COPPER FIX®

robust and well-proven

KE KELIT®
INNOVATIVE PIPE SYSTEMS

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Copper pipe systems

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KE KELIT quality targets

1. Our quality targets extend beyond the quality of the products themselves and include all areas required by ÖNORM EN ISO 9001.
2. Suppliers and customers are integrated into the order-related quality assurance system to ensure that errors are prevented at an early stage.
3. All employees are responsible for the quality of their own work, and should be highly motivated to perform continuous self-assessment.
4. In our view, meeting specific market and customer demands is the pre-requisite to achieving the highest levels of customer satisfaction.
5. A responsible attitude towards the environment, both now and in the future, is the driving force that pushes us to manufacture long-lasting products using environmentally-friendly processes.

Senator Karl Egger

Honorary Managing Director

Contents

Note:
Please consult this handbook for installation rules, specifically in regard to the joining technology, prior to using COPPERFIX for the first time.

Approvals – Tests – System Testing

Both the individual parts and the entire system are subject to basic and regular tests. Multiple integrated management systems were certified by Quality Austria to ensure that quality targets are achieved:

ÖNORM EN ISO 9001	–	Reg.no. AT 00366/0
ÖNORM EN ISO 14001	–	Reg.no. AT 02097/0
ÖNORM EN ISO 10005	–	Reg.no. AT 00001/0
ÖNORM EN ISO 50001	–	Reg.no. AT 0126/0

Self-monitoring at the KE KELIT quality laboratory:

- Raw material parameters
- Dimensions and tolerances
- Processing quality

Third-party monitoring by authorized testing authorities:

- System testing, material identity
- Fittings tests
- Corrosion behaviour
- The ÖVGW quality mark results from the sum of self-monitoring and third-party monitoring

Registration No. for copper
press system: W 1.741

Copper and copper alloy fittings press fittings for metal-plated pipes
ÖNORM EN 1254/7
Drinking water suitability
ÖNORM B 5014-1 and -3

Technical regulations

DVGW work sheet W 534/2004, quality standard QS-W 402
„Pipe systems for hot water and cold water installations made of copper and stainless steels“
ÖNORM EN 12502-2 Protection against corrosion of metal materials

Threaded fittings

- conical thread in accordance with ÖNORM EN 10226
- cylindrical thread in accordance with ISO 228-1

The COPPERFIX fitting concept

A balanced, comprehensive copper fitting concept for a

simple, robust, well-proven application

Application areas:

- Drinking water systems
- Heating systems
- Solar systems
- Compressed air systems
- Cooling and chilling systems

Advantages

- non-releasable press connection „leak before pressed"
- low thermal longitudinal expansion
- thin-walled, large cross-section - small dimensions

COPPERFIX press fittings

- hot-drawn fittings: Cu-DHP material CW024A
- Threaded fittings: Bronze material CC499K
- Drinking water suitability
- non-corrosive surface
- non-releasable press system

Copper pipes

EN1057 Type X Copper Tube is stocked by KE KELIT NZ and the standard pipe supplied

Dimension mm	Nom. Diameter (Outside)	Wall thickness mm	Half Hard bar+	Hard bar+	Annealed bar+
15	15	0,7	*58	-	45
18	18	0,8	*56	-	43
22	22	0,9	*51	-	39
28	28	0,9	*40	-	31
35	35	1,2	42	*51	33
42	42	1,2	35	*43	27
54	54	1,2	27	*33	21
66,7	66,7	1,2	20	*27	17
76,1	76,1	1,5	24	*29	18
88,9	88,9	2	23	*29	19
108	108	1,5	17	*20	13
133	133	1,5	14	*17	10
159	159	2,0	15	*18	12

*Tube temper supplied by KE KELIT NZ

EN1057 Type X Copper Tube is used for above ground services including drinking water supply, hot and cold water systems, sanitation central heating and other general applications

EN1057 Type Y Copper Tube is avabille via indent only. Please contact NZ for more information

Dimension mm	Nom. Diameter (Outside)	Wall thickness mm	Half Hard bar+	Hard bar+	Annealed bar+
15	15	1,0	87	-	67
18	18	1,0	72	-	55
22	22	1,2	69	-	53
28	28	1,2	55	-	42
35	35	1,5	54	65	41
42	42	1,5	45	54	34
54	54	2,0	47	56	36
66,7	66,7	2,0	37	45	28
76,1	76,1	2,0	33	39	25
108	108	2,5	29	34	22

EN1057 Type X Copper Tube is used for underground works and heavy duty requirements including hot and cold water supply, sanitary plumbing, heating and general engineering

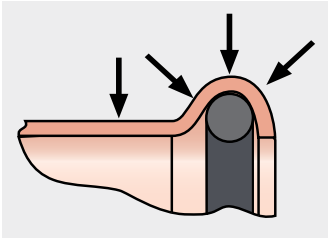
COPPERFIX application areas

COPPERFIX press fittings are made of Cu-DHP CW024A (hot-drawn fittings) material, as well as bronze material 2.109 (threaded fittings).
The COPPERFIX press fittings are “leak before pressed” and fitted with EPDM gaskets in the factory.

Operating conditions	O-rings	Operating temperature	short-term	Operating pressure
Drinking water installations	EPDM (black)	±0°C bis +85°C	+130°C	max. 10 bar
Heating installations	EPDM (black)	-20°C bis +110°C	+130°C	max. 16 bar
Cooling water installations	EPDM (black)	-20°C bis +110°C		max. 16 bar
Solar systema	Viton (FPM green)	-20°C bis +200°C	+230°C	max. 10 bar
Compressed air	EPDM (black)	-20°C bis +110°C		max. 10 bar
Compressed air	Viton (FPM green)*	-20°C bis +110°C		max. 10 bar

* Viton (FPM green) O-rings with an oil content in the compressed air over 25 mg /m³

Pressing with M-contour - „leak before pressed“



Advantages of M-contour:

The fitting is pressed onto the pipe using the radial pressing method. This created longitudinal tractions and an impermeable connection.

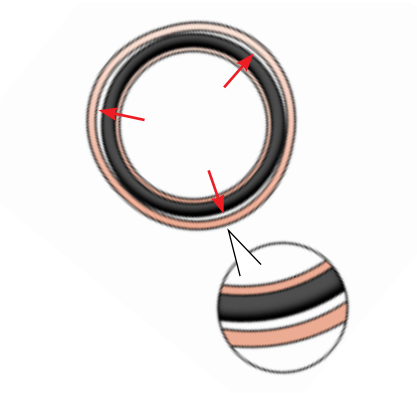
The seamless transition between the fitting and pipe effectively prevents the penetration of dirt or dust particles into the sealing chamber of the fitting.

The contour edge ensures additional mechanical securing of the pipe-fitting connection. The position of the O-ring at the beginning of the fitting enables quick and secure checking/replacement of the sealing element. With the M-pressing, the sealing chamber is deformed evenly from three sides, due to which a wide contact surface of the O-ring is achieved. KE KELIT recommends the use of the offered original press tools.

If third-party tools should be used, please note the system approval for COPPERFIX pressings and the processing instructions of the respective manufacturer.

The “leak before pressed” function

The mechanical characteristics of copper differ from stainless steel and C-galvanised steel. Copper is a much softer material, so that it is possible to create the “leak before pressed function in the fitting with an oval design, so that with lower pressures during the pressure test, leaks occur. This structure has the same function as the “leak before pressed” O-ring for C-galvanised steel and stainless steel, namely for finding forgotten press connections and avoid errors in the installation process.



Functioning of COPPERFIX with LBP function

The oval design of the fitting ensures that a target leakage point is created at 3 points between the fitting and O-ring.

Through the pressing, the fitting is put into the required shape.
The result is the accustomed secure connection, completely watertight and airtight.

Assembly instructions
COPPERFIX - press connection

Only trained and qualified installers may carry out the work.

1. Specification of the pipe lengths

The pipe lengths can be determined using the Z-measurement method. Check the pipe for surface damage and contamination!

The fittings measurements and the Z-measurements can be taken from the programm overview.

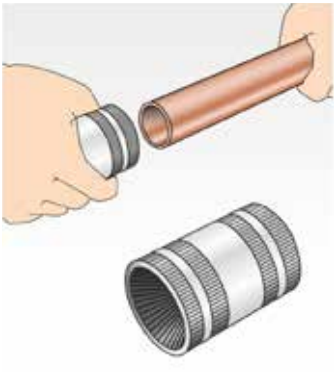
2. Separation of the pipes

Always cut to length at a right angle!

- with pipe cutter
- pipe cutter with electric motor
- fine-toothed handsaw
- mechanical saw with electric motor
- for processing copper pipes, the tools must be suitable for copper
- pipes must never by separated using separating disks, saws with rough toothing.
- Saw cuts must be carried out professionally and completely, i.e. breaking apart of cuts that are not made completely is NOT permitted!

3. Deburring the pipes

In order to avoid damaging the sealing elements when pushing on the press fittings, after cutting to length, the pipe ends must be carefully deburred and cleaned on the inside and outside.



- with WZ210 pipe deburrer up to d54 mm
- electric pipe deburrer
- Smoothing file – semi-circular (alternatively)
- sawdust or similar that adhere to the pipe must be removed
- for copper, stainless steel or C-galvanised steel pipes, separate pipe deburrers must be used.

4. Inspection of the pipes and fitting

Prior to assembly, the following points must be checked:

- the pipes must be cut off at right angles, deburred and round
- checking of the functionality and visual inspection of the O-rings in the fitting.
- check pipe and fittings for foreign bodies (dirt, burrs etc.), clean this off, if necessary.

5. Marking of the insertion depth on the pipe

In order to ensure secure and professional pressing, prior to assembly, the insertion depth must be permanently marked on the press fitting with insertion ends.

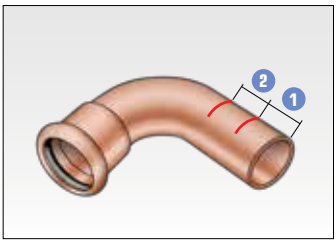
- marking of the insertion depth with WZ240 press insertion gauge up to d108 mm

6. Insertion depth for COPPERFIX-press fittings

Dim	mm	Dim	mm
d15	20	d54	35
d18	20	d66,7	50
d22	21	d76,1	50
d28	23	d88,9	64
d35	26	d108	64
d42	30		

When fittings with adjustable ends are shortened, sufficient length should remain to accommodate both the insertion depth and the minimum bending radius.

Insertion depth for COPPERFIX press fittings

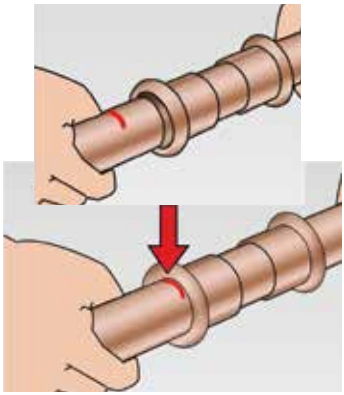


1. maximum cutting length – dimension specific
2. insertion depth – dimension specific

The pressing procedure

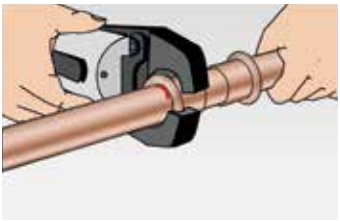
7. Insertion of the pipes into the press fittings

- slide the pipe in while turning slightly and pressing in an axial direction at the same time up to the marked insertion depth
- The marking of the insertion depth must still be visible on the pipe!
- For fittings without stop mechanism (e.g. sliding sleeves), the pipe must be pushed into at least the marked insertion depth
- it is not permitted to “tip in” the pipe into the press fittings, as it can lead to damage to the O-ring
- depending on assembly, the O-ring may additionally be treated with water
- IN NO CASE may oils or fats be used as lubricants



8. Pressing

It must be ensured that the instructions for operating the device are observed, as well as all pressings only being carried out with pressing machines in a proper condition and regular maintenance is performed according to the specifications of the pressing machine manufacturers.



- it must be ensured that the pressing jaws / press slings **(M-contour)** that are appropriate to the fitting dimension are used
- prior to pressing, the press jaw **(M-contour)** must be checked for dirt and cleaned off, if necessary
- checking of the press jaws for damage or similar
- the groove of the press jaw/press sling must enclose the sealing chamber of the press fittings

WZ280

WZ281

WZ282/WZ288

KE KELIT recommends:

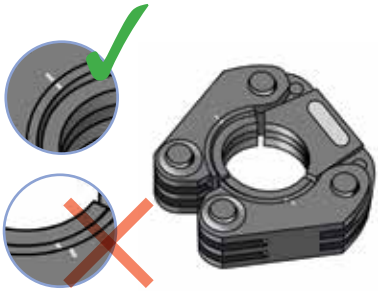
WZ280 press jaws-M d12-35mm

WZ281 press adapter d35-54mm in conjunction with

WZ282 press sling-M d42-54mm

WZ281 press adapter d67-108/1mm and 108/2mm in conjunction with

WZ288 press sling-M d67-108mm

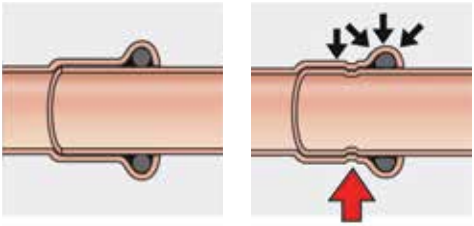


In order to ensure the proper function of the press slings, the sliding segments must be movable. It must be ensured that the markings on the sliding segments and the shells form one line in the starting position.

Attention! In the dimension d108 mm, two pressings are necessary with different WZ287 press adapters (108/1) - ZB 221 and (108/2) - ZB 222!

- the pressing procedure must be carried out without interruption up to the end, KE KELIT offers pressing machines with a forced return
- after pressing, the marking must be visible on the pipe

The proper processing ensures a secure and permanently tight connection.The deformation of the pipe and coupler by the pressing contour is a well-proven connection with longitudinal traction.



Before pressing

After pressing

- After 50 respective pressings in the dimensions of d42 –108mm, the joints and sliding elements press slings must be sprayed with graphite oil!
- The regular maintenance of machines and press jaws must be performed in accordance with the manufacturers' specifications. As a guideline, once per year / after 2500 pressings applies.

Dismantling of the stainless steel push fittings

Note Page 10–11 points 1-6 for assembly!

Use the dimension-based WZ260 STEELFIX stainless steel push disassembling tool for dismantling.

1. The NF457 fittings in the dimensions d15-28 mm can be dismantled in the fitting again using the dismantling tool by pushing together and sliding the plastic sleeve into the fitting and by relieving the grab ring (bracket) in the fitting.
2. By screwing on the end ring (TDX) with the dismantling tool, the fittings NF457A of the dimensions d35–54 mm can be pulled off of the pipe again.
3. The end ring (TDX) of the grab ring is relieved with the WZ260 dismantling tool, by turning the inner ring in the dismantling.
4. The fitting can be released from the pipe.

Both of these fittings are specifically designed for the press-off process and can also be mounted on C-galvanised steel, stainless steel and copper pipes.

5. Spare parts for NF457A d35–54 mm are available seperately

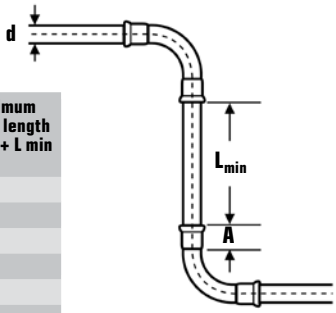
- NF980 stainless steel push-fitting O-ring
- NF982 stainless steel push-fitting grab ring
- NF984A stainless steel push-fitting disassembly - end ring (TDX)

Press connection

Assembly and space requirements

For the assembly of COPPERFIX pipe systems, several assembly-related measurements of the fittings and pipes must be observed.
In order to ensure professional processing, important minimum distances and the space requirement for the assembly must be shown in the table.
The measurements are based on the general installation geometries and are schematically illustrated in Figures A, B and C.

Pipe fitting - minimum distance and minimum pipe length



Dimension d mm	Fitting insertion depth A mm	Minimum distance L min mm	Minimum pipe length 2xA + L min
15	20	10	50
18	20	10	50
22	21	10	52
28	23	10	56
35	26	10	62
42	30	20	80
54	35	20	90
66,7	50	30	130
76,1	50	55	140
88,9	64	65	193
108	64	80	208

Dim. d mm	a mm	b mm	c mm	Dim. d mm	e mm	f mm
15	56	20	75	25	28	40
18	60	20	75	25	28	40
22	65	25	80	31	35	40
28	75	25	80	31	35	60
35	75	30	80	31	44	70
42	140/115*	60/75*	140/115*	60/75*	75*	70
54	140/120*	60/85*	140/120*	60/85*	85*	70
66,7	145*	110*	145*	100*	100*	70
76,1	140*	110*	165*	115*	115*	80
88,9	150*	120*	185*	125*	125*	90
108	170*	140*	200*	135*	135*	100

*) Press slings

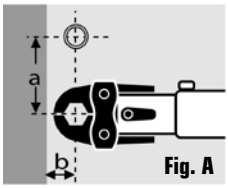


Fig. A

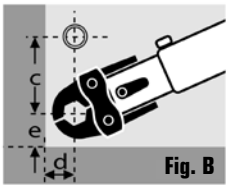


Fig. B

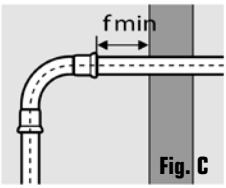


Fig. C

Sizing and pressure loss for copper pipes

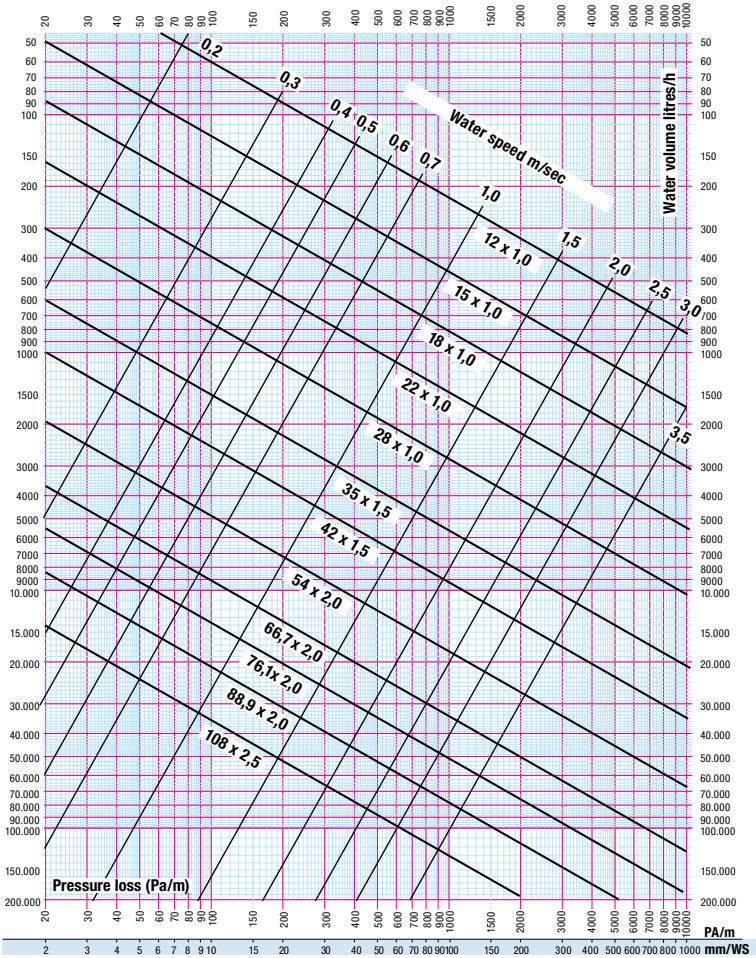
The calculation of the individual resistances can be found in the handbook on Page 18.

Copper pipe:
d12, 15, 18, 22, 28, 35, 42, 54, 67, 76, 89, 108 mm

The calculation of the pressure losses for water takes place according to the Nikuradse formula:

$$R = 8{,}48455 \cdot 10^{9} \cdot \dot{m}^{1{,}77487} \cdot di^{-4{,}80701}$$

Pipe roughness: 0.0015 mm
Water temperature 45°C
R = Pipe friction pressure gradient (Pa/m)
$\dot{m}$ = Mass flow (l/sec)
di = Inner pipe diameter (mm)



Pressure test - Heating systems

KE KELIT recommends performing the leak-tightness test on the basis of EN 14336. Every pressure test is a snapshot of the actual state and cannot be a guarantee against installation errors.

Attention! Prior to every pressure test, ensure that all points of the assembly instructions (page 10 to 13) have been followed.

When using "leak before pressed" fittings, a functional test must be performed according to the manufacturer's specifications.

For temperature differences (> 10 K) between the ambient temperature and fill water temperature, a waiting time of 30 minutes must be adhered to after filling the system with drinking water so the temperature can equalize.

Test pressure:	0.05 MPa (0.5 bar) up to max. 0.2 MPa (2 bar)
Test duration:	15 minutes after temperature equalization between pipe and test medium.
Test differential pressure:	0.0 bar

A visual check must then be performed on all pipe connections.

The functional test is not necessary if the pressure test is carried out using air or an inert gas, on condition that the procedure for pressure testing drinking water systems, outlined on page 26 of this handbook, is followed.

Pressure test

The pipe network must be tested with 1.3 times system pressure. Only use pressure measurement devices that allow a pressure change of 0.1 bar to be easily read off. The pressure measurement device should preferably be at the lowest position in the system.

The temperature equalisation between ambient and filling water temperature must be taken into account after the testing pressure is generated. The testing pressure should be restored after the waiting time, if necessary.

All containers, devices and fittings that are not suitable for the testing pressure should be disconnected from the system during the pressure test. The system is filled with filtered water and bled completely. During the test, a visual inspection is performed of the pipe connections.

KE KELIT recommends a testing time of 30 minutes.

Calculated testing pressure: ..... bar

Testing time ..... h

☐ During the testing time, NO loss of pressure was determined.

☐ The system contains ..... as anti-freeze

☐ **The system contains NO anti-freeze and has therefore be emptied completely for safety reasons.**

Place:.....

Object: .....

System pressure: .....

Confirmation

Clerk:: .....

Date:..... Time: from ..... to .....

Client: .....

Pipe sizing and pressure loss in COPPERFIX systems

The total pressure loss (Δp) of a COPPERFIX system is calculated from the pipe length (l) times the pipe friction pressure gradient (R), plus the sum (Σ) of the individual resistances (Z)

Total pressure loss Δp: $\Delta p = (l \cdot R + \Sigma Z)$ **in Pa**

The selection of the pipe dimension for the water pipes is dependent on:

- available water pressure, geodetic height difference
- pressure loss from apparatus and minimum flow pressure (fittings)
- pipe friction pressure gradient, flow speeds
- individual resistances of the moulded parts
- type, number and simultaneousness of the extraction points

Permitted flow speeds in accordance with DIN 1988-300

computed flow speed m /s with flow duration Line section	< 15 min	≥ 15 min
Consumption lines: Partial sections with resistance coefficients[n] ζ < 2.5 for the individual resistances[a]	5m/s	2m/s
KE KELIT recommends following these guidelines for COPPERFIX	**3m/s**	
Consumption lines: Partial sections with resistance coefficients ζ ≥ 2.5 for the individual resistances[b]	2.5m/s	2m/s

a e.g. piston valve, ball valve, angle seat valves b e.g. globe valve

Guidelines for circulation pipelines according to DIN 1988-300

The circulation pipe system should be designed so that there is a maximum fall in temperature of 5K between exit of and entry into the drinking water storage tank. The temperature of the hot water should not fall below 55°C at any point in the system.
For economic reasons the flow velocity should be between 0.2m/s and 0.5 m/s and in exceptional cases up to a maximum of 1.0 m/s.
KE KELIT recommends a maximum of 0.5 m/s for COPPERFIX in accordance with EN 12502-2.

Calculation of the individual resistances (Z) with typical moulded parts:

$$Z = \zeta \cdot \frac{v^2 \varrho}{2}$$

ϱ = Density kg/m³
v = computed flow speed
ζ = Verlustbeiwert

Dimension d mm	Coupling irrelevant ζ	Elbow 90° ζ	Elbow 45° ζ	T-piece duct with dividing flow ζ	T-piece outlet with dividing flow ζ	Wall disk ζ
						
15	0,36	1,02	0,69	0,40	1,13	1,08
18	0.46	0,93	0,77	0,50	1,41	1,22
22	0,11	0,44	0,38	0,15	1,05	1,09
28	0,05	0,35	0,28	0,13	0,93	-
35	0,03	0,31	0,29	0,08	0,93	-
42	0,06	0,25	0,22	0,11	1,20	-
54	0,06	0,30	0,19	0,09	1,15	-
76,1	0,04	0,25	0,15	0,08	1,07	-
88,9	0,04	0,24	0,13	0,07	1,06	-
108	0,03	0,23	0,12	0,07	1,05	-

Sizing in accordance with EN 806/3

With the calculation method, the ascertainment of the pipe dimension takes place for normal installations for up to a maximum of 12 housing units. This method is used for cold water and hot water pipes. The definition for normal installations can be found in EN 806-3 Point 4.2. For specialist installations, such as hospitals, sanatoriums, hotels, schools etc., in accordance with ÖNORM B 2531, te DIN 1988/300 must be used for the calculation. See pages 20–23.

Extraction point	QA l/s	Q_{min} l/s	LU
Washstand, sink, bidet, cistern	0,1	0,1	1
Dishwasher, shower head, sink basin, household kitchen sink, washing machine[a]	0,2	0,15	2
Urinal flusher	0,3	0,15	3
Bathtub drain	0,4	0,3	4
Tap fitting for garden / garage	0,5	0,4	5
Commercial kitchen sink DN 20, bathtub drain	0,8	0,8	8
Pressure flusher DN 20	1,5	1,0	15

a) For commercial washing machines according to the manufacturer's specifications

1 load value (LU) corresponds to an extraction fitting flow QA of 0.1 l/s.

With respect to the efficiency, the flow speed should be a minimum of 1 m/sec.
With respect to the flow noises, 2 m/sec should not be exceeded with collective supply lines, rising mains and storey pipes. With individual supply lines, flow speeds of max. 4 m/sec. are permitted.

After the addition of the already-weighted load values (LU), the pipe diameter (d) can be selected in accordance with the inner diameter (di) from the following table.

Example:

A total of the following are connected to a rising main:

4 bathtubs	4	x LU 4	= 16
2 showers	2	x LU 2	= 4
4 washstands	4	x LU 1	= 4
4 cisterns	4	x LU 1	= 4
4 kitchen sinks	4	x LU 2	= 8
4 dishwashers	4	x LU 2	= 8
2 washing machines	2	x LU 2	= 4
Total load value (LU)			48

Result:

in accordance with EN 806-3, this results in the following table COPPERFIX d28 x 1.5 mm.

Dimension d x s mm	Inner diameter di mm	Flow rate l/m	Load value LU	largest individual value LU	max. pipe length m
15x1	13,0	0,13	3	-	15
15x1	13,0	0,13	4	-	9
15x1	13,0	0,13	6	4	7
18x1	16,0	0,20	10	5	-
22x1,0	20,0	0,31	20	8	-
28x1,5	25,0	0,49	50	-	-
35x1,5	32,0	0,80	165	-	-

Guidelines for sizing

Extract from DIN 1988-300

1. Determining the calculation flows and minimum flow pressures of the extraction fittings

The calculation flow $\dot{V}_R$ is an assumed extraction fitting flow for the calculation step. Guideline values of the calculation flows for conventional fittings are shown in the table.
The calculation flow $\dot{V}_R$ as a mean value results from the following calculation:

$$\dot{V}_R = \frac{\dot{V}_{min} + \dot{V}_{max}}{2}$$

2. Calculation sum flows and allocate to the partial sections

Against the direction of flow – ending at the respective furthest-away extraction point and at the supply line – the calculation flows are added together and the sum flows that are calculated in this way are then allocated to the respective line sections. The respective partial section starts with the fitting at which the sum flow or the diameter changes.

At the junction point of the cold water pipe to the drinking water heater, the sum flows of the cold and hot water side are added together.

3. Use of the conversion curve from the sum flow to the peak flow

With the calculation of pipe systems, all extraction points should basically be used with their calculation flows.

The exception from this is the case where a utilisation unit, a second sink, a shower tray in addition to the bathtub, a bidet, a urinal or discharge valves exist in anterooms or toilet facilities. They are not taken into account in the sum flow.

4. Simultaneousness depending on building type

The peak flow calculation takes place on the basis of the sum flow, the simultaneousness of the water extraction is dependent on the type of use of the building (e.g. in flats, hotels etc.).

In general, it is not anticipated that all connected extraction points are fully opened simultaneously.

On pages 22 and 23, you will find the conversion curves for the various building types.

5. Select pipe diameter

Calculate pipe diameter and pipe friction pressure gradient, as well as related computed flow speed. (Pressure loss diagram: Page 24)

6. Comparison of pressure loss with available pressure

The total pressure loss for the calculated pipe diameter should essentially reach the available pressure difference, but not exceed it.

7. Minimum flow pressures and calculation flows $\dot{V}_R$ (l/s) conventional drinking water extraction points

Minimum flow pressure bar	Type of drinking water extraction point	Dimension	V·R:l/s
	Drainage valve		
0,5	without aerator[a]	DN 15	0,30
0,5		DN 20	0,50
0,5		DN 25	1,00
1,0	with aerator	DN 10	0,15
1,0		DN 15	0,15
	Mixer valves [b, c] for shower		
1,0	shower	DN 15	0,15
1,0	tray bathtubs	DN 15	0,15
1,0	kitchen sinks	DN 15	0,07
1,0	washstands	DN 15	0,07
1,0	bidet	DN 15	0,07
	Household machines		
0,5	Dishwasher	DN 15	0,07
0,5	Washing machine	DN 15	0,15
	WC bowl and urinals		
1,0	Flushing valve for urinal bowl manual or electronic	DN 15	0,30
1,2	Flushing valve for WC	DN 20	1,00
0,5	Cistern in accordance with EN 14124	DN 15	0,13

a) Without connected apparatus (e.g. lawn sprinkler)

b) The specified calculation flow must be invoiced for the cold and hot wat connection

c) Elbow valves for (e.g. washstand fittings and hose connections for showersare to be taken into account as individual resistances or minimum flow pressure of the extraction fitting

Important note:

The manufacturers of valves must state the minimum flow pressure and the calculation flows ($\dot{V}_R$) for fittings. Basically, the manufacturers' specifications must be taken into account for the measurement of the pipe diameter, but if these are above the values stated in the table, the drinking water installation must be measured with the manufacturers' specifications.

Comment:

Extraction points that are not recorded in the table and apparatus of the same type, with larger fitting flows or minimum flow pressures than stated must also be taken into account according to the manufacturers' specifications.

Extract from DIN 1988-300

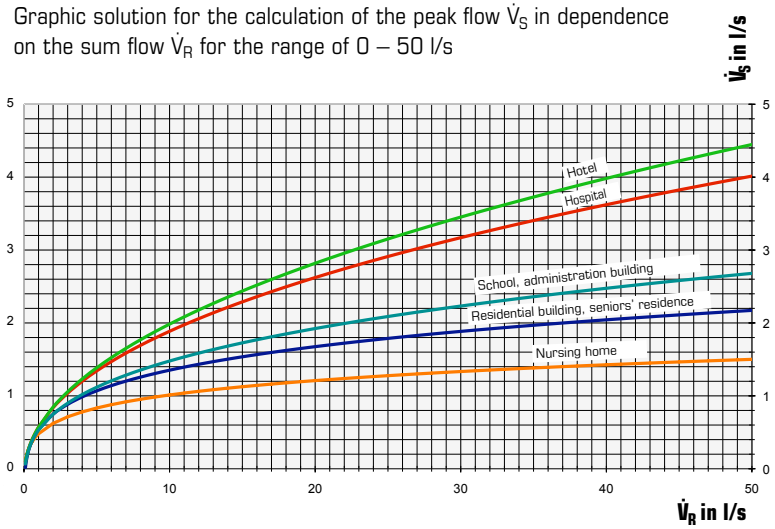
For the building types mentioned in the table, the peak flow $\dot{V}_S$ is calculated in the following scope:

$\Sigma \dot{V}_R$: 0,2 to ≤ 500 l/s

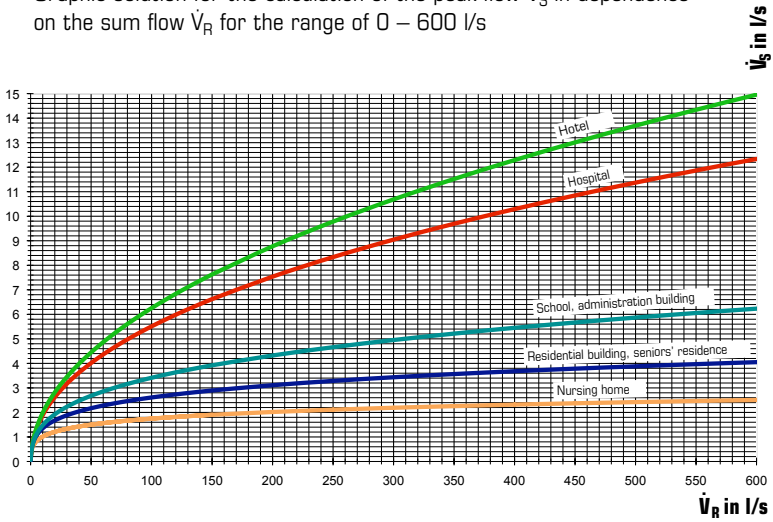
The peak flow $\dot{V}_S$ is calculated according to the building type with the constants from the table (Page 19) as follows:

$\dot{V}_S : a\,(\Sigma \dot{V}_R)^b - c$

Graphic solution for the calculation of the peak flow $\dot{V}_S$ in dependence on the sum flow $\dot{V}_R$ for the range of 0 – 50 l/s



Graphic solution for the calculation of the peak flow $\dot{V}_S$ in dependence on the sum flow $\dot{V}_R$ for the range of 0 – 600 l/s



Constants (a, b, c) for the peak flow depending on building type

Building type	Constant		
	a	b	c
Residential building	1,48	0,19	0,94
Installation for assisted living, seniors' residence	1,48	0,19	0,94
Ward in hospital	0,75	0,44	0,18
Hotel	0,70	0,48	0,13
School and administration building	0,91	0,31	0,38
Nursing home	1,40	0,14	0,92

Exceptions to the calculation of the peak flow $\dot{V}_S$

Utilisation units

A room with an extraction point in a residential building (e.g. bathroom, kitchen, housekeeping room) or also in a non-residential building, if use similar to residential is assumed. From experience, in the direction of flow towards the end of the branch line and in the storey distribution of utilisation units, the flow of the calculation are too high, because usually no more than two extraction points are opened at the same time, e.g. in a bathtub.
Therefore, the peak flow in each partial section of a utilisation unit is set to a maximum of bot of the largest extraction points installed in the partial section (also applies to cases in a utilisation unit, where not smaller flow results from the calculation).
If a second utilisation unit is connected to a partial section (e.g. in the rising main), the peak flows of both utilisation units are added together, provided that the resulting peak flow is less than according to the equation of the computed value. Otherwise, the peak flow is determined according to the respective equation.

Permanent consumers

The flow of the permanent consumer is added to the peak flow of the other extraction points. Permanent consumption is regarded as water extractions with a duration of more than 15 min., e.g. garden sprinkler valve.

Series systems

The basis for the calculation is the sum flow. The simultaneousness of water extraction must be defined with the operator. The peak flows of the series system are to be added up, if they can occur simultaneously.

Special buildings, commercial and industrial plants

For special buildings (i.e. different from the other building types mentioned), industrial, agricultural, plant nursery, abattoir, dairy, commercial, laundry operations, catering kitchens, public swimming pools etc., the peak flow must be determined in consultation with the operator of the system from the sum flow. The peak flows of the sub-areas of the drinking water installation must be added together, if they coincide in terms of timing.

Sizing and pressure loss for copper pipes

The calculation of the individual resistances can be found in the handbook on Page 18.

Copper pipe:

d15, 18, 22, 28, 35, 42, 54, 67, 76, 89, 108 mm

The calculation of the pressure losses for water takes place according to the "Nikuradse" formula:

$$R = 9{,}87161 \cdot 10^{9} \cdot \dot{m}^{1{,}7558} \cdot di^{-4{,}80112}$$

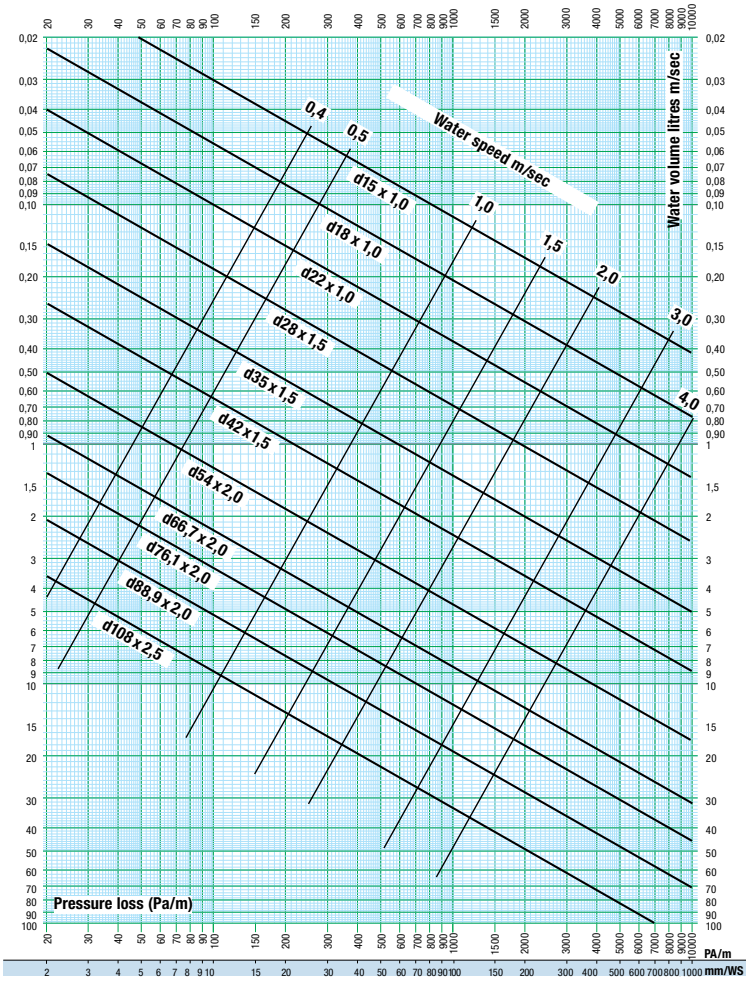
Pipe roughness: 0.0015 mm

Water temperature 10°C

R = Pipe friction pressure gradient (Pa/m)

$\dot{m}$ = Mass flow (l/sec)

di = Inner pipe diameter (mm)



Rinsing of drinking water systems report

in accordance with ÖNORM B 2531

Drinking water system – Rinsing medium – Drinking water

Client: .....

Contractor: .....

Object: .....Test section: .....

Pipe material: .....Date: .....

In order to fulfil the requirements of EN 806-4, proceed as follows.

Table 2: Guideline values for the minimum number of extraction points to be opened

Largest nominal widths of the line in the current flushing section (DN/ID)	**20**	**25**	**32**	**40**	**50**	**65**	**80**	**100**
Minimum number of extraction points to be opened	2	2	4	6	8	12	18	28
Opened for flushing:								

Comment: Regardless of the flushing procedure, each extraction point should be opened fully once during the course of commissioning.

According to EN 806-4, the flushed pipes must be properly commissioned after a maximum of 7 days. The flushing process with a water/air mixture is described in accordance with EN 806-4.

- ☐ The drinking water that is used for flushing has been filtered (no particles greater than or equal to 150 µm)
- ☐ Hot and cold water lines were flushed separately.
- ☐ Circulation lines were flushed section-by-section, directly prior to entry into the water heater.
- ☐ Minimum number of extraction points were defined in accordance with Table 2.
- ☐ All shut-off valve and control valves were completely opened during the flushing process.
- ☐ Sensitive fittings (e.g. magnetic valves, flushing valves, thermostatic valves, control valves) and apparatus (e.g. drinking water heaters) were replaced with adapters or bridged in accordance with the manufacturers' specifications.
- ☐ Die Installation was flushed in phases, starting with the first rising main after the main shut-off.

The proper flushing of the system is confirmed by

the installation company/fitter.....

Client.....

Pressure test – Drinking water systems with air or inert gases in accordance with ÖNORM B 2531

The pressure test with air or inert gases (a. or i.g.) takes place in a 2-stage procedure comprised of the tightness test and the load test. The tightness test for pipes ≤ DN 50/ OD 63 can be performed in 2 versions.

The pressure test with a. or i.g. may take place in phases and does not replace the final pressure test with drinking water!

The pressure test must essentially be performed in oil-free and dust-free a. or i.g. and is suitable for all pipe materials. In buildings with increased hygiene requirements (e.g. with medical facilities), inert gas must be used for the pressure test.

Due to the compressibility of the medium, no test pressure above 300 kPa (3 bar) may be applied for the pressure test with a. or i.g. for safety reasons. Higher test pressures mean a larger safety risk and do not increase the testing accuracy.

The safety of persons and goods during the test must be observed. Splitting into small line sections for the pressure test provides higher testing accuracy Step-by-step pressure increase is meaningful as an additional safety measure. All line openings must be impermeably sealed with a stopper or blind flange with sufficient strength compared to the test pressure. With the pressure test with a. or i.g., the connection points of the pipe sections must be accessible and visible, vent valves are to be provided for releasing the test pressure without danger.If leaks are determined or if a loss of pressure is noticeable, all connections must be tested with appropriate bubble-forming test equipment for tightness, after remedying the leaks, the pressure test must be repeated.

Two-stage pressure test for all pipes ≤ DN 50/OD 63

Comprised of a tightness test according to version 1 or 2 and load test.

Tightness test - version 1

Test pressure 15 kPa (150 mbar) – test duration 60 min. Display accuracy of the pressure measuring device or standpipe 0.1 kPa (1 mbar).

Tightness test - version 2

Test pressure 100 kPa (1 mbar) – test duration 60 min. Display accuracy of the pressure measuring device 5 kPa (50 mbar), additionally, all connection points in the system must be checked for tightness with appropriate bubble-forming test equipment.

Load test

Test pressure 300 kPa (3 bar) – test duration 10 min. Display accuracy of the pressure measuring device 10 kPa (100 mbar).

Two-stage pressure test for all pipes > DN 50/OD 63

Comprised of a tightness test and load test.

Tightness test

Test pressure 15 kPa (150 mbar) – test duration 90 min. Display accuracy of the pressure measuring device or standpipe 0.1 kPa (1 mbar), additionally, all connection points in the system must be checked for tightness with appropriate bubble-forming test equipment.

Load test

Test pressure 100 kPa (1 mbar) – test duration 10 min. Display accuracy of the pressure measuring device 10 kPa (100 mbar).

Pressure test report

According to ÖNORM B 2531 for COPPERFIX drinking water systems
Test medium: Air or inert gases

Client:.....

Contractor: .....

Object: .....Test section:.....

Pipe materials and dimensions:.....

Ambient temperature: .....Temperature equalisation: ☐

Highest system operating pressure MDP: .....Visual inspection:..... ☐

Two-stage pressure test for all pipes ≤ DN 50/OD 63:
Comprised of a tightness test according to version 1 or 2 and load test

Tightness test - version 1 ☐

Test pressure 15 kPa (150 mbar) – test duration 60 minutes

Tightness test - version 2 ☐

Test pressure 100 kPa (1 bar) – test duration 60 minutes

Additionally, all connection points in the system must be checked for tightness with appropriate bubble-forming test equipment

Load test ☐

Test pressure 300 kPa (3 bar) – test duration 10 minutes

Two-stage pressure test for all pipes ≤ DN 50/OD 63:

Tightness test ☐

Test pressure 15 kPa (150 mbar) – test duration 90 minutes

Additionally, all connection points in the system can be checked for tightness with appropriate bubble-forming test equipment.

Load test ☐

Test pressure 100 kPa (1 bar) – test duration 10 minutes

Comment

After successful pressure testing, we recommend the preparation of a confirmed test log.The pressure test with air or inert gases does not replace the pressure test with drinking water in accordance with EN 806-4, this must be performed directly prior to commissioning of the system.

Confirmation

Clerk: ..... .

Date: ..... Time: from ..... until .....

Client: .....

Pressure test - Drinking water systems using drinking water

When using "leak before pressed" fittings, a functional test must be performed according to the manufacturer's specifications

For temperature differences (> 10 K) between the ambient temperature and fill water temperature, a waiting time of 30 minutes must be adhered to after filling the system with drinking water so the temperature can equalize.

Test pressure: 0.05 MPa (0.5 bar) up to max. 0.2 MPa (2 bar)
Test duration: 15 minutes after temperature equalization between pipe and test medium.
Test differential pressure: 0.0 bar
A visual check must then be performed on all pipe connections.

The functional test is not necessary if the pressure test is carried out using air or an inert gas, on condition that the procedure for pressure testing drinking water systems is followed.

Pressure test for drinking water systems in conformity with ÖNORM EN 806-4

The pressure test using drinking water is a combined leak and load test and, according to ÖNORM EN 806-4, must be performed on all pipes. Pipes and other pipeline parts must be sized for the highest system operating pressure (MDP) according to ÖNORM EN 805 and the ÖNORM EN 806 series.

However, they must be designed for at least a system operating pressure (MDP) or nominal pressure (PN) of 1.0 MPa (10 bar).

Because ÖNORM EN 806-4 requires that the test pressure be 1.1 times the highest system operating pressure, the pressure test must be conducted with at least 1.1 MPa (11 bar).

Display accuracy of the pressure gauge (preferably positioned at the lowest point): 0.02 MPa (0.2 bar).

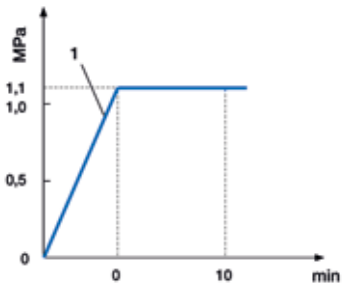
Based on the pipe materials and sizes, test method "A" should be used as a leak and load test for STEELOX according to ÖNORM EN 806-4.

Test method A – test duration 10 minutes

- For all multilayer composite systems with **d14–75mm**
- For all metal pipe systems with **d12–108mm**
- For all plastics (e.g. PP, PE, PEX, PB and others) ≤ **DN 50/OD 63**
- For all combined systems (metal and multilayer composite systems with plastics) ≤ **DN 50/OD 63**

The system must be filled with water, all air must be bled out, and all points of use must be closed.

The test pressure (1) must be applied with pumps and maintained for 10 minutes. During this time, the test pressure must remain constant, without any decreases.



Pressure test report

According to ÖNORM 806-4 for COPPERFIX drinking water systems,

test medium: drinking water

Client: .....

Property:..... Test section:.....

Pipe materials and sizes: .....

Functional test according to manufacturer's specifications
Test pressure: 0.05 MPa (0.5 bar) up to max. 0.2 MPa (2 bar)
Test duration: 15 minutes

Ambient temperature: ..... Air bled from system ☐

Temperature equalization ☐ Visual inspection ☐

Functional test performed: yes ☐ no ☐

Pressure test for drinking water systems with at least 1.1 MPa (11 bar)

Highest system operating pressure MDP:. Test pressure 1.1 x MDP: **....**

Pipe: d12 .....m	Pipe: d28 .....m	Pipe: d67 .....m
Pipe: d15 .....m	Pipe: d35 .....m	Pipe: d76 .....m
Pipe: d18 .....m	Pipe: d42 .....m	Pipe: d89 .....m
Pipe: d22 .....m	Pipe: d54 .....m	Pipe: d108 .....m

Test method A – test duration 10 minutes ☐

Metal systems and multilayer composite pipe systems – all sizes

Plastic systems and combined systems with plastics ≤ DN 50/OD 63

Visual inspection ☐ System is tight ☐

Notes:
- **Temperature fluctuations can influence the test pressure.**
- **Each pressure test represents a snapshot of the actual situation and cannot provide a guarantee against installation errors.**
- **After a successful pressure test, we recommend preparing a confirmed test report.**

Confirmation

Responsible person: .....

Date: ..... Time: from ..... to .....

Client: .....

Pressure test for drinking water systems using drinking water, with prior test performed using air or inert gases

When using "leak before pressed" fittings, a functional test must be performed according to the manufacturer's specifications

The functional test is not necessary if the pressure test is carried out using air or an inert gas, on condition that the procedure for pressure testing drinking water systems, outlined on page 26 of this handbook, is followed.

Pressure test for drinking water systems using drinking water according to ÖNORM B 2531, with prior test performed using air or inert gases

This pressure test is only permissible if a pressure test has already been performed using air or inert gases according ÖNORM B 2531.

It is a combined leak and load test and, according to ÖNORM EN 806-4, must be performed on all pipes within buildings and premises, but with a reduced system pressure of 0.9 MPa (9 bar).

If components (e.g., safety valves) that cannot withstand the system test pressure are to be installed, suitable measures must be taken.

However, they must be designed for at least a system operating pressure (MDP) or nominal pressure (PN) of 1.0 MPa (10 bar).

If a pressure test was performed using air or inert gases, the functional test can be performed with 0.9 MPa (9 bar) according to ÖNORM B 2531.

Display accuracy of the pressure gauge (preferably positioned at the lowest point): 0.02 MPa (0.2 bar).

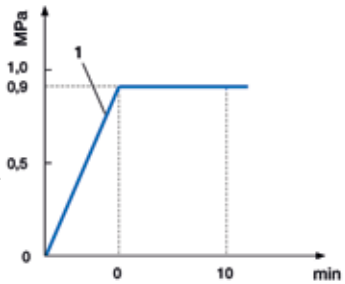
Based on the pipe materials and sizes, test method "A" should be used as a leak and load test for STEELOX according to ÖNORM EN 806-4.

Test method A – test duration 10 minutes

- For all multilayer composite systems with **d14–75mm**
- For all metal pipe systems with **d12–108mm**
- For all plastics (e.g. PP, PE, PEX, PB and others) ≤ **DN 50/OD 63**
- For all combined systems (metal and multilayer composite systems with plastics) ≤ **DN 50/OD 63**

The system must be filled with water, all air must be bled out, and all points of use must be closed.

The test pressure (1) must be applied with pumps and maintained for 10 minutes. During this time, the test pressure must remain constant, without any decreases.



Pressure test report

Pressure test for drinking water systems using drinking water according to ÖNORM B 2531, with prior test performed using air or inert gases.

Test medium: drinking water

Client: .....

Property: .....Test section:.....

Pipe materials and sizes: .....

Ambient temperature: ..... Air bled from system ☐

Temperature equalization ☐ Visual inspection ☐

Functional test performed: yes ☐ no ☐

Combined air and drinking water test for drinking water systems after pressure test performed with air or inert gases according ÖNORM B 2531 at least 0.9 MPa (9 bar)

Highest system operating pressure MDP:.... Test pressure 1.1 x MDP: ....

Pipe: d12 .....m	Pipe: d28 .....m	Pipe: d67 .....m
Pipe: d15 .....m	Pipe: d35 .....m	Pipe: d76 .....m
Pipe: d18 .....m	Pipe: d42 .....m	Pipe: d89 .....m
Pipe: d22 .....m	Pipe: d54 .....m	Pipe: d108 .....m

Test method A – test duration 10 minutes ☐

Metal systems and multilayer composite pipe systems – all sizes

Plastic systems and combined systems with plastics ≤ DN 50/OD 63

Visual inspection ☐ System is tight ☐

Notes:

- **Temperature fluctuations can influence the test pressure.**
- **Each pressure test represents a snapshot of the actual situation and cannot provide a guarantee against installation errors.**
- **After a successful pressure test, we recommend preparing a confirmed test report.**

Confirmation

Responsible person: .....

Date: ..... Time: from ..... to .....

Client: .....

Thermal insulation for cold and hoter water

Thermal insulation for cold water pipes in accordance with ÖNORM H 5155

ÖNORM H 5155 is valid for the insulation of technical installations, in order to standardise and simplify the planning, execution and maintenance of insulation systems.

- The aim of ÖNORM H 5155 is to specify insulation thicknesses in order to achieve minimisation of the heat flow of the transport medium to the environment or vice versa.
- ÖNORM H 5155 is applicable to the thermal insulation of all components of heating and drinking water systems.
- Another differentiating criterion is the type of installation and the location of the pipes (e.g. front wall installation, intermediate ceiling, heated room etc...)
- For these, please follow the recommendations of KE KELIT, which also take comfort aspects, such as noise insulation etc., into consideration.
- Insulation for hot water pipes (Page 33)

ÖNORM H 5155 specifies a lambda value λ of 0.036 W/mK, with a mean temperature of 0°C and an outer heat transfer coefficient of 9 W/m²K.

On the basis of the lambda value (λ) of 0.038 W/mK at 20°C of LEXEL, insulation can be executed in the insulation thicknesses required in the ÖNORM with the following LEXEL insulations:

LEXEL insulation hose 4 mm	LEXEL insulation hose 9 mm
LEXEL insulation hose 13 mm	LEXEL insulation hose 20 mm

Excerpt from ÖNORM H 5155, Table 6. In this case, however, the DN/OD values have been adapted to the specific KE KELIT pipe dimensions.

Rohraußendurchmesser	**15**	**18**	**22**	**28**	**35**	**42**	**54**	**67**
Lage der Leitung	**Minimum insulation thickness (mm)**							
Technology space	13	13	13	13	19	19	25	25
Unheated space	9	9	9	9	13	13	19	19
Unheated space	13	13	13	13	19	19	25	25
Installation shaft, installation corridor together WITH thermal pipes	13	13	13	13	19	19	25	25
Installation shaft, installation corridor together WITH thermal pipe	9	9	9	9	13	13	19	19
Intermediate ceiling, raised floor, light-weight construction wall, flush-mounted, floor (only distribution lines)	13	13	13	13	19	19	25	25
Front wall installation, floor (storey and individual supply lines)	4	4	4	4	9	9	13	13
Front wall installations, floor, next to thermal circulating pipes (storey and individual supply lines)	13	13	13	13	19	19	25	25

Country-specific standards and laws regarding pipe insulation must be taken into consideration and complied with.

Thermal insulation for hot water pipes in accordance with ÖNORM H 5155

ÖNORM H 5155 is valid for the insulation of technical installations, in order to standardise and simplify the planning, execution and maintenance of insulation systems.

- The aim of ÖNORM H 5155 is to specify insulation thicknesses in order to achieve minimisation of the heat flow of the transport medium to the environment or vice versa.
- ÖNORM H 5155 is applicable to the thermal insulation of all components of heating and drinking water systems.
- Another differentiating criteria is the type of installation and the location of the pipes (e.g. front wall installation, intermediate ceiling, heated room etc...)
- For these, please follow the recommendations of KE KELIT, which also take comfort aspects, such as noise insulation etc., into consideration.
- Insulation for cold water pipes (Page 32)

ÖNORM H 5155 specifies a lambda value λ of 0.047 W/mK, with a mean temperature of 50°C and an outer heat transfer coefficient of 9 W/m²K for the heating and hot water lines application case.

On the basis of the lambda value (λ) of 0.040 W/mK at 40°C of LEXEL, insulation can be executed in the insulation thicknesses required in the ÖNORM with the following LEXEL insulations:

LEXEL insulation hose 4 mm	LEXEL insulation hose 9 mm
LEXEL insulation hose 13 mm	LEXEL insulation hose 20 mm

Excerpt from ÖNORM H 5155, Table 2. In this case, however, the DN/OD values have been adapted to the specific KE KELIT pipe dimensions.

Outer diameter of pipe d	**15**	**18**	**22**	**28**	**35**	**42**	**54**	**67**
Installation location	**Minimum insulation thickness (mm)**							
Utility room	20	20	25	30	40	40	70	70
Unheated room	20	20	25	30	40	40	70	70
Heated room	10	10	15	15	20	20	35	35
Installation shaft or corridor mostly adjacent to unheated areas	20	20	25	30	40	40	70	70
False ceiling, raised floor, installation shaft or corridor mostly adjacent to unheated areas	10	10	15	15	20	20	35	35
In-wall installation, floors in unheated rooms	10	10	10	10	10	10	10	10
In-wall installation, floors in heated rooms	5	5	5	5	10	10	10	10

Country-specific standards and laws regarding pipe insulation must be taken into consideration and complied with.

Thermal expansion and expansion compensation of copper pipes

Pipes expand differently, depending on the material, due to thermal stress. Minor length changes can be absorbed by the own elasticity of the pipe network.

Larger length changes must be compensated during installation with appropriate expansion space, expansion compensators or by setting sliding and fixing points.

Through a prior calculation of the expected length change, the compensator that comes into question can be determined and taken into account during installation.

The longitudinal expansion is dependent on the pipe length, the temperature increase and the expansion coefficient, however, independently from the dimension.

Calculation of the longitudinal expansion:

$$\Delta_l = L \cdot \Delta_t \cdot \alpha$$

Δ_l = Longitudinal expansion in (mm)

L = Length of the pipe in (m)

Δ_t = Temperature difference (K)

α = the longitudinal expansion coefficient

Example of copper:

L :25 m
α:0,017
Δ_t:60 K

Δ_l=25 x 60 x 0,017 = 25,5 mm

Under this condition, the free expansion of a copper pipe is 25.5 mm

Material properties of different materials

	Expansion coefficient α=mm/mK	E-module 60°C N/mm²
C-galvanised steel	0,0108	220.000
Stainless steel	0,016	200.000
Copper	0,017	130.000
KELEN	0,150	300
KELIT ALU	0,035	3.500
PEX	0,175	540
KELOX	0,025	4.240
PVC	0,080	1.100

Important material properties for copper pipes:

Longitudinal expansion coefficient:

Copper pipes:
α = 0,017 mm/mK

Copper longitudinal expansion diagram

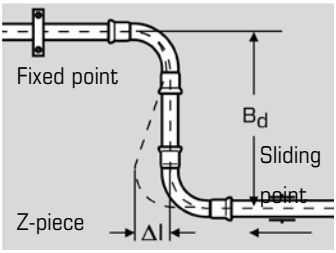
Temperature difference Δ_t (K)

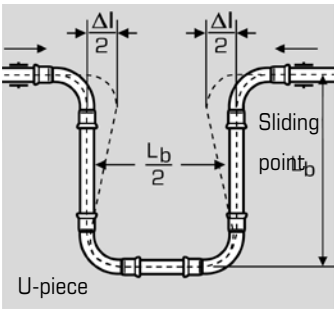
pipe length (m)	10	20	30	40	50	60	70	80	90	100
1	0,17	0,34	0,51	0,68	0,85	1,02	1,19	1,36	1,53	1,70
2	0,34	0,68	1,02	1,36	1,70	2,04	2,38	2,72	3,06	3,40
3	0,51	1,02	1,53	2,04	2,55	3,06	3,57	4,08	4,59	5,10
4	0,68	1,36	2,04	2,72	3,40	4,08	4,76	5,44	6,12	6,80
5	0,85	1,70	2,55	3,40	4,25	5,10	5,95	6,80	7,65	8,50
6	1,02	2,04	3,06	4,08	5,10	6,12	7,14	8,16	9,18	10,20
7	1,19	2,38	3,57	4,76	5,95	7,14	8,33	9,52	10,71	11,90
8	1,36	2,72	4,08	5,44	6,80	8,16	9,52	10,88	12,24	13,60
9	1,53	3,06	4,59	6,12	7,65	9,18	10,71	12,24	13,77	15,30
10	1,70	3,40	5,10	6,80	8,50	10,20	11,90	13,60	15,30	17,00
11	1,87	3,74	5,61	7,48	9,35	11,22	13,09	14,96	16,83	18,70
12	2,04	4,08	6,12	8,16	10,20	12,24	14,28	16,32	18,36	20,40
13	2,21	4,42	6,63	8,84	11,05	13,26	15,47	17,68	19,89	22,10
14	2,38	4,76	7,14	9,52	11,90	14,28	16,66	19,04	21,42	23,80
15	2,55	5,10	7,65	10,20	12,75	15,30	17,85	20,40	22,95	25,50
16	2,72	5,44	8,16	10,88	13,60	16,32	19,04	21,76	24,48	27,20
17	2,89	5,78	8,67	11,56	14,45	17,34	20,23	23,12	26,01	28,90
18	3,06	6,12	9,18	12,24	15,30	18,36	21,42	24,48	27,54	30,60
19	3,23	6,46	9,69	12,92	16,15	19,38	22,61	25,84	29,07	32,30
20	3,40	6,80	10,20	13,60	17,00	20,40	23,80	27,20	30,60	34,00
25	4,25	8,50	12,75	17,00	21,25	**25,50**	29,75	34,00	38,25	42,50
30	5,10	10,20	15,30	20,40	25,50	30,60	35,70	40,80	45,90	51,00
35	5,95	11,90	17,85	23,80	29,75	35,70	41,65	47,60	53,55	59,50
40	6,80	13,60	20,40	27,20	34,00	40,80	47,60	54,40	61,20	68,00
50	8,50	17,00	25,50	34,00	42,50	51,00	59,50	68,00	76,50	85,00
55	9,35	18,70	28,05	37,40	46,75	56,10	65,45	74,80	84,15	93,50
60	10,20	20,40	30,60	40,80	51,00	61,20	71,40	81,60	91,80	102,00

Expansion length (mm)

Expansion leg of freely installed copper pipes

Freely installed copper pipes, which are exposed to thermal expansion, must receive appropriate expansion compensation. Minor longitudinal expansions can be absorbed with expansion clearance or through the elasticity of the pipe network. With larger length expansions, it is necessary to provide for expansion legs in Z-shape, T-shape or in U-shape. In complicated cases, commercially available axial compensators can also be used.





Calculation of the expansion leg:

$$B_d = K_z \times \sqrt{d \times \Delta l}$$

$$L_b = K_u \times \sqrt{d \times \Delta l}$$

B_d: Z- and T-bending leg length in (mm)

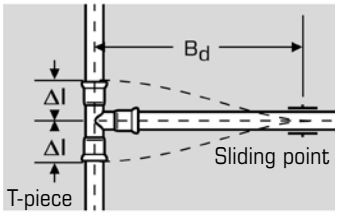
L_b: U-bending leg length (mm)

K_z: 35 for Z- and T-expansion compensation

K_u: 25 for U-expansion compensation

d: Dimension of the pipe (mm)

ΔI: Length expansion (mm)



Compensation solutions

Compensation always takes place between two fixed points and between two fixed points and directional changes.

Important material constants for COPPERFIX:

K_z:35 = for Z- and T-expansion leg

K_u:25 = for a U-expansion leg

U-piece

Example - copper:

L: 25 m

Δt:60 K

α: 0,017 (copper)

d: copper pipe d22 mm

ΔI: 25 x 60 x 0,017 = 25,5 mm

With Z- and T-expansion compensation:

B_d: $K_z \times \sqrt{d \times \Delta l}$

B_d: $35 \times \sqrt{22 \times 25{,}5} = 829{,}99$ mm

With U-expansion compensation:

L_b: $K_u \times \sqrt{d \times \Delta l}$

L_b: $25 \times \sqrt{22 \times 25{,}5} = 592{,}14$ mm

The bending leg length of a copper pipe for a Z- and

T- leg is: **830 mm**

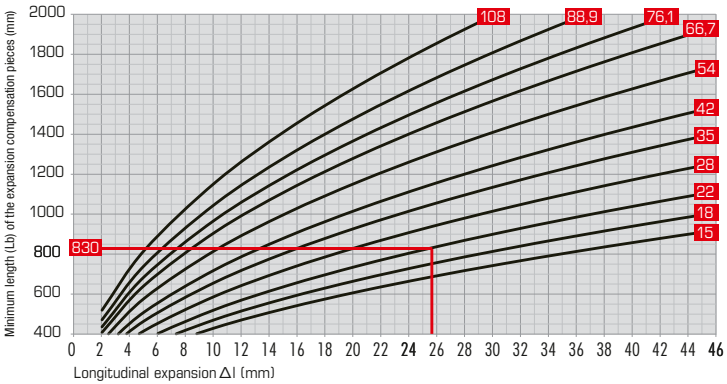
for a U-leg **592 mm**

Positioning of mountings

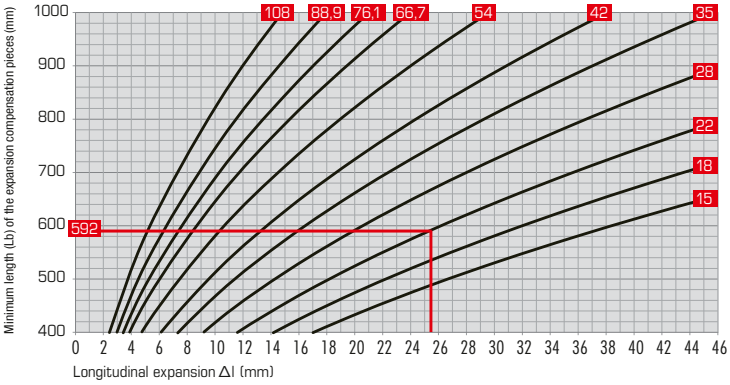
The correct positioning of pipe clamps, fixing points, sliding points etc. are an important factor for the installation of copper pipes and their mountings. The following rules must be observed:

- Do not position fixing point in the direct vicinity of fittings
- Slide rails must not impede the expansion in a longitudinal direction
- in order to prevent the possible deformation of the pipe, with straight pipe sections without expansion compensation, only one fixed point may be provided, in order to direct the possible longitudinal expansion in both directions, it is recommended to position this in the middle of the straight-line section, as far as possible
- it is recommended to use pipe clamps with an elastomer insert
- the suppliers of mounting clamps can offer usable solutions (fixing points, sliding clamps, etc.), if necessary
- Guideline values for support widths Page 40

Graphic solution for the calculation of Z- and T-expansion legs



Graphic solution for the calculation of U-expansion legs



Summary of important installation and assembly guidelines

Storage and transport

- Store and transport all COPPERFIX system components with care.
- Damage, notches and ridges on the pipe lead to problems in the sealing area.
- The storage of copper, stainless steel and C-galvanised steel pipes must take place separately.
- Copper pipes must be stored in a dry place. Moisture may lead to surface corrosion.

Press connections

- Prior to pressing, the press jaw must be checked for functionality and cleaned off, if necessary
- The tools used, including press jaws, must be inspected for damage prior to the pressing procedure.
- The fittings must not be rotated again after pressing!
- Pressing with press slings WITHOUT fittings is not permitted
- In the dimensions d12– 88.9, multiple pressing of a connection is not permitted!

Attention! In the dimension d108 mm, 2 pressings are necessary with the WZ281 press adapters (108/1) - ZB 221 and (108/2) - ZB 222!

Press connections

Commercially available pressing tools are comprised of a pressing machine and the associated press jaws and press slings. The pressing machine may be battery-powered or mains-powered. For each pipe diameter, the relevant press jaws or press slings with M-contour must be used. For the diameter d42 to d108mm, in addition to the press slings, a special adapter is used.

Maintenance of pressing tools

- After 50 respective pressings in the dimensions of d42–108mm, the joints and sliding elements press slings must be sprayed with graphite oil!
- KE KELIT recommends that pressing tools are inspected once a year to check that they are functioning correctly and to fulfil the conditions for the warranty. Please contact KE KELIT or the manufacturer of the tools directly!

Threaded connections

- COPPERFIX inner and outer threads are produced in accordance with EN 10226, ISO 228-1.
- For sealing copper press fittings, hemp or commercially available sealants may be used (e.g. liquid sealant, Teflon strips, ...).

Bending of copper pipes

- For this, commercially available manual, hydraulic or electrically powered draw bending tools are used with appropriate bending segments. Copper pipes are bendable cold up to d54 mm.
- Hot bending of copper pipes is NOT permitted (risk of corrosion)!
- Pipe ends that end in a fitting are not permitted to show any ovality from the bending procedure.
- KE KELIT recommended threaded connections prior to pressing for sealing and screwing in.

Bending radii of copper pipes

Copper pipe* d12–54mm **R_{min} = 3.5 x d**

*On the basis of EN 1057 and DVGW-GW392
Smaller bending radii are not permitted!

Important processing guidelines

- Cut pipe ends to length at right angles and straight.
- Deburr pipe ends on the inside and outside
- Mark insertion depth
- Check O-ring – visual inspection
- Insert straight, pay attention to insertion depth
- Pay attention to minimum pipe depths
- Use appropriate pressing machines
- Execute pressing with M-contour press jaws
- Perform pressure test according to the standard and KE KELIT regulation
- Flush line according to standard

Expansion

- The longitudinal expansion of the copper pipes is temperature-dependent (assembly-operating temperature).
- The expansion force for metal pipes is many times higher than for plastic pipes, pay attention to expansion forces.
- Pipes that branch off of main pipes or risers in the brickwork or similar should be insulated, so that they are not exposed to any mechanical load.
- Pay attention to expansion properties, particularly the correct positioning of the mountings and pipe clamps (see Page 34–37)

Spans and mountings for copper pipes

- To effectively prevent structure-borne noise transfer, clamps are used with elastomer inserts for acoustic decoupling!
- Fasting points are only set on pipes, not on fittings!
- Through the correct positioning of fixing and sliding clamps, the expansion properties of the copper pipes cannot be impaired.

Copper pipe d mm	EN 806-4 m	KELIT recommendation m
15	1,20	1,50
18	1,50	1,50
22	1,80	2,50
28	1,80	2,50
35	2,40	3,50
42	2,40	3,50

Copper pipe d mm	EN 806-4 m	KELIT recommendation m
54	2,70	3,50
66,7	3,00	5,00
76,1	3,00	5,00
88,9	3,00	5,00
108	3,00	5,00

Equipotential bonding

Copper pipes conduct electricity, so that they must be included in the main equipotential bonding of electrical systems (earthing). This must be performed by a licensed electrical company.

Insulation of the pipes

- Use installation-appropriate, closed-cell and approved insulating materials.
- Copper pipes and COPPERFIX moulded parts that are installed in the floor and flush-mounted area must be protected from outer corrosion with a protective coat and anti-corrosion bandages or with water-impermeable, spliced insulating materials.
- COPPERFIX pipe systems must not be exposed to permanent moisture, insulations made of felt are not to be used.
- Connection lines that protrude from the ground must be protected against corrosion (cleaning water and detergent).
- Copper pipes and COPPERFIX moulded parts in exposed areas (wetness, moisture, ...) must have an anti-corrosion coat applied to them.
- Copper pipes, which may fall below the dewpoint due to the operating conditions, must be bonded and insulated in a diffusion-tight manner in accordance with ÖNORM H5155.

Anti-freeze and auxiliary heating

- Copper systems must be protected against frost and insulated accordingly
- System-appropriate auxiliary heaters may be mounted on COPPERFIX systems, as long as it is ensured that a permanent pipe wall internal temperature of 60°C is not exceeded (formation of chloride ions).
- Glycols or anti-freeze that are available from specialist retailers with a mixing ratio with water of up to – 20°C are not a problem for copper pipes and their connection components.
- Observe the application instructions of the suppliers.

Pressure test

- Any water/heating installation must be subjected to a pressure test in accordance with the standard, for this, use the plug-press adapters.
- The pressure test should be performed prior to insulation, painting etc.
- For hygiene reasons, with drinking water installations in accordance with EN 806-4, the pressure test with water should only be performed directly prior to commissioning of the system.
- Due to the risk of corrosion, after the pressure test has been performed, the line should be left in a filled state, or complete drainage and drying of the system should be ensured.
- With partially drained copper pipe systems, after pressure tests, an increased risk of hole corrosion exists.
  That is why KE KELIT recommends performing the pressure test with air/inert gases.
- COPPERFIX press system parts are “leak before pressed”.
- Each installation must be subjected to a visual inspection during the pressure test.
- It is recommended to prepared a pressure test log about the pressure test. See pages 17 and 26 to 31.

Flushing of drinking water pipes

- After the installation, drinking water lines must be flushed in accordance with the standard, if necessary, the specific regulations of ÖNORM B 2531 and EN 806-4 must be taken into account (see page 25).

Fire behaviour of copper pipes

- Non-insulated copper pipes that are certified in accordance with EN 1057/DVGW are to be classified as non-flammable pipes in building materials class A1 in accordance with EN 13501-2.

Fire protection

- Regional guidelines and regulations must be complied with.

Special applications

- Special applications must be approved by KE KELIT in written form.
- When using chemicals, the functionality must be coordinated with the pipe and sealing elements.
- Service water is not a problem for copper pipes, but the application must be coordinated with KE KELIT.
- Treated, osmosis, demineralised water in cannot be pumped through public drinking water systems made of copper.
- Osmosis or treated water are not a problem in closed heating systems made of copper, but the use should be coordinated with KE KELIT.
- Press connections are not gap-free connection technologies, so that they can only be used to a limited extent in the food sector.
- The COPPERFIX press system it equipped with EPDM O-rings (black). For the use of water temperatures up to 200°C, VITON – O-rings (FPM, green) are available. These must be replaced by the user!
- COPPERFIX can be used for vacuum implementation with a maximum vacuum of -0.6 bar
- COPPERFIX systems have no test for flammable media (e.g. gases, ...)

Proper installation

of the COPPERFIX system requires a normal set of tools. For your safety, we recommend using the original tools that have been tried and tested many times in practice and their regular servicing.

Mixed installation

For connections with C-galvanised steel and ignoble fittings or valves, contact corrosion may occur. This can be avoided with a fitting or spacer made of plastic or coloured metal with a minimum length of 50 mm.

Material mix combination options

Fittings		Copper	Brass	C-galvanised steel	Stainless steel
Pipe	**System**				
Copper	closed	allowed	allowed	allowed	allowed
	open	allowed	allowed	not allowed	allowed
C-galvanised steel	closed	allowed	allowed	allowed	allowed
	open	not allowed	not allowed	not allowed	not allowed
Stainless steel	closed	allowed	allowed	allowed	allowed
	open	allowed	allowed	not allowed	allowed

Flow rule (with open water systems)

In the flow direction of the water, copper is always installed after galvanising (base metal) components.

Disinfection

- Short-time loads up to 130°C don't present a problem for the COPPERFIX-System. Avoid higher temperature loads for longer periods of time and water temperature over 130°C.
  Pay attention to valid guidelines and standards.
- The disinfection of the drinking water system must comply with KE KELIT's disinfection guidelines - **www.kekelit.com.**
- The concentration and residence time of the disinfectants (e.g. chlorine, chlorine dioxide, ozone etc.) listed in ÖNORM B 5019 and B 5021, must be adhered to and must never be exceeded.
  If the disinfection is not done according to KE KELIT's disinfection guidelines and according to the stated concentration and residence time stated in the standard, material damage cannot be ruled out.
  According to ÖNORM B 5019 preference is given to thermal disinfection over chemical disinfection!

EN 12502-2 Protection against corrosion of metal

Please observe the contents of EN 12502-2 with regards to the probability of corrosion of metal.
The standard contains an overview of the factors influencing the probability of corrosion in pipes, tanks and accessory components made of copper and copper alloys. The standard applies for all copper pipe systems transporting water.

Outer copper corrosion

With moisture/dew water formation on the outer surface, the following must be observed:

- To avoid outer corrosion, it must be ensured that the environment or possible used insulation material does not contain any sulphide, ammonia or nitrate components. Nitrate / ammonia content may not be greater than 0.02%.
- In order to keep the risk of outer corrosion to a minimum, the insulating materials must be used in combination with a vapour barrier.
- For installations in the flush-mounted/screed area, the COPPERFIX system must be protected from outer corrosion.
- For this, KE KELIT recommends insulations without the above-mentioned components / protective coats over the entire surface.

Inner copper corrosion

- Effects of flow conditions
  Erosion corrosion is determined primarily by the local flow rate, especially under conditions where gas bubbles occur due to a decrease of the static and/or dynamic pressure.
- Closed water circuits (heating/cooling)
- Copper is suitable for all closed water systems. Any order of metals is possible in closed systems.
- Open water systems (drinking water)
- The chemical and physical properties of drinking water can be affected by internal corrosion. Additionally, corrosion can occur in copper pipes and fittings if the composition of the drinking water is problematic.

The following guideline values are to be complied with on the basis of EU Directive L 330/32:1998:

- pH. value > 7.4 or in the range of
- pH. value 7.0 to 7.4 with organically bonded carbon (TOC) < 1.5 g/m³

The salt/chlorine content of drinking water is limited in accordance with the Drinking Water Ordinance

- Sulphate-ions < 240 mg/l
- Nitrate-ions < 50 mg/l
- Sodium-ions < 200 mg/l
- Chloride < 250 mg/l

If in doubt, don't hesitate to consult our service technicians.

There won't be the perfect solution for every case but we can always be of assistance!

Demonstration videos can be downloaded by scanning the KE KELIT QR code.

www.youtube.com/kekelit

Product range COPPERFIX

The COPPERFIX pipe system is constantly adapted to practical requirements and is systematically enhanced. Please see the respective valid COPPERFIX price list for the current status of the supply range.

The short symbols:

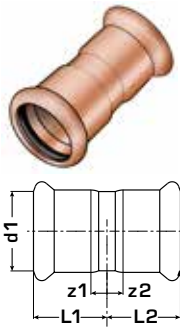
e.g. COF440 = COPPERFIX Press T-piece

significantly simplify ordering and are therefore requested in your order from the wholesaler.

Application:

Press-system: -20°C to 110°C tmax 130°C/16 bar

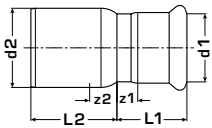
COF410 Copper press-coupling



Press-coupling straight made of copper, incl. EPDM sealing components, „leak before pressed"
Press contour: M

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm
12	12	21	4	21	4
15	15	22	2	22	2
18	18	22	2	22	2
22	22	23	2	23	2
28	28	25	2	25	2
35	35	28	2	28	2
42	42	36	4	36	4
54	54	42	5	42	5
66.7	66.7	55	5	55	5
76.1	76.1	55	5	55	5
88.9	88.9	66	8	66	8
108	108	72	5	72	5

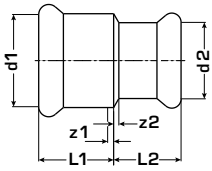
COF411 Copper press-red.socket i/a



Press-reduction socket f/m straight made of copper, incl. EPDM sealing components, „leak before pressed“
Press contour: M

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm
12	15	21	4	23	3
15	18	24	4	23	3
15	22	24	4	28	7
18	22	24	4	26	5
15	28	25	4	37	14
18	28	26	4	35	12
22	28	25	4	30	7
22	35	29	9	39	13
28	35	28	5	35	9
22	42	25	4	49	19
28	42	27	4	44	14
35	42	35	8	38	8
28	54	27	4	59	24
35	54	35	9	53	18
42	54	40	9	47	12
42	66.7	43	13	67	17
54	66.7	49	14	63	13
35	76.1	39	13	74	24
42	76.1	43	13	70	20
54	76.1	52	17	64	14
66.7	76.1	66	16	60	10
42	88.9	46	16	89	27
54	88.9	48	13	84	22
76.1	88.9	65	15	75	13
42	108	47	17	106	39
54	108	54	20	102	35
76.1	108	70	20	92	25
88.9	108	82	20	84	17

COF412 Copper press-reducer i/i



Press-reducer f/m straight made of copper, incl. EPDM sealing components, „leak before pressed“
Press contour: M

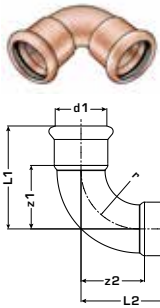
d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm
15	12	23	3	22	5
22	15	28	7	25	5
28	15	35	12	23	3
28	22	29	6	26	5
35	28	33	7	28	5
42	35	37	7	31	5
54	42	46	11	34	4

COF415 Copper press-repair coupling

Press-repair coupling straight made of copper, incl. EPDM sealing components, „leak before pressed“
Press contour: M

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm
15	15	40	20	40	20
18	18	40	20	40	20
22	22	42	21	42	21
28	28	46	23	46	23
35	35	50	25	50	25
42	42	60	30	60	30
54	54	71	36	71	36
66,7	66,7	55	50	55	50
76,1	76,1	55	50	55	50
88,9	88,9	66	50	66	50
108	108	72	68	72	68

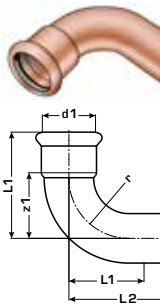
COF420 Copper press-elbow 90°



Press-elbow 90° made of copper, incl. EPDM sealing components, „leak before pressed“
Press contour: M

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm	r mm
15	15	38	17	38	17	17
18	18	42	22	42	22	22
22	22	47	26	47	26	26
28	28	56	34	56	34	34
35	35	68	42	68	42	42
42	42	80	50	80	50	50
54	54	100	65	100	65	65
66.7	66.7	132	87	132	87	80
76.1	76.1	142	92	142	92	90
88.9	88.9	170	106	170	106	105
108	108	201	135	201	135	161

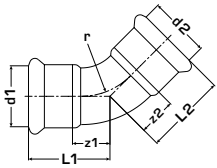
COF421 Copper press-elbow 90° i/a



Press-elbow 90°, f/m, made of copper, incl. EPDM sealing components, „leak before pressed“
Press contour: M

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm	r mm
15	15	36	16	50	30	18
18	18	42	22	53	33	22
22	22	47	27	58	38	26
28	28	58	34	64	40	34
35	35	69	44	82	57	42
42	42	81	52	101	72	50
54	54	100	66	120	86	65
66.7	66.7	130	78	175	123	80
76.1	76.1	143	93	150	100	90
88.9	88.9	170	112	178	116	106
108	108	208	141	259	194	161

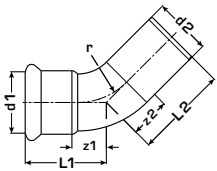
COF425 Copper press-elbow 45°



Press-elbow 45° made of copper, incl. EPDM sealing components, „leak before pressed"
Press contour: M

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm	r mm
15	15	28	8	28	8	18
18	18	29	9	29	9	22
22	22	31	12	31	12	26
28	28	37	16	37	16	34
35	35	44	18	44	18	42
42	42	51	21	51	21	50
54	54	62	27	62	27	65
66.7	66.7	85	35	85	35	80
76.1	76.1	91	45	91	45	91
88.9	88.9	109	46	109	46	107
108	108	125	59	125	59	130

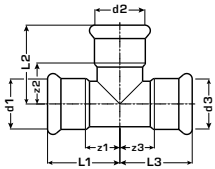
COF426 Copper press-elbow 45° i/a



Press-elbow 45°, female/male, made of copper, incl. EPDM sealing components, „leak before pressed"
Press contour: M

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm	r mm
15	15	28	8	37	17	18
18	18	29	9	39	19	22
22	22	32	11	44	23	26
28	28	37	14	47	24	34
35	35	43	17	58	32	42
42	42	51	21	71	41	50
54	54	62	27	82	47	65
66.7	66.7	85	35	88	38	80
76.1	76.1	90	40	97	54	91
88.9	88.9	109	47	116	54	107
108	108	115	50	136	69	130

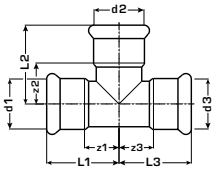
COF440 Copper press-tee



Press-tee equal or reduced made of copper, incl. EPDM sealing components, „leak before pressed“
Press contour: M

d1 mm	d2 mm	d3 mm	L1 mm	z1 mm	L2 mm	z2 mm	L3 mm	z3 mm
15	15	15	32	12	32	12	32	12
15	18	15	35	15	32	12	23	35
15	22	15	38	18	34	13	23	38
18	15	15	34	14	35	15	40	20
18	15	18	34	14	35	15	34	14
18	18	15	34	14	34	14	42	22
18	18	18	34	14	34	14	34	14
22	15	15	37	16	44	18	43	23
22	15	22	37	16	38	18	37	16
22	18	18	37	16	38	18	41	21
22	18	22	37	16	38	18	37	16
22	22	15	37	16	37	16	46	26
22	22	18	37	16	37	16	43	23
22	22	22	37	16	37	16	37	16
22	28	22	52	31	42	19	52	31
28	15	28	42	19	41	21	42	19
28	18	28	42	19	41	21	42	19
28	22	22	42	19	41	20	49	28
28	22	28	42	19	41	20	42	19
28	28	22	42	19	42	19	52	31
28	28	28	42	19	42	19	42	19
35	15	35	45	19	44	24	45	19
35	22	35	45	19	45	24	45	19
35	28	28	51	25	44	21	67	44
35	28	35	50	24	44	21	50	24
35	35	35	50	24	50	24	50	24

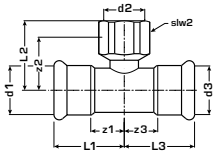
COF440 Copper press-tee



Press-tee equal or reduced made of copper, incl. EPDM sealing components, „leak before pressed“
Press contour: M

d1 mm	d2 mm	d3 mm	L1 mm	z1 mm	L2 mm	z2 mm	L3 mm	z3 mm
42	15	42	50	20	48	28	50	20
42	22	42	50	20	48	27	50	20
42	28	42	56	26	49	26	56	26
42	35	35	56	26	50	24	74	48
42	35	42	56	26	50	24	56	26
42	42	42	58	28	58	28	58	28
54	22	54	60	25	54	33	60	25
54	28	54	60	25	55	32	60	25
54	35	54	61	24	55	29	61	24
54	42	42	69	34	64	34	83	53
54	42	54	69	34	64	34	69	34
54	54	54	69	34	69	34	69	34
66.7	35	66.7	80	29	70	43	80	29
66.7	42	66.7	82	32	76	41	82	32
66.7	54	66.7	88	47	78	43	88	47
66.7	66.7	66.7	95	45	111	62	95	45
76.1	22	76.1	73	22	73	50	73	22
76.1	28	76.1	77	26	73	50	77	26
76.1	35	76.1	80	30	78	53	80	30
76.1	42	76.1	103	55	106	70	103	55
76.1	54	76.1	93	41	85	50	93	41
76.1	76.1	76.1	101	51	119	69	101	51
88.9	54	88.9	136	77	119	77	136	77
88.9	76.1	88.9	151	91	146	96	151	91
88.9	88.9	88.9	162	100	162	100	162	100
108	66.7	108	117	46	141	96	117	46
108	108	108	159	92	159	92	159	92

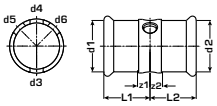
COF447 Copper press-adaptor tee female



Press-tee with threaded branch female made of red brass, incl. EPDM sealing components, „leak before pressed“
Press contour: M

d1 mm	d2 inch	d3 mm	L1 mm	z1 mm	L2 mm	z2 mm	L3 mm	z3 mm	slw2 mm
15	1/2"	15	34	14	25	13	34	14	26
18	1/2"	18	42	22	24	8	42	22	26
22	1/2"	22	42	21	26	11	42	21	26
22	3/4"	22	45	24	27	11	45	24	32
28	1/2"	28	44	21	29	14	44	21	26
28	3/4"	28	42	19	35	14	42	19	32
35	1/2"	35	50	24	34	19	50	24	26
42	1/2"	42	57	27	38	23	57	27	26
54	1/2"	54	69	34	44	29	69	34	26

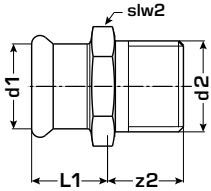
COF447M Copper press-multi tee female



Multi-press-tee with two, three or four threaded branches, male, red brass, incl. EPDM sealing components, „leak before pressed“
Press contour: M

d1 mm	d2 mm	d3 inch	d4 inch	L1/L2 mm	z1/z2 mm
67	67	1/2"	1/2"	65	15
76	76	1/2"	1/2"	65	14
89	89	3/4"	3/4"	80	18
108	108	3/4"	3/4"	85	18

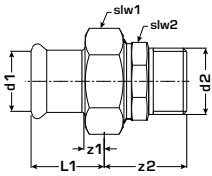
COF450 Copper press-adaptor male



Press-adaptor with male thread conforming to EN 10226-1 made of red brass, incl. EPDM sealing components, „leak before pressed"
Press contour: M

d1 mm	d2 inch	L1 mm	L2 mm	z2 mm	slw2
12	1/2"	17	19	11	19
15	1/2"	20	17	8	21
15	3/4"	20	19	10	25
18	1/2"	20	17	9	25
18	3/4"	20	19	10	25
22	1/2"	21	17	9	30
22	3/4"	21	19	10	30
22	1"	21	21	11	32
28	3/4"	23	21	11	36
28	1"	23	20	10	36
35	1"	26	22	12	41
35	1 1/4"	26	28	15	41
42	1 1/4"	30	28	16	51
42	1 1/2"	30	28	16	51
54	2"	35	28	12	57
66,7	2 1/2"	50	42,5	25	74

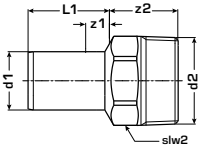
COF451 Copper press-union male



Press-union with male thread conforming to EN 10226-1 made of red brass, incl. EPDM sealing components, „leak before pressed"
Press contour: M

d1 mm	d2 inch	L1 mm	z1 mm	L2 mm	z2 mm	slw1	slw2
15	1/2"	30	10	32	24	30	25
15	3/4"	25	5	33	23	30	25
18	1/2"	28	8	31	23	30	25
18	3/4"	28	8	33	24	30	25
22	3/4"	36	15	38	28	36	32
28	1"	36	13	39	30	46	40
28	3/4"	36	13	40	30	46	40
35	1 1/4"	36	10	43	24	52	46
42	1 1/2"	44	14	44	31	58	51
54	2"	52	17	49	33	75	65

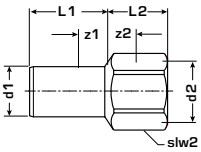
COF453 Copper straight connector male



Straight connector with male thread conforming to EN 10226-1 made of red brass with pipe dimension

d1 mm	d2 inch	L1 mm	z1 mm	L2 mm	z2 mm	slw2 mm
15	1/2"	30	10	21	12	19
18	1/2"	30	10	20	12	19
18	3/4"	30	10	23	14	25
22	1/2"	30	9	24	13	25
22	3/4"	30	9	23	13	25
28	1"	32	9	26	15	32
35	1 1/4"	35	9	29	16	36
42	1 1/2"	51	21	29	16	46

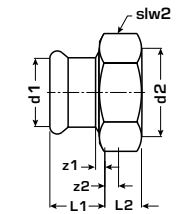
COF454 Copper straight connector female



Straight connector with female thread conforming to EN 10226-1 made of red brass with pipe dimension

d1 mm	d2 Zoll	L1 mm	z1 mm	L2 mm	z2 mm	slw2
15	1/2"	30	10	18	3	22
18	1/2"	30	10	17	3	22
18	3/4"	30	10	20	3	30
22	1/2"	30	9	17	2	22
22	3/4"	30	9	19	3	30
28	1"	32	9	22	3	37
35	1"	35	9	21	2	37
35	1 1/4"	35	9	25	4	46
42	1 1/2"	51	21	25	4	48
54	2"	56	21	30	4	65

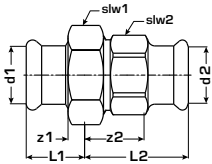
COF455 Copper press-union female



Press-adaptor female screw connection to fittings, made of red brass, incl. EPDM sealing components, „leak before pressed“ Press contour: M

d1 mm	d2 Zoll	L1 mm	z1 mm	L2 mm	z2 mm	slw2
15	3/4"	30	10	11	3	30
18	3/4"	28	8	11	3	30
22	1"	36	15	13	3	36
28	1 1/4"	36	13	14	4	46
35	1 1/2"	36	10	15	4	52
42	1 3/4"	44	14	17	4	58

COF456 Copper press-union



Press-union made of red brass, incl. EPDM sealing components, „leak before pressed"
Press contour: M

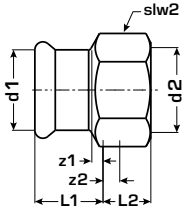
d1 mm	d2 mm	L1 mm	z1 mm	L2 mm	z2 mm	slw1	slw2
15	15	27	7	33	13	30	25
18	18	29	9	33	13	30	25
22	22	31	10	37	16	36	32
28	28	33	10	41	17	46	40
35	35	33	7	38	14	52	46
42	42	41	11	50	20	58	51
54	54	48	13	51	16	75	65

CP455D Seal for press-union CP/NP451, CP/NP455 a. CP466

Spare EPDM seal for STEELFIX press-system parts CP451, NP451, CP455, NP455 and CP466 and COPPERFIX press-system parts COF455 and COF456

d mm	IG inch	PU1 unit
15-18	3/4"	20
22	1"	20
28	5/4"	20
35	6/4"	20
42	1 3/4"	20
54	2 3/8"	20

COF457 Copper press-adaptor female

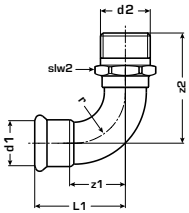


Press-adaptor with female thread conforming to EN 10226-1 made of red brass, incl. EPDM sealing components, „leak before pressed"
Press contour: M

d1 mm	d2 inch	L1 mm	z1 mm	L2 mm	z2 mm	slw2
12	1/2"	18	0	17	8	22
15	1/2"	20	3	18	8	25
15	3/4"	21	5	19	8	30
18	1/2"	19	2	18	8	25
18	3/4"	20	2	19	9	30
22	1/2"	20	1	17	7	30
22	3/4"	20	0	19	9	30
28	3/4"	23	3	22	10	37
28	1"	23	3	17	7	42
35	1"	24	5	22	10	46
35	1 1/4"	25	3	25	11	46
42	1 1/4"	30	0	22	8	46
42	1 1/2"	29	3	25	11	48
54	2"	34	3	25	11	48

COF460 Copper press-elbow adaptor 90° male

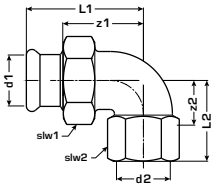
Press-elbow adaptor 90° male conforming to EN 10226-1 made of red brass, incl. EPDM sealing components, „leak before pressed“
Press contour: M



d1 mm	d2 inch	L1 mm	z1 mm	z2 mm	slw2 mm	r mm
15	1/2"	38	19	34	18	18
18	1/2"	42	15	37	18	22
22	3/4"	47	28	43	25	26
28	1"	58	36	53	33	34
35	1 1/4"	55	30	47	40	42
42	1 1/2"	62	32	51	50	50
54	2"	70	35	63	60	65

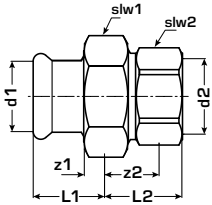
COF465 Copper press-union 90° female

Press-elbow union 90° with female thread conforming to EN 10226-1 made of red brass, incl. EPDM sealing components, „leak before pressed“
Press contour: M



d1 mm	d2 inch	L1 mm	z1 mm	L2 mm	z2 mm	slw1 mm	slw2 mm
15	1/2"	53	33	32	17	30	27
18	1/2"	55	35	32	17	30	27
22	3/4"	66	45	40	21	36	40
28	1"	68	45	44	25	46	40

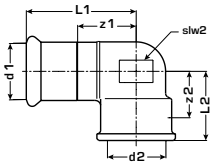
COF466 Copper press-union female



Press-union with female thread conforming to EN 10226-1 made of red brass, incl. EPDM sealing components,
„leak before pressed"
Press contour: M

d1 mm	d2 inch	L1 mm	z1 mm	L2 mm	z2 mm	slw1 mm	slw2 mm
15	1/2"	30	10	22	7	34	27
15	3/4"	25	5	30	13	34	34
18	1/2"	28	8	20	5	34	27
18	3/4"	28	8	29	13	34	34
22	3/4"	36	14	32	15	41	40
28	1"	36	13	29	10	50	45
35	1 1/4"	36	9	38	17	56	50
42	1 1/2"	44	14	39	18	61	57
54	2"	52	17	38	12	79	70

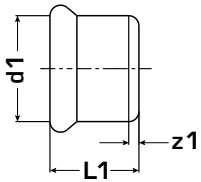
COF467 Copper press-elbow adaptor 90° female



Press-elbow adaptor 90° female conforming to EN 10226-1 made of red brass, incl. EPDM sealing components,
„leak before pressed"
Press contour: M

d1 mm	d2 inch	L1 mm	z1 mm	L2 mm	z2 mm	slw2 mm
15	1/2"	41	21	23	12	18
18	1/2"	41	21	24	14	21
22	3/4"	45	24	27	11	25
28	1"	51	28	33	14	33
35	1 1/4"	55	29	45	21	46
42	1 1/2"	63	35	52	26	53
54	2"	74	42	60	33	65

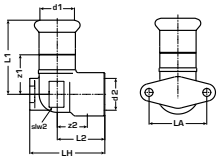
COF471 Copper press-cap



Press-cap made of red brass, incl. EPDM sealing components,
„leak before pressed"
Press contour: M

d1 mm	L1 mm	z1 mm
15	20	2
18	20	2
22	21	2
28	23	2
35	26	2
42	30	2
54	35	2
66,7	50	2
76,1	50	2
88,9	64	2
108	67	2

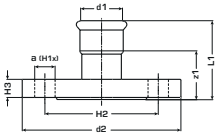
COF480 Copper press-wall bracket 90° female



Press-wall bracket 90°, female, made of red brass, incl. EPDM sealing components, „leak before pressed“
Press contour: M

d1 mm	d2 inch	L1 mm	z1 mm	L2 mm	z2 mm	LH mm	LB
15	1/2"	42	22	20	9	35	40
18	1/2"	43	23	24	9	39	40
22	3/4"	45	24	27	11	45	40

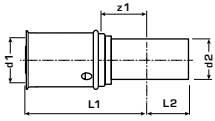
COF486 Copper press-adaptor flange PN10/16



Press-adaptor flange, flat sealing made of red brass, incl. EPDM sealing components, „leak before pressed“
Press contour: M
Flange dimensions conforming to DIN 2501 - PN16

d1 mm	DN	L1 mm	z1 mm	a mm	H2 mm	H3 mm	d2 mm	hole
66.7	DN65	103	53	18	145	20	185	4
76.1	DN65	103	53	18	145	20	185	4
88.9	DN80	113	51	18	160	20	200	8
108	DN100	126	59	18	180	20	220	8

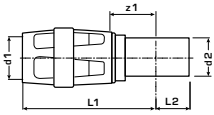
KMU489 KELOX-ULTRAX - STEELFIX press adaptor



Press adaptor from straight-pipe size Steelfix, Copperfix, pipe size to KELOX-PROTEC - pressing socket made from non-porous metallized gunmetal, incl. support sleeves with O-rings and steel or stainless steel d16-32mm press-fit sleeves, „not pressed, not sealed“
ATTENTION! Connection to pipe end only suitable as a screw or compression connection!

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm
16	15	35	12.5	20
20	18	35	9.5	20
20	22	35	11	21
25	22	44	11	21
32	28	44	11	23
40	35	63	18	26

KMP489 KELOX-PROtec - STEELFIX press adaptor



Press/plug-in adaptor from straight-pipe size Steelfix, Copperfix, pipe size to KELOX-PROTEC - plug-in sleeve made from non-porous metallized gunmetal, support sleeves, O-rings, withdrawal barriers and a protector ring as an insertion locking device

ATTENTION! Connection to pipe end only suitable as a screw or compression connection!

d1 mm	d2 mm	L1 mm	z1 mm	L2 mm
16	15	47	14	20
20	18	47	14	20
20	22	47	16	21
25	22	55	16	21
32	28	55	15	23

COF980 EPDM O-ring seal

Press-EPDM O-ring seal for COPPERFIX pipe systems
Temperature-resistant to 110°C
Press contour: M
Colour: black

size	PU1 unit
15	10
18	10
22	10
28	5
35	5
42	2
54	2
66,7	1
76,1	1
88,9	1
108	1

COF990 FPM O-ring seal

Press-VITON O-ring seal for COPPERFIX pipe systems, High-temperature-resistant to 200°C, for compressed air systems based on mineral and plant-based oils, fats and industrial applications
Press contour: M
Colour: green

size	PU1 unit
15	10
18	10
22	10
28	5
35	5
42	2
54	2
66,7	1
76,1	1
88,9	1
108	1

WZ210 KELIT pipe deburrer

For deburring and chamfering on the inside and the outside of STEELFIX and COPPERFIX pipes.

You should use different pipe deburrers for STEELFIX C steel, stainless steel and COPPERFIX pipes!

After deburring the pipes carefully clean the swarf from them!

size	PU1 unit
15-35	1
15-54	1

WZ235 KELIT wheel pipe cutter

For cutting to length STEELFIX and copper pipes up to d54 mm

size	PU1 unit
15-42	1
15-54	1
Cutting wheel d15-42	1
Cutting wheel d15-54	1

WZ241 COPPERFIX press-insertion guide

For marking the insertion depth of COPPERFIX press-fit system components up to d108mm
Colour: orange

size	PU1 unit
12-108	1

WZ970 KELIT battery press machine

Electro-mechanical Klauke 18V 3Ah li-ion battery press machine for pressing d16-75mm KELOX and WINDOX press system components and
STEELFIX d15-54mm system press components
COPPERFIX d15-54mm system press components
CLIMATEFIX d12mm system press components
including two 18 V rechargeable batteries and 230V charger for 18V.

ATTENTION! When using third-party products, note that a minimum pressing force of 30 kN is needed!

KE KELIT recommends inspecting pressing tools once per year to ensure proper function and maintain the warranty; please contact KE KELIT or the respective device manufacturer directly!

type	PU1 unit
Press-SET 18V Li-Ion	1
Rechargeable battery 18V li-Ion	1
Charger 18V Li-Ion	1
Case blue 18V	1

WZ274N KELIT press machine ACO 203XL

Electro-mechanical Novopress li-ion battery press machine for pressing
STEELFIX and COPPERFIX d15-108mm fresh water and heating system press components with
WZ280 press jaws d12-35mm,
WZ282 press loops d42-54mm and WZ288 press loops d67-108mm
STEELFIX high-pressure system press components with
WZ280 press jaws d15-35mm and WZ282S press loops d42-54mm
KELOX system press components d16-75mm
including two 18 V rechargeable batteries and 230V charger for 18V, packaged in a case

KE KELIT recommends inspecting pressing tools once per year to ensure proper function and maintain the warranty; please contact KE KELIT or the respective device manufacturer directly!

type	PU1 unit
Press set, ACO 203 XL	1
Case ACO 203 XL	1
Rechargeable battery ACO 203 XL/403 3Ah	1
Charger, ACO 203 XL/403	1

WZ280 KELIT press jaws-M

Press jaw inserts for pressing STEELFIX and COPPERFIX system components using a
WZ274N KELIT press machine (ACO 203 XL) or a
WZ970 KELIT battery press machine
Pressing: M contour

Attention! Cannot be used for KELOX!

KE KELIT recommends inspecting pressing tools once per year to ensure proper function and maintain the warranty; please contact KE KELIT or the respective device manufacturers directly!

size	PU1 unit
12	1
15	1
18	1
22	1
28	1
35	1

WZ281 KELIT press Adaptor 35-108

Press adapter suitable for WZ274N KELIT press (ACO 203 XL) for pressing KELIT d35 system components of up to d108mm using a WZ282, WZ282S or WZ288 press loop M
or WZ970 KELIT battery press machine for pressing KELIT d35 system components of up to d54mm using WZ282, press loop M
KE KELIT recommends inspecting pressing tools once per year to ensure proper function and maintain the warranty; please contact KE KELIT or the respective device manufacturers directly!

type	PU1 unit
35-54 (ZB203)	1
67-108/1 (ZB221)	1
108/2 (ZB222)	1

WZ282 KELIT press loop - M

Press loop for pressing STEELFIX and COPPERFIX system components using a
WZ281 press adapter d42-54mm and a WZ274N (ACO 203 XL) or WZ970 KELIT battery press machine
Pressing: M contour
Attention! Do not carry out pressing without fittings!
Attention! Cannot be used for KELOX!
KE KELIT recommends inspecting pressing tools once per year to ensure proper function and maintain the warranty; please contact KE KELIT or the respective device manufacturers directly!

type	PU1 unit
42 Snap on	1
54 Snap on	1

WZ288 KELIT press loop - M

Press loop for pressing STEELFIX and COPPERFIX system components using a
WZ281 press adapter d67-108/1 and d108/2mm and a WZ274N KELIT press machine (ACO 203 XL)
Pressing: M contour
To press size d108mm, you need the WZ281 adapters 108/1 and 108/2!
Attention! Do not carry out pressing without fittings!
Attention! Cannot be used for KELOX!
KE KELIT recommends inspecting pressing tools once per year to ensure proper function and maintain the warranty; please contact KE KELIT or the respective device manufacturers directly!

type	PU1 unit
67 Snap on	1
76 Snap on	1
89 Snap on	1
108 Snap on	1

WZ290 KELIT press-set - M

Press set for pressing STEELFIX and COPPERFIX system components using a
WZ274N press machine ACO 203 XL
Pressing: M contour

Press set 1 consisting of:
1 WZ281 press adapter d35-54
1 WZ282 press loop M d42
1 WZ282 press loop M d54
1 toolbox 1

Press set 2.2 consisting of:
1 WZ281 press adapter d67-76-89-108/1
1 WZ288 press loop M d67
1 WZ288 press loop M d76
1 WZ288 press loop M d89
1 toolbox 2

Press set 3.2 consisting of:
1 WZ281 press adapter d108/2
1 WZ288 press loop M d108
1 toolbox 2

Press set 4.2 consisting of:
1 WZ281 press adapter d67-76-89-108/1
1 WZ281 press adapter d108/2
1 WZ288 press loop M d108
1 toolbox 2

Press set 5 consisting of:
1 pce each WZ280 press jaw -M d15, 18, 22, 28 and 35
1 WZ210 pipe deburrer d12-35
1 WZ240 insert depth gauge (press) d12-54
1 toolbox 5

Klauke press jaw inserts for pressing STEELFIX and COPPERFIX system components using a
WZ972 KELIT mini battery press machine
Pressing: M contour

Do not carry out pressing without fittings!
Attention! Cannot be used for KELOX!

KE KELIT recommends inspecting pressing tools once per year to ensure proper function and maintain the warranty; please contact KE KELIT or the respective device manufacturers directly!

type	PU1 unit
Press set 1	1
Press set 2.2	1
Press set 3.2	1
Press set 4.2	1
Press set 5	1
Case 1	1
Case 2	1
Case 5	1

Representative offices, production and headquarters

Please note that for technical printing reasons the numbers are written according to the common practice in the German speaking countries (i.e. the number and the decimals are separated by a comma).

Full technical back-up and support for the COPPERFIX fitting systems is provided by KE KELIT-Austria/Europe.

The network of sales partners, subsidiaries and agents is constantly being expanded. Please ask at the Austrian headquarters for the current status.

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