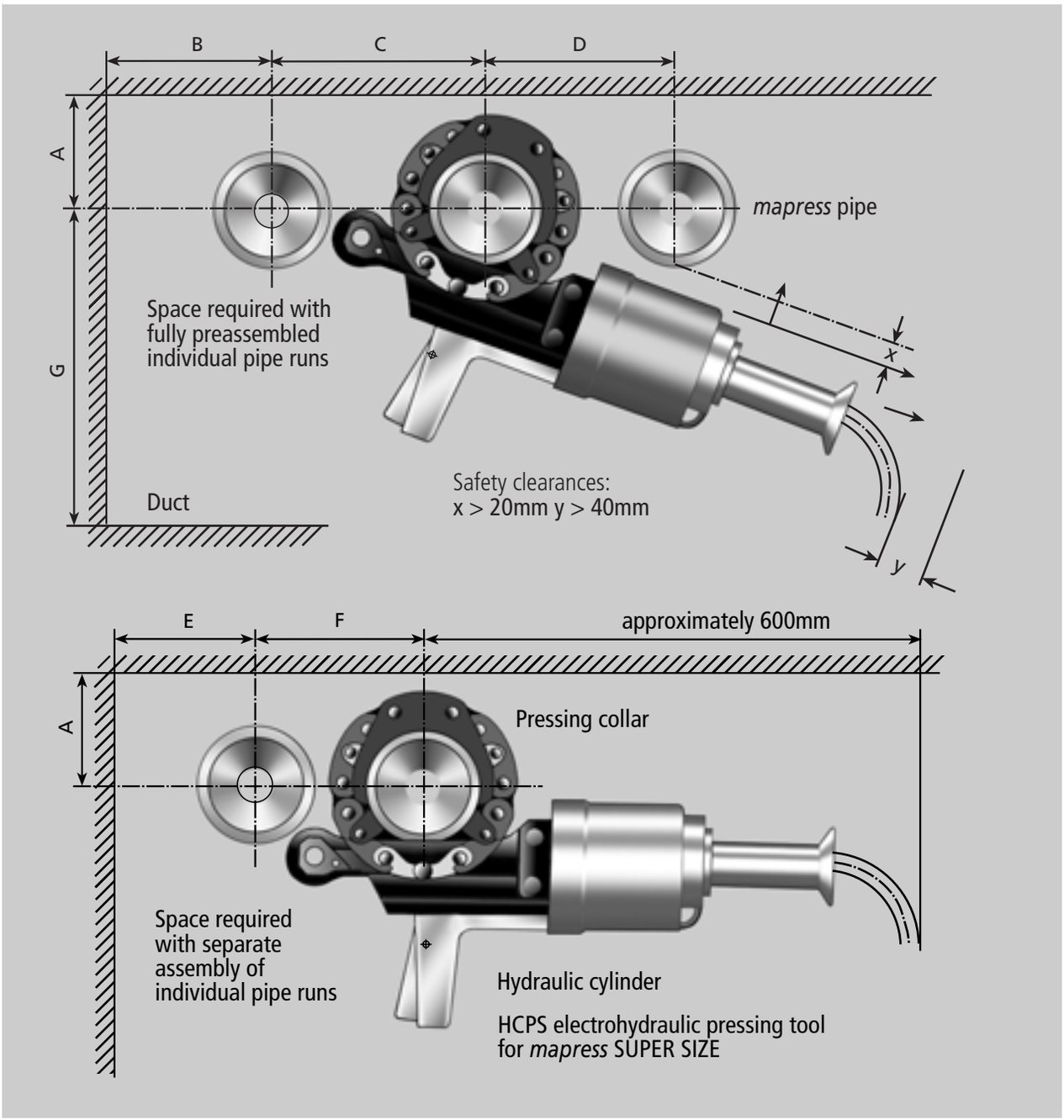


Figure 8.0-59 Minimum space required for pressing

8.0 Handling and Installation

Table 8.0-6 Minimum gaps, insertion distances, etc, for the pressfitting system

	Minimum gap and pipe length between 2 pressfittings Minimum projection and clearances for pipes passing through walls and slabs						
Outside diameter of pipe	**Pressfitting gap and clearance**		***mapress*** **pipe clearance**	***mapress*** **pipe projection**	**Minimum pipe length**	**Diameter of fitting bead**	**Insertion distance**
OD x t	A_{min}	B_{min}	D_{min}	C_{min}	L_{min}	D_b	**i**
[mm]	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**
12 x 1.2 **15 x 1.6**	10	35	77	52	44	20	**17**
15 x 1.0/1.2	10	35	85	55	50	23	**20**
18 x 1.0/1.2	10	35	89	55	50	26	**20**
22 x 1.2/1.5	10	35	95	56	52	32	**21**
28 x 1.2/1.5	10	35	107	58	56	38	**23**
35 x 1.5	10	35	156/121[1)]	61	62	45	**26**
42 x 1.5	20	35	202/147[1)]	65	80	54	**30**
54 x 1.5/2.0	20	35	235/174[1)]	70	90	66	**35**
76.1 x 2.0/1.5	30/20[2)]	75	305/223[1)]	128	136/126[2)]	95	**53**
88.9 x 2.0/1.5	30/20[2)]	75	347/249[1)]	135	150/140[2)]	110	**60**
108 x 2.0	30/20[2)]	75	411/292[1)]	150	180/170[2)]	133	**75**

[1)] Elbow with short leg
[2)] Dimension applies to ECO 3

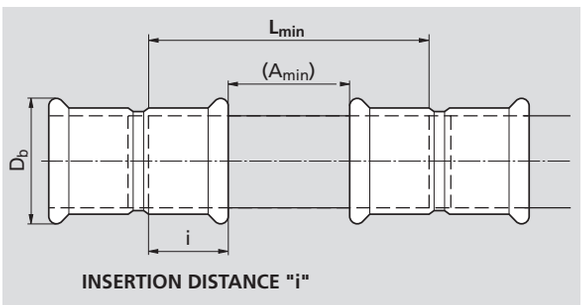


Figure 8.0-60 Insertion distance "i", minimum gap „A_{min}" and minimum pipe length „L_{min}" between two pressfittings

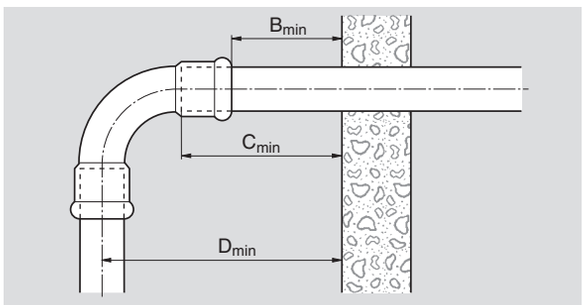


Figure 8.0-61 Minimum projections and clearances for pipes passing through slabs and walls

9.1 Pressure tests

9.1.1 General

Subject finished pipework to leak tests before covering or painting.

The pressure test of water supply and heating systems can be carried out with water, air or noncorrosive gases.

The pressure test of gas systems must be carried out with air or noncorrosive gases.

Document the results of the pressure test appropriately.

If the pipework is to be emptied again after a water pressure test, or not remain completely full, it is advisable to conduct the pressure test with air in order to avoid an increased risk of pitting!

9.1.2 Water supply systems

Conduct the pressure test of laid pipework in accordance with DIN 1988/TRWI 1988.
Fill the pipework with filtered water so that it is free from air. Carry out a preliminary and main pressure test. The preliminary test of smaller components, such as connecting and distribution pipes within bathrooms, may be regarded as sufficient in itself.

- Preliminary test

For this test, apply a pressure equal to the permissible working pressure plus 5 bar, which must be restored twice at 10-minute intervals within a period of 30 minutes. Then, after a test period of a further 30 minutes, the test pressure must not have dropped by more than 0.6 bar (0.1 bar per 5 minutes).

- Main test

Conduct the main test immediately after the preliminary test. The duration of this test is 2 hours. The test pressure read off after the preliminary test must not have fallen by more than 0.2 bar after this 2-hour period. There must not be any leaks visible from any point of the tested system.

• Pressure test with air

A pressure test with air or noncorrosive gases may be carried out in accordance with the ZVSHK/BHKS Codes of Practice "Pressure Test with Air or Noncorrosive Gases".

9.1.3 Heating systems

The pressure test of the laid pipework is generally conducted with water.

"Test hot water heating systems at a pressure equal to 1.3 times the total pressure at any point in the system, and at least 1 bar. As soon as possible after the cold water pressure tests, heat the system up to the design hot water temperature to check whether it also remains watertight at the maximum temperature."

9.1.4 Gas systems

• Natural gases:

Conduct the pressure test of the laid pipework in accordance with DVGW G 600/TRGI 86/96.

Subject pipes with working pressures of up to 100 mbar to a preliminary and a main test.

- Preliminary test

"Conduct the preliminary test with air or a noncorrosive gas (eg nitrogen or carbon dioxide), but not with oxygen, at a test pressure of 1 bar. The test pressure must not drop during the 10-minute test period."

- Main test

"Conduct the main test with air or a noncorrosive gas (eg nitrogen or carbon dioxide), but not with oxygen, at a test pressure of 110 mbar. After temperature equalisation the test pressure must not drop during the subsequent test period of at least 10 minutes."

„Subject pipes with working pressures between 100 mbar and 1 bar to a combined load and leak test. Conduct the test with air or a noncorrosive gas (eg nitrogen or carbon dioxide), but not with oxygen, at a test pressure of 3 bar. The test period must be at least 2 hours, taking account of any possible changes in the temperature of the test fluid, and after a temperature equalisation period of about 3 hours. Use a class 1 pressure recorder and a class 0.6 pressure gauge as measuring instruments."

• Liquefied gases:

Conduct the pressure test of the laid pipework in accordance with TRF 1996 (German liquefied gas regulations).

The pressure test requirements apply to low and medium pressure pipework. Conduct the pressure test of liquefied gas pipes with air or nitrogen at 1.1 times the permissible working pressure, but at least 1 bar, and include the fittings.
The test may be carried out as a pressure test, with water as the test fluid, at 1.3 times the permissible working pressure. If a pressure test with water is planned for the first or regular tests, it must be allowed for beforehand, when the pipework is installed, by arranging the lowest points and drain connections so it can be properly drained.

9.0 Supplementary Work

9.2 Flushing pipework

Flush pipework with drinking water or an intermittent mixture of compressed air and water before commissioning. DIN 1988 and the codes of practice of the ZVSHK/BHKS have directions for flushing water supply pipework.

- ***STAINLESS STEEL/EDELFLEX***

The possibility of corrosion promoted by foreign matter such as dirt or swarf can be ruled out in the case of stainless steel. It is therefore sufficient to simply flush the pipework with drinking water.

- ***COPPER***

The ZVSHK/BHKS codes of practice only refer to the method of flushing with water. The particular method to be used is left to the discretion of the client, designer and installer.

9.3 Identification and colour-coding of pipework

Visible pipework and system components should be clearly identified in terms of the fluids carried. This helps ensures reliability, makes it easier to organise servicing and repairs, and prevents accidents and damage to health.

Clearly identify pipework with labels, signs or tags and the name of the fluid carried at easily accessible locations (end of pipes, branch points, points at which pipes pass through structural members, valves, etc).
Colour coding may be achieved by

- painting the pipe along its entire length (in conjunction with corrosion protection),
- colour stickers or
- use of signs.

These forms of identification must at least include the following:

- fcolour coding for fluid carried
- direction of flow of the fluid
- code number or name of the fluid

Table 9.0-1 Suggestions for identifying pipes

Fluid	Colour coding based on DIN 2403			
Drinking water	Drinking water	pale green	RAL 6018	→
Hot (drinking) water	Hot (drinking) water	pale red	RAL	→
Drinking water circulation	Circulation	pale red	RAL	→
Foul water	Foul water	ochre	RAL 8001	→
Natural gas	Natural gas	yellowish orange	RAL 2000	→
Heating flow	Heating flow	red	RAL	→
Heating return	Heating return	blue	RAL	→
Steam	Steam	red	RAL 3003	→
Condensate	Condensate	blue	RAL	→
Vacuum	Vacuum	grey	RAL 7001	→
Compressed air	Compressed air	grey	RAL 7001	→

9.4 Lagging

Pipework is lagged to prevent

- heat losses,
- heating of the fluid carried by the surroundings and
- noise transmission.

Closed cell lagging materials are also suitable for providing corrosion protection.

Lagging must comply with national guidelines.!

• Water supply systems

Protect pipes carrying drinking water against condensation and heating. Lay cold water pipework sufficiently far away from heat sources, or insulate so that the quality of the water is not affected by heating. To save energy and ensure proper hygiene, lag hot water and circulation pipes to prevent excessive heat losses.

• Heating systems

Lagging hot water heating systems is one way of saving energy, and therefore reduces $CO2_2$ emissions and protects the environment. At 53% of the total energy consumption, heating is the largest element of domestic energy consumption.

• Coolant and chilled water systems

The main reasons for lagging coolant and chilled water pipes is to prevent condensation and reduce energy consumption over their entire service life. A reliable, permanent reduction in energy costs and avoidance of the dew point can only be achieved through correct design.

Lagging materials and sleeves can promote corrosion on pipework. It is therefore essential to choose suitable materials.

9.0 Supplementary Work

9.5 Subsequent corrosion protection

9.5.1 Anticorrosion tapes

First, clean off any dirt and moisture present on the pressed fitting to be taped and at least 20mm of the adjoining plastic coating of the *mapress CARBON STEEL* pipe. Then apply a coat of primer to the fitting, including a 20mm length of the plastic coating, and allow to dry.

Figure 9.0-1 Priming

The primer only provides a surface to which the anticorrosion tape can adhere. It does not itself provide any protection against corrosion!

Wrap the tape around the connection and prepared section of the plastic coating, with adequate laps of at least 15mm.

Figure 9.0-2 Anticorrosion taping of connection

To ensure the tape remains effective, avoid subsequent damage from tools, etc.

Figure 9.0-3 Anticorrosion tape

Anticorrosion taping also offers good external protection of stainless steel pipes against chloride enrichment.

9.5.2 Closed cell lagging sleeves

Provided the cuts and joints of sleeves have been carefully sealed, closed cell lagging materials offer good corrosion protection for *CARBON STEEL, STAINLESS STEEL* and *COPPER* pipes. It is essential to follow the manufacturer's instructions for use.

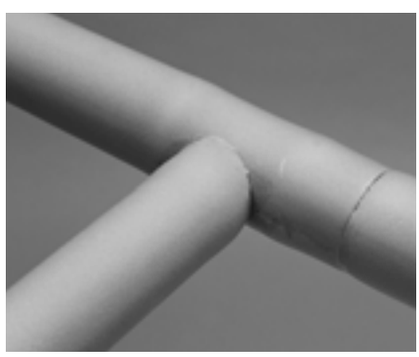


Figure 9.0-4 Insulating with closed cell lagging sleeves

Conduct the leak test before applying the corrosion protection.

Apply coatings or suitable primers and paints as the minimum protection against external corrosion.

Felt sleeves or coverings are not permitted, since this material retains absorbed moisture for a long time and therefore promotes corrosion!

9.6 Disinfecting stainless steel pipework

This is carried out to meet more stringent hygiene requirements, and in the event of severe microbial contamination.

mapress STAINLESS STEEL can also be disinfected with chlorine. To protect the environment and simplify handling, the DVGW recommends the use of hydrogen peroxide instead of chlorine.

Before commissioning the pipework carefully follow the instructions for use, particularly in relation to the contact time, maximum solution concentration and subsequent flushing.

To reliably prevent corrosion damage, during disinfection do not exceed the maximum chlorine concentration and contact times tabulated below!

Table 9.0-2
Chlorination of STAINLESS STEEL pipework

	1	2
Max concentration of free chlorine in the water	100mg/l	50mg/l
Max contact time	16h	24h
Thorough flushing with drinking water	Residue-free chlorine in the drinking water: <1mg/l ≈ 1 ppm	

9.7 Equipotential bonding

Include gas and water pipes in the main equipotential bonding system of the building.

Equipotential bonding is required for all electrically conductive pipework.

- *mapress STAINLESS STEEL*
- *mapress EDELFLEX*
- *mapress SUPER SIZE HEATING*
- *mapress COPPER*
- *mapress STAINLESS STEEL GAS*
- *mapress COPPER GAS*

are electrically conductive pipe systems.

- *mapress CARBON STEEL*

is not an electrically conductive system and therefore does not have to be included in the main equipotential bonding system. It is therefore also unsuitable for the supplementary equipotential bonding system.

The electrical contractor is responsible for the equipotential bonding system.

In the case of *mapress EDELFLEX*, the equipotential bonding system must be connected to the fitting rather than the pipe.

9.8 Commissioning

Pipe systems must be commissioned in accordance with the applicable standards and regulations. The installation contractor must familiarise the user with the system. This is to be documented with a handover and acceptance record. The user must also be provided with the manufacturer's maintenance and operating instructions for the installed valves and equipment.

9.9 Operation and maintenance

The user of the pipe (eg water supply, heating or gas) system is under an obligation to ensure they are maintained in serviceable condition.
The system must be operated in such a way that faults and other factors affecting the reliability of the system are ruled out. The user is therefore advised to conclude a maintenance agreement with an installation contractor.

9.10 Descaling pipework

Limescale on the bore of pipes can by caused by a variety of service conditions (excessively high water temperatures, impermissibly high temperatures on the bore of the pipe or excessively hard water).

If required, *mapress STAINLESS STEEL* including the black butyl rubber (CIIR) seal ring can be descaled with suitable chemical descalers approved by Mapress. Mapress cannot comment on the effectiveness of these descalers.

- Amidosulphonic acid (H_2NSO_3H),

which is known under the Hoechst brand name

„SULFAMIC ACID"

can be used for descaling in the form of a 5 to 10% (maximum) aqueous solution at up to 25°C.

mapress pipes with a small amount of limescale can also be descaled with brief use of pure diluted

- citric acid

(HO-C CH_2 CO_2 H_2 CO_2)

Dilute (25%) citric acid up to a temperature of +20°C is suitable as a descaler for stainless steel.

Additives for descaling the bore of pipes must be checked for compatibility with the black (CIIR) seal ring and approved by Geberit

Follow the manufacturer's instructions for use when employing descaling or disinfectant solutions.

10.0 *mapress MAM* (pipe connection with metal to metal seal)

10.1 *mapress MAM* technology

The *mapress MAM* pressfitting system is made of:

- stainless steel

and has the following components:

- ***mapress MAM* pressfittings**
  (metal to metal seal)

- ***mapress* pipes**
  - *STAINLESS STEEL*

- ***mapress* pressing units**
  - EFP 2
  - MFP 2
  - ECO 1
  - ACO 1
  - ECO 3
  - ACO 3
  - PFP 2-Ex.

The system covers a range of sizes (pipe ODs) from 18 to 54mm. The pressed connection is made by pushing the prepared pipe a defined distance into the *MAM* pressfitting, then pressing pipe and fitting together with the matching tool. During pressing, a stainless steel ring is pushed onto the outside taper of the end of the fitting with a defined force. The pressing force is applied along the axis of the pipe. The five sharp ring projections in the socket section of the *MAM* pressfitting elastically deform the inserted end of the pipe.
A metal to metal pipe connection made thus is permanently tight, and thanks to its positive and frictional nature cannot be pulled apart.

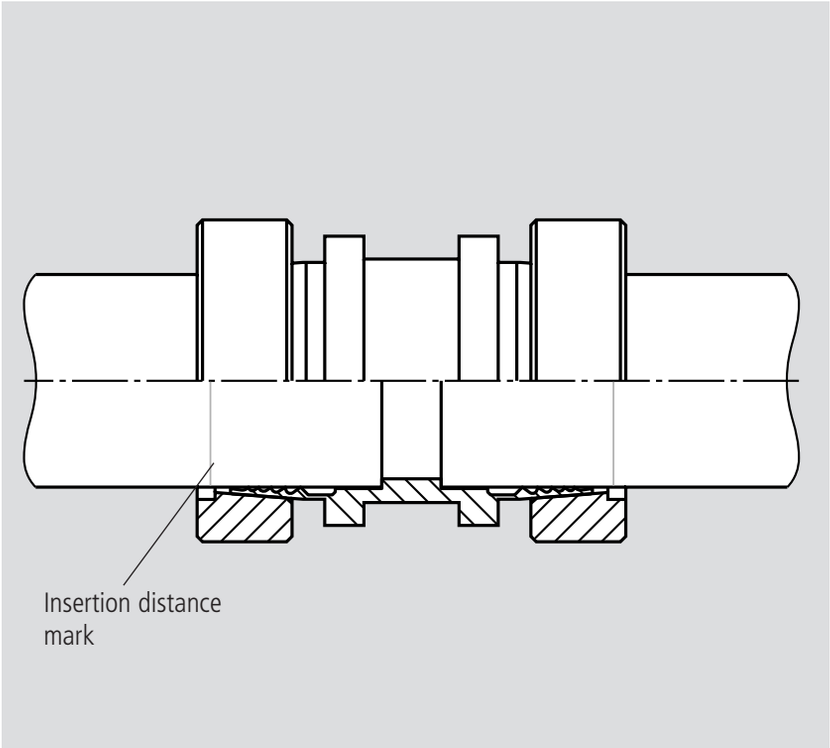


Figure 10.0-1 *mapress MAM* pressfitting connection before pressing

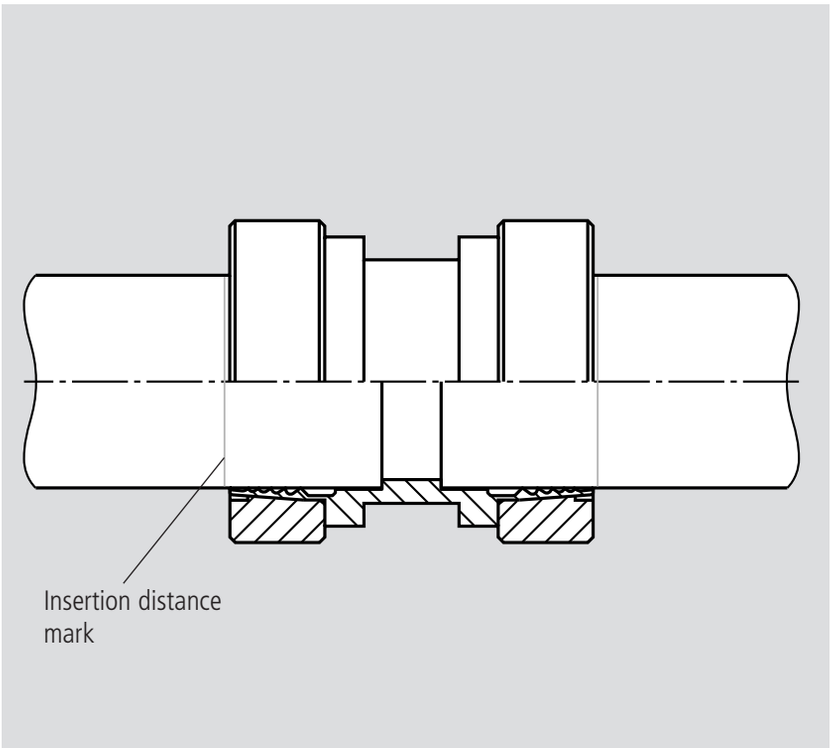


Figure 10.0-2 *mapress MAM* pressfitting connection after pressing

10.2 *mapress MAM* components

10.2.1 Pressfittings

The basic element of the metal to metal pressfitting connection is the pressfitting designed for elastic deformation. The *MAM* pressfitting consists of the body with its factory-fitted pressring. The factory incorporates five sharp ring projections in its socket section to provide a permanently tight, metal to metal connection.

The *mapress* pipe is pushed the specified insertion distance into the pressfitting, and the *MAM* pressfitting connection pressed with the matching tool.

The *mapress MAM* pressfitting is manufactured from stainless Cr-Ni-Mo steel (material No 1.4401/BS 316 S 33). It is supplied in sizes (pipe ODs) from 18 to 54mm.

10.2.2 Pipes

The *mapress MAM* pressfitting connection is made with the *mapress STAINLESS STEEL* pipe in sizes (pipe ODs) from 18 to 54mm.
The high alloy, austenitic (material No 1.4401 to DIN 10088/BS 316 S 33) *mapress STAINLESS STEEL* pipes are thin walled, welded products to DVGW Code of Practice W 541. These *mapress* pipes also conform to DIN EN 10312.

10.2.3 Pressing tools

The pipe connection with a metal to metal seal can be made with the *mapress* pressing tools and special jaws.

The following pressing jaws may be used:

- ***MAM* pressing jaws I**
  for adapters for
  ODs from 18 to 28mm

- ***MAM* pressing jaws II**
  for adapters for
  ODs from 35 to 54mm

Figure 10.0-3 *mapress* pressing jaws including adapters

10.3 Applications

The *mapress MAM* pressfitting system is designed for industrial applications with stringent static pressure, pressure cycling, temperature and corrosion requirements.
Working pressures of 40 bar and more (depending on the outside diameter of the pipe, vacuum pressures and temperature up to about 200°C) are possible across the size range of ODs from 18 to 54mm.
The properties of the material (1.4401 / BS 316 S 33), and the special method of connection, make the *mapress MAM* pressfitting system as resistant to aggressive fluids as a welded pipe system made of 1.4571 (BS 320 S 31).
The system is suitable for a very wide range of mainly industrial applications.
For example:

- Chemical and pharmaceutical industries
- Food industry
- Paper industry
- Refineries
- Mining
- Mechanical engineering
- Power stations and
- Shipbuilding

In the various branches of industry, *MAM* can be used as a pipe system for:

- Fire extinguishing systems
- Vacuum systems
- Compressed air systems
- Hydraulic systems
- Industrial gases
- Production systems and
- Supply systems

10.4 Approvals

The *mapress MAM* pressfitting system has gained the following approvals

And has been submitted for various other approvals.

10.5 Advantages of *mapress MAM* pressfitting at a glance

The advantages of the *mapress MAM* pressfitting system made of stainless Cr-Ni-Mo steel (material No 1.4401/ BS 316 S 33) are as follows:

- Metal to metal seal without elastomers
- Quick and easy, yet safe and reliable pipelaying
- Fast installation ensures high system availability
- Permanently tight pipe connection that cannot be pulled apart
- No fire risks during installation
- May be installed in hazardous areas
- Light and
- Resists aggressive fluids

10.6 Installing *mapress MAM*

10.6.1 Transportation and storage

mapress STAINLESS STEEL pipes and *mapress MAM* pressfittings must be protected against dirt and damage in transit and while being stored. *mapress* pipes are factory sealed with plugs. The pressfittings are packed in practical plastic bags in the factory.

10.6.2 Cutting

The required pipe lengths can be determined using the z-dimension method and must take account of the specified insertion distance "i" into the *MAM* pressfitting. The dimensions involved are specified on the data sheet "z-dimensions of the *mapress MAM* pressfitting system".

After being marked, the pipes may be cut to the required lengths with

- fine-toothed hacksaws,

Figure 10.0-4 Cutting to length with fine-toothed hacksaw

- pipe cutters or

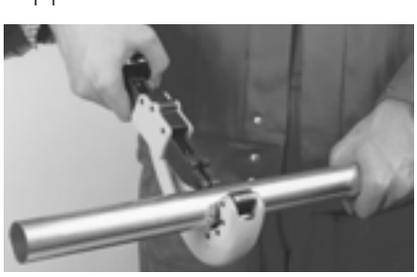


Figure 10.0-5 Cutting to length with pipe cutter

- electric saws

Figure 10.0-6 Cutting to length with electric saw

The tools must be suitable for stainless steel!

Stainless steel must not be tarnished!

Do not used abrasive wheels or flame cutting!

These methods lead to sensitisation of stainless steel due to uncontrolled local heating. This increases the likelihood of corrosion.
When sawing *STAINLESS STEEL* pipes to length, cut right through properly rather than breaking them off beforehand, otherwise there will be a risk of corrosion.

10.6.3 Deburring

Deburr the inside and outside of the ends of the pipes after cutting to length. This must be done carefully to avoid the metal sealing surfaces being damaged when the pipes are pushed into the *MAM* pressfittings.

Externally deburring and chamfering of the ends of the pipes cut to length may be carried out with, for example:

- a commercial hand deburrer suitable for stainless steel
  or

Figure 10.0-7 External deburring with hand deburrer

- the RE1 electric pipe deburrer

Figure 10.0-8 External deburring with RE1 electric pipe deburrer

10.6.4 Marking insertion distance

To ensure a reliable, properly made *MAM* pressfitting connection, before being assembled with the fittings the pipes must be marked with the required insertion distance "i"

Figure 10.0-9 Marking insertion distance

This can be carried out with the insertion distance gauge and felt-tip pen, or with the M1 marking tool.

Figure 10.0-10 Marking insertion distance

The mechanical strength of the connection will only be achieved if the pipes are pushed the specified insertion distance 'i' into the pressfitting.

The insertion distance "i" marked must remain visible on the pipes after they have been pushed into the pressfittings and the connection pressed!

- **Marking pressfittings**

Pressfittings with plain ends, such as reducers, must be marked with the specified insertion distance 'i' before assembly!

Figure 10.0-11 Pressfitting with plain end and insertion distance 'i' mark

10.6.5 Checking sealing surfaces

Before assembling the *MAM* pressfitting with the pipes, check the sealing surfaces and remove any foreign matter that might impair the tightness of the connection. Also ensure the stainless steel ring used to plastically deform the end of the fitting and the *mapress* pipe is fitted on the tapered external surface of the end of the fitting.

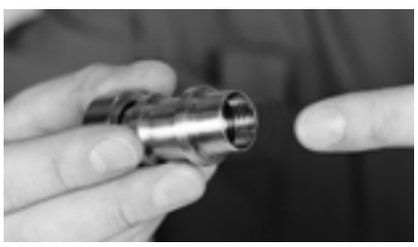


Figure 10.0-12 Checking sealing surfaces

10.6.6 Pushing pipe into pressfitting

Remove the factory-fitted plugs from the *mapress* pipe before pushing it into the *MAM* pressfitting. Before pressing, push the pipe home into the pressfitting axially, turning slightly at the same time. Avoid introducing the pipe in the *MAM* pressfitting at an angle, as this risks damaging the sealing surface.

Figure 10.0-13 Pushing *mapress* pipe into pressfitting

The pipes and prefabricated assemblies must be aligned before the fittings are pressed. The movement that normally occurs when pipes are lifted after pressing is however permissible. Any alignment necessary after pressing must not impair the strength of the connections.

To avoid overstressing the pressfitting connection, threaded joints must be sealed before pressing is carried out.

10.6.7 Pressing with EFP 2, ECO 1, ACO 1 or ECO 3/ACO 3 electromechanical tools

In addition to the pressing units, the *mapress MAM* pressfitting system includes the matching pressing jaws. There are a series of quickly and easily changed individual adapters for the different pipe ODs:

- *MAM* pressing jaws I for adapters for ODs from 18 to 28mm EFP 2, ECO 1, ACO 1
- *MAM* pressing jaws II for adapters for ODs from 35 to 54mm EFP 2, ECO 1, ACO 1
- *MAM* pressing jaws I for adapters for ODs from 18 to 28mm ECO 3, ACO 3
- *MAM* pressing jaws I for adapters for ODs from 35 to 54mm ECO 3, ACO 3

Please note only the jaws matching the pressing units may be used.

Insert the adapters for the particular size of pipe into the special *MAM* pressing jaws. Then insert the *MAM* pressfitting between the adapters of the jaws, so that the collar of the body of the *MAM* pressfitting with the factory-fitted stainless steel pressring lies against the adapters, and the pressfitting connection can made properly.
The automatic action always ensures that, once started, pressing is completed and the required maximum pressing force applied.
The pressfitting connection is properly made if the stainless steel pressring lies against the collar of the fitting and the mark on the *mapress* pipe is visible again.

Figure 10.0-14 *mapress MAM*

10.0 *mapress MAM* (pipe connection with metal to metal seal)

10.7 Minimum spacing and clearances for *mapress MAM* pressfitting

Table 10.0-1 Minimum gaps, insertion distances, etc, for the *MAM* pressfitting system

	Minimum gap and pipe length between 2 axial pressfittings Minimum projection and clearances for pipes passing through walls and slabs					
Outside diameter of pipe	Pressfitting gap and clearance		*mapress* pipe clearance	*mapress* pipe projection	Minimum pipe length	Insertion distance
OD x t [mm]	A_{min} [mm]	B_{min} [mm]	D_{min} [mm]	C_{min} [mm]	L_{min} [mm]	i [mm]
18 x 1.0	28	22	97	49	82	**20**
22 x 1.2	28	22	113	50	84	**21**
28 x 1.2	28	22	122	52	88	**23**
35 x 1.5	28	22	139	58	99	**26**
42 x 1.5	28	22	147	62	107	**30**
54 x 1.5/2.0	28	22	162	67	113	**35**

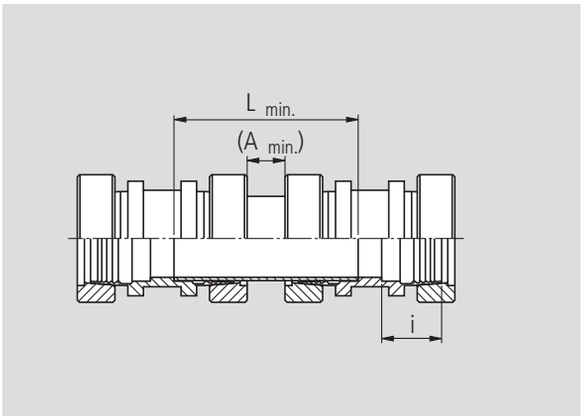


Figure 10.0-15 Insertion distance "i", minimum gap „A_{min}" and minimum pipe length „L_{min}" between two *MAM* pressfittings

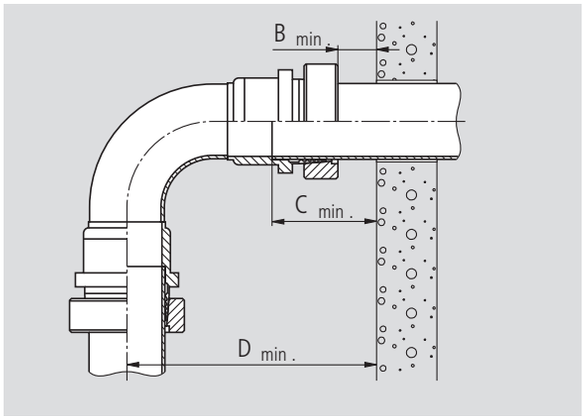


Figure 10.0-16 Minimum projections and clearances for pipes passing through slabs and walls

11.1 Pressure test record for water supply system

Building project: _____

mapress

Client's representative: _____

Contractor's/responsible tradesperson's representative: _____

Material: _____ Method of connection: _____

Pressurisation with drinking water

☐ Use filtered water to fill and fully vent the pipe system.
The permissible working pressure
p_{perm} = 10 bar / _____bar (if higher)

Water temperature = _____°C

Ambient temperature = _____ °C

Temperature differential = _____ K

1. Apply test pressure (at least 15 bar)
   $p_{test} = p_{perm} \times 1.5$ = _____ bar

2. ☐ Temperature differential < K

2.1 Test period = 10 minutes
☐ The pressure did not drop during this time and no leaks were detected

3. ☐ Temperature differential ≥ 10 K

3.1 Wait of 30 minutes for temperature to equalise after applying p_{test}

3.2 Test period = 10 minutes
☐ The pressure did not drop during this time and no leaks were detected

☐ The pipes are watertight

Pressurisation with noncorrosive gas

System temperature: _____

Ambient temperature _____ °C Test fluid temperature _____ °C

Test fluid ☐ oil-free compressed air ☐ nitrogen ☐ carbon dioxide ☐

Test fluid ☐ oil-free compressed air ☐ nitrogen ☐ carbon dioxide ☐

The water supply system was tested
☐ as a complete system ☐ in _____ sections

Seal all pipes with metal plugs, caps, blanks or blind flanges. Isolate valves, pressure vessels and water heaters from the pipes. A visual inspection of all pipe connections was carried out to verify that they had been properly made.

☐ **Strength test at elevated pressure**

Max test pressure for ≤ 50DN 3 bar > 50DN 1 bar

Test period per 100 litres of pipe volume at least 30 minutes
Test period _____ minutes
Wait for temperature to equalise and plastics to stabilise, then start test period.

☐ The pressure did not drop during the test period
☐ The pipe system is watertight

☐ **Leak test**

Test pressure 110 mbar
Test period per 100 litres of pipe volume at least 30 minutes

Pipe volume _____ litres Test period _____ minutes

Wait for temperature to equalise and plastics to stabilise, followed by test period.

☐ The pressure did not drop during the test period

Place _____ Date _____

Signed (client/representative) _____ Signed (contractor/representative) _____

Source: ZVSHK Code of Practice

11.0 Forms

11.2 Flushing record for water supply system

Building project: _____

mapress

Client's representative: _____

Contractor's/responsible tradesperson's representative: _____

The pressure test was conducted on _____

Material: _____ Method of connection: _____

Table: Guide value for the minimum number of draw-off points to be opened, related to the largest size of distribution pipe

Largest size (outside diameter x wall thickness in mm) of distribution pipe in the section currently being flushed.	28 x 1.2	35 x 1.5	42 x 1.5	54 x 1.5	76.1 x 2.0	88.9 x 2.0	108 x 2.0
Minimum number of draw-off points (OD = 15 mm) to be opened	2	4	6	8	12	18	28

On a particular floor, fully open the draw-off points, starting with one furthest away from the riser.

After flushing for 5 minutes, successively close the draw-off points, starting with the last one opened.

Use filtered water for flushing.

Static pressure p_s = ___ bar.

Fully open maintenance valves (floor and upstream isolating valves)

Sensitive valves and requirement were removed and bridged with adapters or flexible hoses.

Aerators, flow smoothing diffusers, and restrictors were removed.

Strainers and traps upstream of valves were cleaned after flushing.

The system was flushed in sections, starting from the main stopcock in the flushing sequence, and finishing with the draw-off point furthest away.

The water supply system was properly flushed

_____ Place

_____ Date

_____ Signed (client/representative)

_____ Signed (contractor/representative)

Source: ZVSHK Code of Practice

11.3 Commissioning and familiarisation training record for water supply system

Building project: _____

mapress

Client's representative: _____

Contractor's/responsible tradesperson's representative: _____

The following system components were commissioned in the presence of the above representatives:

No	Component, item of equipment[1)]	Comments
1	Building service connection	
2	Main stopcock	
3	Nonreturn valve	
4	Pipe isolation valve	
5	Filter	
6	Pressure reducing system	
7	Distribution pipework	
8	Riser/isolating valves	
9	Floor pipework/isolating valves	
10	Riser vacuum breaker/drip pipe	
11	General safety devices/drip pipe	
12	Draw-off points with individual safety device	
13	Hot water system/drinking water heater	
14	Safety valve/vent pipe	
15	Circulation pipe/circulation pump	
16	Metering system	
17	Softening system	
18	Pressure booster system	
19	Fire extinguishing and protection system	
20	Swimming pool inlet	
21	Sampling valve	
22	Appliance	
23	Drinking water tank	
24	Other system components	

[1)] Cross out and add items as appropriate.

Additional comments by client:

Additional comments by contractor:

The training to familiarise the user with the system was carried out, and all of the necessary operating documentation and available operating and maintenance instructions on the attached list handed over.

Place _____ Date _____

Signed (client/representative) _____ Signed (contractor/representative) _____

Source: ZVSHK Code of Practice

11.4 Pressure test record for gas system

Building project: _____

mapress

Client's representative: _____

Contractor's/responsible tradesperson's representative: _____

Material: _____ Method of connection: _____

Maximum working pressure in bar: _____

The water supply system was tested ☐ as a complete system ☐ in _____ sections

Test fluid ☐ air ☐ nitrogen ☐ carbon dioxide ☐ .....

All pipes were sealed with metal plugs, caps, blanks or blind flanges.

Low pressure gas system < 100 mbar

1. **Preliminary test**

1.1 Valves
- ☐ removed
- ☐ fitted (nominal pressure ≥ test pressure)

1.2 ☐ Test pressure of 1 bar

1.3 ☐ Test period of 10 minutes

1.4 ☐ The pipes were tapped (to dislodge dirt and dust)

1.5 ☐ Test pressure did not drop during the test period

1.6 ☐ The test pressure was relieved at the draw-off point furthest away

2. **Main test**

2.1 ☐ The values were removed

2.2 ☐ Test pressure of 110 mbar

2.3 ☐ Test period 10 minutes (after temperature equalisation)

2.4 ☐ Test pressure did not drop during the test period

2.5 ☐ The system is gastight

Medium pressure gas system < 1 bar

1. **Load and leak test**

1.1 ☐ Valves removed (nominal pressure ≥ test pressure)

1.2 ☐ Test pressure of 3 bar

1.3 ☐ Temperatures allowed to equalise for about 3 hours

1.4 ☐ Test period ≥ 2 hours (if pipe volume greater than 2000 litres add 15 minutes to the test period for each additional 100 litres)

1.5 ☐ Test pressure did not drop during the test period

1.6 ☐ The system is gastight

1.7 Pressure test documented with
- ☐ class 1 pressure recorder with class 0.6 pressure gauge
- ☐ other

1.8 ☐ Pressure test documentation appended

The test pressure was relieved at the draw-off point furthest away.

Place _____ Date _____

Signed (client/representative) _____ Signed (contractor/representative) _____

Source: DVGW G 600 • TRGI 1986/96

11.5 Commissioning and familiarisation training record for gas system

Building project: _____

mapress

Client's representative: _____

Contractor's/responsible tradesperson's representative: _____

The following system components were commissioned in the presence of the above-mentioned representatives:

No	Component, item of equipment[1)]	Comments
1	Building service connection	
2	Main isolating valve	
3	Pressure regulator	
4	Distribution pipework	
5	Risers/isolating valves	
6	Floor pipework/isolating valves	
7	Flued gas appliances: instantaneous and storage water heaters	
8	Combination water heater and central heating boiler	
9	Gas condensing boiler	
10	Gas space heater	
11	Gas fired air heater	
12	Gas fired radiant heater	
13	Gas range with CH	
14	Gas cooker	
15	Gas heat pump	
16	Gas burner	
17	Flue gas system with or without flow-operated safety device	
18	Flue system for air and flue gas	
19	Thermally/mechanically operated flue gas dampers	
20	Supplementary air Ventilation and combustion air	
21	Air supply, flue gas, combustion air, combustion air chamber, combination chamber and external joints	
22	Outside air supply elements (air inlets) other system components	

[1)] Cross out and add items as appropriate

Additional comments by client:

Additional comments by contractor:

The training to familiarise the user with the system was carried out, and all of the necessary operating documentation and available operating and maintenance instructions on the attached list handed over.

Place _____ Date _____

Signed (client/representative) _____ Signed (contractor/representative) _____

Source: DVGW G 600 • TRGI 1986/96

11.6 Acceptance record

Building project: _____

_____

_____

mapress

Client's representative: _____

Contractor's/responsible tradesperson's representative: _____

Construction contract of _____

( ) Water supply system ( ) Air conditioning system ( ) Heating system

Acceptance negotiated on _____

The following items and services were accepted: _____

_____

_____

_____

The following defects were found:

_____

_____

_____

The following unfinished work is insignificant and will be completed by the Contractor without delay and no later than_____:

_____

_____

_____

The following unfinished defects are insignificant and will be remedied by the Contractor without delay and no later than_____:

_____

_____

The items and services provided by_____ (Contractor) are hereby accepted.

_____ Place

_____ Date

_____ Signed (client/representative)

_____ Signed (contractor/representative)

12.1 European directives

Name	Title
Health and Safety Framework Directive	[89/391/EEC, 12 June 1989] Directive on the introduction of measures to encourage improvements in the health and safety of workers at work
Construction Products Directive	[89/106/EEC, 27 December 1988] Directive on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products
Drinking Water Directive	[98/83/EC, 3 November 1998] Directive on the quality of water intended for human consumption
Water Framework Directive	[2000/60/EC, 23 October 2000] Directive establishing a framework for community action in the field of water policy
DIN EN 806	[April 2001 edition] Technical Regulations For Installing Drinking Water Supply Systems
DIN EN 1057	Seamless Circular Copper Pipes for Water and Gas in Water Supply and Heating Systems
DIN EN 1412	Copper and its Alloys European Materials Numbering System
DIN EN 1717	[May 2001 edition] Protection of Drinking Water Against Impurities in the Water Supply System and General Requirements for Safety Devices for Preventing Contamination of Drinking Water by Back Pressure and Back Siphonage
DIN EN 10088	[1995 German version] Directory of Stainless Steels
DIN EN 10305	[February 2003 version] Precision Steel Pipes Technical Terms of Supply
DIN EN 10312	[April 2003 edition] Welded Stainless Steel Pipes for Aqueous Liquids including Drinking Water – Terms of Supply
DIN EN 12329	[September 2000 edition] Corrosion Protection of Metals. Galvanising with Supplementary Treatment on Iron
DIN EN 12828	[June 2003 edition] Heating Systems in Buildings Designing Hot Water Heating Systems

12.0 Technical Standards

Name	Title
prEN 12502	Corrosion Protection of Metals Likelihood of Corrosion in Water Pipe Systems Part 1: General Part 2: Overview of Factors Affecting Copper and Its Alloys Part 3: Overview of Factors Affecting Hot Dip Galvanised Steel Part 4: Overview of Factors Affecting Stainless Steels Part 5: Overview of Factors Affecting Cast Iron, Unalloyed and Low Alloy Steels
DIN EN ISO 900	[August 1994 edition] Quality Management Systems Quality Assurance Model/QM Description in Design, Development, Production, Assembly and Maintenance
DIN EN ISO 8044	Corrosion of Metals and Alloys Basic Terminology and Definitions
Equipment Safety Legislation	Legislation covering technical equipment and general administrative provisions
Gas Appliances Directive	[90/396/EEC] Directive on the safety requirements of appliances burning gaseous fuels and their accessories and requirements for bearing the CE mark
Machinery Directive	[98/37/EC (previously 89/392/EEC), 14 June 1989] Directive on the approximation of the laws of the Member States relating to machinery
Product Liability Directive	[85/374/EEC, 25 July 1985] Directive on the approximation of the laws, regulations and administrative provisions of the Member States concerning liability for defective products
Produktsicherheitsgesetz	[92/59/EEC, 29 June 1992] Directive on the approximation of the laws, regulations and administrative provisions of the Member States concerning general product safety

12.2 German legislation, regulations and standards

Name	Title
AGI Q 135	Lagging; Determination of Content of Water Soluble Chlorides of Mineral Fibre Lagging Materials
AGI Q 151	Lagging; Corrosion Protection with Lagging of Equipment Against High and Low Temperatures
Regulations for the Use of Equipment	[AMBV] Health and Safety Regulations Governing the Use of Equipment at Work
State Building Regulations	[Edition] State Building Regulations for …
DIN 1988	[TRWI] Technical Regulations for Installing Water Supply Systems
DIN 2999	[1982 edition] Whitworth Pipe Threads for Threaded Pipes and Fittings (in conjunction with International Standard ISO 7/1)
DIN 4102	Fire Characteristics of Building Materials and Structural Members Part 1: Building Materials – Terminology, Requirements and Tests
DIN 4102, Part 11	Fire Characteristics of Building Materials and Structural Members. Pipe Coatings, Sleeves, Fire Stops, etc.
DIN 4109	[Published approximately July 2000] Noise Insulation in Structural Engineering
DIN 4140	[November 1996 edition] Insulation of Equipment and Building Services Compliance with Minimum Gaps between Insulated Pipes.
DIN 17455	Welded Circular Stainless Steel Pipes for General Requirements
DIN 30672	Anticorrosion Tapes and Shrink-on Sleeving, Anticorrosion Taping of Pipes
DIN 50929	Likelihood of Corrosion of Metals in Environment Liable to Promote External Corrosion (Parts 1-3) Part 2: Indoor Components
DIN 50930	Corrosion of Metal Bores of Pipework (Parts 1, 5 & 6) Part 1: Corrosion of Metal Bores of Pipework Carrying Water, General Part 4: Evaluation of the Likelihood of Corrosion of Stainless Steels Carrying Water Part 5: Evaluation of the Likelihood of Corrosion of Copper Carrying Water

12.0 Technical Standards

Name	Title
DIN 50930, Part 6	Corrosion of Metal Bores of Pipework and Insides of Tanks and Equipment Carrying Water Part 6: Affect on Water Quality
DIN 50961	[September 2000 edition] Electroplating Tools, Galvanising on Iron. Terminology, Corrosion Testing and Corrosion Resistance (applies only in conjunction with DIN EN 12329)
DIN VOB 18380	VOB General Terms and Conditions Applicable to Building Contracts Part C: General Contractual Conditions (ATV), Heating Systems and Central Heat Generation Systems
DVGW G 260	[July 1997 edition] Gas Composition
DVGW G 600/TRGI 86/96	[DVGW TRGI 1986, 1996 edition] Technical Regulations for Installing Gas Systems
DVGW GW 392	Seamlessly Drawn Copper Pipes for Gas and Water Systems; General and Test Requirements
DVGW VP 614	[Provisional Test Guidelines: Permanent] Connections for Metal Gas Pipes: Pressed Connectors
DVGW W 270	Water Hygiene/Microbiology, Propagation of Microorganisms on Materials for Water Supply Systems
DVGW W 534	Connectors and Connections for Pipes for Installing in Water Supply Systems; Requirements and Testing
DVGW W 541	Steel and Titanium Pipes for Installing in Water Supply Systems; Requirements and Testing
DVGW W 551	[1993 edition] Water Supply Heating and Pipe Systems, Technical Measures for Reducing the Growth of Legionella
DVGW W 552	[1996 edition] Water Supply Heating and Pipe Systems; Technical Measures for Avoiding the Growth of Legionella Clean-up and Operation
DVGW W 553	[April 1996 edition]
Energy Saving Legislation	[EnEG] Saving Energy in Buildings
Energy Saving Regulations	[EnEV] Thermal Insulation and Energy Saving Equipment in Buildings
Energy Industry Legislation	[EnWG] Public Electricity and Gas Supplies
Firing System Regulations	[FeuV]
Equipment Safety Legislation	[GSG] Relating to Technical Equipment

Name	Title
Pipework Guidelines	[LAR] Guidelines for Pipework Fire Protection Requirements
KTW Recommendations	Synthetic Materials in Contact with Drinking Water
Model Building Regulations for the German States	[MBO]
Model Firing System Regulations	[MFeuV]
Drinking Water Regulations	[TrinkwV] Relating to Drinking Water and Water for the Food Industry
VDI Guidelines 2035	[April 1996 edition] Drinking Water Heating and Pipe Systems, Technical Measures for Avoiding the Growth of Legionella - Clean-up and Operation Provisional Test Guidelines for Permanent Connections for Metal Gas Pipes, Pressfitting Connectors Avoidance of Damage in Hot Water Heating Systems, Scaling in Water Heating and Hot Water Heating Systems
VDI 6023	Hygiene Conscious Design, Installation, Operation and Maintenance of Water Supply Systems
Water Resources Legislation	[WHG] Control of Water Resources
ZVSHK Code of Practice	[March 1993 edition] Guidelines for Flushing Water Supply Systems to TRWI DIN 1988
ZVSHK Code of Practice	Pressure Testing of Water Supply Systems to TRWI DIN 1988 with Compressed Air or Noncorrosive Gases

13.0 Liability

13.1 Transferred liability agreements with ZVSHK and BHKS

Transferred liability agreements have been concluded with the **Heating, Plumbing and Air Conditioning Federation** (ZVSHK), and with the **Federal Association for Heating, Air Conditioning, Plumbing and Building Services** (BHKS), for the benefit of the tradespeople and installation contractors indirectly represented by these organisations.

Their full wording is available from the associations or Mapress GmbH & Co. KG.

Their most important aspects may be summarised as follows:

Mapress accepts liability for damages arising from the causes specified in the agreement and in the following applications

- **Hot water heating systems**
- **Water supply systems**
- **Gas systems**

and relating to the following products

- ***mapress STAINLESS STEEL*** **pipe and pressfitting**
- ***mapress EDELFLEX*** **pipe and pressfitting**
- ***mapress CARBON STEEL/SUPER SIZE HEATING*** **pipe and pressfitting**
- ***mapress BALL VALVE***
- ***mapress COPPER*** **pressfitting**
- ***mapress STAINLESS STEEL GAS*** **pipe and pressfitting**
- ***mapress COPPER GAS*** **pressfitting**
- ***mapress CUNIFE*** **pipe and pressfitting**
- ***mapress MAM*** **pipe and pressfitting**
- ***mapress*****/Novopress pressing tool**

The liability essentially extends to

- **free replacement of defective parts,**
- **necessary removal and reinstallation costs, and where applicable**
- **other consequential damages up to a maximum sum of 1 million euros per event**

Liability is accepted from the time of installation of the mapress products and covers the contractual warranty period specified in the BGB (German Civil Code) and VOB/B (Terms and Conditions Applicable to Building Contracts).

Other details, such as the obligations of the installer, are to be found in the texts of the agreements.

13.2 Declaration of liability

§ 1 Scope

This Declaration of Liability (Declaration) applies to all Contractors that install in Germany products in the *mapress* Pressfitting System range for Water Supply and Heating Systems of Geberit Mapress GmbH (Geberit Mapress) for water supply and hot water heating applications. Such products must be supplied in accordance with the following provisions and bear *mapress* markings. This Declaration also covers all of the products also distributed by Geberit Mapress and listed in the Geberit Mapress Installation Guidelines for Water Supply and Heating Systems and in the Geberit Mapress Product Range for Water Supply and Heating Systems.

§ 2 Liability

If, as a result of culpable
a) design errors
b) manufacturing defects
c) material defects
d) instruction deficiencies, eg in the Installation Guidelines for the *mapress* Pressfitting System and/or
e) lack of properties assured generally or individually in writing by Geberit Mapress, the Installation Contractor (Contractor) suffers damages through the use of brand new products covered by this Declaration, and the Contractor's Client (Client) justifiably claims against the Contractor in this respect, Geberit Mapress agrees: (where payment is reduced) to reim burse the invoiced amount, up to a maximum of €250,000 per event, by which the Client has justifiably and appropriately reduced its payment to the Contractor, or alternatively to provide a replacement delivery free point of use of the parts necessary to remedy the damage, and to accept the neces sary removal and installation costs and the costs of restoring the original condition of the building, unless repair costs are objectively disproportionate to the advantage obtained by the Client as a result of the deficiency being remedied (§ 635, Clause 3 of German Civil Code (BGB)). Geberit Mapress also agrees to accept the other direct consequential damages up to a maximum sum of €1m per event. All of the monetary payments will be made without VAT, unless in the case of remedying of deficiencies Geberit Mapress has expressly instructed the Contractor to carry out the work. Claims arising from this Declaration are subject to a limitation period as agreed between the Contractor and its counterparty in relation to deficiencies but not exceeding five years after acceptance of the work carried out by the Contractor. In the case of damages the Contractor must provide Geberit Mapress with documentary evidence of the date of acceptance. Geberit Mapress supplies a standardised, coherent pressfitting system consisting of *mapress* pressfittings and *mapress* pipes. This Declaration does not apply when other (non-*mapress*) pipes, fittings, seal rings or pressing tools (pressing unit and/or pressing jaws/pressing collar) not approved by Mapress are used. It only applies to *mapress COPPER* provided the requirements of the Geberit Mapress Installation Guidelines in relation to the pipes are met.

§ 3 Contractor's Obligations

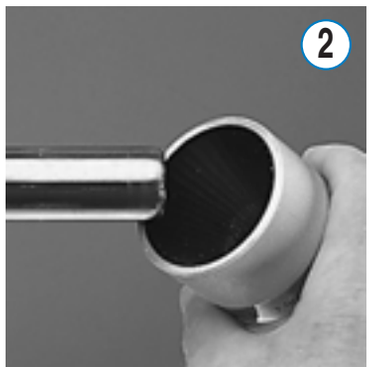
The Contractor must: follow the edition of the Geberit Mapress Installation Guidelines current at the time of installation in conjunction with accepted practice and the written service conditions with any restrictions imposed, immediately notify Geberit Mapress in writing when the Contractor discovers or should have discovered any damage that has arisen, giving a description of the event, immediately carry out all measures necessary to reduce the damage, give Geberit Mapress the opportunity after receiving the notification of damage to determine the damage itself or to have it appraised by an expert. Immediately after receiving the notification Geberit Mapress must tell the Contractor the alternative to be adopted. Geberit Mapress is entitled to demand the opportunity to remedy the damage itself or have it remedied by a third party. Geberit Mapress must make the parts responsible for the damage available immediately and store them until the remedial work is ultimately completed. Geberit Mapress must tell the Contractor the result of the investigation. If the Contractor fails to meet one of the above obligations, Geberit Mapress is relieved of the liability arising from this Declaration. The liability persists insofar as this failure does not affect the opportunities for determining the damage or its level.

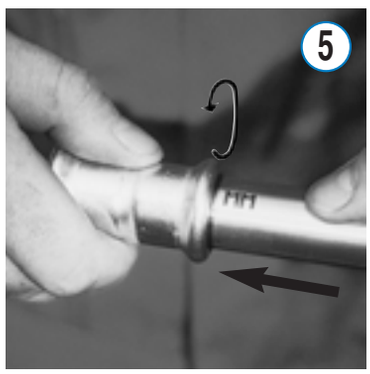
The scope and associated legal consequences of this Declaration are governed by German law.

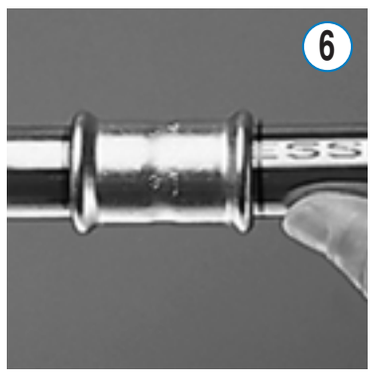
Langenfeld, February 2002
Geberit Mapress GmbH

14.0 Installation Quick Reference

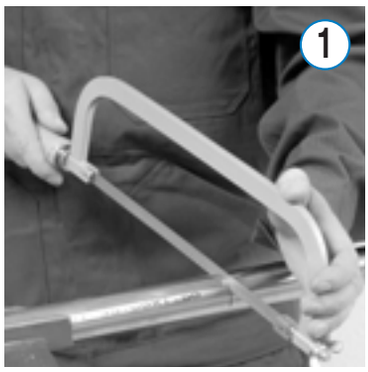
14.1 *mapress STAINLESS STEEL/SUPER SIZE HEATING/STAINLESS STEEL GAS/CUNIFE mapress COPPER* and *COPPER GAS* with bare DIN EN/DVGW copper pipes

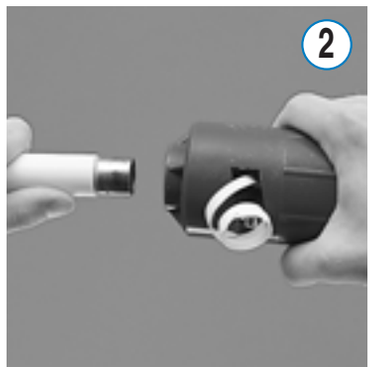


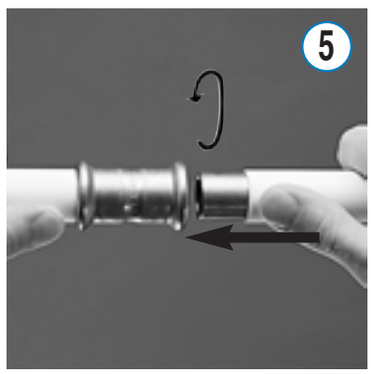


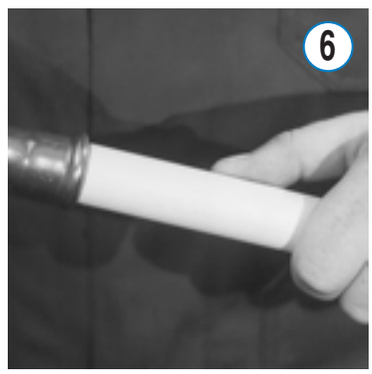


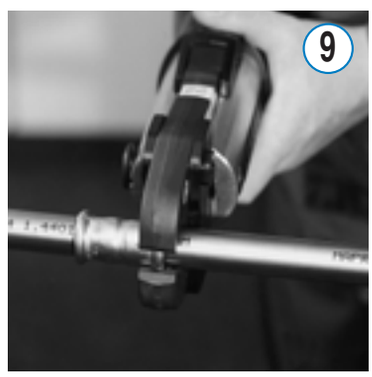
14.2 *mapress CARBON STEEL*
mapress COPPER and *COPPER GAS* with coated DIN EN/DVGW copper pipes





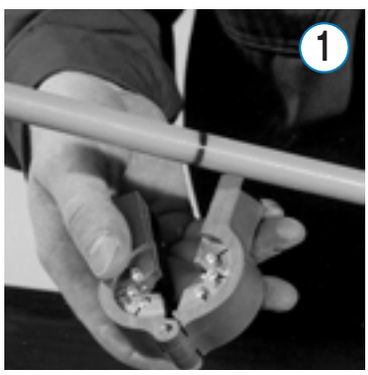


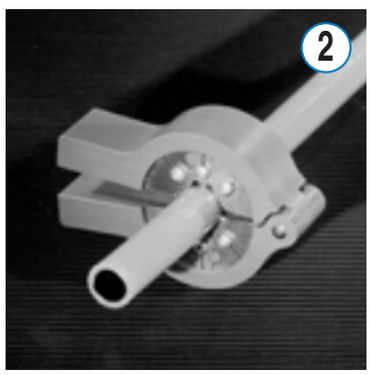


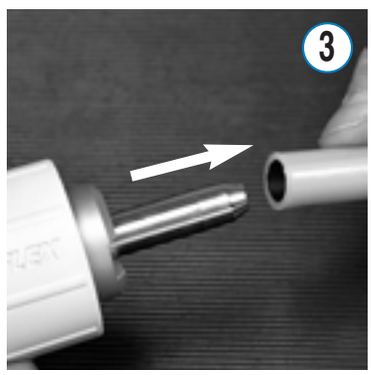


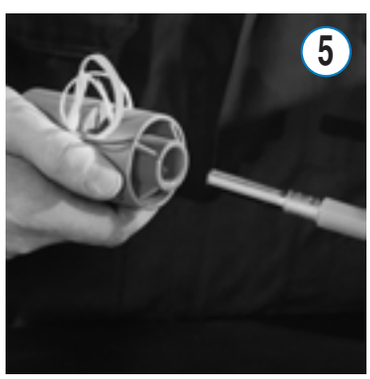
14.0 Installation Quick Reference

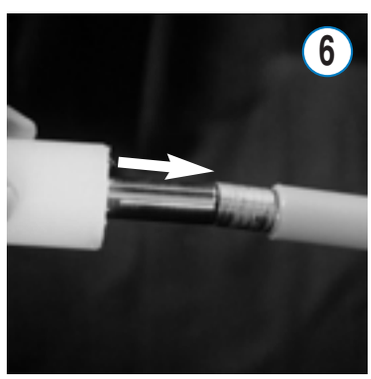
14.3 *mapress EDELFLEX*

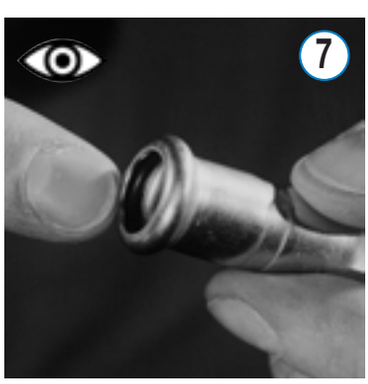


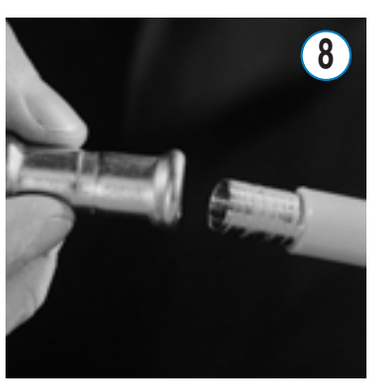


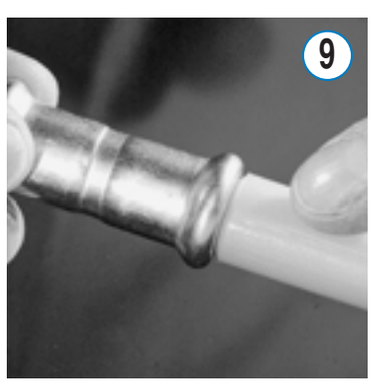


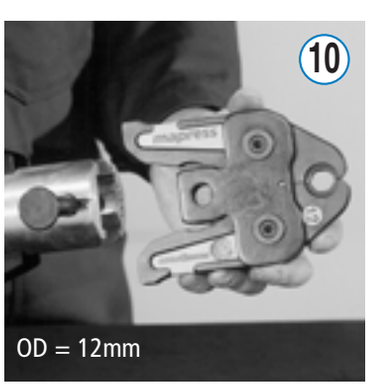


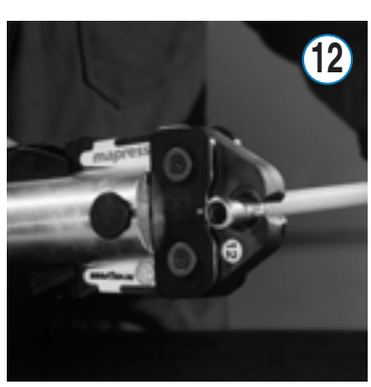




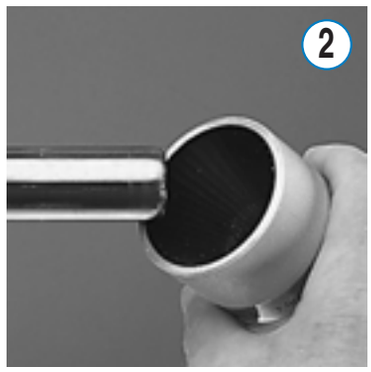


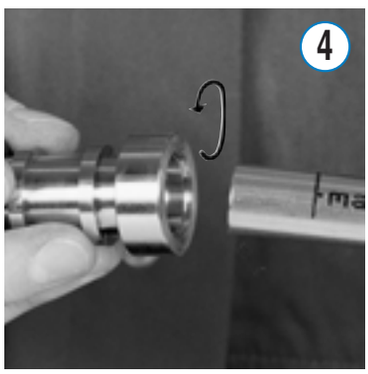


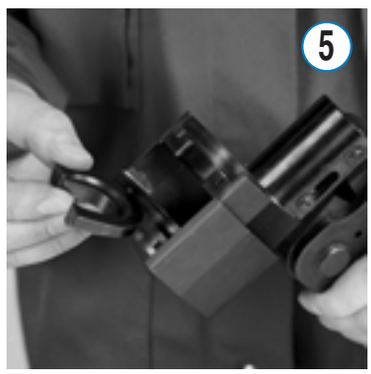


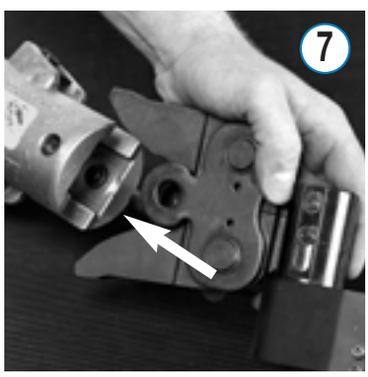


14.4 *mapress MAM*









Notes