FLEXWELL SAFETY PIPE

Pipe systems for installations

Installation, Operating and Maintenance Instructions

kiwa

BRUGG Pipes

Pioneers in Infrastructure

FLEXWELL Safety Pipe

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FLEXWELL Safety Pipe

Pipe system for installations

Flexible, double-walled pipe system with stainless steel inner pipe and outer containment pipe and permanent leak detection with approval DIBt Z-38.4-253[1]

SYSTEM DESCRIPTION

FLEXWELL Safety Pipe (FSR) was specially designed for the underground transport of flammable, water-hazardous fluids. It can be used as a suction or positive pressure supply pipe. The FLEXWELL Safety Pipe can be permanently monitored by means of suitable leak detectors.

CONSTRUCTION

FLEXWELL Safety Pipe is a flexible, permanently monitorable, double-walled pipe system. The FLEXWELL Safety Pipe consists of a corrugated stainless steel inner medium pipe, a reinforcing band and a corrugated outer containment pipe made of stainless steel. The annular gap between the inner and outer pipes is a surveillance space for leak monitoring. External corrosion protection is provided by a PE casing covering the outer pipe.

RANGE OF APPLICATIONS

- suction pipe
- positive pressure supply pipe
- filling pipe

NOMINAL BORES / PRESSURE STAGES

FLEXWELL Safety Pipe is available in nominal bores from DN 12 to DN 150.
It can be operated with positive pressure up to max. 25 bar.

LAYING THE PIPES

FLEXWELL Safety Pipe can be laid directly into the trench in one piece. It can be laid either overground in a trace or inside of bulidings. The unique corrugated pipe geometry of inner medium pipe and outer containment pipe ensures excellent flexibility. It can be cut to the required length at the construction site, laid "endlessly" and bent through tight radii thanks to its flexibility.

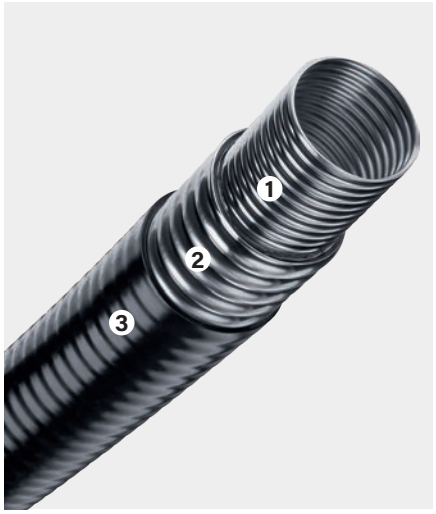
DOUBLE-WALLED FITTINGS

Monitorable through-connections and T-pieces as well as connectors with measuring branches are all part of the comprehensive range of products available in the FLEXWELL Safety Pipe programme.

LEAK MONITORING

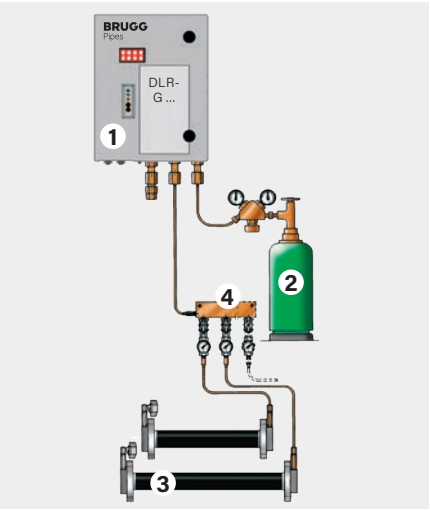
The surveillance space between the inner and outer pipes can be permanently monitored by means of suitable positive or negative pressure leak detectors.
A wide range of leak detection systems for different areas of application and legal requirements is available.

1) DIBt: Deutsches Institut für Bautechnik / German institut for construction technology



FLEXWELL
Safety Pipe

1 corrugated inner medium pipe of stainless steel
2 corrugated outer containment pipe of stainless steel
3 polyethylene casing



Positive pressure leak detector
1 leak detector
2 pressure reservoir
3 double-walled corrugated FLEXWELL Safety Pipe with measuring branch and test valve
4 distributor

Physical properties FLEXWELL Safety Pipe

Material:	inner pipe	1.4404/1.4571
	outer pipe	1.4301
	reinforcing band	steel
	corrosion proofing	PE-LD casing
Operating pressure inner pipe:	vacuum	suction pipe up to –0.8 bar
	positive pressure	up to 25 bar (depending on nominal bore)
Monitoring pressure outer pipe, permanent:	vacuum	–0.7 bar
	positive pressure	up to 25 bar (depending on operating pressure and nominal bore)

Dimensions

Type	**Nominal bore**	**Inner diameter**	**Outer diameter**	**Volume inner pipe**	**Weight**	**Bending radius**
	DN	mm	mm	l/m	kg/m	cm
FSR 13/ 25	12	13	25	0.13	0.52	30
FSR 30/ 48	25	30	48	0.80	1.40	50
FSR 39/ 60	32	39	60	1.30	2.00	60
FSR 48/ 71	40	48	71	2.00	2.90	60
FSR 60/ 83	50	60	83	3.00	3.80	70
FSR 75/107	65	75	107	5.10	6.20	90
FSR 98/134	80	98	134	8.40	9.00	120
FSR 127/175	100	127	175	14.00	18.10	150
FSR 200/262	150	200	262	23.20	29.00	400

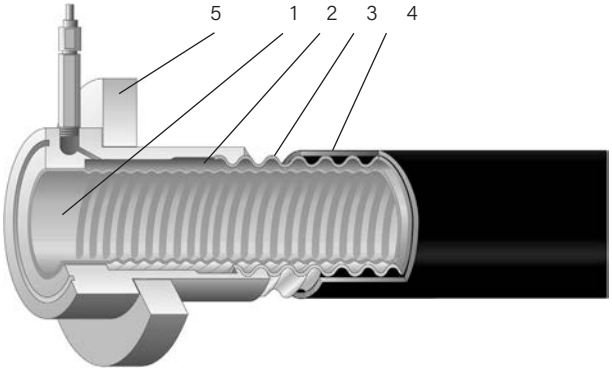
Subject to technical alterations

FLEXWELL Safety Pipe

System description

Construction and function

The FLEXWELL Safety Pipe is a:
- double-walled, monitorable, flexible and factory produced pipe system with all necessary quality tests
- approved for the transport of water-hazardous, flammable or otherwise dangerous fluids
- recognized and approved leak detection system
- Dimensions: DN 12 – DN 150
- Pressure range: –0,8 to 25 bar (temperature range –30 °C to +60 °C
  –0,8 to 10 bar (temperature range –50 °C to +60 °C)
  (max. dep. on fitting, FSR 4.2)
- Temperature range: –30 °C to +60 °C (for PN 25 fittings)
  –50 °C to +60 °C (for PN 10 fittings)
- DIBt Approval Number: Z-38.4-253



Construction of the FLEXWELL Safety Pipe:
1 corrugated inner pipe (1.4404/1.4571)
2 surveillance space
3 corrugated outer pipe (1.4301)
4 Corrosion proofing (PE casing)
5 Connecting fitting

Leak monitoring

The surveillance space between the inner and outer pipe enables permanent leak monitoring using approved leak detection devices operating either on the positive pressure or vacuum principle. The use of these systems is compliant with the highest European safety standards. The system is constructed with safety in mind and will detect any leak above or below the fluid level within a double-walled protective system.

Legal basis

Many laws, standards and regulations determine the requirements for leak detection systems and their use. Here are just a few of the principal ones:
- European Standardisation of Leak Detection Systems (DIN EN 13160, DGRL[1] 97/23/EG)
- Environmental legislation and requirements for water safety (DIN EN 13480, WHG[2] § 62)

Quality, process, pressure and material tests are carried out as part of the approval procedure by external technical inspection agencies as well as our internal quality assurance department

- Fulfillment the requirements for fire and explosion prevention for hydrological engineering and construction of buildings (TRbF[3] 50, MLAR[4])

Laying and installation

- fast, simple laying in continuous lengths directly from drum/coil into trench or in building
- underground and above ground
- changes of direction are compensated by the flexible pipe system
- acceptance test after completion of laying and installation by means of a function test of the leak monitoring system.
- All connecting fittings and double-walled flanged moulded fittings are mounted either on the surface or in manholes and canal ducts
- All non-detachable double-walled moulded fittings (integrated elements) in a pipe can also be laid underground
- laying and installation is done only by trained and accredited specialist firms (acc. to WHG or VAUwS[5])
- optional technical support by BRUGG intallation and service staff

The Advantages of the system

- double-walled, monitorable, flexible pipe system
- delivery in lengths up to 1000 m
- short construction periods, fast laying
- flameless (non-weld) connecting fitting
- no moulded fittings/welded connections along the pipe route
- optionally, BRUGG can provide the entire range of installation and support services
- approved system DIBt Z-38.4-253
- for highly aggressive substances other materials can be applied on a project basis (e.g. 1.4539 or Bitumen)

1) DGRL: Druckgeräterichtlinie / Pressure Equipment Directive
2) WHG: Wasserhaushaltsgesetz / Water Rescources Act
3) TRbF: Technische Regeln für brennbare Flüssigkeiten / Technical Regulations for Combustible Liquids
4) MLAR: Muster-Leitungsanlagen-Richtlinie / Model Pipe System Guideline
5) VAUwS: Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen / Ordinance on Installations for the Handling of Substances Hazardous to Water

BRUGG Pipes

FLEXWELL Safety Pipe

System description

Leak monitoring

The FLEXWELL Safety Pipe is permanently monitored using pneumatic leak detection devices/leak detectors. These regulate the monitoring pressure in the surveillance space and register any changes of pressure which may occur.

The surveillance space prevents the uncontrolled escape of the transport medium into the environment in the event of a leakage. The surveillance space must be constructed in such a way that the proper functioning and operating safety of the leak detection system is ensured under all operating conditions.

In the case of a leakage the alarm is given by acoustic and optical signals.

Definition of a leak detection system

A "leak detection system" according to currently valid regulations is a device which is capable of warning automatically of leaks in the walls of double-walled piping transporting water-hazardous (flammable and non-flammable) fluids under all operating conditions. All equipment necessary for the detection of leaks is included under the term leak detection system/ leak detector.

The main components are:
- the leak detector (LAZ)/leak detection device
- the surveillance space (ÜR)
- the connection to the leak detector ÜR – LAZ
- the double-walled piping
- a leak detection medium

The use of these systems is compliant with the highest European safety standards (Class I). Systems of this Class will detect any leak above or below the fluid level within a double-walled protective system. They are constructed with safety in mind and ensure that no fluid can escape into the environment.

Leak detector (LAZ)/leak detection device

A distinction is made between two types of differential pressure leak detection device for leak monitoring to detect and report leaks in surveillance spaces of double-walled piping either the **vacuum principle** or the **positive pressure principle** with an inert gas.

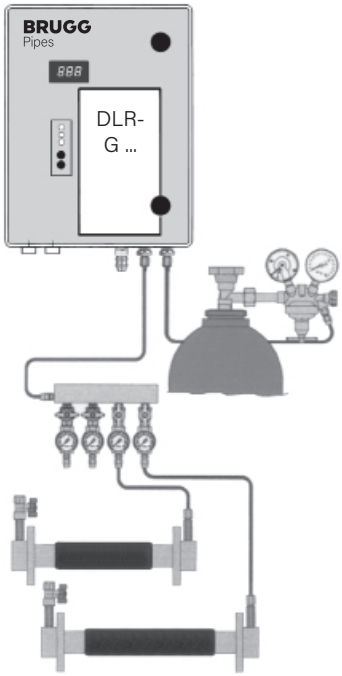
Approval/suitability

All leak monitoring systems must comply with the established construction and testing principles. This means that all the conditions must be considered which might influence the function and operating safety of the system. Consequently the conditions for operation are tested by the competent authorities and clearly defined and stipulated in the approvals issued by them.

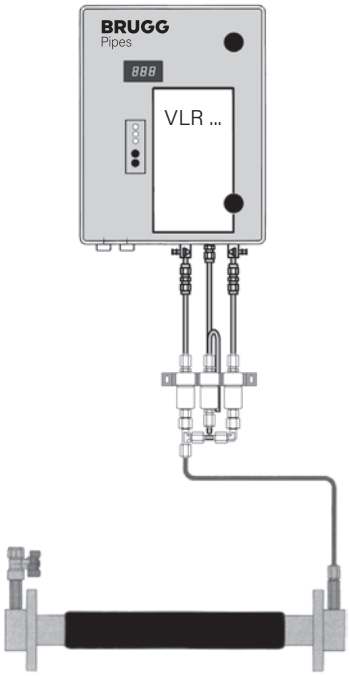
FLEXWELL Safety Pipe with leak monitoring is an approved leak detection system.

Advantages of the system

The use of double-walled FLEXWELL Safety Pipe with leak monitoring has, besides offering excellent operational safety, significant economic advantages:
- the entire system can be simply checked at any time without any downtime in operations
- requirements such as e.g. pressure or volume measurements, pressure tests or inspection of the route can be eliminated



FLEXWELL®
Safety Pipe
with positive
pressure
leak monitoring



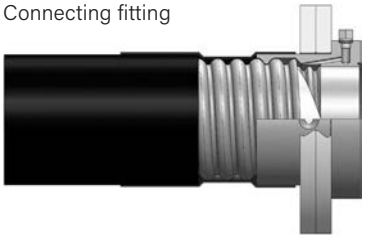
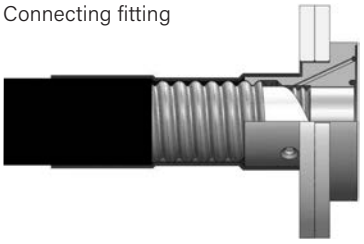
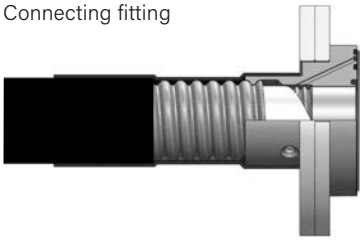
FLEXWELL®
Safety Pipe
with vacuum
leak monitoring

BRUGG Pipes

FLEXWELL Safety Pipe

Product overview

Piping/Connecting fittings TIG welding

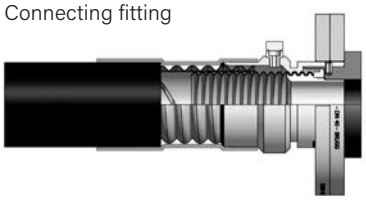
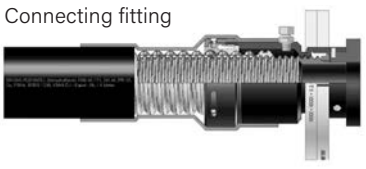
Version	Type FSR	Nominal bore/ Connector DN/DN	Pressure (temp. range) PN	Connector Type of joint inner/outer	Material No.	Work-sheet
Pipe	FSR 13/ 25	12	up to 25 (fitting dependent)	smooth-bore inner pipe corrugated outer pipe	1.4404 1.4301	FSR 4.130
Pipe	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25 32 40 50 65 80 100	up to 25 (fitting dependent)	corrugated inner pipe corrugated outer pipe	1.4404 1.4301	FSR 4.131
Connecting fitting 	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25/ 25 32/ 32 40/ 40 50/ 50 65/ 65 80/ 80 100/125	25 (–30 °C to +60 °C)	collar with split loose flange TIG welding/ hard soldering	collar 1.4404	FSR 4.211
Connecting fitting	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83	25/ 40 / 1 ½" 32/ 50 / 2" 40/ 65 / 2 ½" 50/ 65 / 2 ½"	25 (–30 °C to +60 °C)	external R thread TIG welding/ hard soldering	socket with thread 1.4404	FSR 4.221
Connecting fitting 	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25/ 40 32/ 50 40/ 65 50/ 65 65/100 80/100 100/150	25 (–30 °C to +60 °C)	collar with split loose flange and monitorable sealing surface with O-rings (Part 1) TIG welding/h ard soldering	collar 1.4404	FSR 4.216
Connecting fitting 	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25/ 40 32/ 50 40/ 65 50/ 65 65/100 80/100 100/150	25 (–30 °C to +60 °C)	collar with split loose flange and monitorable sealing surface with O-rings (Part 2) TIG welding/h ard soldering	collar 1.4404	FSR 4.217

BRUGG Pipes

FLEXWELL Safety Pipe

Product overview

Connecting fittings GRAPA graphite compression joint

Version	Type FSR	Nominal bore/ Connector DN/DN	Pressure (temp. range) PN	Connector Type of joint inner/outer	Material No.	Work-sheet
Connecting fitting	FSR 13/ 25	12/12	25 (–50 °C to +60 °C)	pipe end 15 x 1 compression-type screwed joint/ graphite screwed joint	1.4404	FSR 4.202
Connecting fitting	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134	25/25 32/32 40/40 50/50 65/65 80/80	10 (–50 °C to +60 °C)	welded end graphite seal/ hard soldering	in contact with medium 1.4404 outer 1.4301	FSR 4.222
Connecting fitting	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134	25/25 / 1“ 32/32 / 1 ¼“ 40/40 / 1 ½“ 50/50 / 2“ 65/65 / 2 ½“ 80/80 / 3“	10 (–50 °C to +60 °C)	external thread graphite seal/ hard soldering	in contact with medium 1.4404 outer 1.4301	FSR 4.223
Connecting fitting 	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134	25/25 32/32 40/40 50/50 65/65 80/80	10 (–50 °C to +60 °C)	collar with split loose flange graphite seal/ hard soldering	in contact with medium 1.4404 outer 1.4301	FSR 4.224
Connecting fitting	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83	25/25 32/32 40/40 50/50	25 (–30 °C to +60 °C)	welded end graphite seal/ shaped ring screw joint	in contact with medium 1.4404 outer 1.4301	FSR 4.230
Connecting fitting	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83	25/25 / 1“ 32/32 / 1 ¼“ 40/40 / 1 ½“ 50/50 / 2“	25 (–30 °C to +60 °C)	external thread graphite seal/ shaped ring screw joint	in contact with medium 1.4404 outer 1.4301	FSR 4.231
Connecting fitting 	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83	25/25 32/32 40/40 50/50	25 (–30 °C to +60 °C)	collar with split loose flange graphite seal/ shaped ring screw joint	in contact with medium 1.4404 outer 1.4301	FSR 4.232

BRUGG Pipes

FLEXWELL Safety Pipe

Product overview

Through-connections

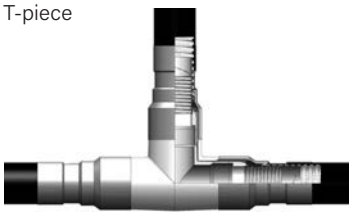
Version	Type FSR	Nominal bore/ DN	Pressure (temp. range) PN	Connector Type of joint inner/outer	Material No.	Work-sheet
Through-connection	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25/ 40 32/ 50 40/ 65 50/ 65 65/100 80/100 100/150	25 (–30 °C to +60 °C)	TIG welding/ hard soldering	collar 1.4404	FSR 4.401
Through-connection	FSR 13/ 25	12	25 (–50 °C to +60 °C)	TIG welding/ hard soldering	in contact with medium 1.4404 outer 1.4301	FSR 4.403
Through-connection	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25 32 40 50 75 80 100	25 (–30 °C to +60 °C)	TIG welding/ hard soldering	in contact with medium 1.4404 outer 1.4301	FSR 4.404
Through-connection	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83	25 32 40 50	25 (–30 °C to +60 °C)	graphite seal/ shaped ring-screw joint	in contact with medium 1.4404 outer 1.4301	FSR 4.405

BRUGG Pipes

FLEXWELL Safety Pipe

Product overview

Elbows, T-pieces

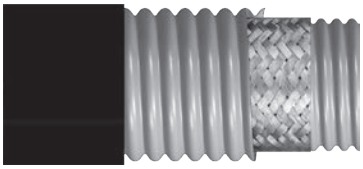
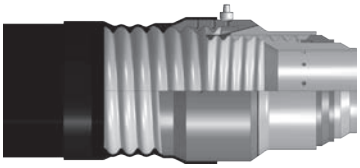
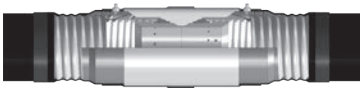
Version	Type FSR	Nominal bore/ Connector DN/DN	Pressure (temp. range) PN	Connector Type of joint inner/outer	Material No.	Work-sheet
Elbow	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25/ 40 32/ 50 40/ 65 50/ 65 65/100 80/100 100/150	25 (–30 °C to +60 °C)	complete assembly	inner/ sealing surface 1.4404 outer 1.4301	FSR 4.410
Elbow	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25 32 40 50 65 80 100	25 (–30 °C to +60 °C)	TIG welding/ hard soldering	in contact with medium 1.4404 outer 1.4301	FSR 4.413
T-piece	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25/ 40 32/ 50 40/ 65 50/ 65 65/100 80/100 100/150	25 (–30 °C to +60 °C)	complete assembly	inner/ sealing surface 1.4404 outer 1.4301	FSR 4.420
T-piece 	FSR 30/ 48 FSR 39/ 60 FSR 48/ 71 FSR 60/ 83 FSR 75/107 FSR 98/134 FSR 127/175	25 32 40 50 65 80 100	25 (–30 °C to +60 °C)	TIG welding/ hard soldering	in contact with medium 1.4404 outer 1.4301	FSR 4.433

BRUGG Pipes

FLEXWELL Safety Pipe

Product overview

Piping/Connecting fittings TIG welding

Version	Type FSR	Nominal bore/ Connector DN/DN	Pressure (temp. range) PN	Connector Type of joint inner/outer	Material No.	Work-sheet
Pipe 	FSR 200/262	150	25 (–30 °C to +60 °C)	corrugated inner pipe corrugated outer pipe	1.4404 1.4301	FSR 4.140
Connecting fitting 	FSR 200/262	150	25 (–30 °C to +60 °C)	168.3 x 4.4	1.4404 1.4301	FSR 4.240
Through-connection	FSR 200/262	150	25 (–30 °C to +60 °C)	TIG welding	1.4404 1.4301	FSR 4.440
Through-connection separated monitoring space 	FSR 200/262	150	25 (–30 °C to +60 °C)	TIG welding	1.4404 1.4301	FSR 4.441

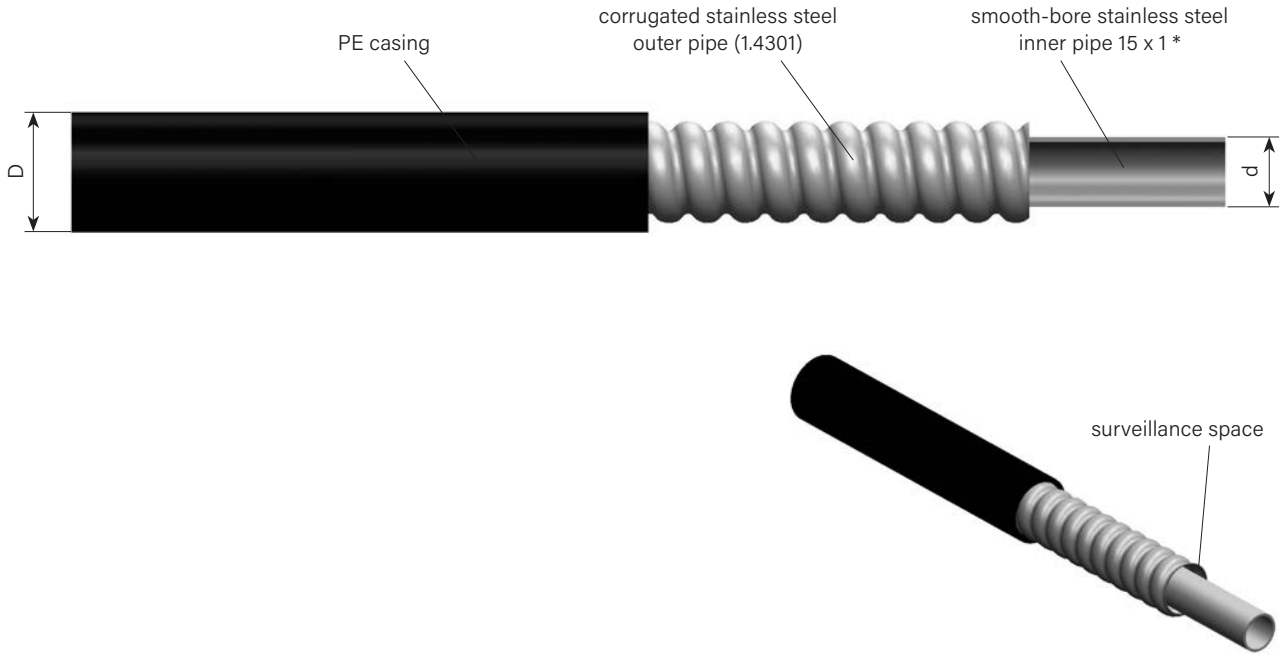
BRUGG Pipes

FLEXWELL Safety Pipe

FLEXWELL® Safety Pipe

with stainless steel smooth-bore inner pipe, stainless steel outer pipe and PE casing

FLEXWELL Safety Pipe Type FSR 13/25



*** inner pipe: Material No. 1.4404/1.4571**

Type	ID/OD	DN	PN	d	D	PE WT	Volume inner pipe	surveillance space	Weight	Bending radius	Article No.
				mm	mm	mm	l/m	l/m	kg/m	cm	
FSR 13/25		12	25	13	25	1.8	0.13	0.12	0.52	30	1015299

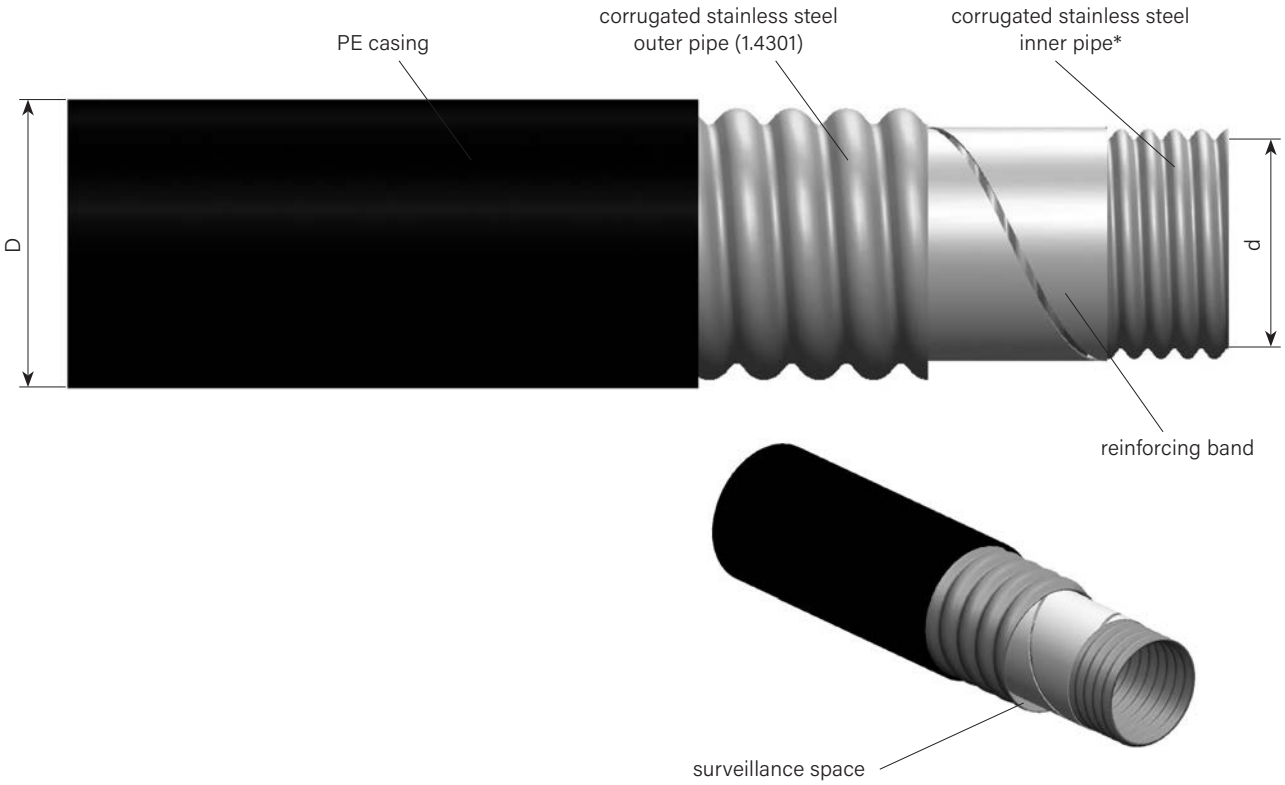
BRUGG Pipes

FLEXWELL Safety Pipe

FLEXWELL Safety Pipe

with stainless steel inner pipe, stainless steel outer pipe and PE casing

FLEXWELL Safety Pipe Type FSR 30/48 – FSR 127/175



*** inner pipe: Material No. 1.4404/1.4571**

Type ID/OD	DN	PN	d	D	PE WT	Volume inner pipe	surveillance space	Weight	Bending radius	Article No.
			mm	mm	mm	l/m	l/m	kg/m	cm	
FSR 30/ 48	25	25	30	48	1.8	0.8	0.38	1.4	50	1015304
FSR 39/ 60	32	25	39	60	1.8	1.3	0.41	2.0	60	1015306
FSR 48/ 71	40	25	48	71	2.0	2.0	0.65	2.9	60	1015302
FSR 60/ 83	50	25	60	83	2.2	3.0	0.73	3.8	70	1015309
FSR 75/107	65	25	75	107	3.0	5.1	1.30	6.2	90	1015311
FSR 98/134	80	25	98	134	3.5	8.4	1.45	9.0	120	1015297
FSR 127/175	100	25	127	175	4.0	14.0	4.00	18.1	150	1015296

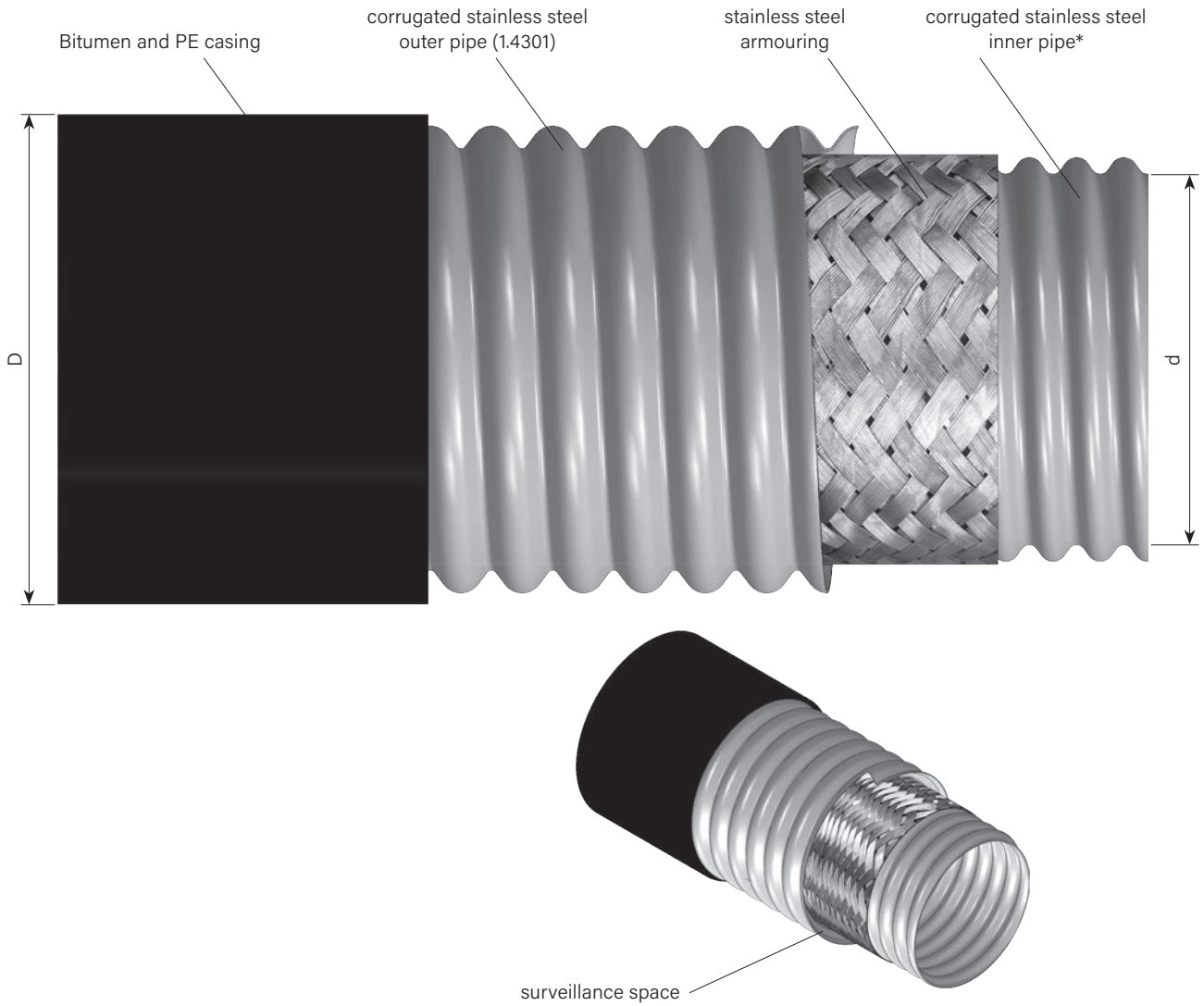
BRUGG Pipes

FLEXWELL Safety Pipe

FLEXWELL Safety Pipe

with stainless steel inner pipe, stainless steel armouring, stainless steel outer pipe, (bitumen) and PE casing – on request

FLEXWELL Safety Pipe Type FSR 200/262



*** inner pipe: Material No. 1.4404/1.4571**

Type	ID/OD	DN	PN	d	D	PE WT	Volume inner pipe	surveillance space	Weight	Bending radius	Bitumen	Article No.
				mm	mm	mm	l/m	l/m	kg/m	cm		
FSR	200/262	150	25	197.5	264	5.0	33.5	9.5	29	400	Yes	1066347
FSR	200/262	150	25	197.5	264	5.0	33.5	9.5	29	400	No	1080234

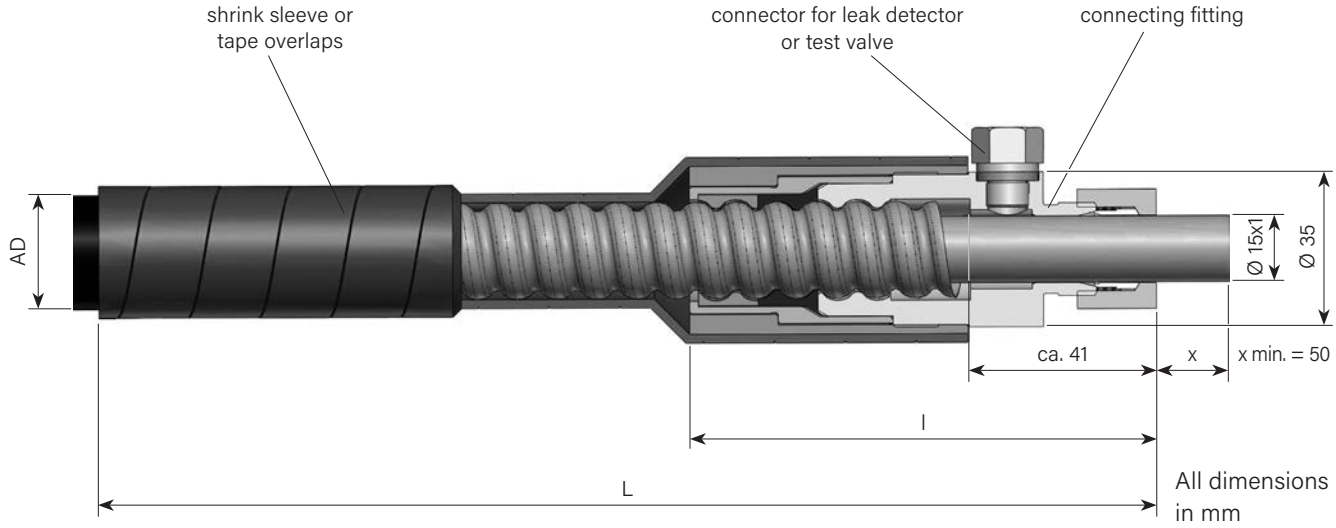
BRUGG Pipes

FLEXWELL Safety Pipe

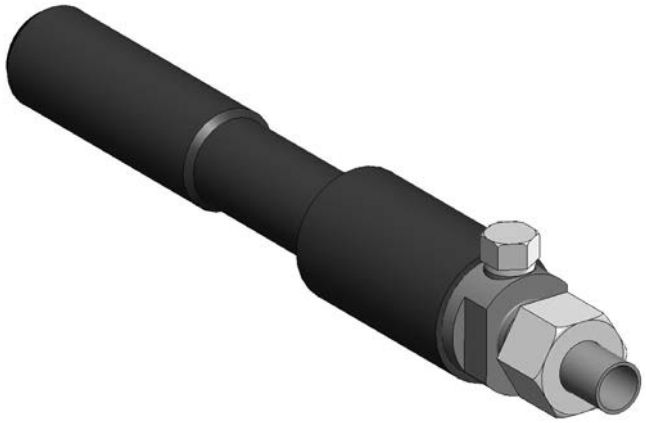
Connecting fitting FSR 13/25 GRAPA

Inner pipe: compression-type screwed joint; outer pipe: graphite compression joint

Connector: pipe 15 x 1
pressure stage PN 25 for design temperature –50 °C to +60 °C



Materials: **stainless steel**
Connecting fitting: Material No. 1.4571/1.4404
Sliding collar: brass, not in contact with medium
Sealing ring: graphite



Type	ID/OD	DN	l mm	L appr. mm	x mm	Article No.
AV-FSR	13/25	12	105	246	100	1015613

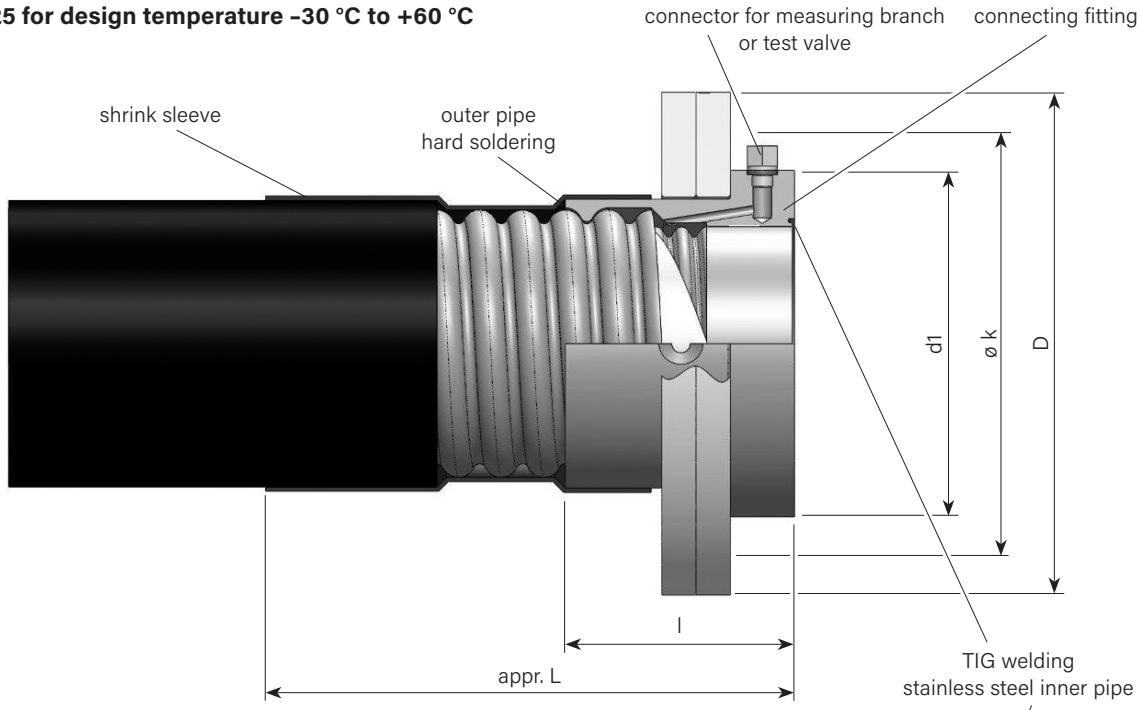
BRUGG Pipes

FLEXWELL Safety Pipe

Connecting fitting with collar and split loose flange

Joining method: TIG welding/hard soldering

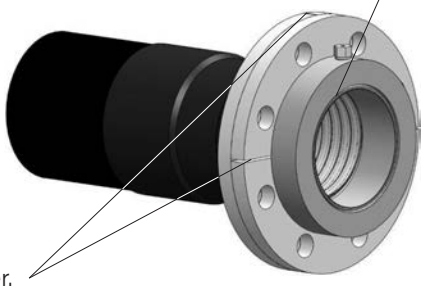
FLEXWELL Safety Pipe Type FSR 30/48 to FSR 127/175, pressure stage PN 25 for design temperature –30 °C to +60 °C



Version:
Collar and split loose flange according to DIN EN 1092-1

Material:
Threaded socket made of material no. 1.4404/1.4571
flange made of material P265GH/P250GH, hot-galvanised

Installation instruction for split loose flange:
The splitting of the loose flange needs to be installed staggered 90° in reverse order.



Type	ID/OD	DN	d1	Flange acc. to DIN EN 1092-1					l	L	Article No.	Article No.
				DN	D	ø k	screws*			appr.	split loose flange	split loose flange
			mm		mm	mm		pcs.	mm	mm	galvanised steel	stainless steel 1.4404
AV-FSR	30/ 48	25	68	25	115	85	M12 x 100	4	85	223	1015619	1015620
AV-FSR	39/ 60	32	78	32	140	100	M16 x 100	4	85	222	1015639	1015640
AV-FSR	48/ 71	40	88	40	150	110	M16 x 110	4	82	216	1015616	1015617
AV-FSR	60/ 83	50	102	50	165	125	M16 x 110	4	90	242	1015663	1015664
AV-FSR	75/107**	65	122	65	185	145	M16 x 120	8	140	300	1015687	1015688
AV-FSR	98/134**	80	138	80	200	160	M16 x 120	8	153	307	1015723	1015724
AV-FSR	127/175	100	190	125	270	220	M24 x 130	8	125	284	1015731	1015732

* Screw length is given for the connector to a welding-neck flange acc. to DIN EN 1092-1.
Screws and nuts are included in the delivery volume.

** Construction AV-FSR 75/107 and FSR-AV 98/134:

Only BRUGG solder Type BRL 8.50.34 may be used!

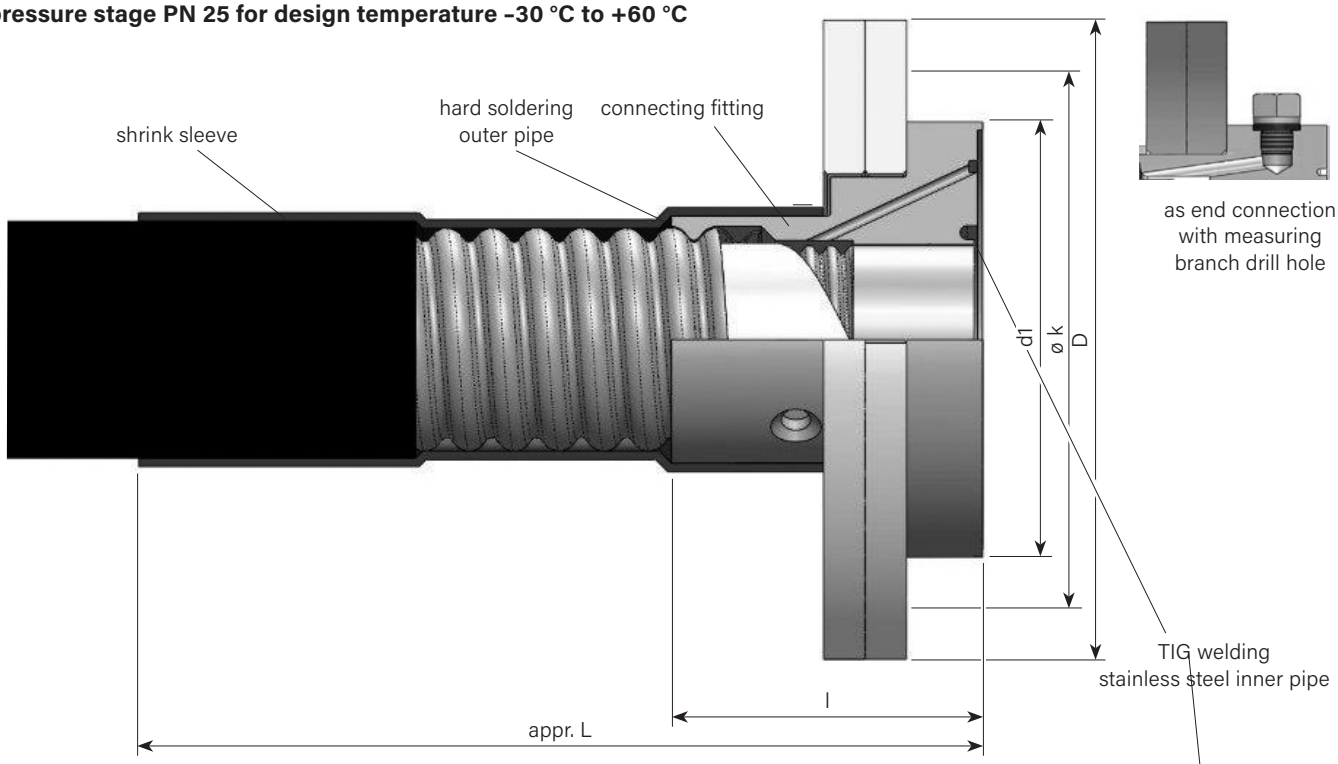
BRUGG Pipes

FLEXWELL Safety Pipe

Connecting fitting monitorable with collar and split loose flange

with monitorable sealing surface (Part 1), joining method: TIG welding/hard soldering

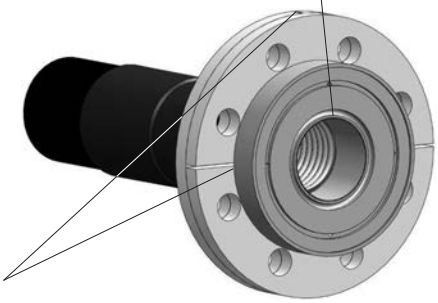
FLEXWELL Safety Pipe Type FSR 30/48 to FSR 127/175,
pressure stage PN 25 for design temperature –30 °C to +60 °C



Version:
Collar and split loose flange acc. to DIN EN1092-1

Material:
Threaded socket made of material no. 1.4404/1.4571
Flange made of material no. 1.4404/1.4571

Installation instruction for split loose flange:
The splitting of the loose flange needs to be installed staggered 90° in reverse order.



Type	ID/OD	DN	d1	Flange acc. to DIN EN 1092-1					l	L	Article No.
				DN	D	ø k	screws*			appr.	without measuring branch split loose flange
			mm		mm	mm		pcs.	mm	mm	stainless steel 1.4404
AV-FSR	30/ 48	25	91	40	150	110	M16 x 80	4	85	222.5	1015893
AV-FSR	39/ 60	32	105	50	165	125	M16 x 90	4	85	222.5	1015911
AV-FSR	48/ 71	40	126	65	185	145	M16 x 90	8	90	242.5	1015928
AV-FSR	60/ 83	50	126	65	185	145	M16 x 90	8	90	242.5	1015952
AV-FSR	75/107	65	166	100	235	190	M20 x 110	8	132	277.5	1015966
AV-FSR	98/134	80	166	100	235	190	M20 x 110	8	136	295.5	1015983
AV-FSR	127/175	100	223	150	300	250	M24 x 120	8	140	299.0	1015999

Threaded socket can be delivered with or without measuring branch drill hole (Article No. for drill hole 1015565)
* Screw length is given for the connector to a welding-neck flange acc. to DIN EN 1092-1.
Screws and nuts are included in the delivery volume.

Only BRUGG solder Type BRL 8.50.34 may be used!

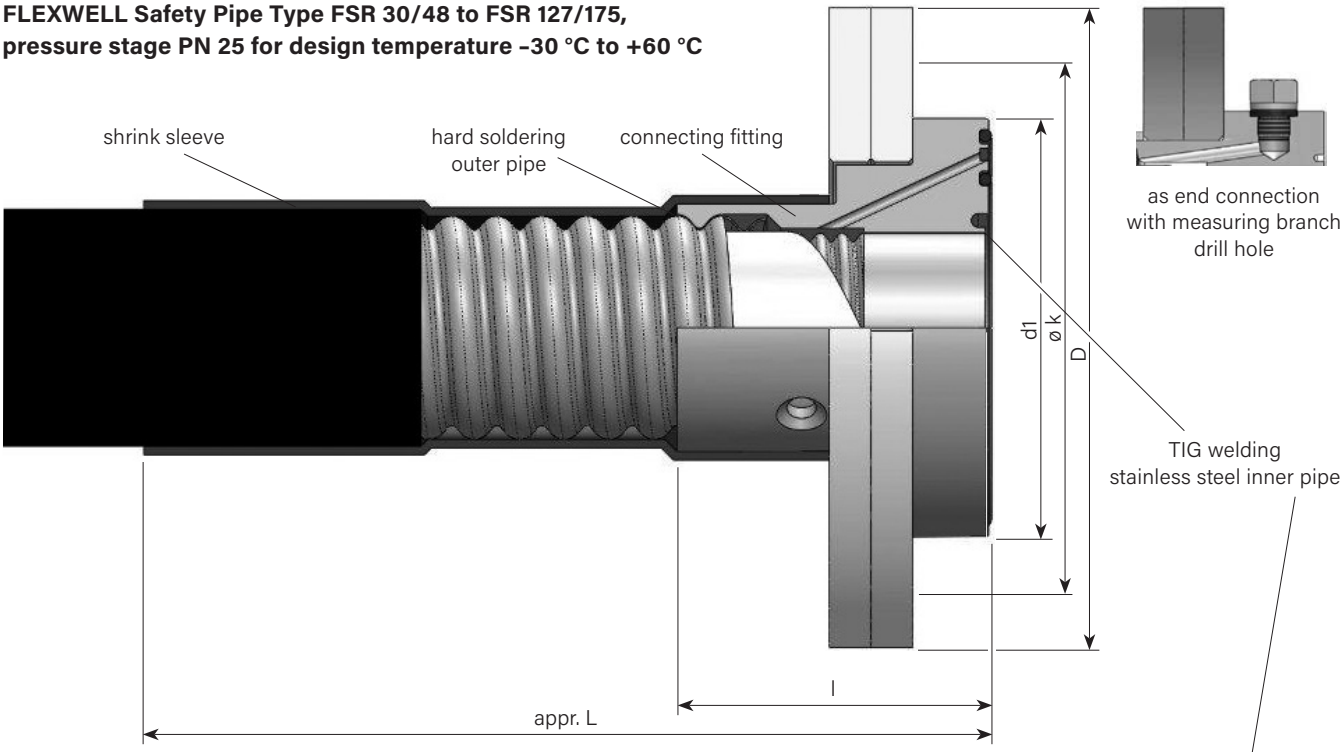
BRUGG Pipes

FLEXWELL Safety Pipe

Connecting fitting monitorable with collar and split loose flange

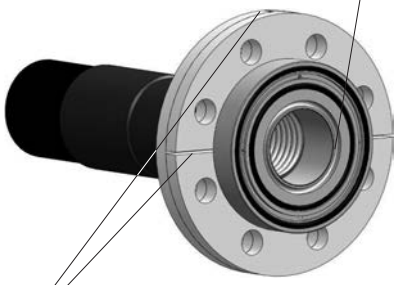
with monitorable sealing surface (Part 2), joining method: TIG welding/hard soldering

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 127/175, pressure stage PN 25 for design temperature –30 °C to +60 °C



Version:
Collar and split loose flange acc. to DIN EN 1092-1

Material:
Threaded socket made of Material No. 1.4404/1.4571
Flange made of Material No. 1.4404/1.4571
O-rings: Viton
O-rings in other materials according to the substances being transported can also be used.



Installation instruction for split loose flange:
The splitting of the loose flange needs to be installed staggered 90° in reverse order.

Type	ID/OD	DN	d1	Flange acc. to DIN EN 1092-1					l	L	Article No. without measuring branch, split loose flange stainless steel 1.4404	Article No. O-rings Viton	O-rings PTFE
				DN	D	ø k	screws*	pcs.		appr.			
			mm		mm	mm			mm	mm			
AV-FSR	30/ 48	25	87	40	150	110	M16 x 80	4	85	223	1015894	1016003	1016008
AV-FSR	39/ 60	32	101	50	165	125	M16 x 90	4	85	222	1058317	1016004	1016009
AV-FSR	48/ 71	40	121	65	185	145	M16 x 90	8	90	244	1015929	1016005	1016010
AV-FSR	60/ 83	50	121	65	185	145	M16 x 90	8	90	242	1015953	1016005	1016010
AV-FSR	75/107	65	162	100	235	190	M20 x 110	8	132	279	1015967	1016007	1016012
AV-FSR	98/134	80	162	100	235	190	M20 x 110	8	136	276	1015984	1016007	1016012
AV-FSR	127/175	100	217	150	300	250	M24 x 120	8	140	350	1016000	1016006	1016011

Threaded socket can be delivered with or without measuring branch drill hole (Article No. for drill hole 1015565)

* Screw length is given for the connector to a welding-neck flange acc. to DIN EN 1092-1.
Screws and nuts are included in the delivery volume.

Only BRUGG solder Type BRL 8.50.34 may be used!

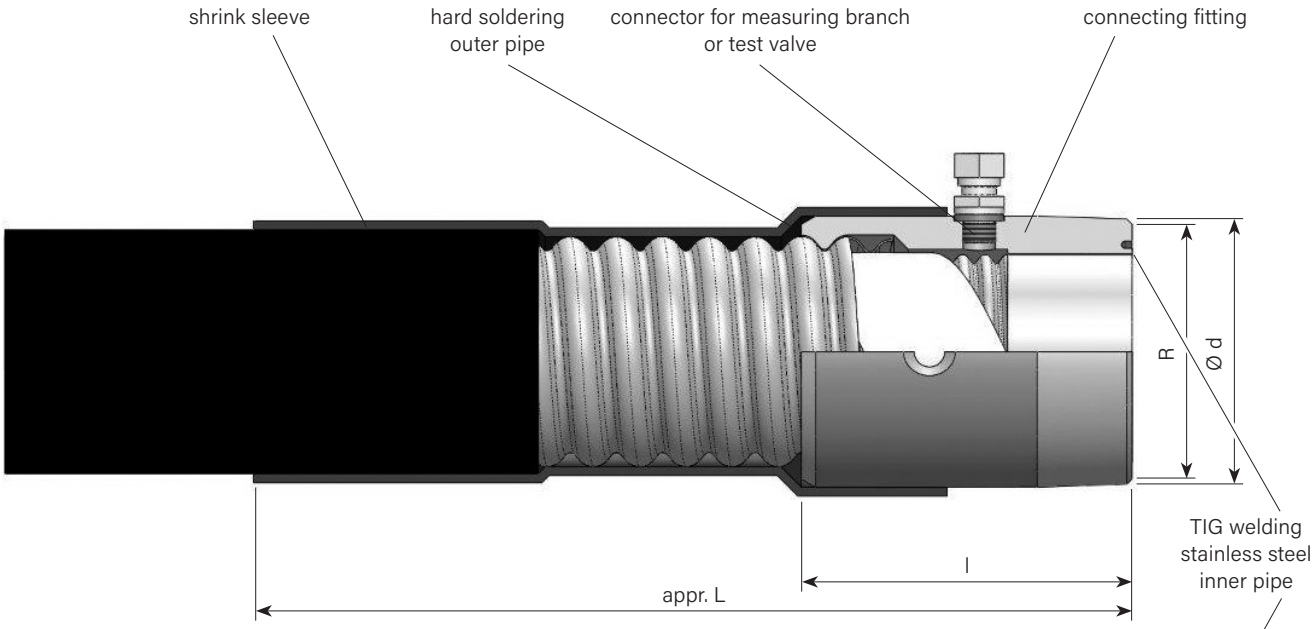
BRUGG Pipes

FLEXWELL Safety Pipe

Connecting fitting with screw connection

Joining method: TIG welding/hard soldering

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 60/83,
pressure stage PN 25 for design temperature –30 °C to +60 °C



Material:
Threaded socket made of material no. 1.4404/1.4571

Type ID/OD	DN	Connector Whitworth pipe thread	Connector DN	d	l	L appr.	Article No.
				mm	mm	mm	1.4404
AV-FSR 30/48	25	R 1 ½"	40	52.0	93	231	1015637
AV-FSR 39/60	32	R 2"	50	63.5	100	232	1015656
AV-FSR 48/71	40	R 2 ½"	65	76.1	93	247	1015679
AV-FSR 60/83	50	R 2 ½"	65	85.0	110	262	1015707

Only BRUGG solder Type BRL 8.50.34 may be used!

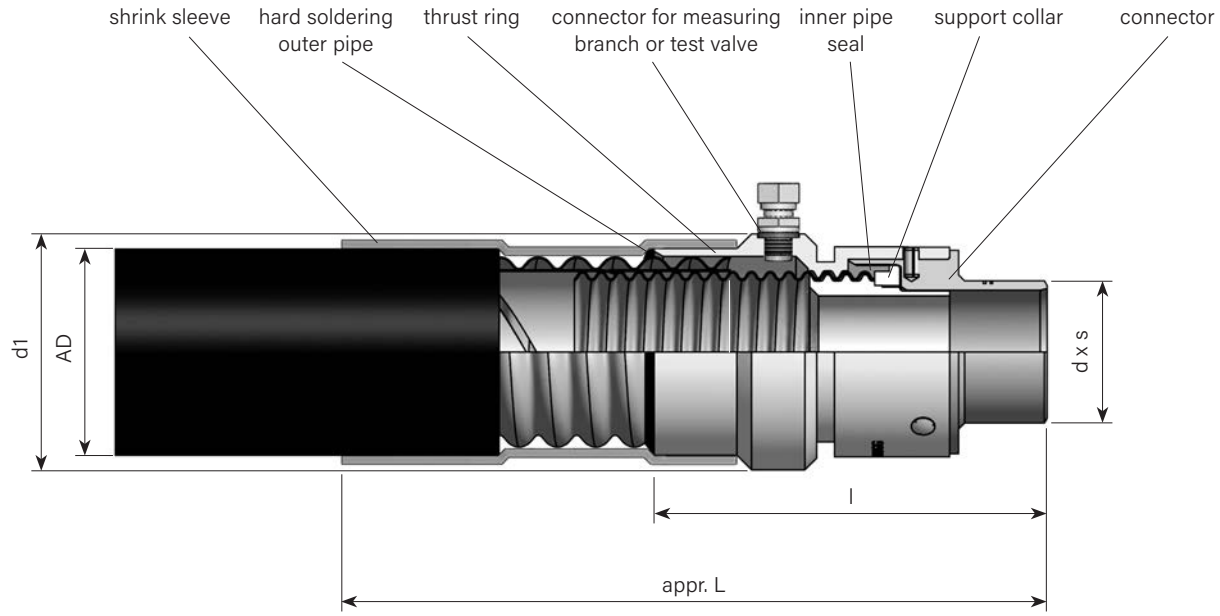
BRUGG Pipes

FLEXWELL Safety Pipe

Connecting fitting GRAPA with welded end

Compression joint, joining method: outer pipe hard soldering

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 60/83
with compression-type graphite seal inner pipe and hard soldering outer pipe,
pressure stage PN 10 for design temperature –50 °C to +60 °C



Materials:

Connector, support collar:	Material No. 1.4404
Thrust ring:	Material No. 1.4301
Inner pipe seal:	graphite
Outer pipe hard soldering:	silver solder

Type ID/OD	DN	OD mm	d x s mm	d1 mm	l mm	appr. L mm	Article No.
AV-FSR 30/ 48	25	46	33.7 x 2.6	60	117	290	1015623
AV-FSR 39/ 60	32	57	42.4 x 2.6	70	115	285	1015644
AV-FSR 48/ 71	40	69	48.3 x 2.6	80	128	305	1015668
AV-FSR 60/ 83	50	81	60.3 x 2.9	90	147	310	1015695
AV-FSR 75/107	65	107	76.1 x 2.9	120	178	345	1015689
AV-FSR 98/134	80	132	88.9 x 3.2	140	240	400	1015725

Only BRUGG solder Type BRL 8.50.34 may be used!

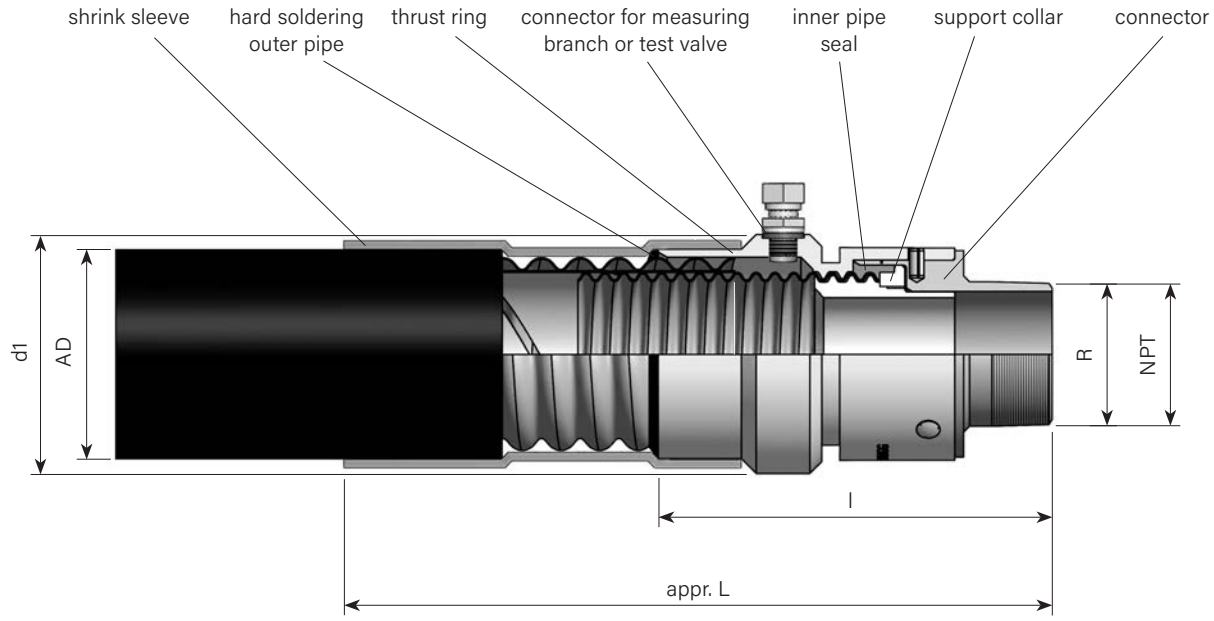
BRUGG Pipes

FLEXWELL Safety Pipe

Connecting fitting GRAPA with external thread

Compression joint, joining method: outer pipe hard soldering

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 60/83
with compression-type graphite seal inner pipe and hard soldering outer pipe,
pressure stage PN 10 for design temperature –50 °C to +60 °C



Materials:

Connector, support collar:	Material No. 1.4404
Thrust ring:	Material No. 1.4301
Inner pipe seal:	graphite
Outer pipe hard soldering:	silver solder

Type ID/OD	DN	OD	Connector R-thread	Connector NPT-thread	d1	l	L appr.	Article No. R-thread	Article No. NPT-thread
		mm			mm	mm	mm		
AV FSR 30/ 48	25	46	R 1"	1" - 11.5	60	117	280	1015624	1015625
AV FSR 39/ 60	32	57	R 1 ¼"	1 ¼" - 11.5	70	115	275	1015645	1015646
AV FSR 48/ 71	40	69	R 1 ½"	1 ½" - 11.5	80	128	290	1015669	1015670
AV FSR 60/ 83	50	81	R 2"	2" - 11.5	90	147	295	1015696	1015697
AV FSR 75/107	65	107	R 2 ½"	2 ½" - 8	120	178	327	1015690	1015691
AV FSR 98/134	80	132	R 3"	3" - 8	140	201	342	1015726	1015727

Only BRUGG solder Type BRL 8.50.34 may be used!

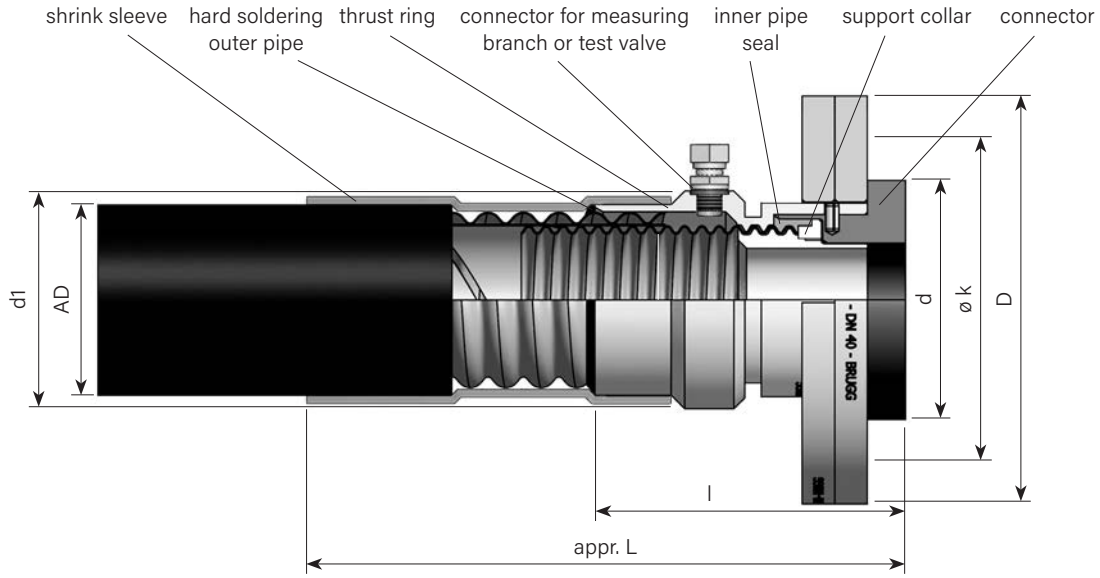
BRUGG Pipes

FLEXWELL Safety Pipe

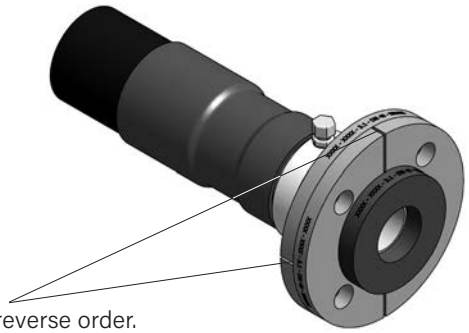
Connecting fitting GRAPA with collar and split loose flange

Compression joint, joining method: outer pipe hard soldering

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 98/134
with compression-type graphite seal inner pipe and hard soldering outer pipe,
pressure stage PN 10 for design temperature –50 °C to +60 °C



Version:
Collar and split loose flange acc. to DIN EN 1092-1



Materials:

Connector, support collar:	Material No. 1.4404
Thrust ring:	Material No. 1.4301
Inner pipe seal:	graphite
Outer pipe hard soldering:	silver solder

Installation instruction for split loose flange:
The splitting of the loose flange needs to be installed staggered 90° in reverse order.

Type	ID/OD	DN	OD	collar and split loose flange acc. to DIN EN 1092-1					d1	l	L	Article No.	Article No.
				d	D	ø k	screws*	pcs.			appr.	split loose flange galvanised steel	split loose flange stainless steel 1.4404
			mm	mm	mm	mm			mm	mm	mm		
AV-FSR 30/ 48		25	46	68	115	85	M12 x 75	4	60	104	275	1015626	1015627
AV-FSR 39/ 60		32	57	78	140	100	M16 x 80	4	70	99	265	1015647	1015648
AV-FSR 48/ 71		40	69	88	150	110	M16 x 80	4	80	114	280	1015671	1015672
AV-FSR 60/ 83		50	81	102	165	125	M16 x 80	4	90	128	290	1015698	1015699
AV-FSR 75/107		65	107	122	185	145	M16 x 85	8**	120	180	347	1015692	1015693
AV-FSR 98/134		80	132	138	200	160	M16 x 95	8	140	204	365	1015728	1015729

* Screw length is given for the connector to a welding-neck flange acc. to DIN EN 1092-1.
Screws and nuts are included in the delivery volume.
** Welding-neck flange: PN 25 = 8 pieces, PN 10 = 4 pieces (8 boreholes in the split loose flange)

Only BRUGG solder Type BRL 8.50.34 may be used!

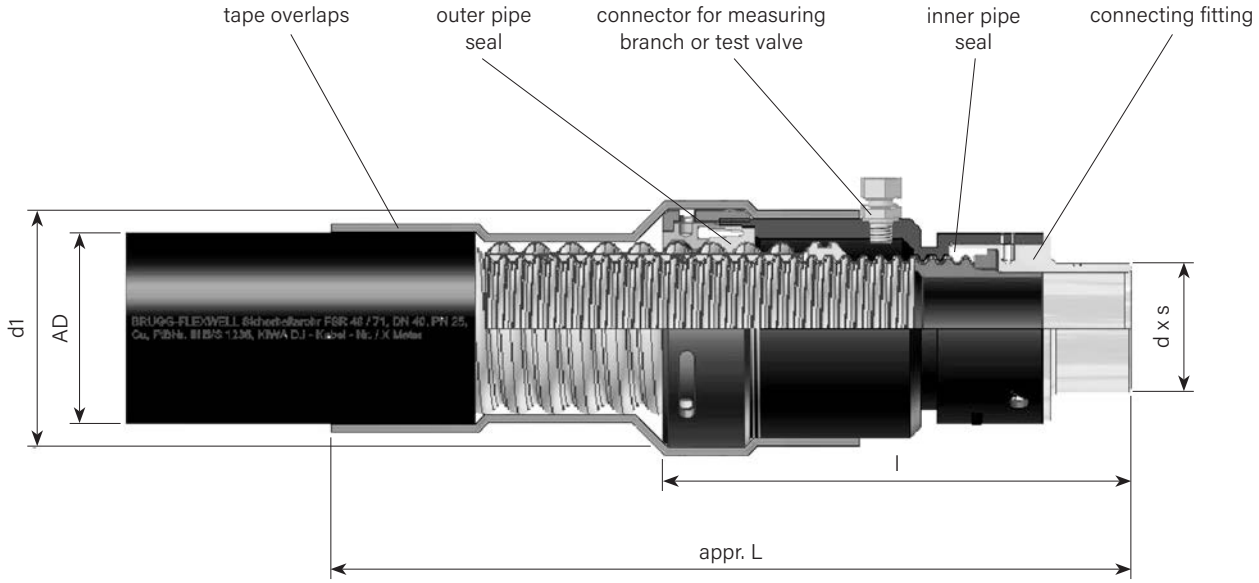
BRUGG Pipes

FLEXWELL Safety Pipe

Connecting fitting GRAPA with welded end

Compression joint/screwed joint

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 60/83
with compression-type graphite seal inner pipe and screwed outer pipe seal,
pressure stage PN 25 for design temperature –30 °C to +60 °C



Materials:

Medium contact elements:	Material No. 1.4404
other elements:	Material No. 1.4301
inner pipe seal:	graphite
outer pipe seal:	moulded elastomer ring

Type ID/OD	DN	OD	d x s	d1	l	appr. L	Article No.
		mm	mm	mm	mm	mm	
AV-FSR 30/48	25	46	33.7 x 2.6	68	157	315	1015634
AV-FSR 39/60	32	57	42.4 x 2.6	78	158	310	1015653
AV-FSR 48/71	40	69	48.3 x 2.6	88	174	335	1015677
AV-FSR 60/83	50	81	60.3 x 2.9	105	191	335	1015703

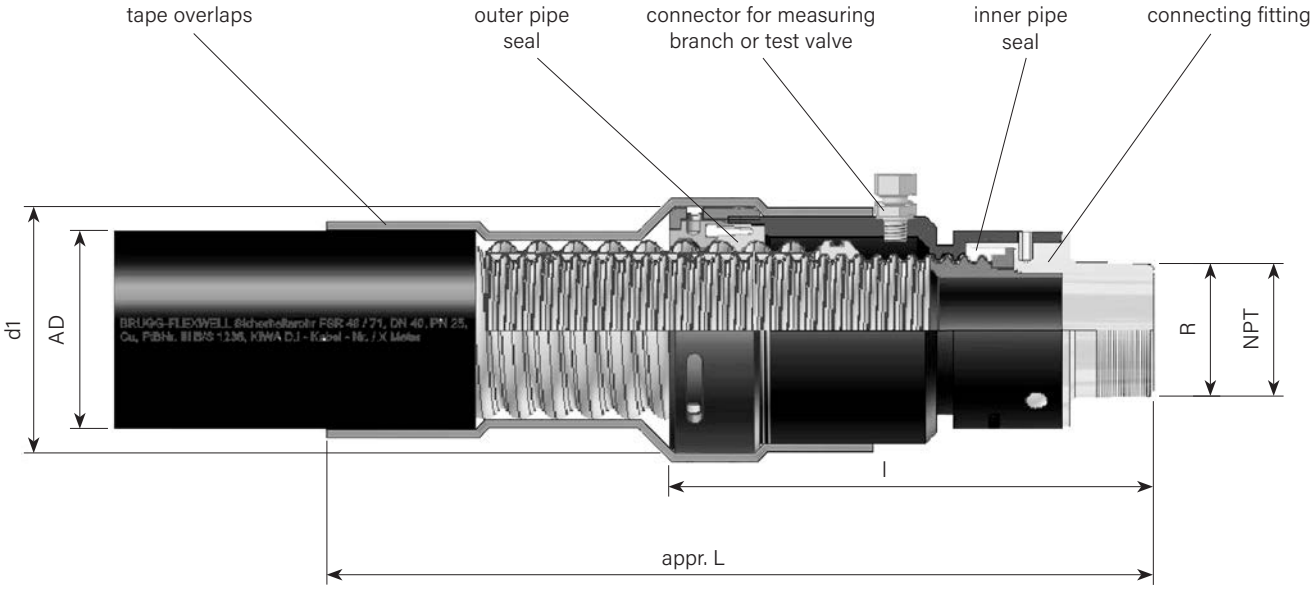
BRUGG Pipes

FLEXWELL Safety Pipe

Connecting fitting GRAPA with external thread

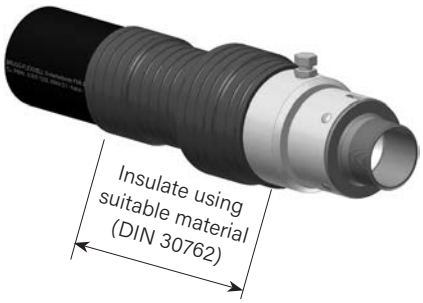
Compression joint/screwed joint

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 60/83
with compression-type graphite seal inner pipe and screwed outer pipe seal,
pressure stage PN 25 for design temperature –30 °C to +60 °C



Materials:

Medium contact elements:	Material No. 1.4404
other elements:	Material No. 1.4301
inner pipe seal:	graphite
outer pipe seal:	moulded elastomer ring



Type ID/OD	DN	OD	Connector R-thread	Connector NPT-thread	d1	l	L appr.	Article No. R-thread	Article No. NPT-thread
		mm			mm	mm	mm		
AV-FSR 30/48	25	46	R 1"	1" - 11.5 NPT	68	157	305	1015638	1015735
AV-FSR 39/60	32	57	R 1 ¼"	1 ¼" - 11.5 NPT	78	158	300	1015657	1015736
AV-FSR 48/71	40	69	R 1 ½"	1 ½" - 11.5 NPT	88	174	320	1015680	1015737
AV-FSR 60/83	50	81	R 2"	2" - 11.5 NPT	105	191	320	1015708	1015738

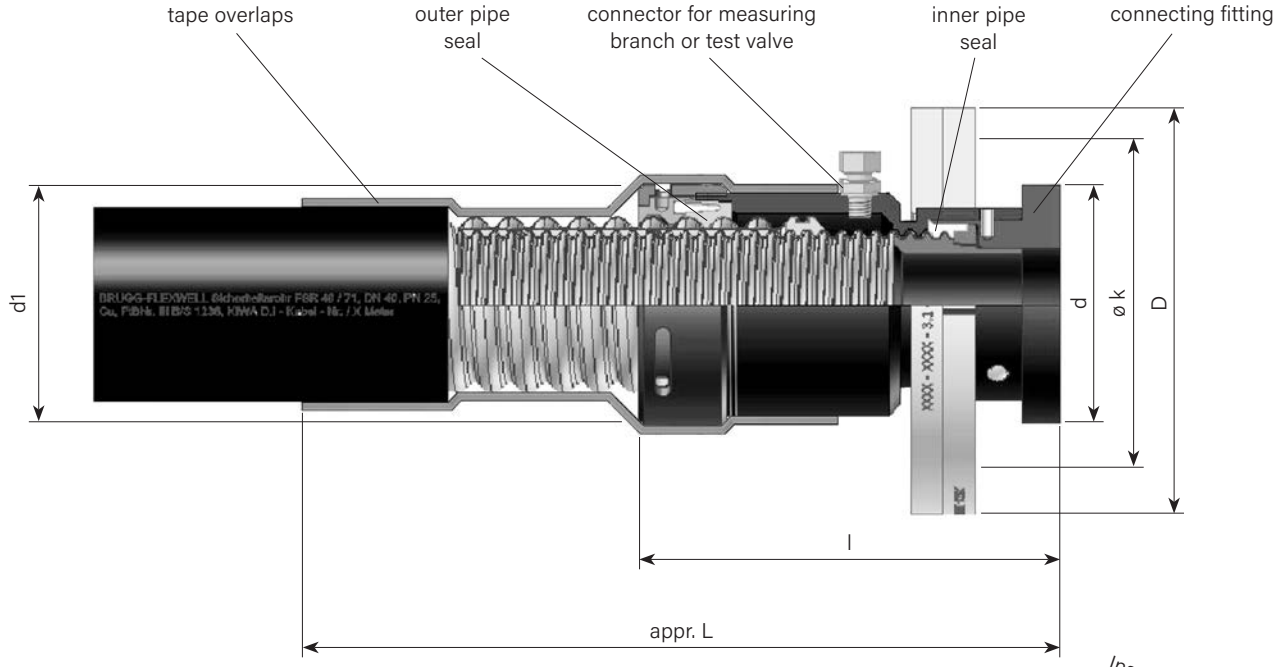
BRUGG Pipes

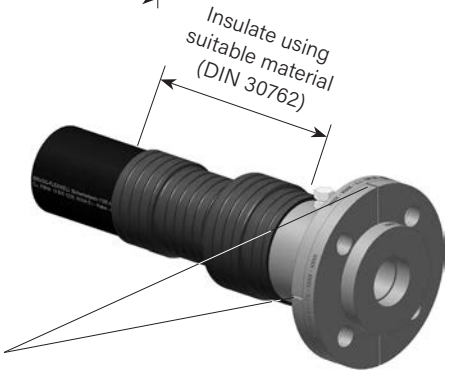
FLEXWELL Safety Pipe

Connecting fitting GRAPA with collar and split loose flange

Compression joint/screwed joint

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 60/83
with compression-type graphite seal inner pipe and screwed outer pipe seal,
pressure stage PN 25 for design temperature –30 °C to +60 °C





Materials:

Medium contact elements:	Material No. 1.4404
other elements:	Material No. 1.4301
inner pipe seal:	graphite
outer pipe seal:	moulded elastomer ring

Installation instruction for split loose flange:
The splitting of the loose flange needs to be installed staggered 90° in reverse order.

Type	ID/OD	DN	OD	collar and split loose flange acc. to DIN EN 1092-1					d1	l	L appr.	Article No. split loose flange galvanised steel	Article No. split loose flange stainless steel 1.4404
				d	D	ø k	screws*	pcs.					
			mm	mm	mm	mm			mm	mm	mm		
AV-FSR 30/48		25	46	68	115	85	M12 x 75	4	68	141	300	1015635	1015631
AV-FSR 39/60		32	57	78	140	100	M16 x 80	4	78	139	290	1015654	1015652
AV-FSR 48/71		40	69	88	150	110	M16 x 80	4	88	174	310	1015678	1015676
AV-FSR 60/83		50	81	102	165	125	M16 x 80	4	105	169	315	1015705	1015702

* Screw length is given for the connector to a welding-neck flange acc. to DIN EN 1092-1.
Screws and nuts are included in the delivery volume.

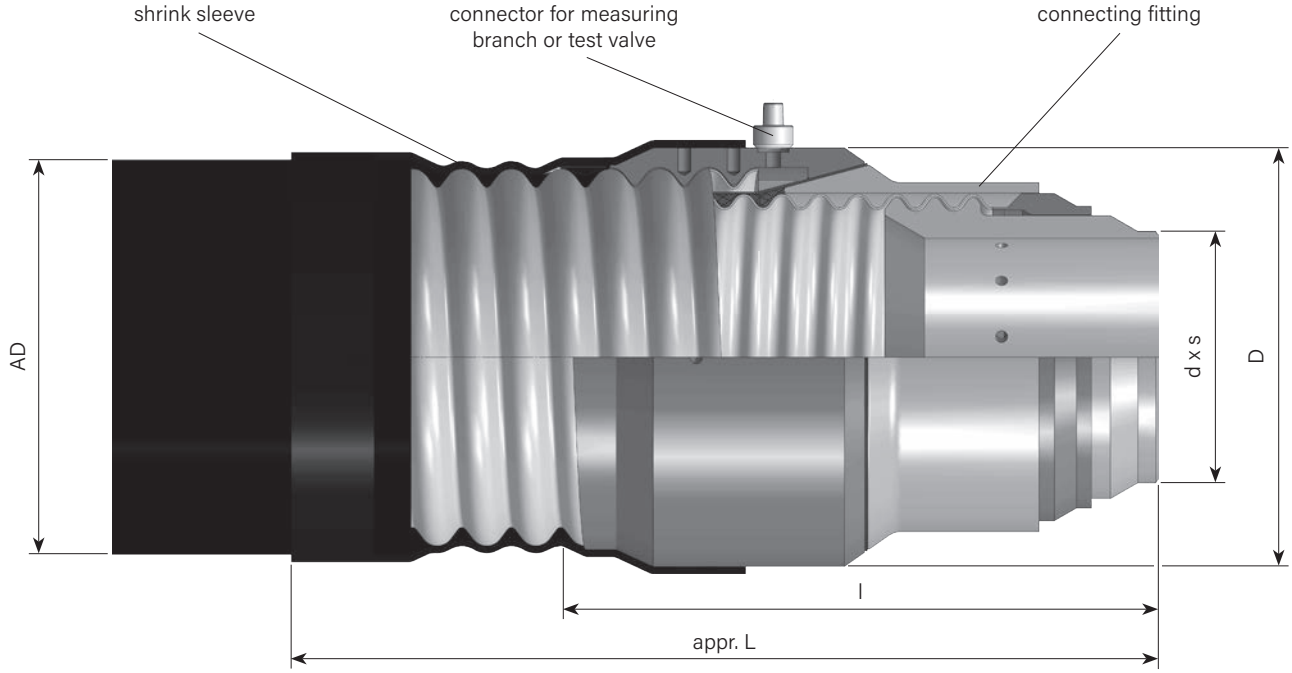
BRUGG Pipes

FLEXWELL Safety Pipe

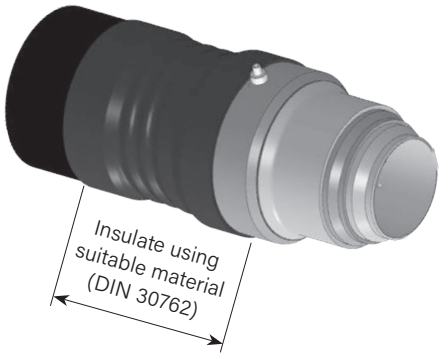
Connecting fitting with welded end

Joining method: TIG welding

FLEXWELL Safety Pipe Type FSR 200/262
pressure stage PN 25 for design temperature –50 °C to +60 °C



Materials:
All components stainless steel
Components in contact with fluid: Material No. 1.4404/1.4571
Other Components: Material No. 1.4301



Type	ID/OD	DN	d x s	D appr.	l appr.	L	Article No.
			mm	mm	mm	mm	
AV-FSR	200/262	150	168.3 x 4.5	280	390	600	1066415

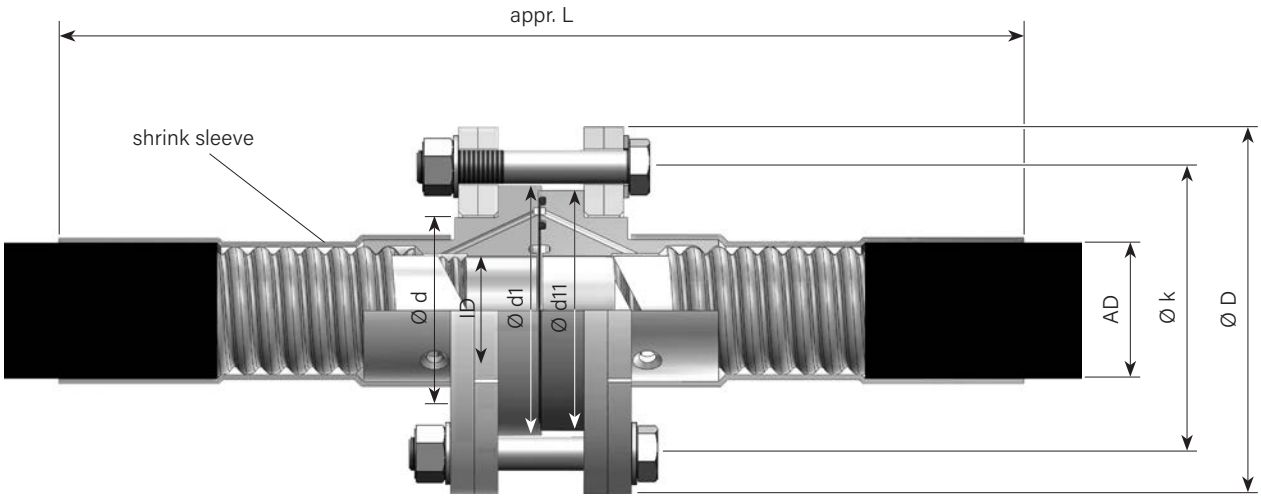
BRUGG Pipes

FLEXWELL Safety Pipe

Monitorable through-connection with flanged connection

Joining method: TIG welding/hard soldering

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 127/175
pressure stage PN 25 for design temperature –30 °C to +60 °C

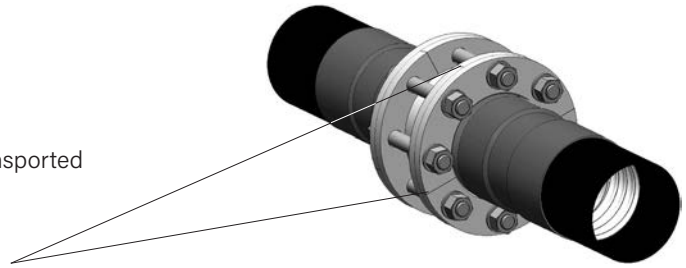


Part 1 **Part 2**

monitorable via O-ring seal

Version:
Collar and split flange acc. to DIN EN 1092-1

Material:
Threaded socket made of material no. 1.4404/1.4571
Flange made of material no. 1.4404/1.4571
O-rings: Viton (see Worksheet FSR 4.217)
O-rings in other materials according to the substances being transported can also be used



Installation instruction for split looseflange:
The splitting of the loose flange needs to be installed staggered 90° in reverse order.

Part 1 + 2

Type	ID/OD	DN	d1	d11	flange	Ø D	Ø k	screws	number of drill holes	L appr.	Article No. split loose flange stainless steel 1.4404
			mm	mm	DN	mm	mm			mm	
DV-FSR	30/ 48	25	91	87	40	150	110	M16 x 110	4	440	1016014
DV-FSR	39/ 60	32	105	101	50	165	125	M16 x 120	4	440	1016020
DV-FSR	48/ 71	40	126	121	65	185	145	M16 x 130	8	480	1016026
DV-FSR	60/ 83	50	126	121	65	185	145	M16 x 130	8	480	1016030
DV-FSR	75/107	65	166	162	100	235	190	M20 x 160	8	550	1016038
DV-FSR	98/134	80	166	162	100	235	190	M20 x 160	8	586	1016043
DV-FSR	127/175	100	223	217	150	300	250	M24 x 160	8	600	1016047

Screws and nuts are included in the delivery volume.
Only BRUGG solder Type BRL 8.50.34 may be used!

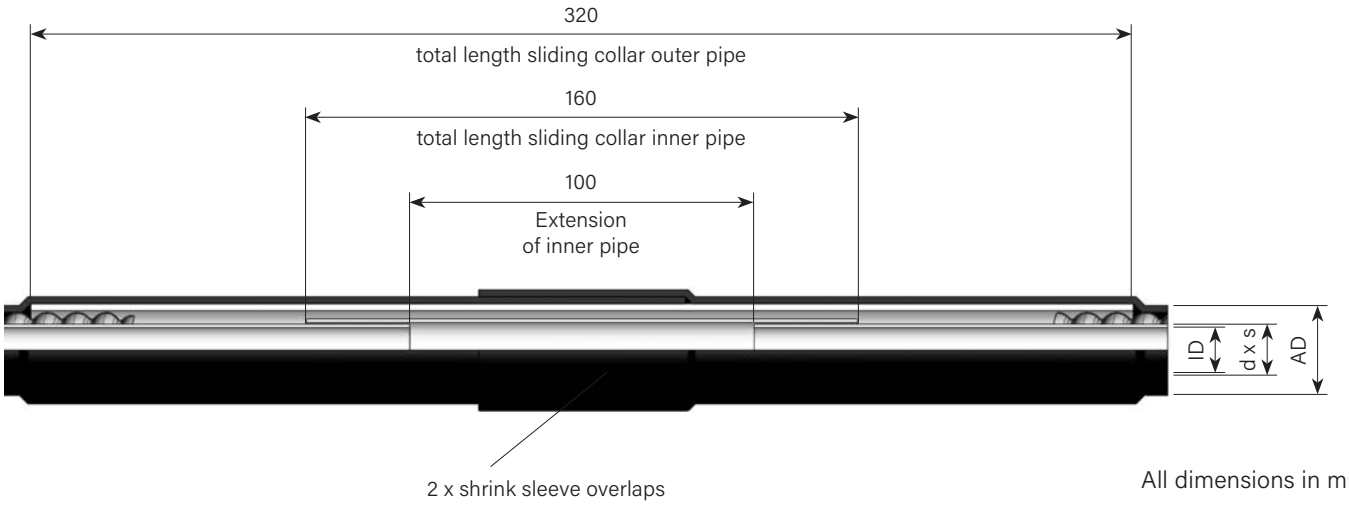
BRUGG Pipes

FLEXWELL Safety Pipe

Integrated through-connection

with smooth-bore inner and outer pipe, joining method: TIG welding/hard soldering

FLEXWELL Safety Pipe Type FSR 13/25
pressure stage PN 25 for design temperature –50 °C to +60 °C



All dimensions in mm

Material:
All parts made of stainless austenitic steel
Material No. 1.4404/1.4571 inner
Material No. 1.4301 outer

Type	ID/OD	DN	d x s mm	Article No. 1.4404/1.4571
DV-FSR 13/25		12	15 x 1	1015611

Only BRUGG solder Type BRL 8.50.34 may be used!

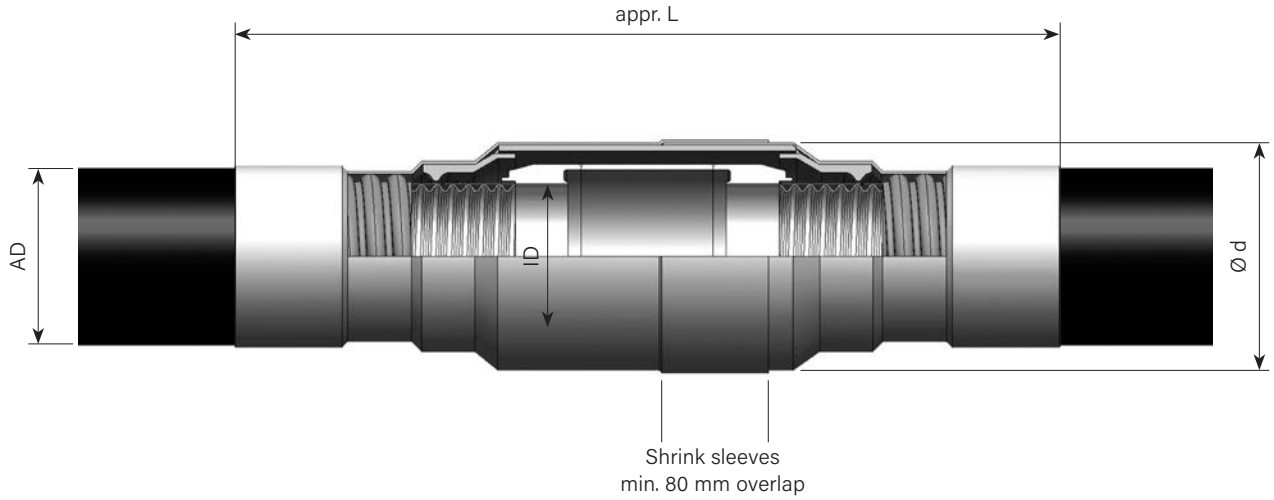
BRUGG Pipes

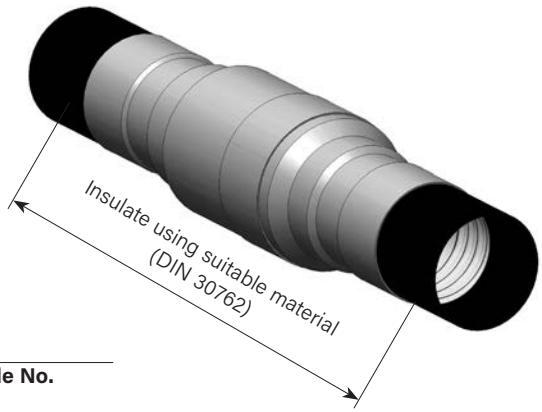
FLEXWELL Safety Pipe

Integrated through-connection

Joining method: TIG welding/hard soldering

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 127/17
pressure stage PN 25 for design temperature –30 °C to +60 °C





Material:
All parts made of stainless austenitic steel
Material No. 1.4404/1.4571 inner
Material No. 1.4301 outer

Type	ID/OD	DN	Ø d	L appr.	Article No.
			mm	mm	1.4404/1.4571
DV-FSR	30/ 48	25	60.3	550	1015757
DV-FSR	39/ 60	32	76.1	550	1015761
DV-FSR	48/ 71	40	88.9	610	1015765
DV-FSR	60/ 83	50	101.6	610	1015766
DV-FSR	75/107	65	139.7	640	1015770
DV-FSR	98/134	80	168.3	660	1015773
DV-FSR	127/175	100	193.7	690	1015774

Longer through-connections available on request.
Only BRUGG solder Type BRL 8.50.34 may be used!

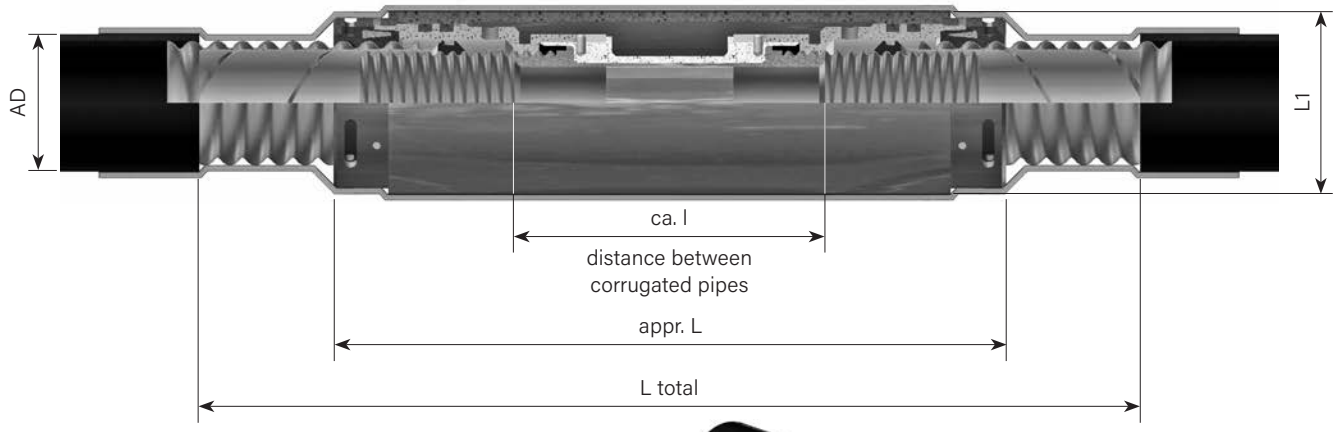
BRUGG Pipes

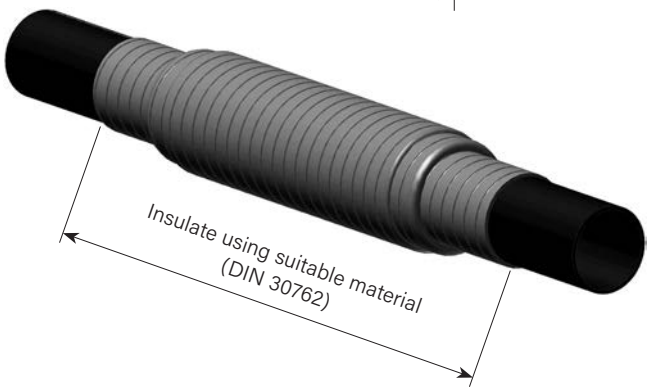
FLEXWELL Safety Pipe

Integrated through-connection GRAPA

Compression joint/screwed joint

FLEXWELL Safety Pipe Type FSR 30/48 to FSR 60/83
pressure stage PN 25 for design temperature –30 °C to +60 °C





Materials:

elements in contact with medium:	Material No. 1.4404/1.4571
other elements:	Material No. 1.4301
inner pipe seals:	graphite
outer pipe seals	moulded elastomer ring

The fitting cannot be detached after installation.

Type	DN	OD mm	D1 mm	appr. l mm	appr. L mm	L total mm	Article No.
DV-FSR 30/48	25	46	76.1	107	307	400	1015628
DV-FSR 39/60	32	57	85.0	107	315	420	1015649
DV-FSR 48/71	40	69	95.0	117	348	460	1015673
DV-FSR 60/83	50	81	114.3	130	373	480	1015700

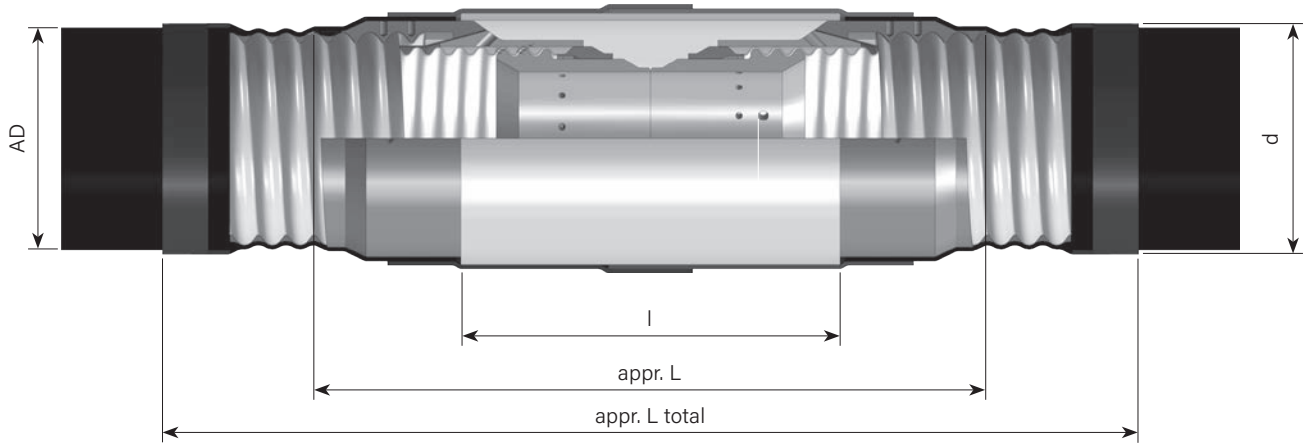
BRUGG Pipes

FLEXWELL Safety Pipe

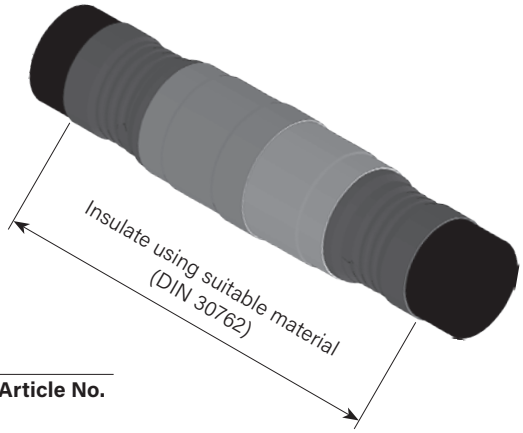
Integrated through-connection

Joining method: TIG welding

FLEXWELL Safety Pipe Type FSR 200/262
pressure stage PN 25 for design temperature –30 °C to +60 °C



Materials:
All components stainless steel
Components in contact with fluid: Material No. 1.4404/1.4571
Other Components: Material No. 1.4301



Type	ID/OD	DN	d appr. mm	l appr. mm	L total mm	appr. L mm	Article No.
DV-FSR	200/262	150	298	450	780	1200	1066416

BRUGG Pipes

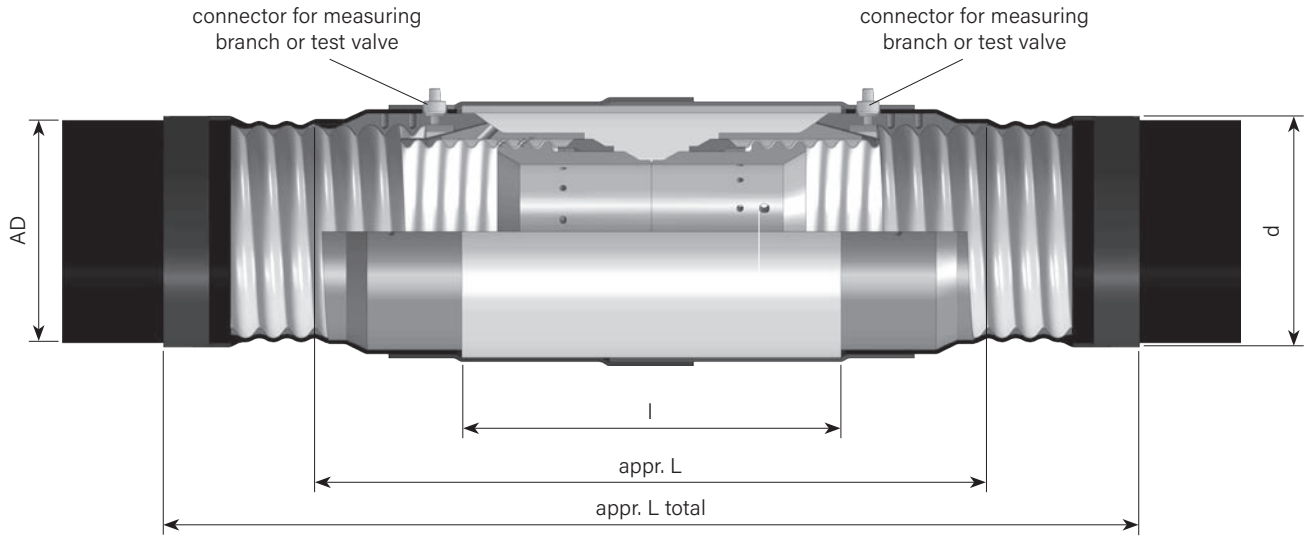
FLEXWELL Safety Pipe

Integrated through-connection

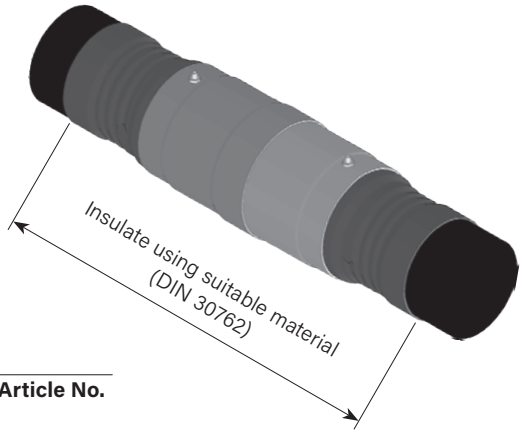
Joining method: TIG welding

Monitoring space separated, with connector to measuring branch and test valve

FLEXWELL Safety Pipe Type FSR 200/262
pressure stage PN 25 for design temperature –30 °C to +60 °C



Materials:
All components stainless steel
Components in contact with fluid: Material No. 1.4404/1.4571
Other Components: Material No. 1.4301



Type	ID/OD	DN	d appr. mm	l appr. mm	L total mm	appr. L mm	Article No.
DV-FSR	200/262	150	298	450	780	1200	1066418

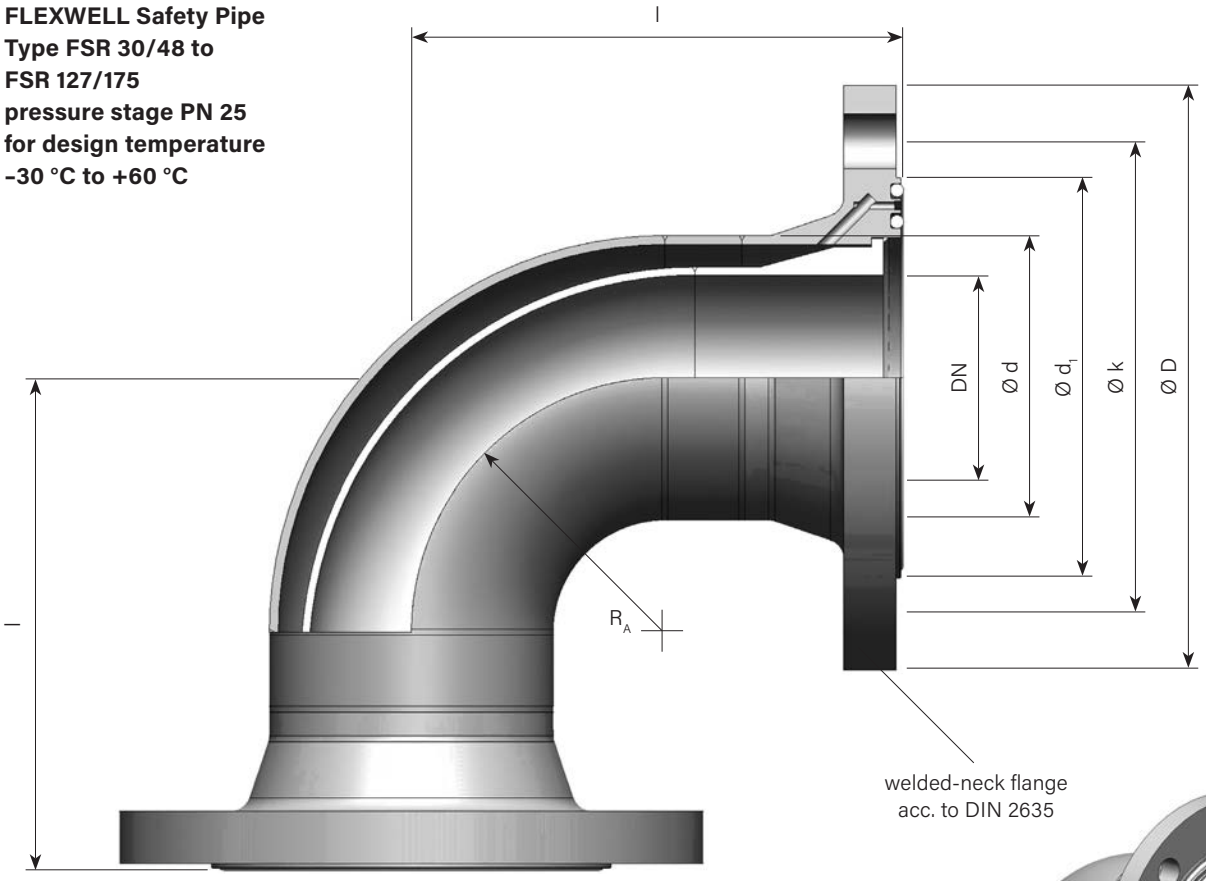
BRUGG Pipes

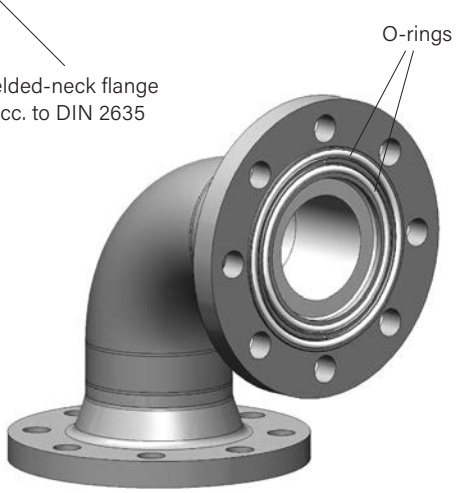
FLEXWELL Safety Pipe

Monitorable elbow with flanged connection

with monitorable sealing surface, complete assembly

FLEXWELL Safety Pipe
Type FSR 30/48 to
FSR 127/175
pressure stage PN 25
for design temperature
–30 °C to +60 °C





Elbow in stainless steel
Material No. 1.4404/1.4571 in contact with medium, Material No. 1.4301 outer parts
The monitorable elbow with flanged connection is flanged together with monitorable connecting fittings with loose flange Part 1 (Worksheet FSR 4.216) or welded-neck flange.

Version:
Complete component asembly, welded and tested
O-ring seals: Viton (see Worksheet FSR 4.217)
O-rings in other materials according to the substances being transported can also be used.

Type	DN	l	RA	Ø d	Ø d1	flange DN	Ø D	Ø k	Screws for steel	Number of screws	Article No.
		mm	mm	mm	mm		mm	mm			
Bogen FSR 30/ 48	25	131	43	48.3	87	40	150	110	M16 x 80	4	1015858
Bogen FSR 39/ 60	32	140	55	60.3	101	50	165	125	M16 x 90	4	1015860
Bogen FSR 48/ 71	40	139	70	76.1	121	65	185	145	M16 x 90	8	1015862
Bogen FSR 60/ 83	50										
Bogen FSR 75/107	65	197	105	114.3	161	100	235	190	M20 x 100	8	1015866
Bogen FSR 98/134	80										
Bogen FSR 127/175	100	265	155	168.3	217	150	300	250	M24 x 110	8	1015869

Screws and nuts are included in the delivery volume.

BRUGG Pipes

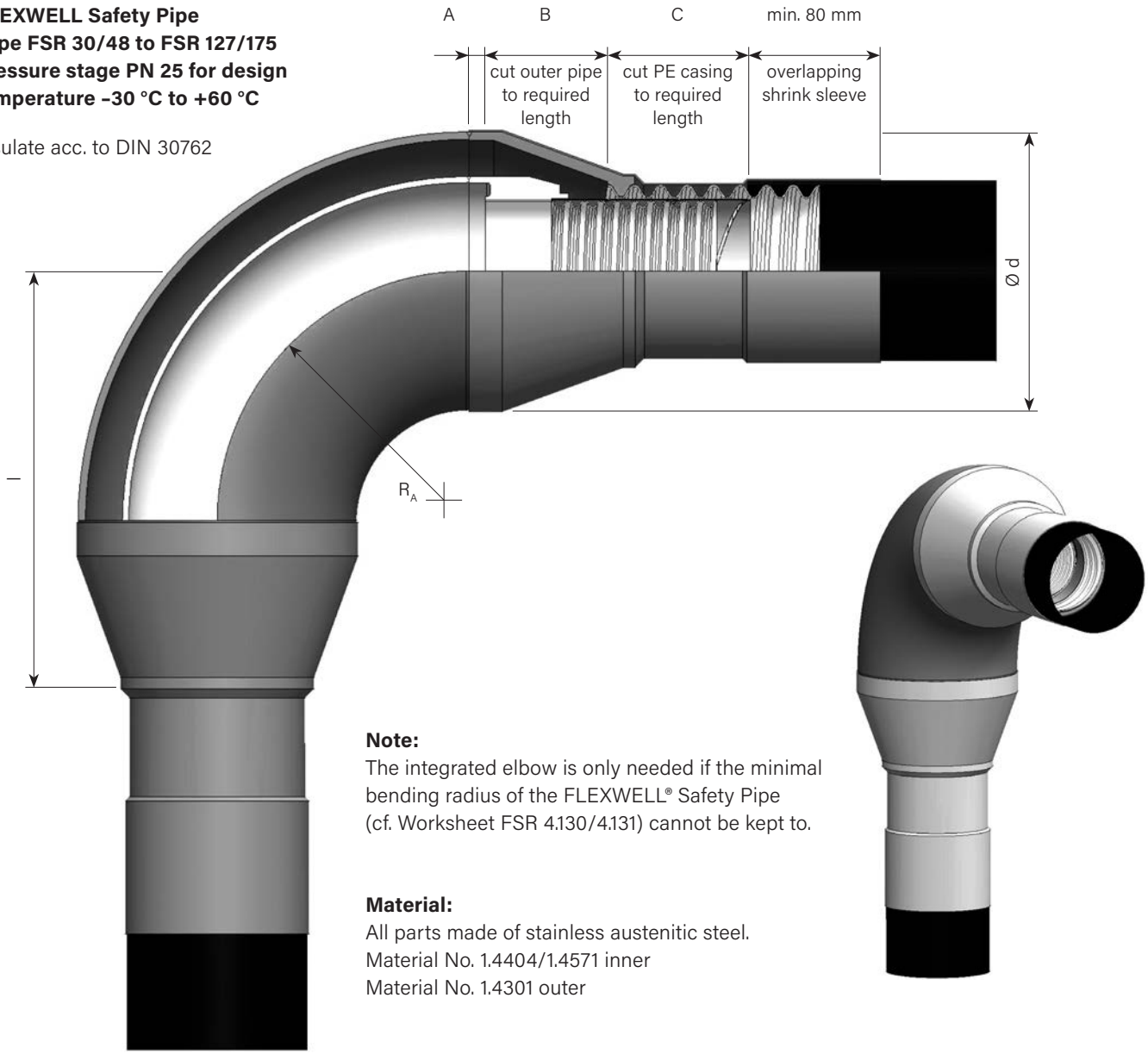
FLEXWELL Safety Pipe

Integrated elbow

Joining method: TIG welding/hard soldering

FLEXWELL Safety Pipe
Type FSR 30/48 to FSR 127/175
pressure stage PN 25 for design temperature –30 °C to +60 °C

Insulate acc. to DIN 30762



Note:
The integrated elbow is only needed if the minimal bending radius of the FLEXWELL® Safety Pipe (cf. Worksheet FSR 4.130/4.131) cannot be kept to.

Material:
All parts made of stainless austenitic steel.
Material No. 1.4404/1.4571 inner
Material No. 1.4301 outer

Type	DN	Ø d mm	l mm	RA	A mm	B mm	C mm	Article No.
Bogen FSR 30/ 48	25	60.3	ca. 145	55	5	60	80	1015859
Bogen FSR 39/ 60	32	76.1	ca. 165	70	5	60	80	1015861
Bogen FSR 48/ 71	40	114.3	ca. 182	102	10	51	100	1015863
Bogen FSR 60/ 83	50	114.3	ca. 210	105	10	58	100	1015864
Bogen FSR 75/107	65	168.3	ca. 252	152	10	58	100	1015865
Bogen FSR 98/134	80	168.3	ca. 237	152	10	60	120	1015868
Bogen FSR 127/175	100	219.1	ca. 410	203	15	90	160	1015870

Only BRUGG solder Type BRL 8.50.34 may be used!

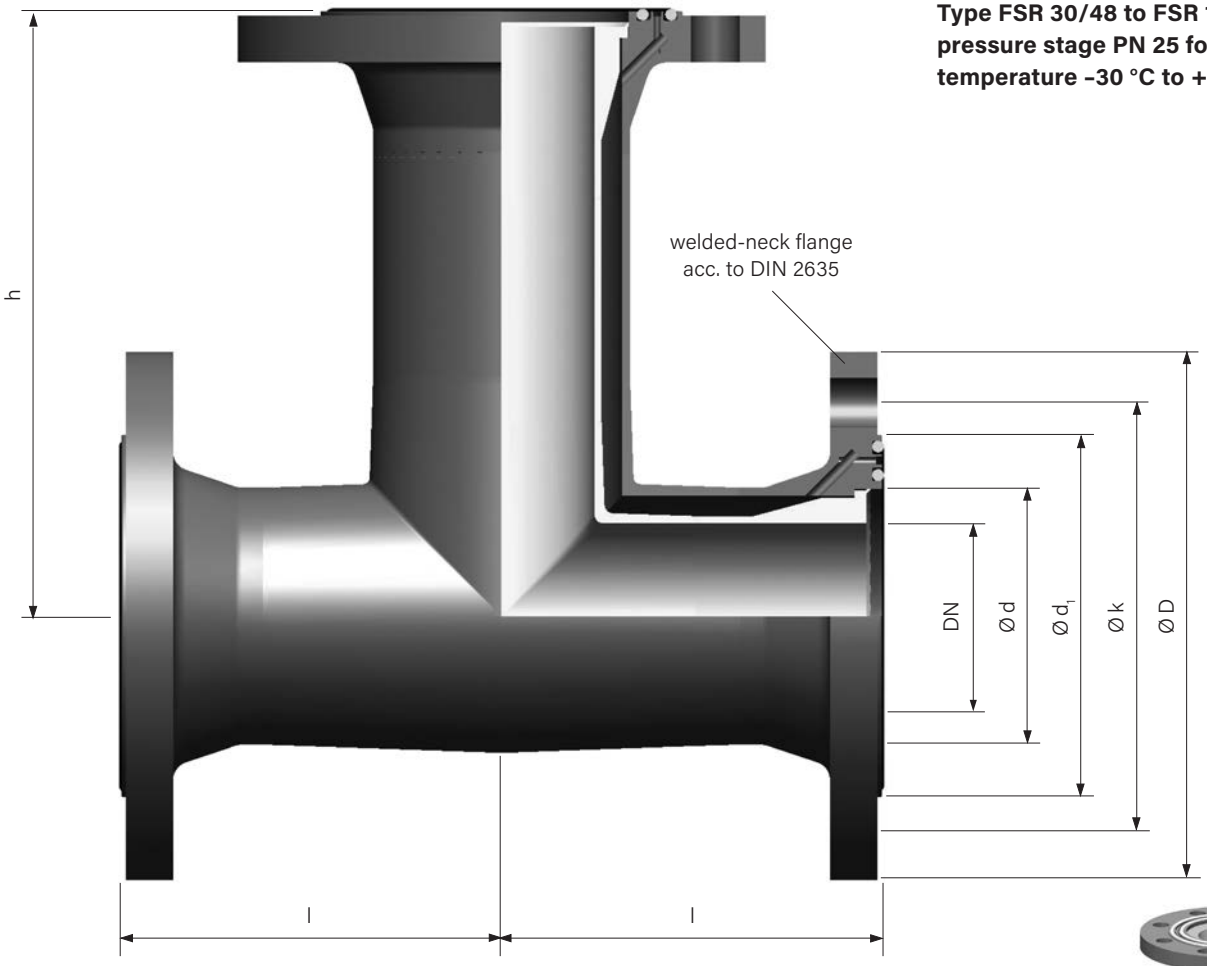
BRUGG Pipes

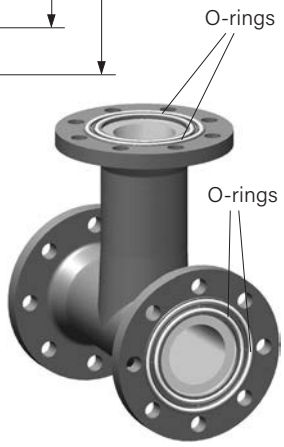
FLEXWELL Safety Pipe

Monitorable T-piece with flanged connection

with monitorable sealing surface, complete assembly

FLEXWELL Safety Pipe
Type FSR 30/48 to FSR 127/175
pressure stage PN 25 for design temperature –30 °C to +60 °C





T-piece in stainless steel
Material No. 1.4404/1.4571 in contact with medium, Material No. 1.4301 outer parts
The monitorable T-piece with flanged connection is flanged together with monitorable connecting fittings with loose flange Part 1 (Worksheet FSR 4.216) or welded-neck flange.

Version:
Complete component asembly, welded and tested
O-ring seals: Viton (see Worksheet FSR 4.217)
O-rings in other materials according to the substances being transported can also be used.

Type	DN	l	h	Ø d	Ø d1	Flange DN	Ø D	Ø k	Screws for steel	Number of screws	Article No.
		mm	mm	mm	mm		mm	mm			
T-Stück FSR 30/ 48	25	101	151	48.3	87	40	150	110	M16 x 80	4	1015871
T-Stück FSR 39/ 60	32	111	161	60.3	101	50	165	125	M16 x 90	4	1015873
T-Stück FSR 48/ 71	40	127	177	76.1	121	65	185	145	M16 x 90	8	1015875
T-Stück FSR 60/ 83	50										
T-Stück FSR 75/107	65	169	269	114.3	161	100	235	190	M20 x 100	8	1015879
T-Stück FSR 98/134	80										
T-Stück FSR 127/175	100	217	317	168.3	217	150	300	250	M24 x 110	8	1015881

Screws and nuts are included in the delivery volume.

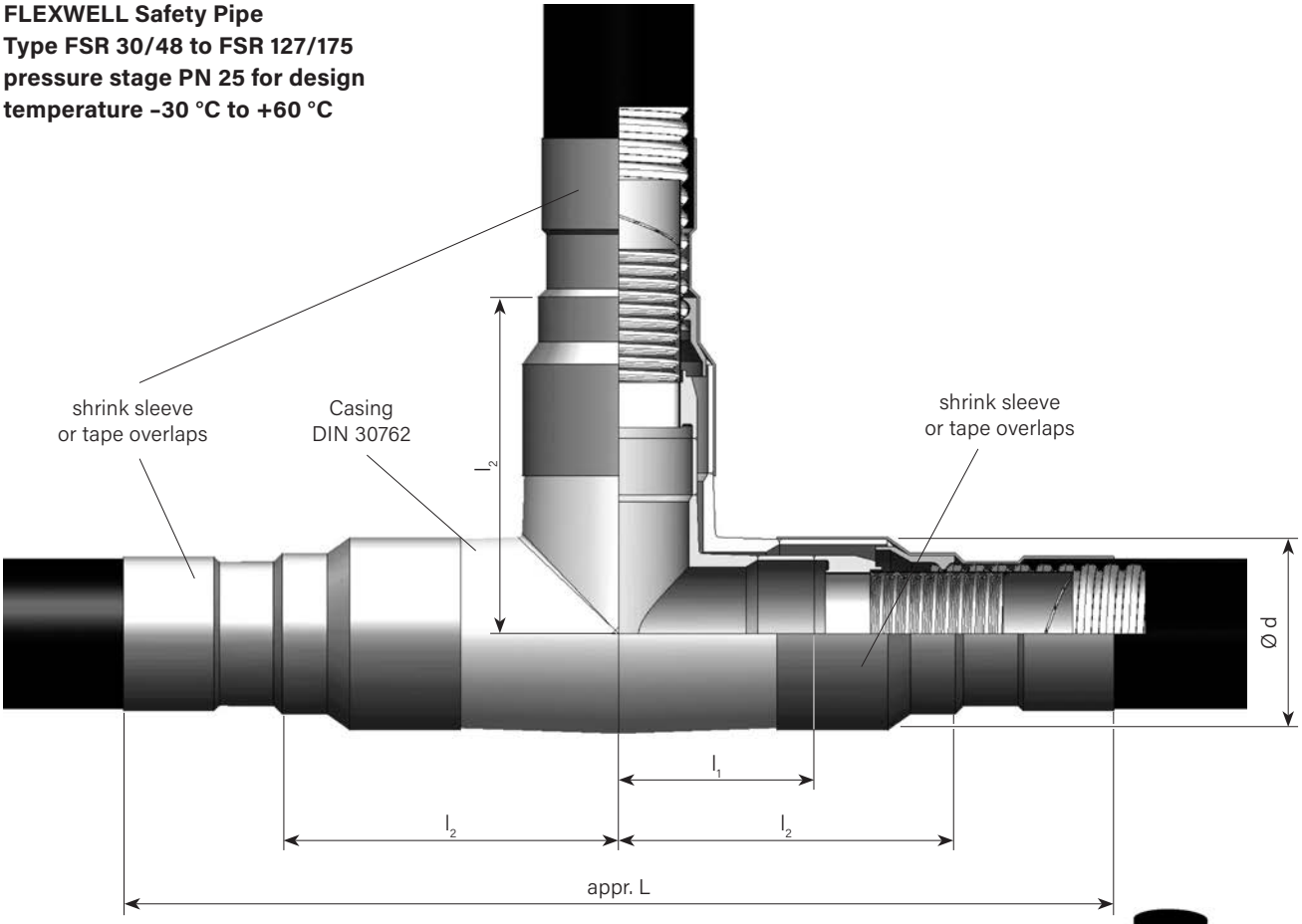
BRUGG Pipes

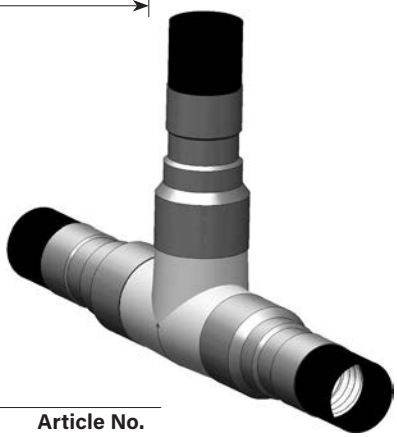
FLEXWELL Safety Pipe

Integrated T-piece

Joining method: TIG welding/hard soldering

FLEXWELL Safety Pipe
Type FSR 30/48 to FSR 127/175
pressure stage PN 25 for design
temperature –30 °C to +60 °C





Material:
All parts made of stainless austenitic steel.
Material No. 1.4404/1.4571 inner
Material No. 1.4301 outer

Type	DN	Ø d	l_1	l_2	L ca.	Article No. 1.4404
		mm	mm	mm	mm	
T-Stück FSR 30/ 48	25	60.3	appr. 87	appr. 174	624	1015872
T-Stück FSR 39/ 60	32	76.1	appr. 94	appr. 188	638	1015874
T-Stück FSR 48/ 71	40	88.9	appr. 104	appr. 201	668	1015876
T-Stück FSR 60/ 83	50	114.3	appr. 131	appr. 233	772	1015877
T-Stück FSR 75/107	65	139.7	appr. 145	appr. 263	820	1015878
T-Stück FSR 98/134	80	168.3	appr. 174	appr. 300	922	1015880
T-Stück FSR 127/175	100	219.1	appr. 248	appr. 383	1086	1015882

Only BRUGG solder Type BRL 8.50.34 may be used!

BRUGG Pipes

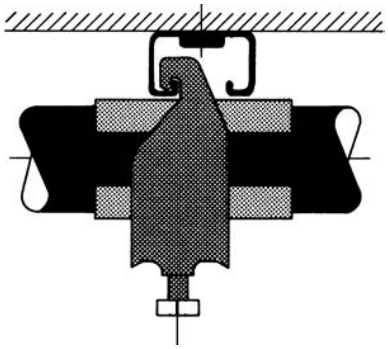
FLEXWELL Safety Pipe

Anchor fittings to buildings, pipe bridges etc.

Anchor fitting in buildings or on supporting structures

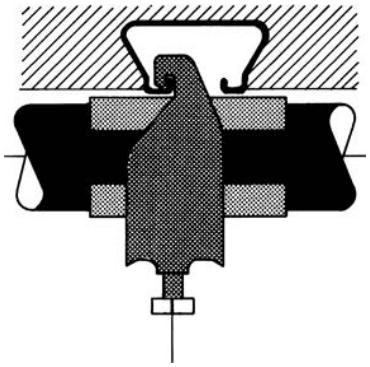
Installation example No. 1

BRUGG anchor fitting
Anchor fitting of the FLEXWELL Safety Pipe on existing installation rails mounted on plaster by means of bracket clamps.



Installation example No. 2

Anchor fitting of the FLEXWELL Safety Pipe on existing structural steel anchor rails embedded in the concrete (Jordahl or other anchor rails) by means of bracket clamps.



N.B.:

Apart from the components illustrated here, other bracket clamps normally in use in the trade with appropriate dimensions may be used with the anchor fitting.

Always take the local circumstances into consideration.

Fixing the anchor fitting to anchor rails or structural steel does however have the following advantages over fitting to an anchor point:

1. The FLEXWELL Safety Pipe can be provisionally secured during laying.
2. To align the pipe correctly, the anchor fitting brackets only need to be loosened, pushed a little to one side and then tightened again afterwards.

Bending radii and bracket distances

Type	Bending radius	Bracket distance max. horizontal	vertical	Article No. BRUGG cable saddles galvanized steel	Brackets provided by builders must be suitable for use with following pipe-Ø
	m	m	m		mm
KSS-FSR 13/ 25	0.30	1.00	1.20	1015541	25 – 30
KSS-FSR 30/ 48	0.50	1.20	1.40	1015544	48 – 52
KSS-FSR 39/ 60	0.60	1.40	1.60	1015545	60 – 65
KSS-FSR 48/ 71	0.60	1.50	1.70	1015543	70 – 75
KSS-FSR 60/ 83	0.70	1.60	1.80	1015546	83 – 90
KSS-FSR 75/107	0.90	1.60	1.90	1015547	107 – 112
KSS-FSR 98/134	1.20	1.60	2.00	1015549	134 – 140
KSS-FSR 127/175	1.50	1.60	2.00	1015550	170 – 180
KSS-FSR 200/262	4.0	1.80	2.00	on request	260 – 280

Anchor rail 250 mm	1015540
Anchor rail 500 mm	1015539

BRUGG Pipes

FLEXWELL Safety Pipe

Instructions for laying and mounting FLEXWELL Safety piping

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Please note:
Please read these instructions through before beginning with the laying of the piping and installing the connection pieces. The instructions apply to the laying of FLEXWELL Safety Pipe.

Familiarise yourself with the installation instructions for:
- FSR connection pieces with GRAPA or elastomer seal
- FSR through connections
- FSR elbows and t-connectors

Important, please take note:
The figures given in "bar" apply to the pressure in excess of standard atmospheric pressure.

All FSR connections described in our instructions for laying the pipes are intended for installation in covered manholes, filling shafts, petrol pump shafts or above ground level or in the shafts.

If it proves necessary to make connections in the ground, please inform your planning engineer and sales dealer beforehand.

Important, temperature declaration:
All FSR pipes must be layed at temperatures above 0 °C to rule out damaging the PE layer.

1 Basics

Familiarise yourself with the routing plan for laying the piping. Your planning engineer can give you an excerpt from this for the individual piping sections. He has access to computer programs which allow him to do this. Use this plan to see the sequence in which the piping should be laid. You will only be able to decide the order in which to lay the pipes yourself if you already have a great deal of experience in the laying of flexible pipes.

It is crucial for the sequence of laying the individual pipes that you avoid reverse gradients as well as unnecessary crossing of pipes in the routing and that the pipes lie in the correct order once laid.

2 Preparing the site

Check the routing and the sand bedding of the pipe runs: they must be wide enough to allow 50 – 100 mm distance between the pipes. A distance of 150 mm must be allowed between the outside pipe and the trench wall.

Check the execution of the pipe runs (sand bedding without stones, downward gradient to the tank). The downward

gradient should be at least 1 – 2 %. Make sure that there are no stones or pebbles in the sand bedding (sand grain size < 2 mm). There should be 100 mm of stone-free sand underneath the piping. At the end of laying the pipes, they should be covered (once again with stone-free sand) all around (min. 200 mm backfill). The pipes shall, including bearing layer, have at least 300 mm total coverage.
For pipes under driving surfaces the laying depth must be adapted to ground pressure requirements.

Checking the preparations at the manhole covers, filling shafts, pump mountings and chambers: are the dome covers and the filling shaft correctly prepared with the right connecting flanges in the right places? The access manhole shafts must have been secured on the tank. The pump mountings and chambers must be equipped with appropriate arrangements for connecting the piping.

Check whether the complete inventory of piping has been delivered (the type of piping and the lengths are secured to the drum) and that all components of the accessory equipment are present (connection pieces, nominal bores, pipe through-connections etc.).

If the piping has been delivered in a coil, make sure that the coil/coils are safely unloaded and stored (and not damaged by vehicles on the construction site). Make certain immediately that the entire consignment has been delivered in undamaged condition (piping and accessories).

If a toolkit has been supplied, please read the instructions for their use through carefully before using them.

Tips for secure storage of the drums: secure unloading of the drums off the truck must be ensured. Organize the necessary means for this on your construction site, e.g. a static or truck-mounted crane or a forklift.

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Make sure that the ends of the pipes have been sealed so that no foreign bodies can find their way into them.

Store the piping at a temporary interim storage position before proceeding to laying.

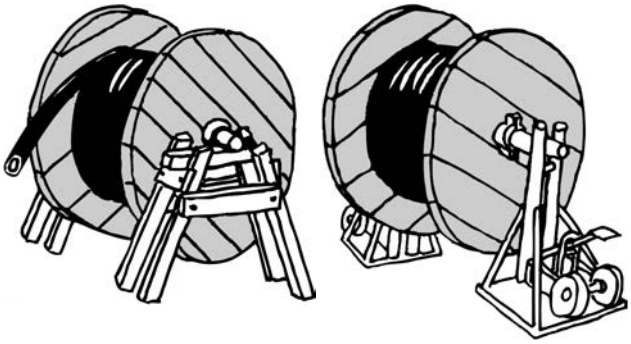
3 Determining the lengths and laying the piping

Determining the length of the pipes: before measuring out the pipe lengths, number the entries to the filling shaft and the through-connections at the corresponding manhole shaft. Then transfer these numbers to the piping routing plan (e.g.: 1, 2, 3 etc.). To determine the length, e.g. of the filling lines, lay a tape measure from connection 1 of the filling shaft along the route of the intended pipe run with the laying radii of the piping to the connection 1 of each manhole cover. Repeat this procedure at the other filling shaft connections. Note down the lengths and add them together. Is the piping which has been delivered long enough for the actual pipe run to be laid?

Attention:
Proceed in the same way when measuring out all the other pipes. Observe the sequence of the pipes to be laid scrupulously. The pipes must be exactly marked (carrier pipe, connection), so that there is no chance of confusing them. It is time-consuming and difficult to "thread through" pipes under piping which has already been laid, so avoid this at all costs.

4 Laying FSR delivered on drums

The drums with the piping wound on them should be placed as close as possible to the pipe runs. Please note that the piping must always be pulled off over the top (see the sketch).



If the piping has been protected during transport by means of shuttering boards, these must be removed before laying using tools such as crowbars, hammers etc. Make absolutely sure when doing this that the piping underneath the boards is not damaged. The boards should only be removed directly prior to laying the piping, however, to prevent any unforeseen damage to the piping.

Another conceivable option is to set up a stationary unwinding device using a DN 100 – DN 125 steel pipe as the axle for the drum.

Another widely used method employs transportable drum stands with a hydraulic lifting device. With this, a rigid axle is passed through the drum as in the method described above. The drum is then lifted using the lifting device.

To pull the piping off, use the loops normally available in the trade (50 mm wide, 2 m long) or similar (ropes etc.).

Warning! Danger of injury!
Before pulling off the loose end of the pipe from the drum, hold it very tight with these loops and only then cut the straps fastening it to the drum using a knife. During this, two men should hold the pipe still and one man should take care of braking the movement of the drum.

After pulling off, draw the piping towards the trench. Always take care while doing this that no sand or other dirt can get into the inside of the piping (hold up the pipe end). Pull the pipe off the drum slowly and carefully, making sure that it is not damaged by sharp edges during pulling-off. If the pulling-off process is interrupted, the drum must also be braked to stop it continuing to turn (coil spring effect).

FLEXWELL Safety Pipe

Instructions for laying and mounting FLEXWELL Safety piping

FSR DN 12 – DN 150

Warning! Danger of injury!
The piping has an angular momentum after pulling-off which is released immediately after it is sawn through.

The ends, which are now open and exposed, must be protected against dirt and contamination by means of placing bags or caps over them. Using a white marker or other similar means of designation (carrier pipe, connection), mark them clearly. Place the piping where it will be installed later on.

5 Laying FSR delivered in coils

Tips for the safe handling of piping coils while unloading them off the truck: if you are using a forklift, a crane or similar equipment to unload the coils, only use textile loops or textile ropes for unloading, in order to avoid damaging the outer pipes.

Please note: the coils may have a diameter of up to 2.40 m. The layers of the coil are fixed and secured by means of several fastening straps. The ends are closed with shrink caps.

Store the piping at a temporary interim storage position before proceeding to laying.

Tips for laying piping delivered in a coil:
Roll the coil as if it were a car tyre. In order to roll out the piping this way, release one fastening strap after the other. Do not under any circumstances remove them all at the same time!

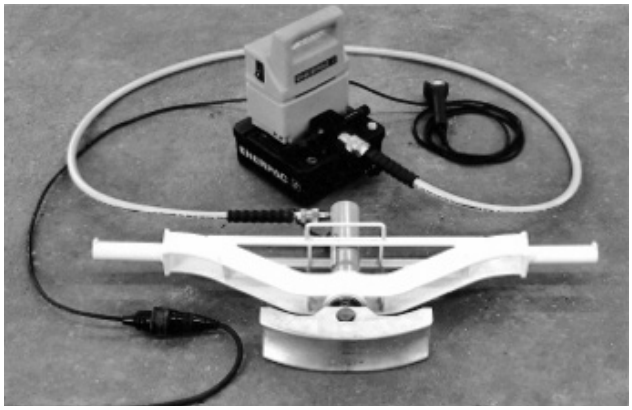
Warning! Danger of injury!
When releasing the fastening straps, the pipe end will jump up! Make sure that neither you yourself or anyone else is injured by the release of tension in the pipe when this happens.

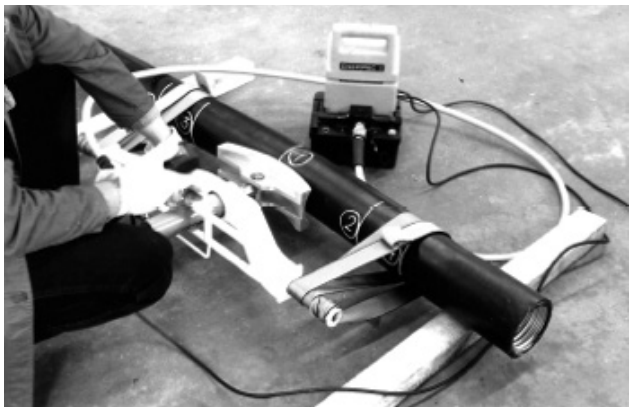
Warning! Danger of injury!
The piping has an angular momentum after pulling-off which is released immediately after it is sawn through. **The pipe end will jump upwards!**

The ends, which are now open and exposed, must be protected against dirt and contamination by means of placing bags or caps over them. Using a white marker or other similar means of designation (carrier pipe, connection), mark them clearly. Then place the pipe sawn off to the correct length in the position where it is to be laid.

6 Bending the piping

Normally, the piping does not need to be bent using the bending device for every change in direction. The pipes can be aligned in the right direction with the help of square timber or beams. Always try wherever possible to move the pipe into the desired position within the radius on the bedding predetermined by the drum or the coil. If it is necessary, however, to bend the pipe through small bending radii, this can be done using an electro-hydraulic bending device.





BRUGG Pipes

FLEXWELL Safety Pipe

Instructions for laying and mounting FLEXWELL Safety piping

FSR DN 12 – DN 150

7 Installing the connections

The pipes must be aligned straight for about 1 m around the connections and the manhole shaft entries. Similarly, if FSR 100 or above pipes need to be bent through tight radii in front of the shafts, which can only be done with the electrohydraulic bending device, this must already have been carried out.

Before installing the connections, the manhole through-entries must be mounted on the pipe. There is no chance to push them subsequently over the connections once these have been installed. Steel shaft entries can also be mounted after the installation of the connections.

8 Tests on site after installation of the connections

All the piping laid must be visually inspected after laying and installing the connections/sleeves. Leak tests of the connections with bubble-forming liquid, additional pressure tests of the piping can/must be carried out.

9 Leak tests

Leak tests on the connection of the inner carrier pipe

Pressurize the inner carrier pipe with max. 1 bar nitrogen or clean, dry compressed air and spray bubble-forming leak detection fluid onto the connections from outside. Observe the connection for about 2 minutes. Bubbles will form if there is an untight spot. If you identify a leak, depressurize and investigate to find the reason. Repeat the leak test until no more bubbles appear.

Leak test of the outer containment pipe

The leak test on the outer containment pipe can be carried out on single pipes or multiple pipes simultaneously. If you want to test several pipes together, you must connect the valves of the monitoring boots by means of pipes or hoses. Fill nitrogen or clean, dry compressed air into the surveillance space at max. 1.0 bar. Filling has been completed when the set value is reached and stays constant (pressure is equalized over the entire length of the pipe).

Spray bubble-forming leak detection fluid onto the connections or monitoring boots from outside. Bubbles will form if there is an untight spot. If you identify a leak, depressurize and investigate to find the reason. Fix it. Repeat the leak test until no more bubbles form.

FLEXWELL Safety Pipe

Instructions for laying and mounting FLEXWELL Safety piping

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Pressure test of the inner carrier pipe after completion of laying

Attention:
Do not carry out a pressure test with liquid.

Find out from the local authorities or inspectors what the required procedure in their area of jurisdiction is and the test frequencies. Fill nitrogen or clean, dry compressed air into the inner pipe.

Attention:
Pressure testing with gas has significant dangers and require safety precautions. They must comply with the local legal regulations.

Please note:
This only makes sense when the pipe is protected from direct sunlight/cold. Measuring errors can occur due to changes in temperature. This test should be seen as an additional test, not as the main leak test.

Warning:
Only carry out this test when the piping is in the correct position as intended and secured in place in the shafts, screwed onto the fittings/valves as envisaged. The piping must be packed around with stone-free sand.

Pressurize the inner pipe/outer pipe slowly. It takes some time after beginning the filling for the pressure to build up. It rises rapidly just before it reaches the desired pressure. Remember to give the system time to stabilize. Then bring it up to the desired pressure in small steps.

Test pressure for the inner pipe:
The maximum allowable pressure PS for the inner pipe is 25 bar. The maximum allowable test pressure is 25 x 1,43 = 35,8 bar.

The test pressure PT shall be the “maximum allowable pressure of the pipe system” x factor 1,43.

For example: If the maximum allowable pressure of the system where the pipe is connected to is 6 bar the test pressure shall be 6 x 1,43 = 8,6 bar.

A pressure test is not necessary if the pipe is only used as a suction pipe. In that case a leak test as described before is sufficient.

Pressure test of the outer containment pipe:
The maximum allowable pressure PS for the outer pipes is 25 bar.

The maximum allowable test pressure for the outer pipe is 25 x 1,43 = 35,8 bar.

The test pressure PT shall be the “maximum allowable pressure of the monitoring system” x factor 1,43.

For example: If the maximum allowable monitoring pressure is 3 bar the pressure shall be 3 x 1,43 = 4,3 bar.

A pressure test is not necessary if the monitoring pressure of the outer containment pipe is only in the range between –0,7 bar to 0 bar. In that case a leak test as described before is sufficient.

FLEXWELL Safety Pipe

Start of Operation and Maintenance

1. Start of operations of the FLEXWELL Safety Pipe System

1.1 Leak testing of the FLEXWELL Safety Pipe System

Leak testing has to be done according to "Instructions for laying and mounting FLEXWELL Safety piping" (FSR 8.70.05).n

Caution: Do not use any liquids or solid materials for the leak test.

Caution: The local rules and regulations for pressure testing have to be strictly adhered to.

1.2 General operating instructions

The operator of a pipe system for flammable or hazardous liquids has to maintain such in proper operating condition and to operate it according to all applicable rules and regulations. The system has to be monitored constantly and necessary maintenance and repair work has to be preformed immediately and, depending on the circumstances, appropriate safety measures have to be taken.

The pipe system may not be operated, if it has deficiencies, which can endanger employees, other persons present or the environment. Appropriate steps have to be taken immediately to eliminate a dangerous condition.

The operator is obligated to issue the necessary orders, to take the necessary steps and to make sure such orders are adhered to to avoid any dangerous conditions.

1.3 Startup of the FLEXWELL Safety Pipe System

Caution: Startup and commissioning has to be performed in strict accordance with the local rules and regulations.

2 Maintenance of the FLEXWELL Safety Pipe System

Inspections by the operator

The operator inspects the pipe system in required intervals for proper operating condition in accordance with the operating instructions and other regulartory mandates:

In particular he makes sure that,

1. fire protection installations are ready for service and that binder for spilled fluids is available in the specified quantity and at the predetermined location(s),
2. fire alarms are operational,
3. no prohibited materials and objects are located in areas with explosion hazards,
4. pipes and fittings are tight,
   procedure for testing of leaks in the interstitial space (annular gap between primary and secondary pipe) as described in point 2.1
5. the required safety installations are functioning,
6. fire lanes are unobstructed at all times
7. and in explosion hazardous areas bans of smoking and open fires are strictly observed.

Caution: Maintenance work and intervals have to be performed in accordance with the local regulations.

After completion of cleaning, maintenance and repair work and inspections the installation has to be returned to operating condition.

In particular all the safety devices have to be returned to operating condition.

Caution: Product pipe may be under pressure after completion of testing.

FLEXWELL Safety Pipe

Start of Operation and Maintenance

3. Shutdown and taking out of service of the FLEXWELL Safety Pipe System

Pipe systems, which are shut down, are to be secured in a such a way that they are no danger to employees or others.

Pipes, which are taken out of service temporarily, are to be emptied and cleaned in such a way that neither an explosive atmosphere exists nor can develop, and that no danger to the environment and groundwater can occur.

Pipes are to be secured against utilization. Leak detection systems and cathodic corrosion protection systems are to remain in operation.

4 Problems

If leakage or damage is detected in any part of the system (either by inspection of the sump, a leak detector, or similar monitors), the problems are to be immediately investigated by the site operator.

Caution: If a leak monitoring system is shut down, the leak tightness of the primary and secondary pipes of the FLEXWELL Safety Pipe System is no longer monitored. A possible leak will no longer be indicated. This means that, if a leak detection system is shut down, the entire pipe system has to be taken out of service.

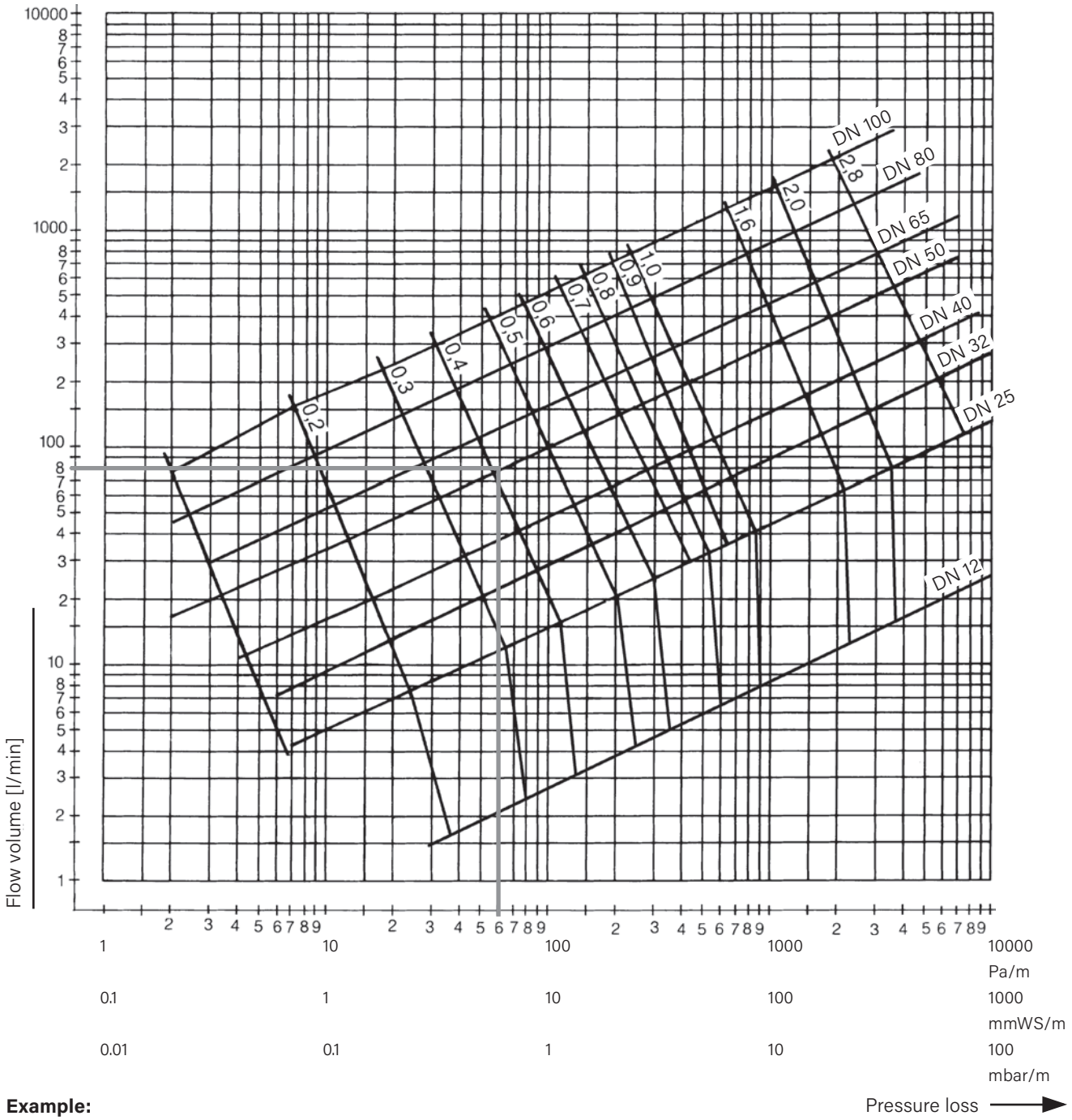
Proceed according to point 1.1 for leak testing. For an exact damage analysis it is allowable to pressurize the primary pipe with a maximum pressure of 37.5 ± 1 bar.

FLEXWELL Safety Pipe

Fluid engineering

Pressure loss diagramme for petrol regular and super (4 star)

Temperature:	15 °C
Specific weight:	735 kg/m³
Kinematic viscosity:	5.5 · 10⁻⁷ m²/s



Example:

Pipe DN 50
With a flow volume of 80 l/min
at a speed of c. 0.4 m/s
the pressure loss is 0.6 mbar/m

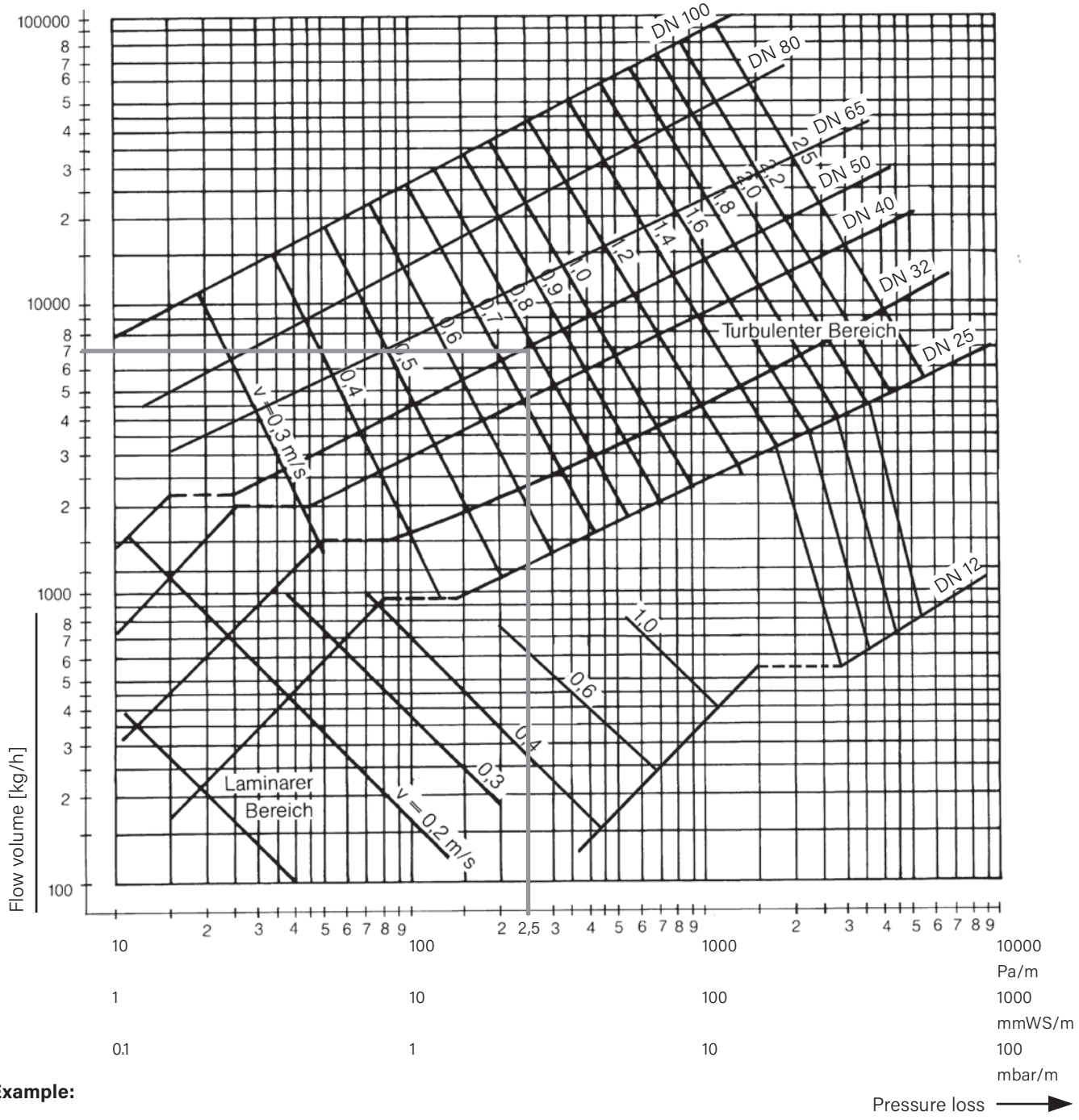
BRUGG Pipes

FLEXWELL Safety Pipe

Fluid engineering

Pressure loss diagramme for heating oil (EL) and diesel fuel

Temperature:	15 °C
Specific weight:	860 kg/m³
Kinematic viscosity:	7 · 10⁻⁶ m²/s

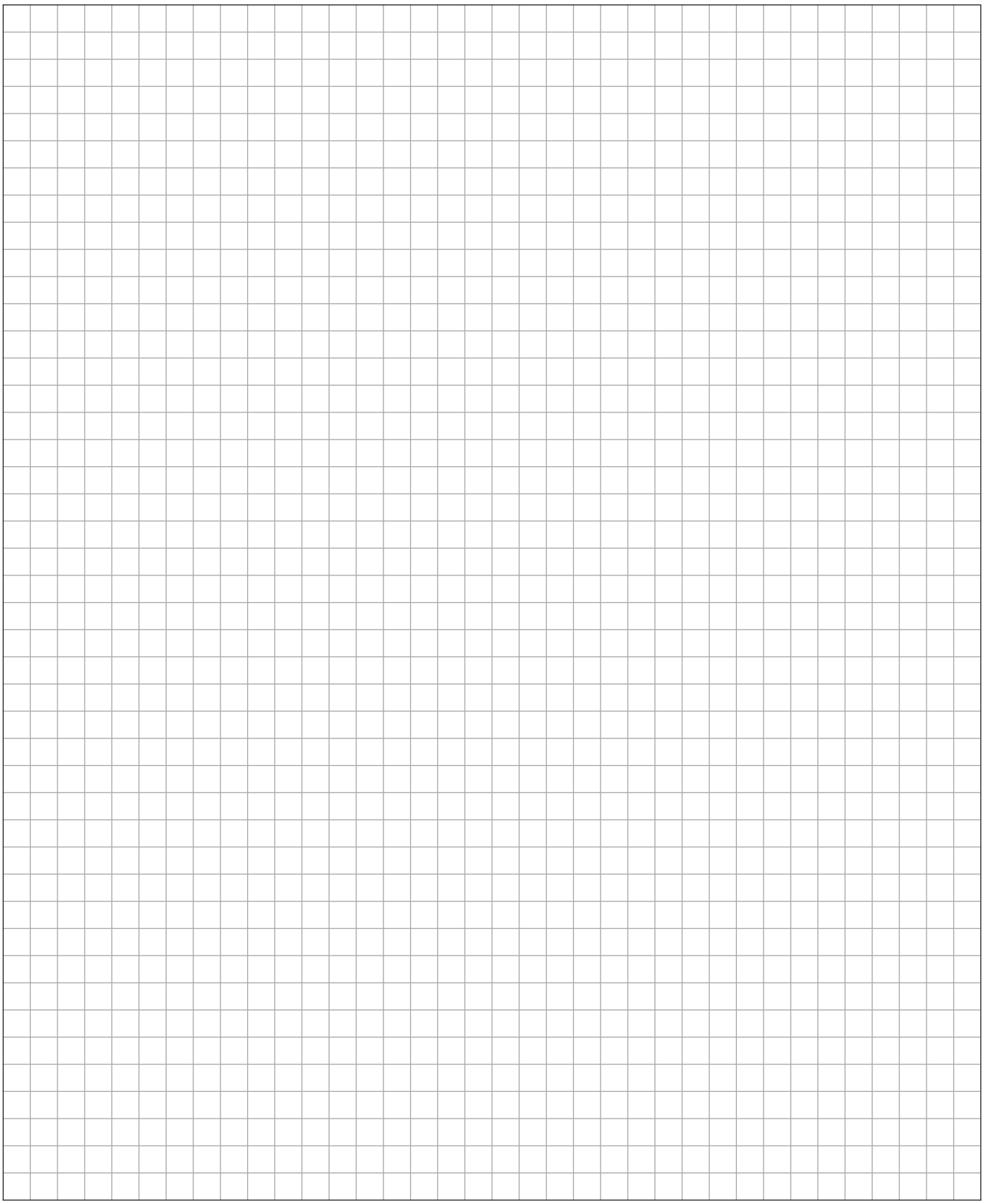


Example:

Pipe DN 50
With a flow volume of 7000 kg/h
at a speed of c. 0.8 m/s
the pressure loss is 2.5 mbar/m

BRUGG Pipes

Notes



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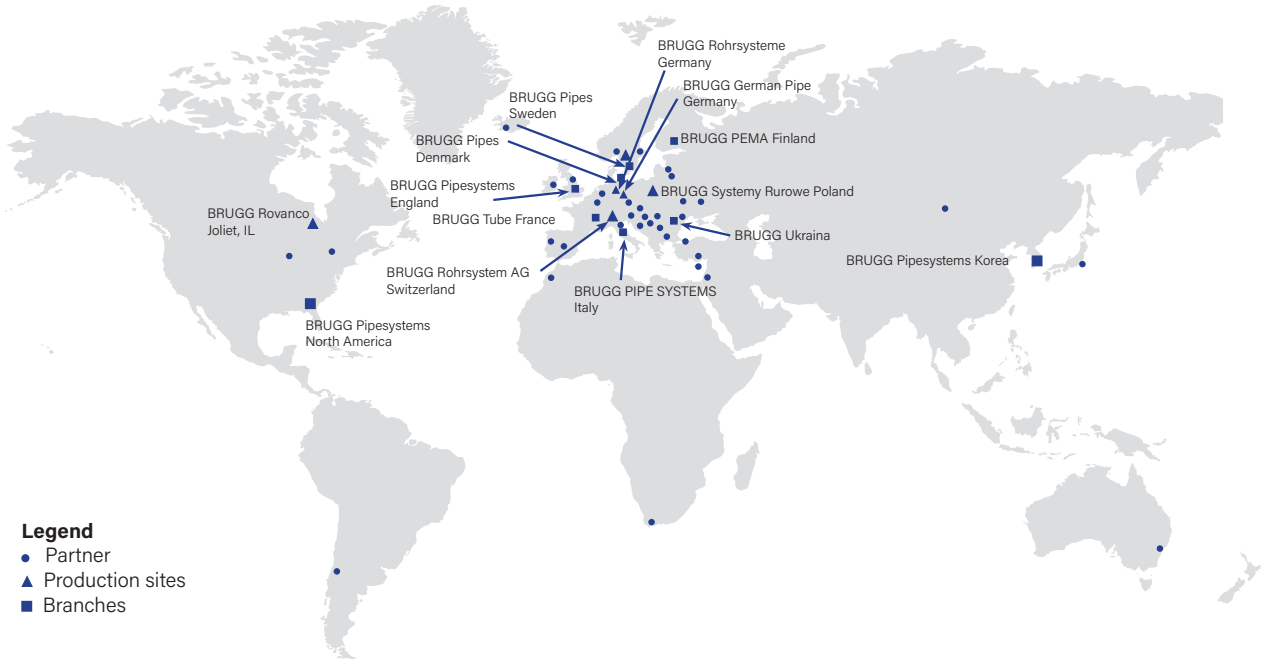

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Pipes

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