Typical outputs - copper pipes/isocu 12.1

Typical outputs - copper pipes/isocu					
at 100 Pa/m (10 mm water column/m) and medium temp. of 80°C					
Carrier pipe	Velocity	Mass flow	Output at Δt=30°C	Output at Δt=40°C	Output at Δt=50°C
d outside mm	(m/s)	(m3/h)	(kW)	(kW)	(kW)
15	0,28	0,13	4,5	6,0	7,5
18	0,32	0,23	7,9	10,6	13,2
22	0,38	0,43	14,5	19,4	24,2
28	0,45	0,83	28,3	37,7	47,1
35	0,52	1,52	51,5	68,7	85,8
42	0,60	2,58	87,5	117,0	146,0
54	0,72	5,27	179,0	239,0	299,0
70	0,85	10,48	356,0	475,0	594,0
88,9	1,00	19,88	676,0	901,0	1126,0

See section 1 on design calculations.

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Heat loss - copper pipes/isocu 12.2

Assumptions - heat loss

When comparing heat loss data, it is important to know the assumptions used in their calculation.

Several factors other than the properties of the pre-insulated pipe are of fundamental importance for heat loss.

The following parameters must be equal if a valid comparison of heat loss is to be made:

- Dimensions of carrier and jacket pipes
- Carrier pipe temperatures
- Soil lambda value
- Soil temperature
- Surface resistance
- Laying depth
- Distance between pipes

As it is in effect the lambda value of the insulation material that is compared, it is of course important that the correct lambda value be used.

The following pages contain heat loss tables for pre-insulated pipes. Heat loss calculations are based on the following assumptions.

Depending on the mechanical properties of the foam, pipes can be produced with a variety of lambda values down to 0,0225 W/m◦C.

$Lambda_{soil}$	1.2000	W/m°C
Lambda - straight pipes	0.027	W/m°C
Lambda - flex pipes	0.024	W/m°C
R_o	0.0685	m^2 °C/W
Laying depth H	600	mm
t_{flow}	80.0	°C
t_{return}	40.0	°C
t_{soil}	8.0	°C
Distance between pipes C	100	mm

Thermal conductivity - soil / sand
Values of 1.5-2.0 W/m°C are typical for moist soils.
Dry sand has a thermal conductivity of approx. 1.0 W/m°C.

Surface resistance
According to the EuHP District Heating Handbook, a value of 0.0685 m^2 °C/W is usually suitable.

Laying depth
Should be stated in mm from upper edge of jacket pipe to soil surface (unpaved areas) or lower surface of paving.

Heat loss - copper pipes/isocu 12.2.1

Heat loss - copper pipes/isocu - single - series 1					
Copper pipe		Jacket pipe		Heat loss	U-value
d outside mm	Wall thickness mm	D outside mm	Wall thickness mm	W/m Φ_{total}	Φ_{total}
Flexible pipe					
15,0*	1,0	65	2,2	10,1	0,097
18,0*	1,0	65	2,2	11,5	0,11
22,0	1,0	65	2,2	13,4	0,129
28,0	1,2	75	2,2	14,6	0,141
Straight pipe / lengths					
35,0	1,5	90	3,0	16,3	0,156
42,0	1,5	110	3,0	15,9	0,153
54,0	1,5	125	3,0	17,9	0,172
70,0	2,0	140	3,0	20,4	0,196
88,9	2,5	160	3,0	23,4	0,225

Heat loss - copper pipes/isocu - single - series 1					
Copper pipe		Jacket pipe		Heat loss	U-value
d outside mm	Wall thickness mm	D outside mm	Wall thickness mm	W/m Φ_{total}	Φ_{total}
Flexible pipe					
15,0*	1,0	75	2,2	9,3	0,089
15,0*	1,0	90 (S3)	2,2	8,3	0,08
18,0*	1,0	75	2,2	10,4	0,1
18,0	1,0	90 (S3)	2,2	9,2	0,089
22,0	1,0	75	2,2	12	0,115
22,0	1,0	90 (S3)	2,2	10,5	0,101
28,0	1,2	90	2,2	12,5	0,12
Straight pipe / lengths					
35,0	1,5	110	3,0	13,6	0,131
42,0	1,5	125	3,0	14,1	0,136
54,0	1,5	140	3,0	15,5	0,149
70,0	2,0	160	3,0	17,6	0,169
88,9	2,5	180	3,0	20,2	0,194

*Available to order.

S3 corresponds to series 3 insulation.

Heat loss is specified per metre trench.
U-values are specified per metre pipe.
Flexible pipes are continuously produced with a diffusion barrier inserted between the jacket pipe and the polyurethane foam. Straight pipes are discontinuously produced.

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Heat loss - copper pipes/isocu 12.2.2

Heat loss - copper pipes/isocu - double - series 1

Copper pipe		Jacket pipe		Heat loss
d outside mm	Wall thickness mm	D outside mm	Wall thickness mm	W/m Ftotal
Flexible pipe				
15+15	1,0+1,0	90	2,2	5,3
18+18	1,0+1,0	90	2,2	6,1
22+22	1,0+1,0	90	2,2	7,4
28+28	1,2+1,2	90	2,2	9,9
Straight pipe / lengths				
22+22	1,0+1,0	110	3,0	7,0
28+28	1,2+1,2	110	3,0	8,7
35+35	1,5+1,5	140	3,0	8,3
42+42	1,5+1,5	160	3,0	8,7
54+54	1,5+1,5	200	3,2	9,2
70+70	2,0+2,0	225	3,4	10,9
89+89	2,5+2,5	250	3,6	13,4

Heat loss - isocu - double - series 2

Copper pipe		Jacket pipe		Heat loss
d outside mm	Wall thickness mm	D outside mm	Wall thickness mm	W/m Ftotal
Flexible pipe				
15+15	1,0+1,0	110	2,5	4,6
18+18	1,0+1,0	110	2,5	5,2
22+22	1,0+1,0	110	2,5	6,1
28+28	1,2+1,2	110	2,5	7,6
Straight pipe / lengths				
22+22	1,0+1,0	125	3,0	6,3
28+28	1,2+1,2	125	3,0	7,7
35+35	1,5+1,5	160	3,0	7,3
42+42	1,5+1,5	200	3,2	7,2
54+54	1,5+1,5	225	3,4	8,1
70+70	2,0+2,0	250	3,6	9,5
89+89	2,2+2,2	280	3,9	11,2

Heat loss - isocu - double - differentiated carrier pipe diameters

Copper pipe		Jacket pipe		Heat loss
d outside mm	Wall thickness mm	D outside mm	Wall thickness mm	W/m Φ_{total}
Flexible pipe				
28+18	1,2+1,0	110	2,5	8,5
28+22	1,2+1,0	110	2,5	9,3

Heat loss is specified per metre trench.
Flexible pipes are continuously produced with a diffusion barrier inserted between the jacket pipe and the polyurethane foam. Straight pipes are discontinuously produced.

Heat loss - copper pipes/isocu 12.2.3

Heat loss - copper pipes - double - differentiated carrier pipe diameters				
Copper pipe		Jacket pipe		Heat loss
d outside mm	Wall thickness mm	D outside mm	Wall thickness mm	W/m Ftotal
Straight pipe / lengths				
35+22	1,5+1,0	125	3,0	11,7
42+28	1,5+1,2	140	3,0	12,7
54+35	1,5+1,5	160	3,0	14,1
70+42	2,0+1,5	200	3,2	14,1

Heat loss is specified per metre trench.
Straight pipes are discontinuously produced.

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Laying rules - isocu 12.3

Connection at branches

Where isocu is connected to traditional steel pipes, the following rules must be observed:

- If tee branches are used, the isocu pipe can be connected without any need for relief measures, L= ∞. See fig. 1.
- If parallel branches are used, the isocu pipe must be bent immediately after the connection point. A maximum of 10 mm movement is allowed on the main pipe. See fig. 2.

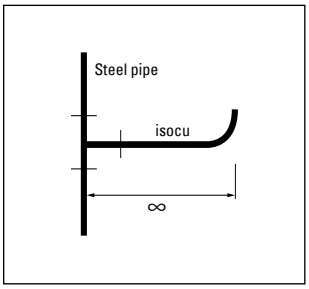


fig. 1

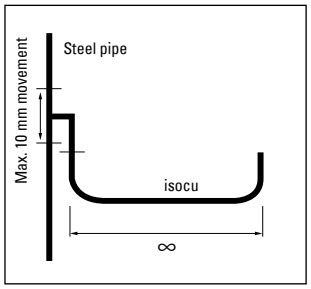


fig. 2

Connection to steel pipes

Where isocu is connected in extension of traditional steel pipes, the following rules must be observed:

- The maximum distance to a fix point on the pipe line must comply with fig. 3.
- When connecting isocu to steel pipes which are not fixated, the rules shown in fig. 4 must be observed.
- When connecting isocu to steel pipes > 13 m, follow the rules shown in fig. 5.

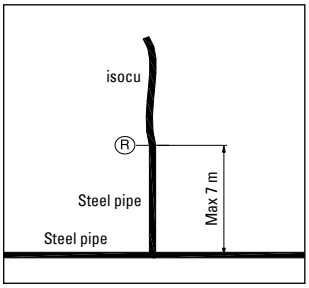


fig. 3

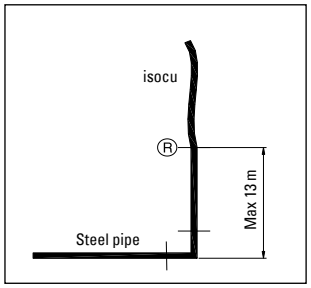


fig. 4

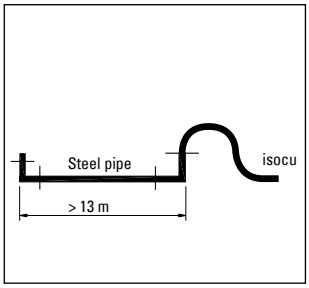


fig. 5

Service lines

Pipe expansion should be considered in connection with building lead-ins. If the pipe is secured within the building, or movement is prevented in some other way, expansion relief must be provided before the pipe is led into the building.

The rules shown in fig. 7 and fig. 8 must be observed.

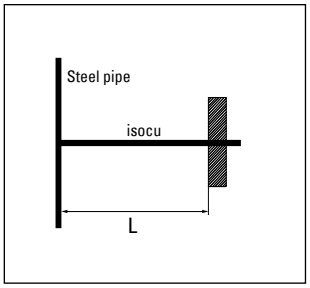


fig. 6

No displacement permissible, L = max. 6 m. Displacement permissible, L = ∞.

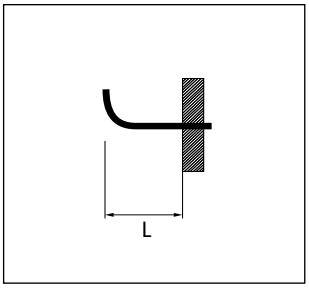


fig. 7

No displacement permissible, L = max. 12 m. Displacement permissible, L = ∞.

Where flexible piping is installed in conduits or using soil displacement techniques, there may be limitations on the stated lengths, or requirements on other expansion-related considerations.

Note: Laying rules apply for both single and double pipes.

Laying rules - isocu 12.3.1

Curve radius

When bending isocu to minimum radius, the pipe must be bent in the same direction as it is coiled. The pipe must be bent evenly, preventing localised kinks. We recommend that a bending tool be used. Copper pipes in straight lengths can be bent up to 100 times the diameter of the copper pipe.

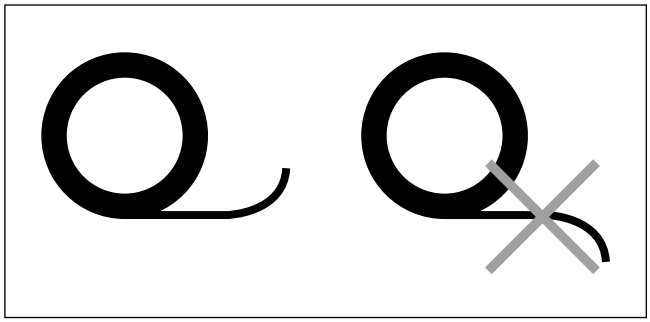
Press couplings

If press couplings are used for copper pipes/isocu, it is important to ensure that the material is completely clean and that the pipe ends are calibrated and free of internal scratches.
Tools approved by isoplus must be used.

Unrolling flexible piping

Always unroll/bend flexible piping in the coil direction.

Where this is not possible, the piping should be handled as described in section 3.



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