

FLEXWELL® Pipe system

The FHK type FLEXWELL® pipe system is part of the FLEXWELL family exactly like the FLEXWELL® safety pipe and the FLEXWELL® Cryo pipe.

FLEXWELL® is the trademark name for a flexible, double-walled and monitorable pipe system

The FHK type FLEXWELL® pipe system guarantees high safety even with high requirement for heat-insulated subterranean liquid transport.

Construction

- double-walled pipe system construction,
- corrugated special steel primary pipe or PE-HD
- heat insulation made of PUR high resistance foam
- corrugated steel outer containment pipe
- high quality outer corrosion proofing

System limitations

Operating temperature: -169 °C to +150 °C
 Operating pressure: up to PN 25
 Dimensions: DN 25 to DN 150



High quality corrosion proofing

The continuous, outer multilayer corrosion proofing provides incomparable safety in the ground while laying and working with pipes.

Primary pipe made of special steel

The FLEXWELL® pipe has a corrugated primary pipe made of special steel. The materials used are extremely corrosion-proof and hence extremely suitable for transporting the most varied liquids.

Primary pipe made of PE-HD

While transporting especially aggressive liquids, a primary pipe made of PE-HD can be used for the FLEXWELL® pipe system. Material: PE-HD according to DIN 8074/75 made of PE 80 or PE 100 with aluminium layer as diffusion block and a safety jacket made of reinforced polyolefin.

The heat insulation

The heat insulation of the FLEXWELL® pipe system consists of a flexible polyurethane high performance foam (FCKW-free).

100% diffusion density

With the entire construction, this pipe system experiences high robustness and 100% diffusion density with the corrugated special steel primary pipe and the corrugated steel outer containment pipe.

(in PE-HD with aluminium block).

- from inside to outside
- from outside to inside

Self-compensation

The corrugation of the primary pipe not only provides for flexibility, it also compensates for its own temperature-dependent linear deformation. Provisions for extension recording (U-bends, L-limb, fixed points) while transporting tempered liquids are not required.

FLEXWELL® Pipe System Type FHK with monitoring

The FLEXWELL® Pipe System (FHK) presents a safety pipe system with high safety levels with the double-wall (metal primary pipe and outer containment pipe) and with the integrated monitoring system.

Monitoring system

Underground pipe systems with a heat insulation can be provided with operation monitoring systems.

These systems check the heat insulation for moisture. Moisture can result both outside from the ground, and inside, from the primary pipe.

The FLEXWELL® Pipe System with the monitoring leads foamed into the heat insulation at the factory, is monitored according to the Resistance-Reference-Measuring procedure.

Function:

- Checking the heat insulation for moisture from outside
- Detecting leaks in a damaged outer containment pipe
- Detecting leaks in a damaged primary pipe in conductive media

Loading capacity

This pipe system that is to be laid directly underground has been tried and tested since years under the most extreme and varying conditions.

- tough line conditions
- built-up lines
- low overlapping heights
- sewerage
- laying in safety pipes
- laying without trenches

The flexibility of the pipe system enables adapting to almost all line conditions without problem. Existing delivery pipes can be crossed over or below, other obstacles can be avoided. The shortest line path can be selected without considering the conventional pipe design.

Especially on less stable grounds, where settling phenomena are possible, as well as on very moist grounds (high ground water level), the FLEXWELL® pipe system is a safe solution. It is possible to lay through water (sewerage) without problem.

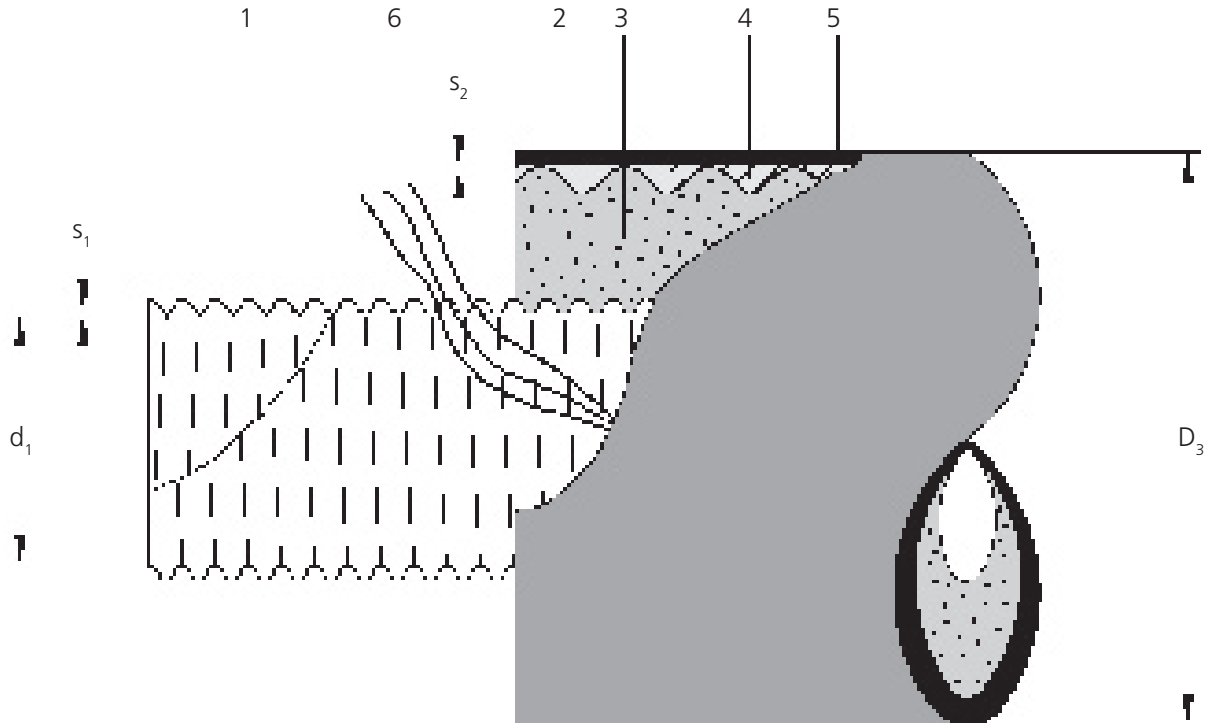
The pipe trenches can be considerably narrower than the conventional rigid pipe systems. Thus, this implies considerable saving in underground measures.

The FLEXWELL® Pipe system is especially suitable for horizontal flush drilling because of its flexibility. This procedure is applied wherever valuable surfaces need to be converted into smooth or tough crossings.

Economical

In addition, if we consider the very short laying time as opposed to laying and installing a conventional double-walled pipe system, the FLEXWELL® pipe system is not only a technically perfect, but also a very economical solution.



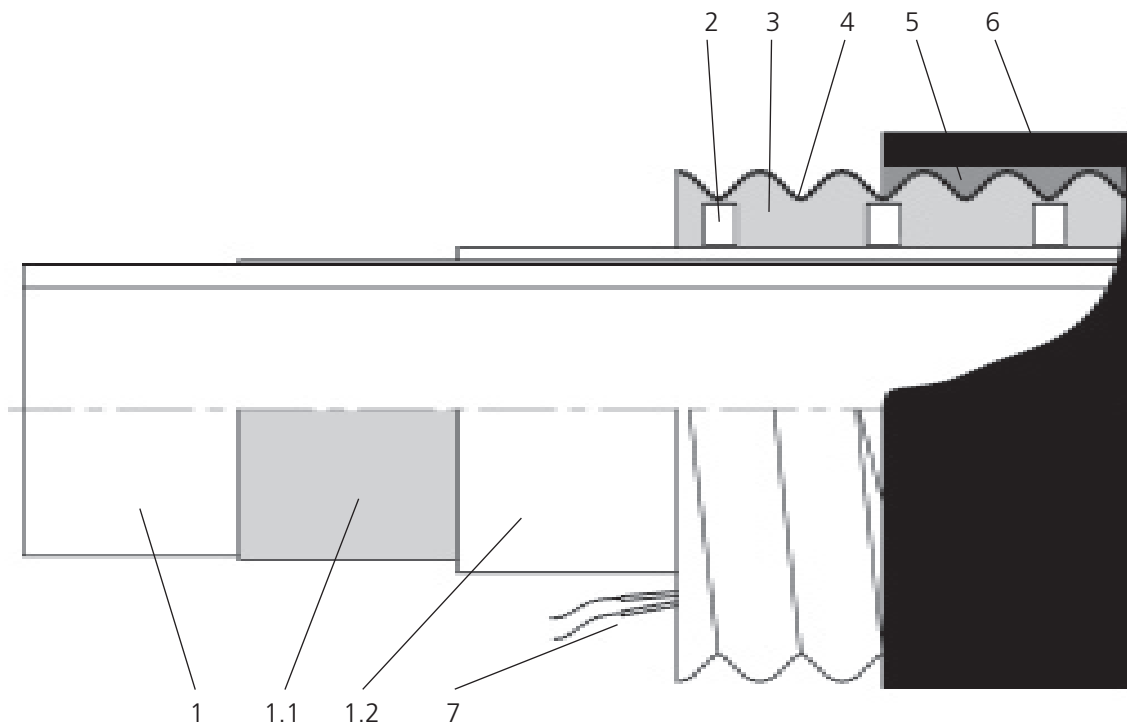


- 1 Corrugated special steel primary pipe, according to EN 10088:
1.4301 (AISI 304) or 1.4571 (AISI 316Ti) or 1.4404 (AISI 316L)
- 2 Corrugated steel jacket pipe made of ASt 4 LG, DIN 1624
- 3 Flexible polyurethane high performance foam (FCKW-free), from -169 °C to 150 °C resistant,
thermal conductivity at 50 °C: 0.032 W/mK
- 4 Double, polymer layer separated by hostaphane foil (bitumen caoutchouc paste)
- 5 Outer jacket made of polyethylene (PE)
- 6 Monitoring leads: integrated in the foam, for leakage detection on the primary and outer
containment pipe, measurement according to the resistance reference
procedure with conductive liquids

Table 1 FLEXWELL® heating cable - Dimensions, weights, delivery lengths

Type FHK	30/91	30/116	39/116	39/148	60/148	75/171	98/171	98/220	127/22	147/22	200/31
Comparable nominal width [DN]	25		32		50	65	80		100	125	150
Special steel carrier pipe d_1 [mm]	30	30	38.9	38.9	60	75.8	98	98	127	147	197.5
s_1 [mm]	0.3	0.3	0.4	0.4	0.5	0.6	0.8	0.8	0.9	1.0	1.2
Steel sheath pipe s_2 [mm]	0.6	0.6	0.6	0.6	0.7	0.8	0.8	0.9	0.9	0.9	1.3
External diameter D_{3max} [mm]	94	121	121	156	156	178	178	233	233	233	313
Carrier pipe volume [dm ³ /m]	0.81	0.81	1.35	1.35	3.12	5.12	8.43	8.43	14.3	17.3	23.2
Weight [kg/m]	3.9	5.4	5.7	8.6	9.1	12.2	12.8	19.3	19.8	20.3	33.2
Max. delivery length*) [m]	1.000	640	640	590	590	480	480	270	270	250	150
Minimum bending radius [m]	1	1.2	1.2	1.5	1.5	2	2	4	4	4	6
Trench width [m]	0.5	0.55	0.55	0.6	0.6	0.65	0.65	0.75	0.75	0.75	1

*) according to maximum possible drum capacity and normal manufacturing length



- 1.0 Primary pipe made of PE-HD according to DIN 8074/75 KIWA-tested PE 80 or PE 100
- 1.1 Aluminium layer as diffusion block
- 1.2 Protective jacket made of reinforced polyolefine
- 2 Distance helix made of PUR high resistance foam
- 3 Flexible polyurethane high resistance foam
- 4 Outer containment corrugated pipe made of steel
- 5 Polymer layer (bitumen caoutchouc paste)
- 6 Outer jacket made of polyethylene (LDPE)
- 7 Pilot conductor system for leak detection

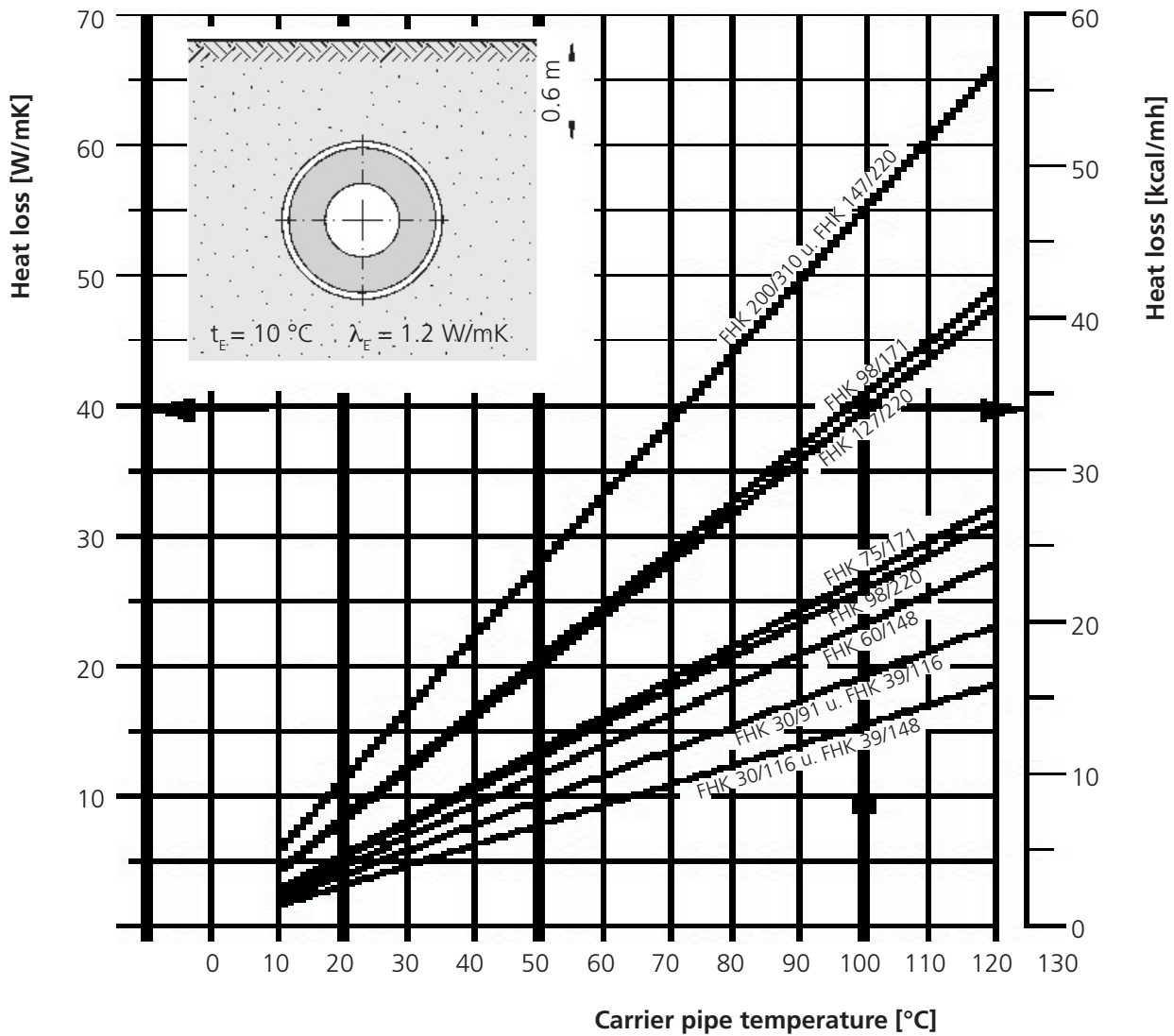
**FLEXWELL® Pipe System with PE-HD primary pipe type: FHK-PEHD
Delivery project-related, no standard**

Dimensions: from Type 25/91 with PE-HD primary pipe 27.5 mm x s

 to Type 180/310 with PE-HD primary pipe 189.0 mm x s

Pressure levels: PE 80 = PN 12.5 and PN 20
 PE 100 = PN 16

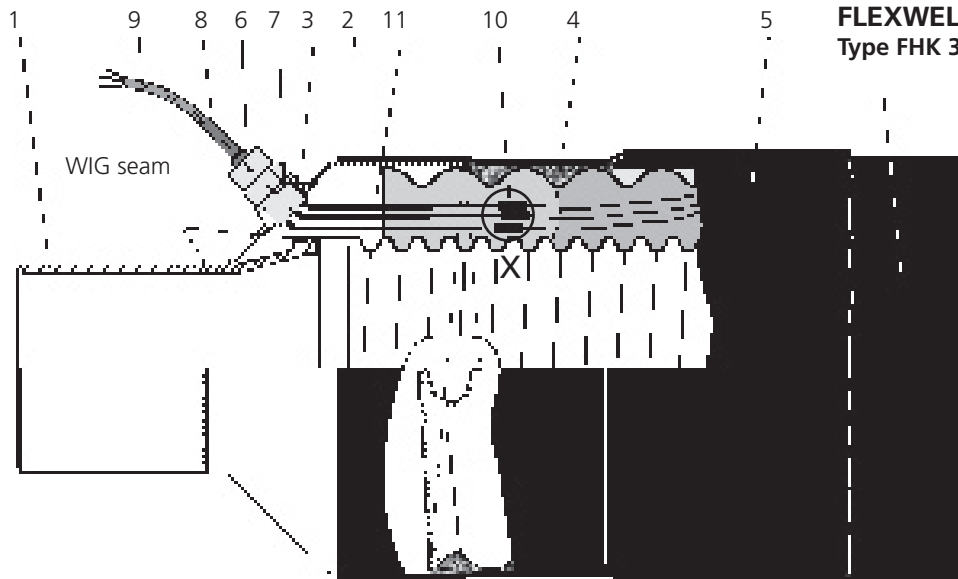
Delivered lengths: depends on diameter, on the drum or in the ring
 in lengths from 150 m to 1000 m



Example:

Carrier pipe temperature 110° C
 FLEXWELL® heating cable type 127/220
 → heat loss 40 W/m or 34 kcal/mh

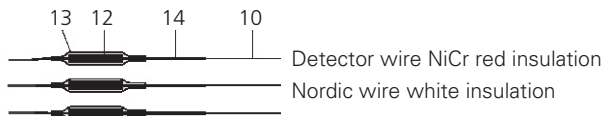
Conductivity of ground $\lambda_E = 1.2\text{ W/mK}$
 Earth temperature $t_E = 10\text{ °C}$



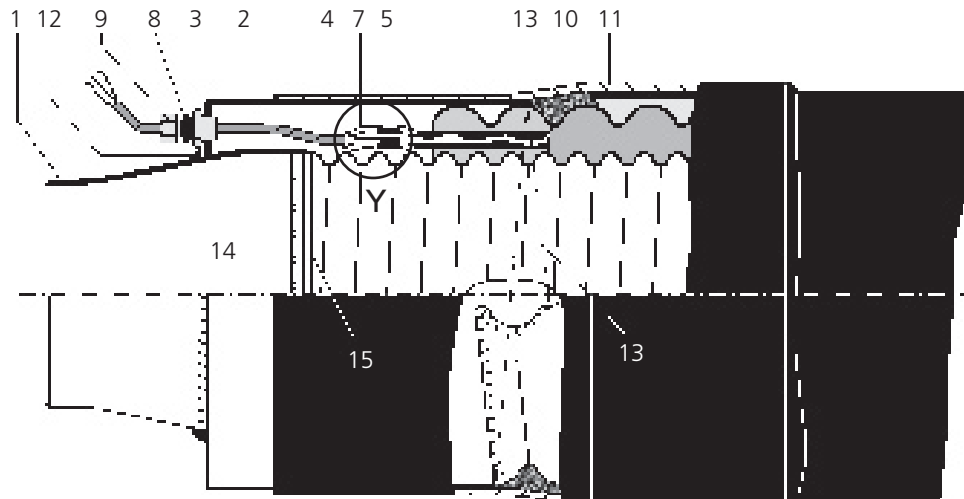
FLEXWELL® heating cable
Type FHK 30/91 - 147/220

- 1 Connection piece with welding socket piece
- 2 Protective cap
- 3 Threaded piece R 1/2"
- 4 Permanently plastic jointing compound
- 5 Heat-shrink sleeve
- 6 Electronic detection conductor bushing R 1/2"
- 7 Sealing ring
- 8 Heat-shrink sleeve
- 9 Silicon cable
- 10 Electronic detection conductors
- 11 Heat-shrink sleeve
- 12 Compression joint
- 13 Heat-shrink sleeve
- 14 Insulation

Detail X



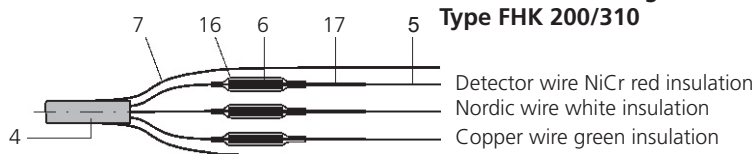
10 Detector wire NiCr red insulation
12 Nordic wire white insulation



FLEXWELL® heating cable
Type FHK 200/310

- 1 Connection piece with welding socket piece
- 2 Protective cap
- 3 Reducing nipple
- 4 Silicon cable
- 5 Electronic detection conductors
- 6 Compression joint
- 7 Glass fabric sleeve
- 8 Sealing ring
- 9 Screwed cable gland
- 10 Permanently plastic seal
- 11 Shrink collar
- 12 Weld seam (protective cap/connection)
- 13 Weld seam (protective cap/connection)
- 14 Weld seam ("black" / "white")
- 15 Weld seam ("white" / "white")

Detail Y

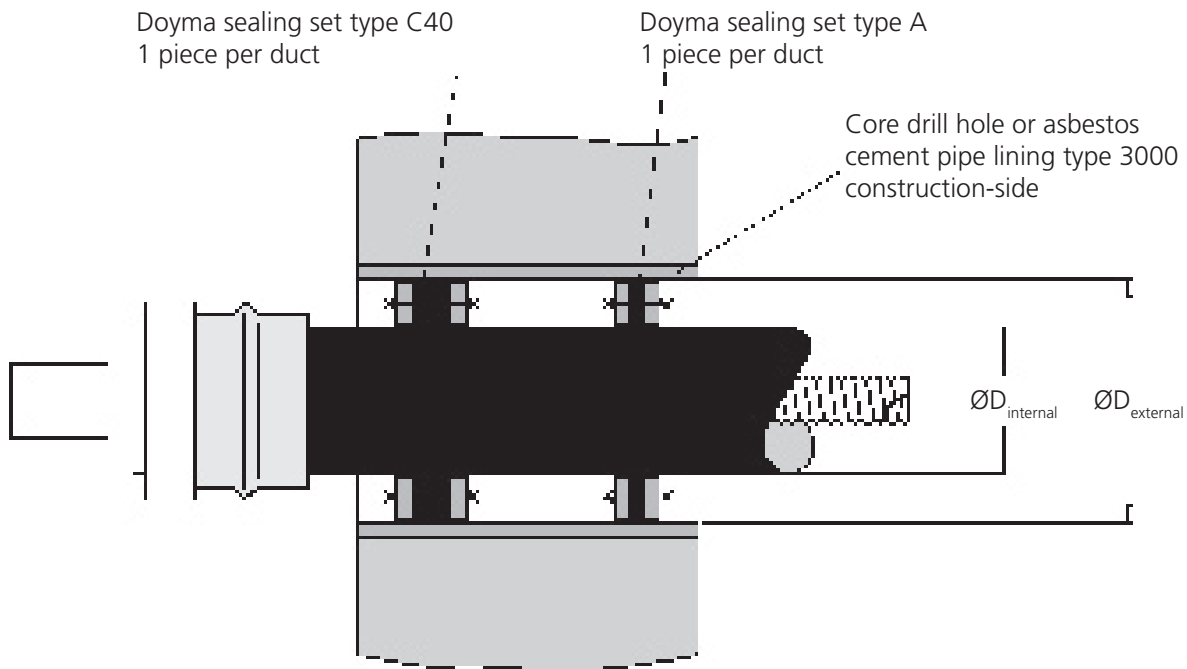


5 Detector wire NiCr red insulation
6 Nordic wire white insulation
7 Copper wire green insulation

Nominal widths, pipe union dimensions

type FHK		30/91 30/116	39/116 39/148	60/148	75/171	98/171 98/220	127/220	147/220	200/310
Comparable nomina width	[DN]	15	32	50	65	80	100	125	150
Pipe union dimensions	[mm]	33.7x2.6	42.4x2.6	60.3x2.9	76.1x2.9	88.9x3.2	114.3x3.6	139.7x4.9	168.3x4.5

Note: In pressure tests in partially filled trenches or with unfixed connectors max. permissible pressure = 0.5 bar.



FHK		Ø Core drill hole or pipe lining 3000	Doyma sealing set	
DN	Type		D _{internal}	D _{external}
25	30/91	150	94	150
25	30/116	200	121	200
32	39/116	200	121	200
32	39/148	250	156	250
50	60/148	250	156	250
65	75/171	250	178	250
80	98/171	250	178	250
80	98/220	350	233	350
100	127/220	350	233	350
125	147/220	350	233	350
150	200/310	400	313	400

The internal diameter of the core drill hole or asbestos cement pipe lining (= ØD_{external}) must be specified when ordering the Doyma sealing set.

The pipe may not be moved axially after mounting the Doyma sealing set.

Trench dimensions

Fig. 1: Trench plan

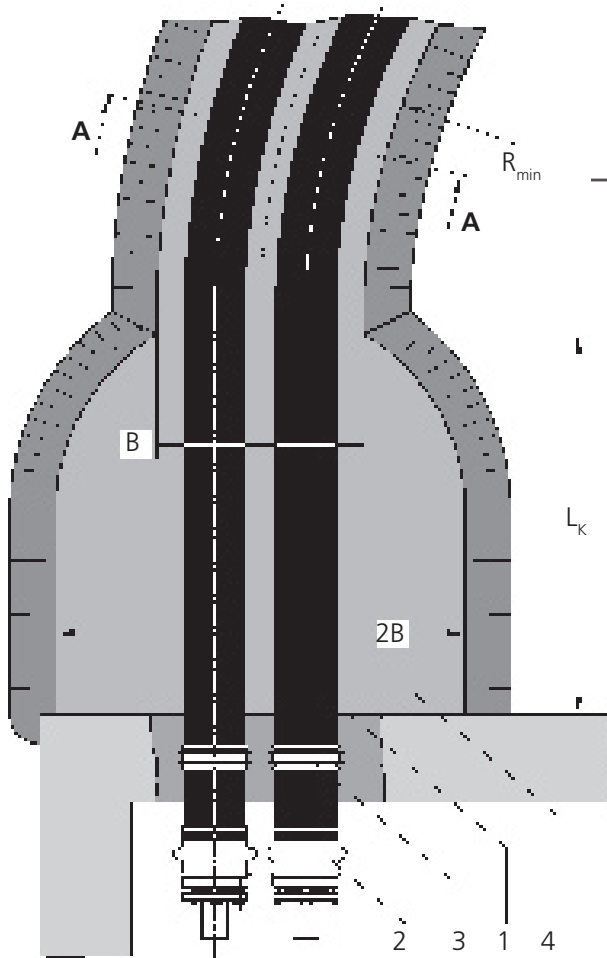
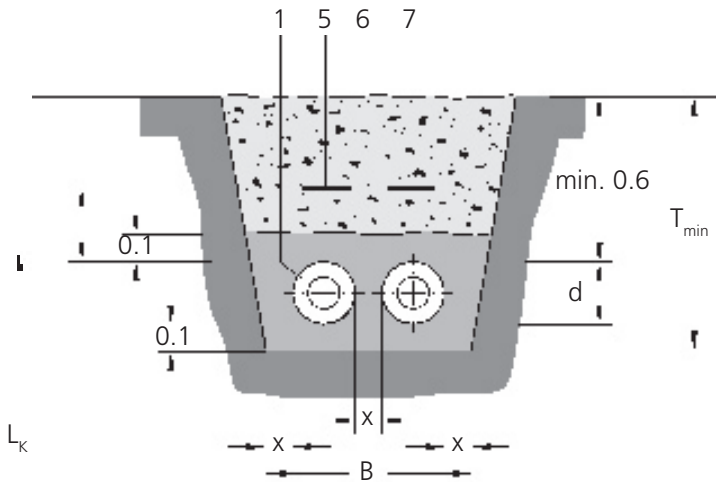


Fig. 2: Trench sectional view A-A (dimensions in m)



- 1 FLEXWELL® Pipe system (FHK)
- 2 Connector
- 3 Wall sealing ring (wall duct)
- 4 Working space in front of buildings and shafts
- 5 Trench warning strip (delivery by BRUGG; laying construction-side)
- 6 Sand filling (grain size 0 - 4 mm)
- 7 Filling material (reusable excavated material)

Trench and working space dimensions, excavation and sand-filling quantities

The trench widths "B" are recommended values. Please pay attention to valid technical rules, directives and accident prevention regulations.

FLEXWELL® heating cable (FHK)	Type		30/91	30/116	39/116	39/148	60/148	75/171	98/171	98/220	127/220	147/220	200/310
External diameter FHK	d	[mm]	94	121	156	178	233	313					
Trench depth T_{min}	for SLW 60 ¹⁾	[m]	0.80	0.85	0.85	0.90	0.95	1.05					
Minimum covering t	for SLW 60	[m]	0.60	0.60	0.60	0.60	0.60	0.60					
Trench width B		[m]	0.50	0.55	0.60	0.65	0.75	0.95					
Working space width 2B		[m]	1.00	1.10	1.20	1.30	1.50	2.00					
Working space length L_k		[m]	0.50	0.50	1.00	1.00	1.50	2.50					
Minimum trench radius ²⁾ R_{min}		[m]	1.00	1.20	1.50	2.00	4.00	6.00					
Excavation ³⁾	for SLW 60	[m ³ /m]	0.40	0.47	0.51	0.59	0.72	1.00					
Sand filling		[m ³ /m]	0.14	0.16	0.18	0.20	0.24	0.39					

1) SLW 60 = 100 kN wheel load according to DIN 1072

2) Smaller radii only after consultation with BRUGG Rohrsysteme

3) Excavation quantities without consideration of the slope inclination