

System description

1. General

CASAFLX® district heating pipe is the registered trade name for a flexible house connection pipe from BRUGG Pipe Systems. It is ideal for use in small and midsize district and local heating networks, in industrial and agricultural applications and in solar collector plants and swimming pool installations.

CASAFLX® district heating pipe has a corrugated carrier pipe made of stainless steel. The design of the corrugated pipe takes account of factors related to fluid dynamics.

The thermal insulation is positioned below the PE-LD casing pipe and consists of a CFC-free, flexible PIR rigid foam (polyisocyanurate foam) with excellent heat insulation properties; a barrier film to impede diffusion of the cellular gases.

The bending capability of CASAFLX® district heating pipe ensures easy adaptation to virtually all pipe routing conditions. It is possible to pass over or under existing supply pipes, and obstacles are easily bypassed.

With CASAFLX® district heating pipe, users can choose the shortest pipe route without considering the classical method of pipe construction.

CASAFLX® district heating pipe is delivered to the site in coils or on drums in the required lengths. The pipe can generally be laid in the ground without joints. This means that the pipe trench can be considerably narrower. This in turn allows considerable savings on underground work. When one considers the very short time required for installation, CASAFLX® district heating pipe is not only a technically perfect solution but also the key to saving time and expense when setting up district heating networks. Less coordination is required on site and the pipes are laid simply and quickly.

The physical characteristics of the corrugated carrier pipe enable it to be laid without having to consider thermal expansion.

Fitting the connectors is a very simple procedure. The connections are fitted quickly and securely with simple components.

2. Range of use

Max. temp. for continuous operation T_{Bmax}	160 °C*
Max. permitted operating temp. T_{max}	180 °C
Max. permitted operating pressure	PN 16 to PN 25

* Type 60+60/182 T_{max} 130 °C

System description

1. Carrier pipe

Materials	Corrugated carrier pipe made of nickel chromium steel X5 CrNi 18-10 (1.4301, AISI 304) or X6 CrNiMoTi 17-12-2 (1.4571, AISI 316Ti) or X2 CrNiMo 17-12-2 (1.4404, AISI 316L)
Requirements:	Steel quality to EN 10088

2. Thermal insulation

Material:	CFC-free, cyclopentane-blown polyisocyanurate rigid foam (PIR) with λ_{50} value: 0.025 W/mK.
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PIR insulation	Reference temperature °C	CASAFLEX® value	Test standard
Density	-	> 60 kg/m ³	DIN 53420
Thermal conductivity	50	≤ 0.025 W/mK	DIN 52612
Percentage of closed cells	-	≥ 90 %	EN 253
Water absorption after 24 hours	-	≤ 10 %	EN 253

3. Expanded metal mesh

Material:	Steel
Purpose:	Mechanical reinforcement of the flexible pipe system

4. Barrier film

Material:	Multiple-layer composite film
Purpose:	To impede diffusion of the cyclopentane cellular gas

5. Protective casing

Material:	Low-density polyethylene (LLD-PE), seamlessly extruded
Purpose:	Protection against mechanical action and humidity

PE-LD protective casing	Reference temperature °C	Value	Test standard
Density	-	931 kg/m ³	ISO 1183
Thermal conductivity	-	0.43 W/mK	DIN 52612
Crystallite melting range	-	122 °C	ISO 11357-3

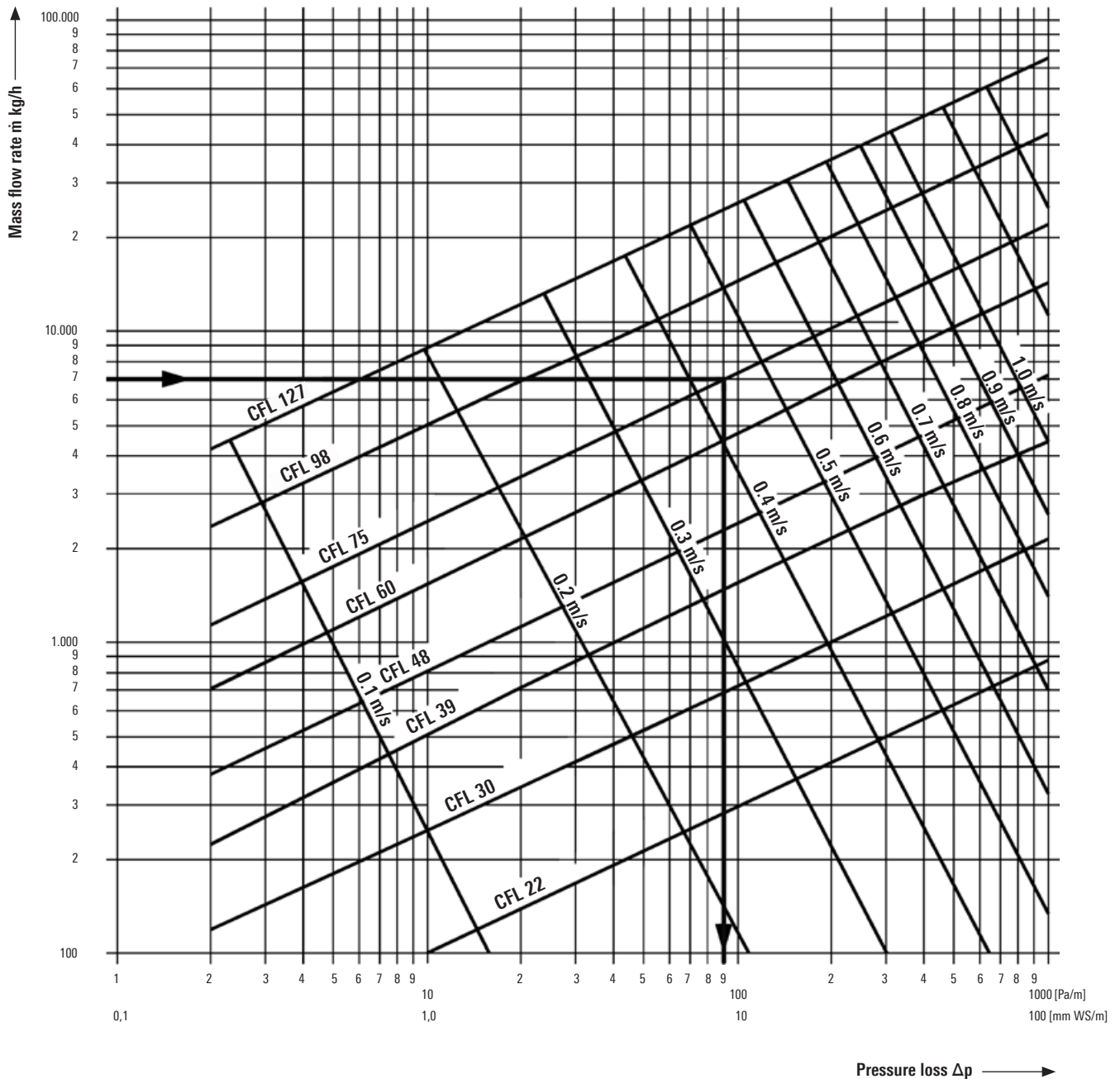
6. Monitoring wires

Materials:	1 x NiCr, red, insulated/perforated, Ø 1.1 mm/0.5 mm ² 1 x Cu, green, insulated, Ø 1.3 mm/0.8 mm ² 1 x Cu, white with nonwoven, Ø 1.55 mm/1.13 mm ²
Systems:	Conductor pairs: NiCr-red + Cu-green \triangleq WIREM/Brandes system Cu-green + Cu-white \triangleq Nordic system
Purpose:	Identification and location of moisture by means of resistance or pulse measurements

Pressure loss chart

Water temperature 80 °C

$\dot{m} \approx \frac{Q \cdot 860}{\Delta T}$	\dot{m} = Flow rate in kg/h
	Q = Power requirement in kW
	ΔT = Temperature difference
	VL (flow) / RL (return) in °C



Example:

Mass flow rate 7000 kg/h; CASAFLEX® type CFL 75
 → Pressure loss 90 Pa/m

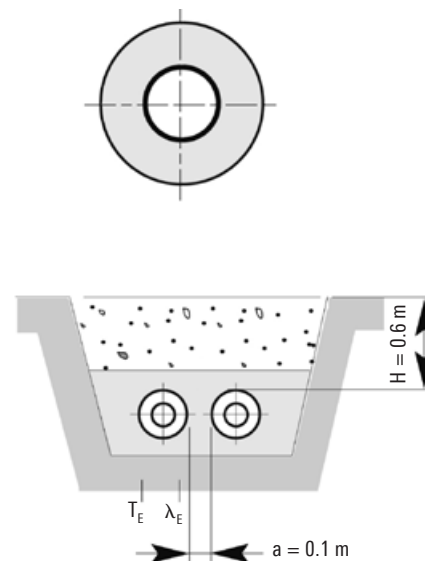
Heat loss

CASAFLEX® UNO

Heat loss q [W/m] for one UNO pipe

CASAFLEX® UNO	U-value [W/mK]	Average operating temperature T _B [°C]									
		40°	50°	60°	70°	80°	90°	100°	110°	120°	130°
22/ 91	0.113	3.4	4.5	5.7	6.8	7.9	9.0	10.2	11.3	12.4	13.5
30/ 91	0.143	4.3	5.7	7.1	8.6	10.0	11.4	12.6	14.3	15.7	17.2
30/111	0.123	3.7	4.9	6.1	7.3	8.5	9.8	11.0	12.2	13.4	14.6
39/111	0.153	4.6	6.1	7.6	9.2	10.7	12.2	13.8	15.3	16.8	18.4
39/126	0.137	4.1	5.5	6.8	8.2	9.6	10.9	12.3	13.6	15.9	16.4
48/111	0.197	5.9	7.9	9.8	11.8	13.8	15.8	17.7	19.7	21.7	23.6
48/126	0.170	5.1	6.8	8.5	10.2	11.8	13.5	15.2	16.9	18.6	20.3
60/126	0.217	6.5	8.7	10.8	13.0	15.2	17.4	19.5	21.7	23.9	26.0
60/142	0.187	5.6	7.4	9.3	11.2	13.0	14.9	16.8	18.6	20.5	22.4
75/142	0.266	8.0	10.6	13.3	15.9	18.6	21.3	23.9	26.6	29.2	31.9
75/162	0.218	6.5	8.7	10.9	13.0	15.2	17.4	19.5	21.7	23.9	26.1
98/162	0.355	10.1	13.4	16.8	20.1	23.5	26.8	30.2	33.5	36.9	40.2
98/182	0.258	7.7	10.3	12.9	15.5	18.1	20.5	23.2	25.8	28.4	31.0
127/202	0.366	11.0	14.7	18.3	22.0	25.6	29.3	33.0	36.6	40.3	44.0
127/225*	0.334	10.2	13.4	16.7	20.1	23.4	26.8	30.1	33.4	36.8	40.1

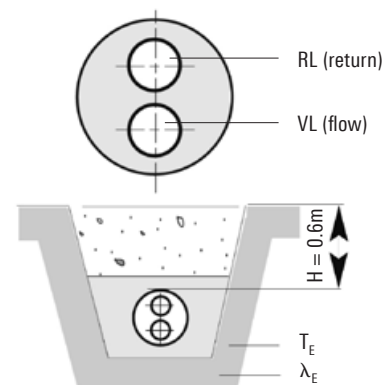
* on request



CASAFLEX® DUO

Heat loss q [W/m] for one DUO pipe

CASAFLEX® DUO	U-value [W/mK]	Average operating temperature T _B [°C]									
		40°	50°	60°	70°	80°	90°	100°	110°	120°	130°
22 + 22/111	0.156	4.7	6.2	7.8	9.4	10.9	12.5	14.0	15.6	17.2	18.7
30 + 30/126	0.181	5.4	7.2	9.0	10.9	12.7	14.5	16.3	18.1	19.9	21.7
39 + 39/142	0.224	6.7	8.9	11.2	13.4	15.7	17.9	20.2	22.4	24.6	26.9
48 + 48/162	0.251	7.5	10.0	12.5	15.0	17.6	20.1	22.6	25.1	27.6	30.1
60 + 60/182	0.293**	8.8	11.7	14.7	17.6	20.5	23.4	26.4	29.3	32.2	35.2
60 + 60/225	0.215	6.5	8.6	10.8	12.9	15.1	17.2	19.4	21.5	23.7	25.8



- Pipe distance: a = 0.10 m
- Coverage height: H = 0.60 m
- Ground temperature: T_E = 10 °C
- Soil conductivity: λ_E = 1.2 W/mK
- Conductivity of PIR foam: λ_{PIR} = 0.0250 W/mK at average temperature of 50 °C
- **Conductivity of PUR foam: λ_{PIR} = 0.0237 W/mK at average temperature of 50 °C
- Conductivity of PE casing: λ_{PE} = 0.43 W/mK

Heat loss during operation:

- q = U (T_B - T_E) [W/m]
- U = Heat transfer coefficient [W/mK]
- T_B = Average operating temperature [°C]
- T_E = Average ground temperature [°C]
- VL = Flow
- RL = Return