

# FLEXWELL® LNG

Project Engineering



# Content

LNG 6.10.02	System description – FLEXWELL® LNG All-in-One
LNG 6.10.03	FLEXWELL® LNG All-in-One VIP – Pipe
LNG 6.10.04	FLEXWELL® LNG All-in-One VIP – Endfitting
LNG 6.10.05	FLEXWELL® LNG All-in-One PUR – Pipe
LNG 6.10.06	FLEXWELL® LNG All-in-One PUR – Endfitting
LNG 6.10.07	FLEXWELL® LNG All-in-One PUR – Accessories
LNG 6.10.08	Leak detection
LNG 6.10.09 – 6.10.10	Basic Planning Parameters – Details for underground work
LNG 6.10.11	Fluid engineering
LNG 6.10.12	Processing Enquiries

# FLEXWELL® LNG All-in-One

## System description

**FLEXWELL® All-in-One is a unique and cost efficient LNG pipe which applies at LNG fuel stations as endless transportation, re-circulation and BOG recovery line: All-in-One!**

### The design of FLEXWELL® LNG All-in-One

Because of a continuous manufacturing technology of the corrugated pipes, FLEXWELL® LNG All-in-One (AiO) comes in an infinite length, which enables an installation without any need of welded joints.

The FLEXWELL® LNG All-in-One consists out of three endless corrugated pipes:

1. LNG-Supply
2. LNG/BOG-Return
3. The third one also is a corrugated pipe which creates a secondary containment for the LNG and contains the
  - a. optimized PUR-foam insulation or
  - b. Vacuum Superinsulation

### Properties of FLEXWELL® LNG All-in-One

Material of corrugated pipes	SS 316 L
Material of protective jacket	HDPE
Min. working temperature	-163 °C / -260 °F
Max. allowed working pressure	25 bar / 360 lbs

### Save costs through a self-compensating and easy to install pipe system

The corrugated pipe technology enables the FLEXWELL® LNG All-in-One to be endless and flexible. And flexibility leads to self-compensation.

Due to the huge temperature differences, regular rigid pipe needs expansion bends (either U or Z shaped) after a certain pipe run. With FLEXWELL® LNG All-in-One no special expansion bends are required with a pipe run which is still straight and continuous.

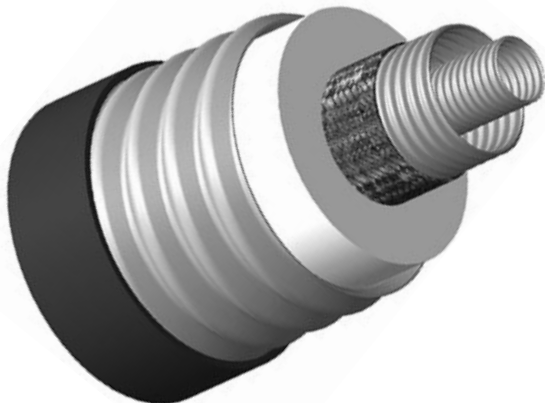
### Safety first!

With FLEXWELL® LNG All-in-One safety never is a problem! Thanks to its integrated leakage detection system, unlikely leakages will be detected immediately and the whole system can be shut down within seconds. The corrugated pipe on the outside provides a double containment for maximal safety, which still encases the LNG in case of a leakage.

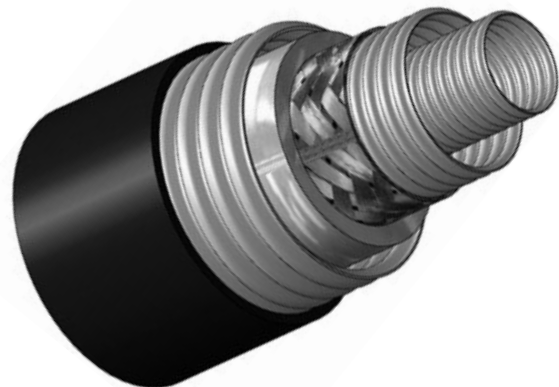
### Insulation standard "Highly efficient" or "high-end"

With the FLEXWELL® LNG All-in-One you have the chance to choose between different insulation layers:

- a. PUR-foam
- b. Vacuum Superinsulation



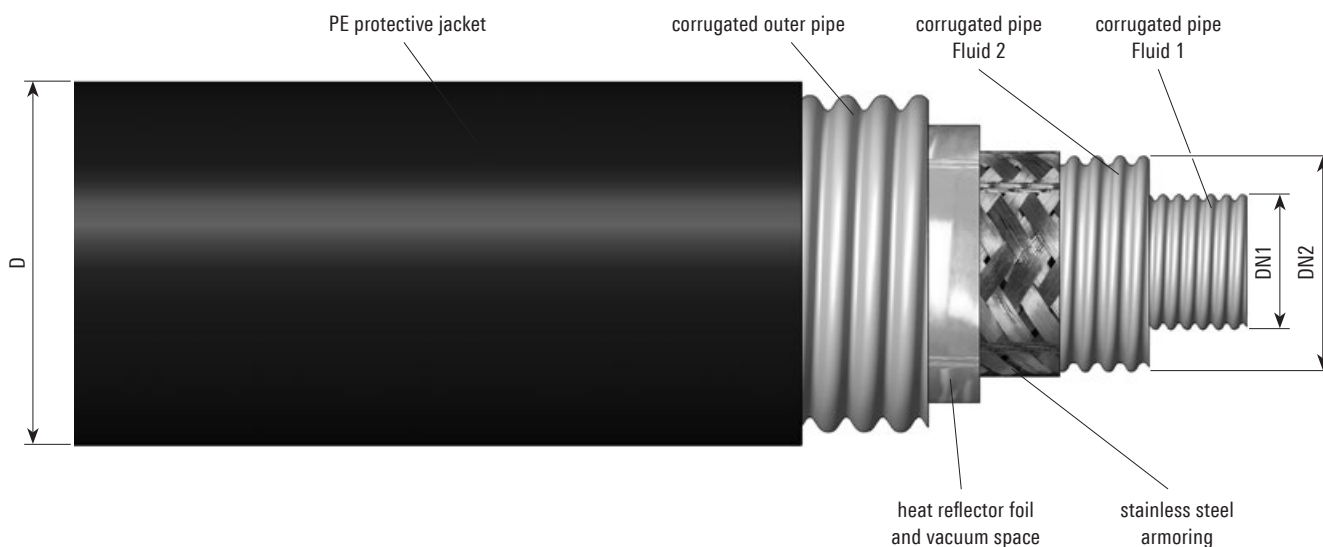
FLEXWELL® LNG All-in-One PUR with PUR-foam insulation



FLEXWELL® LNG All-in-One VIP – the Vacuum Insulated Pipe

# FLEXWELL® LNG All-in-One VIP

Vacuum insulated pipe with stainless steel inner pipe, medium pipe and outer pipe



**Version:**

All-in-One vacuum insulation

**Material:**

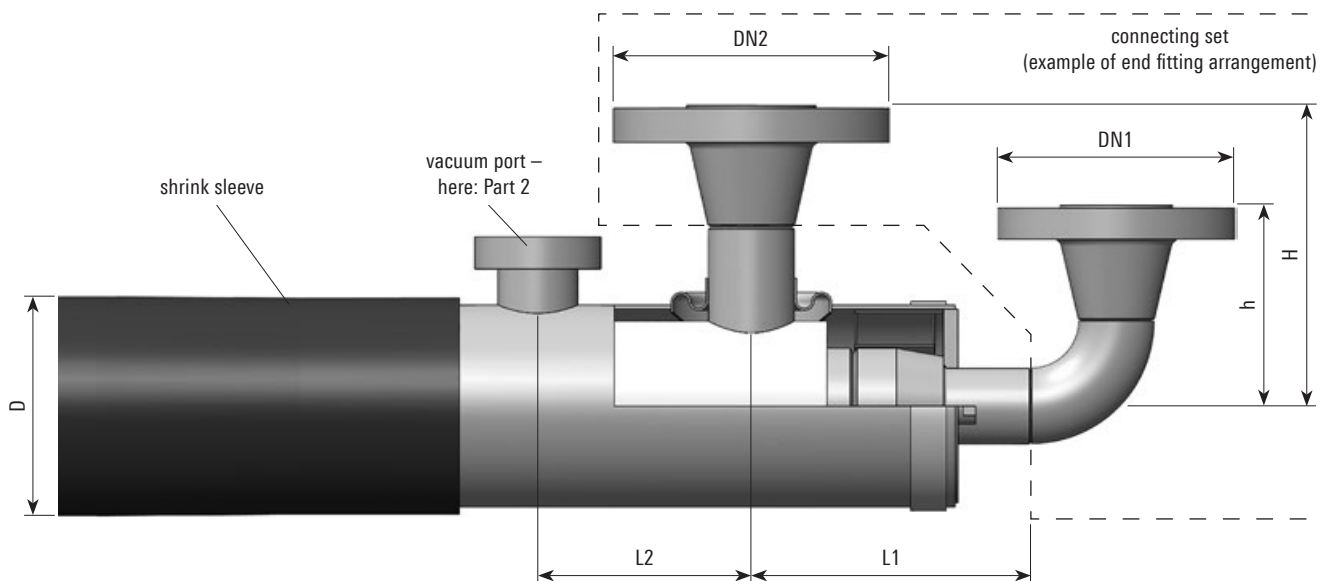
Corrugated pipes 1.4404/316 L  
 Armouring 1.4404/316 L  
 Heat inleak approx. 2.5 W/m



Type	DN1	DN2	PN	D	Volume	Volume	Weight	Bending	Article No.
				inch/mm	DN1	DN2		radius	
AiO VIP 39-64/115	1 ¼" DN 32	1 ¼" DN 32	25	4.6/117	1.35	2.13	7.5	39/1000	1056319
AiO VIP 48-83/152	1 ½" DN 40	2" DN 50	25	6.0/152	2.00	4.00	11.0	47/1200	1059393

# FLEXWELL® LNG All-in-One VIP

Endfitting – TIG welding – vacuum insulated



**Version:**

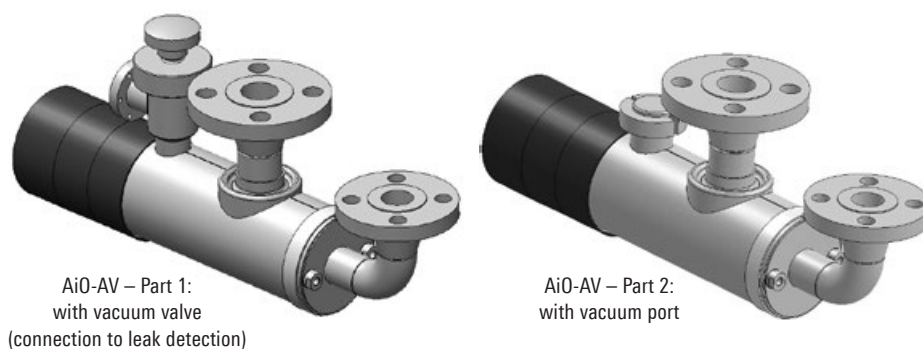
Butt weld ends  
Connecting set optional

**Material:**

Stainless steel 1.4404/316 L

**Insulation:**

Vacuum Super Insulation



Type	DN1	DN2	D	L1	L2	Article No.
<b>Part 1 vacuum valve</b>			inch/mm	inch/mm	inch/mm	
AiO-AV VIP 39-64/115 – P1	1 ¼" DN 32	1 ½" DN 40	4.6/117	8.0/205	4.7/120	1070440
AiO-AV VIP 48-83/152 – P1	1 ½" DN 40	2" DN 50	6.0/152	8.8/224	5.0/129	on request

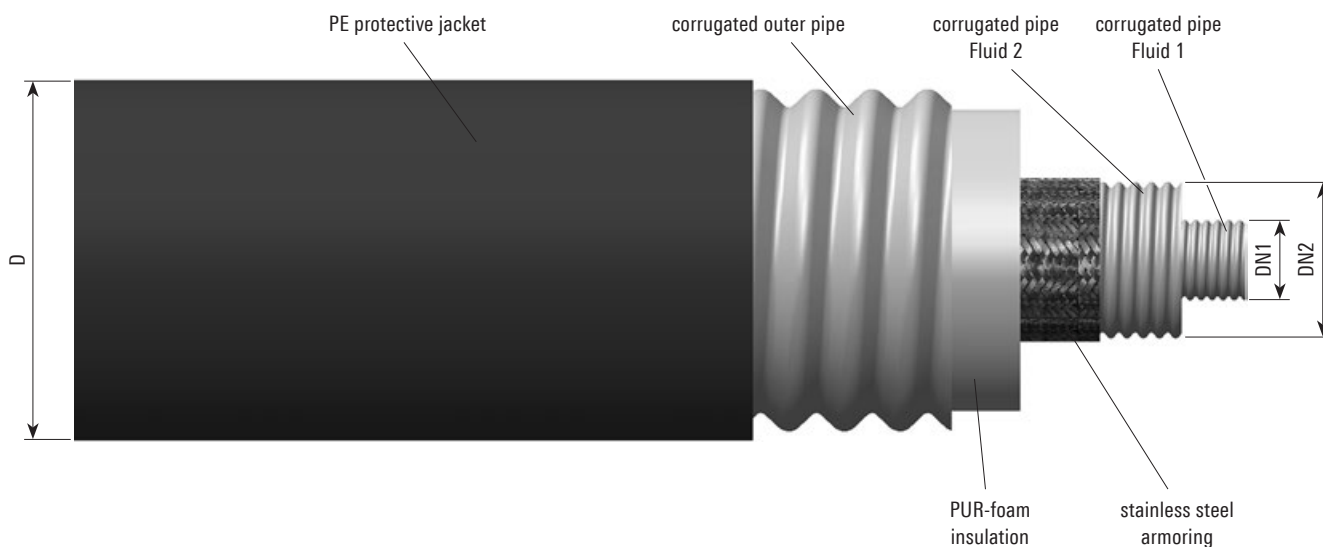
Type	DN1	DN2	D	L1	L2	Article No.
<b>Part 2 vacuum port</b>			inch/mm	inch/mm	inch/mm	
AiO-AV VIP 39-64/115 – P2	1 ¼" DN 32	1 ½" DN 40	4.6/117	8.0/205	4.7/120	1070441
AiO-AV VIP 48-83/152 – P2	1 ½" DN 40	2" DN 50	6.0/152	8.8/224	5.0/129	on request

Connecting set	Remarks	H (eg.)	h (eg.)	Article No.
AiO-AV CS	specific for each project	6.7/169	4.5/113	1070442



# FLEXWELL® LNG All-in-One PUR

PUR-foam insulated pipe with stainless steel inner pipe, middle pipe and outer pipe

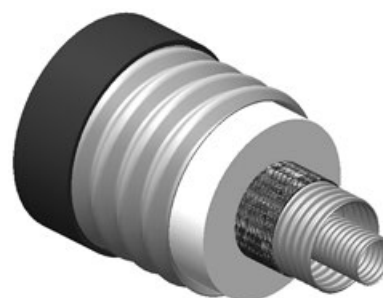


**Version:**

All-in-One PUR-foam insulation

**Material:**

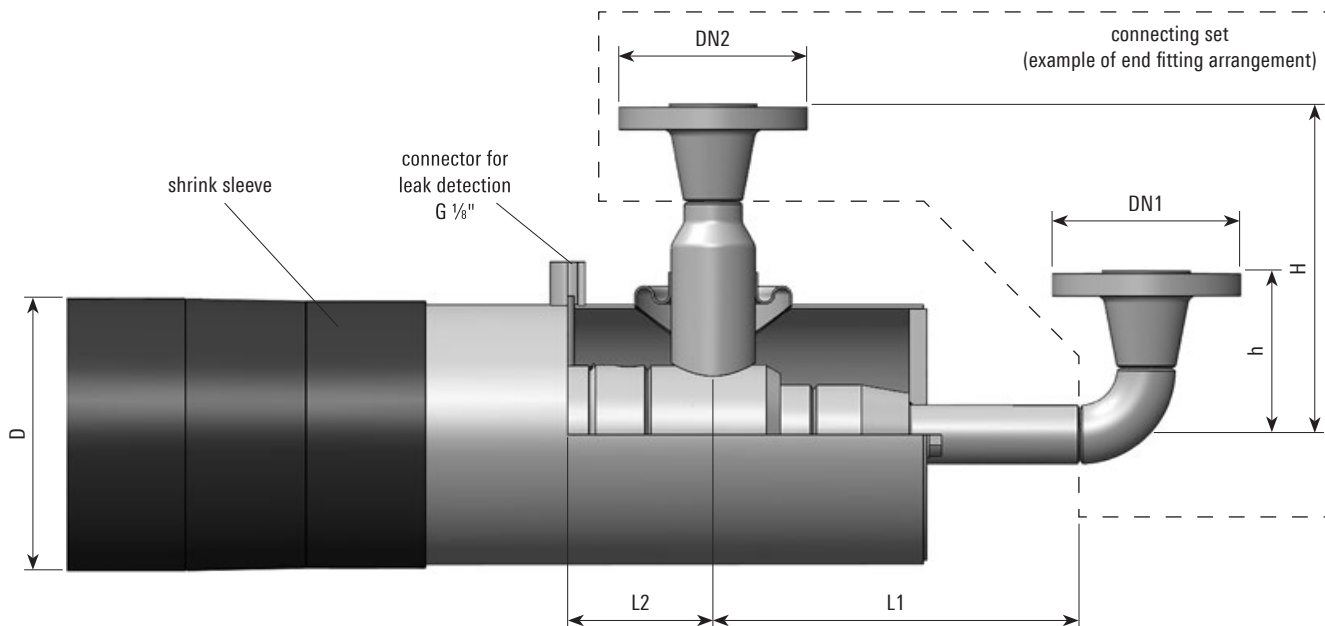
Corrugated pipes	1.4404/316 L
Armouring	1.4404/316 L
Insulation	Polyurethane
Heat inleak	approx. 25 W/m



Type	DN1	DN2	PN	D	Volume DN1	Volume DN2	Weight	Bending radius	Article No.
				inch/mm	l/m	l/m	kg/m	inch/mm	
AiO PUR 39-64/148	1 ¼" DN 32	1 ¼" DN 32	25	6.0/153	1.35	2.13	8.5	47/1200	1015319
AiO PUR 48-83/171	1 ½" DN 40	2" DN 50	25	6.9/175	2.00	4.00	12.5	30/1500	1059459

# FLEXWELL® LNG All-in-One PUR

Endfitting – TIG welding – PUR-foam insulated



**Version:**

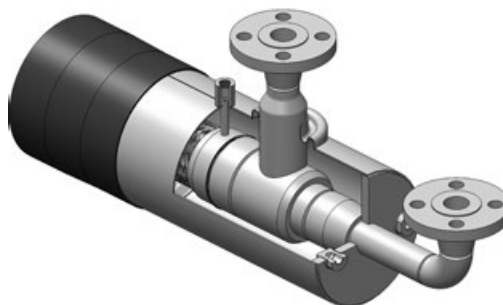
Butt weld ends  
Connecting set optional

**Material:**

Stainless steel 1.4404/316 L

**Insulation:**

Polyurethane PUR-foam

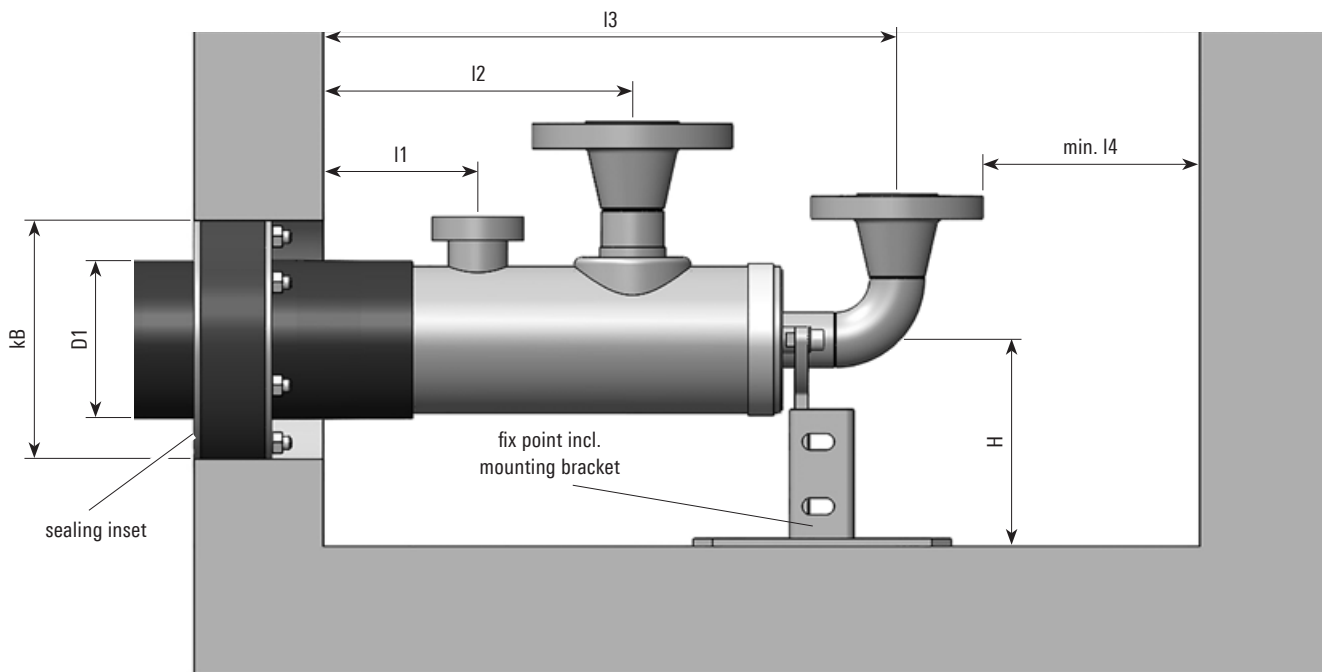


Type	DN1	DN2	D inch/mm	L1 inch/mm	L2 inch/mm	Article No.
AiO-AV PUR 39-64/148	1 ¼" DN 32	1 ½" DN 40	6.0/153	8.1/205	3.3/84	
AiO-AV PUR 48-83/171	1 ½" DN 40	2" DN 50	6.9/175	9.9/244	3.3/84	

Connecting set	Remarks	H (eg.)	h (eg.)	Article No.
AiO-AV CS	specific for each project	8.0/202	4.0/103	1070442

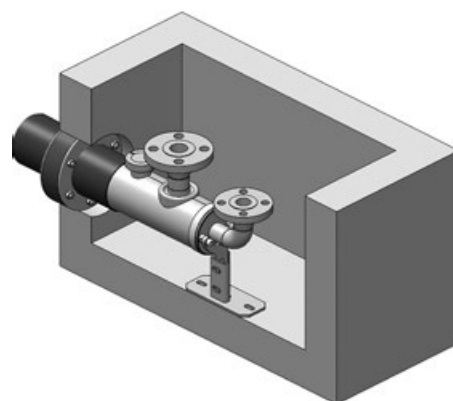
# FLEXWELL® LNG All-in-One

## Accessories



**Version:**

Installation in concrete sump with sealing inset and fix point incl. mounting bracket



Type	I1	I2	I3	I4	D1	kB	H	Article No. fix point	Article No. sealing insert
	min. inch/mm	min. inch/mm	min. inch/mm	min. inch/mm	inch/mm	inch/mm	inch/mm		
AiO VIP 39-64/115 – Part1	10.2/260	15.3/390	23.2/590	5.5/140	4.6/117	11.8/300	6.3/160	1070443	on request
AiO VIP 39-64/115 – Part2	4.7/120	9.4/240	17.3/440	5.5/140	4.6/117	11.8/300	6.3/160	1070443	on request
AiO VIP 48-83/152 – Part1	10.2/260	15.7/400	24.6/625	5.5/140	6.0/152	15.8/400	7.0/180		on request
AiO VIP 48-83/152 – Part2	4.7/120	9.8/250	18.6/473	5.5/140	6.0/152	15.8/400	7.0/180		on request
AiO PUR 39-64/152	4.7/120	8.1/205	17.9/454	5.5/140	6.0/152	15.8/400	7.0/180	1070443	on request
AiO PUR 48-83/171	4.7/120	8.1/205	17.9/454	5.5/140	6.7/171	15.8/400			on request



# FLEXWELL® LNG All-in-One

## Leak detection

FLEXWELL® LNG All-in-One can be monitored permanently with the leak detector LD-VIP. The LD-VIP monitors the vacuum of the super-insulation. If there is a unlikely but significant increase of the pressure it will immediately give an acoustic and optical signal.

The vacuum space between casing and middle pipe prevents the uncontrolled escape of the LNG into the environment in the event of a leakage.

### 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.

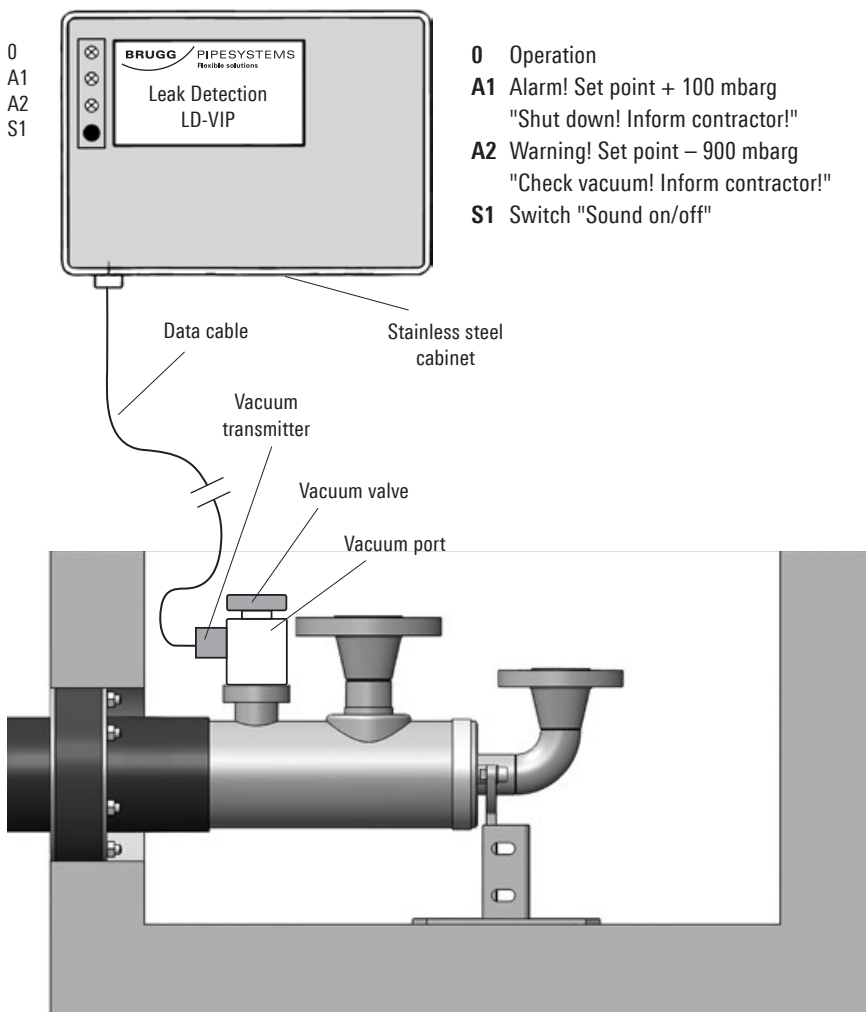
The main components are:

- the leak detector (LD-VIP) / leak detection device
- Vacuum transmitter
- the connection to the leak detector (valve)
- the double-walled piping

### Advantages of the system

The use of FLEXWELL® LNG All-in-One 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
- maintenance interval for reevacuating the insulation space is displayed by the "soft alarm"



Type	Article No.
Leak detector – 1 line	1070437
Leak detector – 2 line	on request
Vacuum transmitter	1070439

# Basic planning parameters

Details for underground work

Figure 1: Layout plan of trench

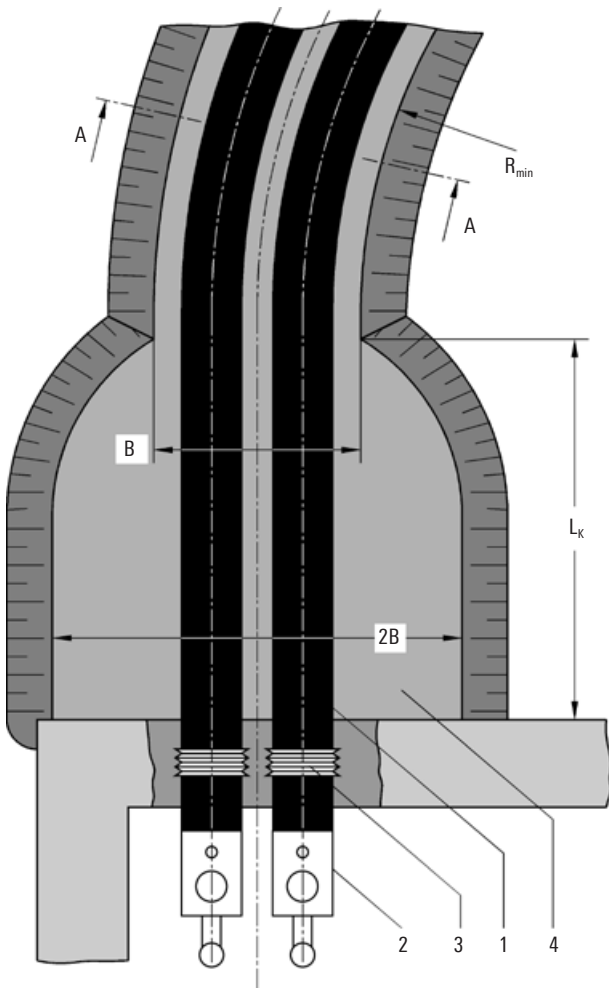
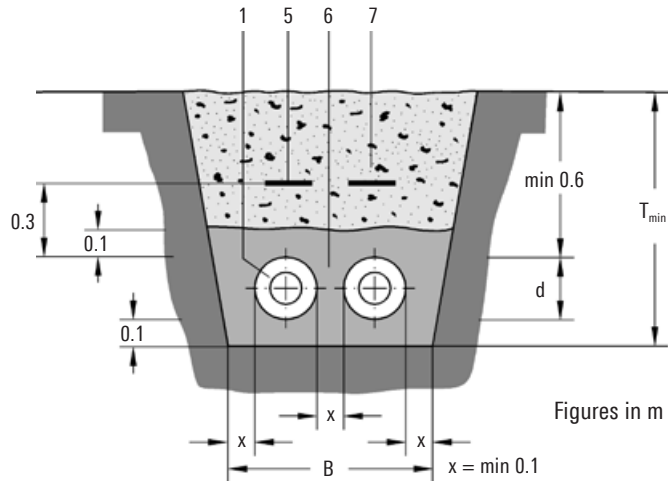


Figure 2: Cross-section of trench

Section A – A



- 1 FLEXWELL® LNG All-in-One
- 2 End fitting
- 3 Sealing inset
- 4 Working space in front of buildings and sumps
- 5 Pipe warning tape (optional)
- 6 Sand filling (0 – 4 mm round particles)
- 7 Filling material (reusable excavated material)

## Trench and working space dimensions, quantities of excavated material and sand filling

FLEXWELL® LNG AiO type			39-64/115	39-64/152	48-83/152
			VIP	PUR	VIP
Outer diameter of pipe	d	mm	115	152	152
Trench depth	$T_{min}$ for SLW 60 <sup>1)</sup>	m	0.85	0.85	0.85
Minimum coverage height	for SLW 60	m	0.60	0.60	0.60
Trench width	B	m	0.55	0.60	0.60
Working space width	2B	m	1.10	1.20	1.20
Working space length	$L_k$	m	0.50	1.00	1.00
Minimum trench radius <sup>2)</sup>	$R_{min}$	m	1.20	1.50	1.50
Material excavated from trench <sup>3)</sup>	for SLW 60	m <sup>3</sup> /m	0.47	0.51	0.51
Sand filling		m <sup>3</sup> /m	0.16	0.18	0.18

Trench widths "B" are recommended values. Please follow generally valid technical rules, guidelines and accident prevention regulations.

- 1) SLW 60 = 100 kN wheel load to DIN 1072
- 2) Smaller radii only after consulting BRUGG Pipe Systems
- 3) Excavation quantities ignoring gradient of embankment

# Basic planning parameters

## Details for underground work

### Distance from other supply lines

The ground temperature in the immediate vicinity of FLEXWELL® LNG AiO piping laid in the ground can be less than normal.

This can influence the transmission performance of electrical lines laid underground. Appropriate minimum distances are therefore required between the supply lines and the LNG pipes (also see VDE 0100 and VDE 0101).

Figure 1: Crossing lines/pipes

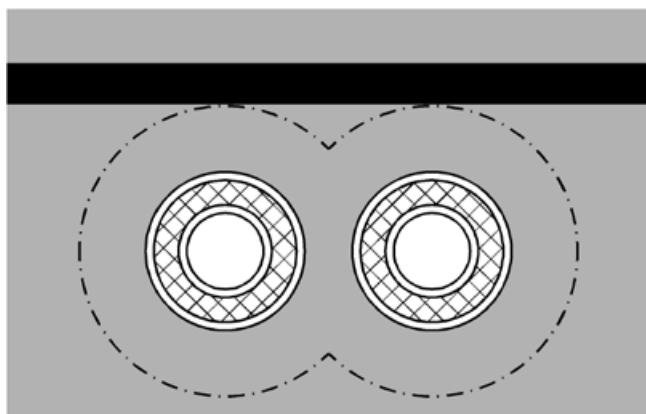


Figure 2: Parallel lines/pipes

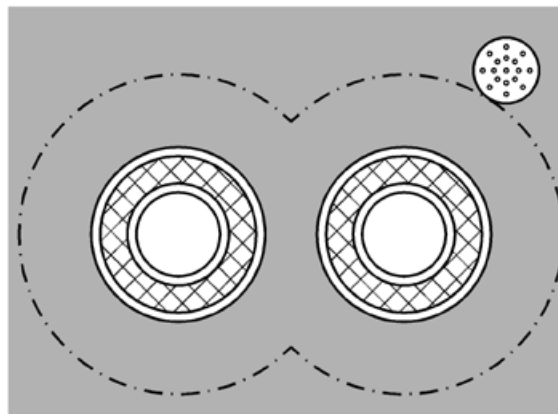


Table 1:  
Minimum distance from crossing pipes/lines

Type of supply line	Minimum distance
1 kV, signal/measuring cable	0.3
10 kV or on 30 kV cable	0.6
Several 30 kV cables or cables above 60 kV	1.0
Gas and water pipes	0.2

Figures in m

Table 2:  
Minimum distance from parallel pipes/lines

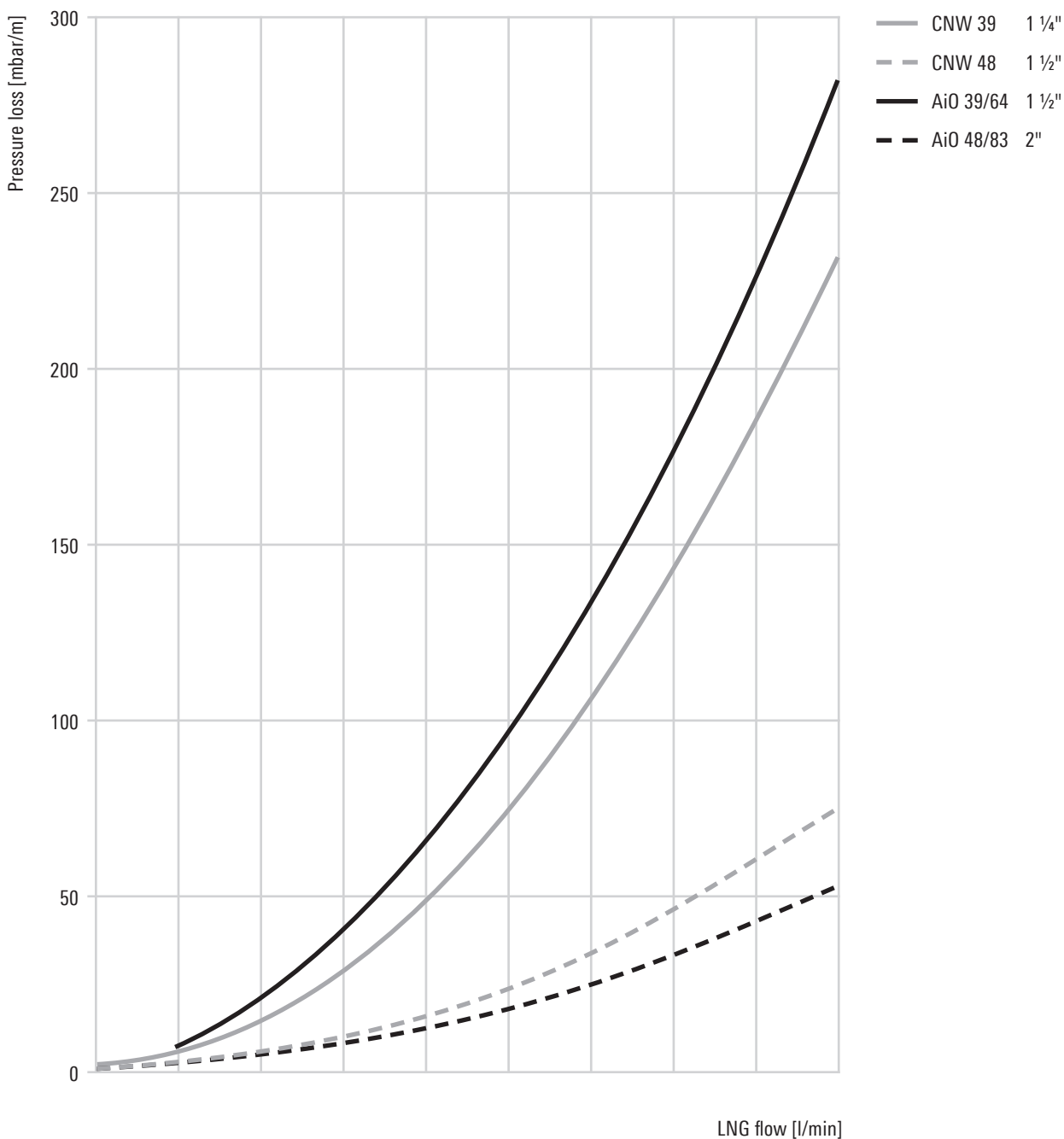
Type of supply line	Minimum distance	
	Parallel routing	
	Length	
	5 m	> 5 m
1 kV, signal/measuring cable	0.3	0.3
10 kV or on 30 kV cable	0.6	0.7
Several 30 kV cables or cables above 60 kV	1.0	1.5
Gas and water pipes	0.4	0.4

Figures in m

# Fluid engineering

## LNG Pressure loss diagramm

Temperature: -163 °C  
 Specific weight: 450 kg/m<sup>3</sup>  
 Kinematic viscosity: 134 · 10<sup>-6</sup> kg/(m·s)



# Processing enquiries

FLEXWELL® LNG All-in-One

**Customer/Contractual partner**

Company: \_\_\_\_\_

Country: \_\_\_\_\_

Contact person: \_\_\_\_\_

eMail address: \_\_\_\_\_

**Project details**

Project name: \_\_\_\_\_

ZIP / City: \_\_\_\_\_

Final customer: \_\_\_\_\_

**Project data**

Number of dispensers: \_\_\_\_\_ Date of installation: \_\_\_\_\_

Distance [m]	LNG tank	Dispenser 1	Dispenser 2	Dispenser 3
LNG tank	_____	_____	_____	_____
Dispenser 1	_____	_____	_____	_____
Dispenser 2	_____	_____	_____	_____
Dispenser 3	_____	_____	_____	_____

Flow rate [kg/m]	Flow	Return	Density [kg/m³]	LNG	Return
Flow to dispenser 1	_____	_____	_____	_____	_____
Flow to dispenser 2	_____	_____	Temperature [°C]	_____	_____
Flow to dispenser 3	_____	_____	Pressure [bar]	_____	_____

**Quotation for**

- FLEXWELL® LNG All-in-One PUR – dispenser line  
PUR-foam insulation, flow and return all in one
- FLEXWELL® LNG All-in-One VIP – dispenser line  
Vacuum insulation, flow and return all in one
- FLEXWELL® LNG PUR – fill line  
PUR-foam insulation, single line

**Notes**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_







# Pipe systems for the future

District heating – Industry – Petrol stations – System packages



## Your partner for pipe systems

We are the people you should talk to when you need to find efficient solutions for transporting liquid materials. With our project engineers, development department, in-house production unit, and our professional team of fitters, we have the know-how and the resources to look after your projects competently and reliably in the sectors of heating systems, petrol station construction, industrial plant construction, and system packages.

## International network

Our global partnership network can be reached on site at any time. More than 34 partners in 20 different countries will look after you wherever you are.

## Customer-specific solutions

Brugg is the full service provider in the field of single-wall, double-wall and insulated pipe systems. This know-how allows us to manufacture project-specific customised items.

## Give us a call!

Our engineers would be pleased to advise you and find a made-to-measure solution.

### BRUGG Rohrsysteme GmbH

Adolf-Oesterheld-Straße 31  
D-31515 Wunstorf  
phone +49 (0)5031 170-0  
fax +49 (0)5031 170-170  
info.brg@brugg.com  
www.brugg.de

A company of the BRUGG Group