GB USA

Vetter Leak-Sealing Systems

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Introduction

Vetter leak-sealing systems may only be operated with compressed air, never with flammable or aggressive gases. The leak-sealing systems may only be filled using original Vetter fittings.

Pay attention to DIN 7716 if stored for longer periods of time.

We will be happy to supply an excerpt from this standard.

Safety instructions

- Always wear safety clothing during work.
- Use only Vetter original fittings.
- Check that the leak-sealing system is resistant to the hazardous material before use. A resistance list is enclosed (P. 33).
- Pay attention to the pertinent regulations relating to work with hazardous liquids.
- Please check the perfect condition of the fittings and leak-sealing systems before and after every use.

Risk of explosion

Prevent any sparks from fittings when working with flammable liquids or gases.

- Vetter leak-sealing systems may only be filled if tensioned correctly. Fill leak-sealing systems until the leak is closed (max. working pressure 1.5 bar/22 psi.).

- A leak in a tank or pipe is a weak spot. You should thus avoid any other damage by only inflating the leak-sealing system until no more liquid escapes. This may occur at a pressure lower than the maximum working pressure
- The PVC acidproof envelope (accessory) for the leak-sealing bag provides additional protection against acid splashes.
- Sharp edges or points in the area of the leak must be adequately covered with suitably dimensioned sealing plates before fitting the leak-sealing systems.

Vetter leak-sealing bags LD 50/30

Apply leak-sealing bags in such a way that the complete leak is covered.

Tensioning the straps

Pass the end of the strap through the slot in the ratchet and tighten by hand. The strap is tensioned with the operating lever. The leak-sealing bag can be filled following correct tensioning (see section "Operating the leak-sealing systems", P. 29-30).

LD 50/30 W / LS 20/12 S (with revolving eyelets)

Fit tensioning and ratchet straps to the rotating eyelets on the bag with carbine swivels.
Pass straps around tank making sure that they run parallel. Differentiation is facilitated by different coloured straps (orange/blue).

Technical data Vetter leak-sealing bags LD 50/30W; LS 20/12 S

Type		LD 50/30 W LS 20/12 S
Article no.		155 01 000 155 01 000
Size	cm	69 x 31
	in.	27 x 12
Sealing area	cm	50 x 30
	in.	20 x 12
Max. working pressure	bar	1.5
	psi.	22
Test pressure	bar	1.95
	psi.	28
Max. sealing pressure	bar	1.4
	psi.	20
Nominal content	litres	7.0
	cu.ft.	0.25
Weight	kg	6.9
	lbs.	15.2

Scope of delivery
LD 50/30W; LS 20/12 S
(Figure 1)

Vetter 1.5 bar/22 psi. leak-sealing bag set, Type LD 50/30 W; LS 20/12 S (with revolving eyelets), Art. No. 155 00 000, consisting of:

1 x foot pump with safety valve
1 x filling hose, 10 m/ 32 ft., blue
1 x leak-sealing bag, Type LD 50/30 W; LS 20/12 S with revolving eyelets
1 x ratchet strap 2 m/6.6 ft., orange
1 x ratchet strap, 2 m/6.6 ft., blue
1 x extension strap, 5 m/16 ft., orange
1 x extension strap, 5 m/16 ft., blue
1 x tensioning and extension strap, 10 m/32 ft., orange, with ratchet
1 x tensioning and extension strap, 10 m/32 ft., blue, with ratchet
2 x sealing plates, 600 x 300 x 30 mm/ 24 x 12 x 1.2 in.
1 x sealing plate, 1000 x 300 x 30 mm/ 39 x 12 x 1.2 in.
1 acidproof envelope, PVC, yellow, for LD 50/30 W; LS 20/12 S

Weight: 25 kg/55 lbs.

Alternative accessories:
1 x pressure reducer 200/300 bar/3,000/4,500 psi.
1 x controller 1.5 bar/22 psi., fitting

Figure 1: Scope of delivery Vetter 1.5 bar/22 psi. leak-sealing bag set, type LD 50/03 W; LS 20/12 S (with revolving eyelets)

Figure 2: Scope of delivery Vetter 1.5 bar/22 psi. leak-sealing bag set, type LD 50/30 S; LS 20/12 B (with tension slots)

LD 50/30 S; LS 20/12 B (with tension slots)

Pass tensioning and extension straps through tension slots in bag.

The straps over the leak-sealing bag exert an additional pressure.

Make sure that the straps run parallel. Differentiation is facilitated by different coloured straps (orange/ blue).

Leak-sealing bags may only be filled when strapped in place correctly.

The leak-sealing bag can be emptied if there is no longer any counter-pressure.

Then relieve the ratchet straps by releasing the shackle.

Scope of delivery LD 50/30 S; LS 20/12 B
(Figure 2)

Vetter 1.5 bar/22 psi. leak-sealing bag set, Type LD 50/30 S; LS 20/12 B (with tension slots), Art. No. 156 00 000, consisting of:

1 x foot pump with safety valve
1 x filling hose, 10 m/32 ft., blue
1 x leak-sealing bag, Type LD 50/ 30 S; LS 20/12 B with strap slots
2 x tensioning and extension strap, 10 m/32 ft., orange, with ratchet
2 x tensioning and extension strap, 10 m/32 ft., blue, with ratchet
2 x sealing plates, 600 x 300 x 30 mm/ 24 x 12 x 1.2 in.
1 x sealing plate, 1000 x 300 x 30 mm/ 39 x 12 x 1.2 in.
1 x acidproof envelope, PVC, yellow, for LD 50/30 S; LS 20/ 12 B

Weight: 16.9 kg/37 lbs.

Alternative accessories:
1 x pressure reducer 200/300 bar/3,000/4,500 psi.
1 x controller 1.5 bar/22 psi., fitting

Technical data Vetter leak-sealing bags LD 50/30S; LS 20/12 B

Type		LD 50/30 S LS 20/12 B
Article no.		156 01 000 156 01 000
Size	cm	61.5 x 31
	in.	24 x 12
Sealing area	cm	50 x 30
	in.	20 x 12
Max. working pressure	bar	1.5
	psi.	22
Test pressure	bar	1.95
	psi.	28
Max. sealing pressure	bar	1.4
	psi.	20
Nominal content	litres	7.0
	cu.ft.	0.25
Weight	kg	4.2
	lbs.	9.2

Vetter leak-sealing bandage

Determine the diameter of the pipe and select the suitable leak-sealing bandage size.

Place the leak-sealing bandage around the pipe. The bandage should surround the pipe with at least one overlap. The enclosed spacers ensure a parallel arrangement of the straps.

Pass the strap through the central part of the ratchet and tighten.

Fill the leak-sealing bandage in the manner described in the section “Operating the leak-sealing systems” (P. 29-30).

Empty the leak-sealing bandage if there is no longer any counter-pressure in the pipeline and release the ratchet straps.

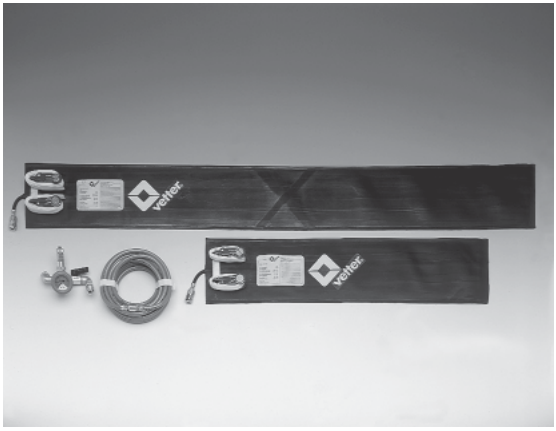


Figure 3: Scope of delivery Vetter 1.5 bar/22 psi. leak-sealing bandage set

Technical data Vetter 1.5 bar/22 psi. leak-sealing bandage

Type		LB 5-20 LS 2-8	LB 20-48 LS 8-19
Article no.		185 01 000 185 01 000	185 02 000 185 02 000
Size	cm	98 x 21	177 x 21
	in.	39 x 8	70 x 8
Sealing area	cm	19 wide	19 wide
	in.	7 wide	7 wide
Working pressure	bar	1.5	1.5
	psi.	22	22
Test pressure	bar	1.95	1.95
	psi.	28	28
Sealing pressure	bar	1.4	1.4
	psi.	20	20
Nominal content	litres	8	16
	cu.ft.	0.285	0.57
Weight	kg	2.3	3.6
	lbs.	5	8

Vetter leak-draining bags

Position leak-draining bags over the leak. Pay attention to the drain chamber size of 32 x 13 cm/13 x 5 in.

Tensioning the straps

Pass the tensioning and extension straps through the tension slots in the bag.

Pass the end of the strap through the slot in the ratchet and tighten by hand. The strap is tensioned with the operating lever.

The leak-draining bag can be filled following correct tensioning (see section “Operating the leak-sealing systems”, P. 29-30).

The excess pressure can be relieved via the drain chamber and the medium drained.

For this purpose the, stainless steel ball valve (accessory) must be fitted before filling the leak-draining bag and a collecting vessel provided.

The leak-draining bag can be emptied if there is no longer any counter-pressure.

Then relieve the ratchet straps by releasing the shackle.

Scope of delivery

(Figure 4)

Vetter 1.5 bar/22 psi. leak-draining bag set, Type DLD 50/30; DB 20/12, Art. No. 157 00 000, consisting of:

- 1 x foot pump with safety valve
- 1 x filling hose, 10 m/32 ft., blue
- 1 x leak-draining bag, type DLD 50/30; DB 20/12, with stainless steel coupling, Storz D
- 2 x tensioning and extension strap, 10 m/32 ft., orange, with ratchet
- 2 x tensioning and extension strap, 10 m/32 ft., blue, with ratchet
- 1 x ball valve, stainless steel, Storz D

Weight: 21.7 kg/48 lbs.

Alternative accessories:

- 1 x pressure reducer 200/300 bar/3,000/4,500 psi.
- 1 x controller 1.5 bar/22 psi., fitting

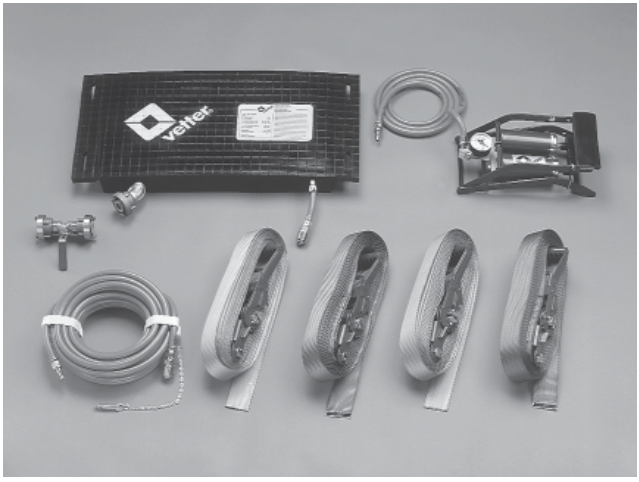


Figure 4: Scope of delivery Vetter 1.5 bar/22 psi. leak-draining bag set

Technical data Vetter 1.5 bar/22 psi. leak-draining bag

Type		DLD 50/30 DB 20/12
Article no.		157 01 000 157 01 000
Size	cm	62 x 30
	in.	24 x 12
Sealing area	cm	50 x 30
	in.	20 x 12
Drain chamber	cm	40 x 20 x 3.5
	in.	16 x 8 x 1.3
Max. working pressure	bar	1.5
	psi.	22
Test pressure	bar	1.95
	psi.	28
Max. sealing pressure	bar	1.0
	psi.	14
Nominal content	litres	2.5
	cu.ft.	0.09
Weight	kg	7.6
	lbs.	17

Vetter Mini leak-sealing bags

Select the largest possible bag according to the size of the leak and tank.

Prepare tensioning straps.

Place bag over centre of leak and lay tensioning straps under tension around the tank and over the mini leak-sealing bag.

Press hook-and-eye fastener together over complete surface.

Tensioning straps can be coupled together for tanks with larger diameters.

When using LDK 10/25 or LDK 20/20, MS 6/12 or MS 10/10 it may prove practical to use the tensioning straps in pairs and in parallel.

The mini leak-sealing bag can be filled following correct tensioning (see section “Operating the leak-sealing systems”, P. 29-30).

Once the tank has been emptied, empty the mini leak-sealing bag and release the tensioning straps.

Scope of delivery
(Figure 5)

Vetter mini leak-sealing bag set, Art. No.
158 10 000, consisting of:
Mini leak-sealing bag, Type LDK 10/10, LDK 10/25, LDK 20/20, MS 6/6, MS 6/12, MS 8/8

1 x foot pump with safety valve
2 x tensioning straps 150 cm/5 ft. long, blue, with hook-and-eye fastener
3 x tensioning straps 350 cm/ 10 ft. long, blue, with hook-and-eye fastener
1 x carrying case. dimensions 37 x 35 x 13.5 cm/ 15 x 15 x 5 in.

Weight: 11.5 kg/25 lbs.

Technical data Vetter 1.5 bar min leak-sealing bag

Type Model		LDK 10/10 MS 6/6	LDK 10/25 MS 6/12	LDK 20/20 MS 10/10
Article no.		158 01 000 158 01 000	158 02 000 158 02 000	158 03 000 158 03 000
Size (L x W x H)	cm	15.0 x 15.0 x 1.2	15.0 x 31.0 x 1.2	25.0 x 25.0 x 1.2
	in.	6 x 6 x 0.5	6 x 12 x 0.5	10 x 10 x 0.5
Sealing area	cm	9.5 x 9.5	9.5 x 25.5	19.5 x 19.5
	in.	4 x 4	4 x 10	8 x 8
Max. working pressure	bar	1.5	1.5	1.5
	psi.	22	22	22
Test presure	bar	1.95	1.95	1.95
	psi.	28	28	28
Max. sealing pressure	bar	1.4	1.4	1.4
	psi.	20	20	20
Nominal content	litres	0.4	1.0	2.14
	cu.ft.	0.01	0.03	0.07
Weight	kg	0.5	0.8	1.0
	lbs.	1.1	1.8	2.2

Figure 5: Scope of delivery Vetter 1.5 bar/22 psi. mini leak-sealing bag set

Vetter leak-sealing lance

Select a wedge or conical bag according to the size of the leak.

Connect bag, lance and connection hose for the foot pump.

Press the nipple into the coupling until it catches in place.

Insert the bag into the leak.

Fill the bag using the foot pump until the leak is sealed (max. working pressure 1.5 bar/22 psi.).

Close ball valve.

Attention

Sharp edges around the leak hole can damage the bag.

At the end of work, empty the bag using the pressure relief device of the foot pump's safety valve. Do not use the wedge or conical bags if they display visible signs of damage.

Scope of delivery
(Figure 6)

Vetter 1.5 bar/22 psi. leak-sealing lance set, Art. No. 158 20 000, consisting of:

1 x wedge bag size 6 cm/ 2.4 in.
1 x wedge bag size 8 cm/ 3.2 in.
1 x wedge bag size 11cm/ 4.3 in.
1 x conical bag size 7 cm/ 2.8 in.
1 x lance, 35 cm/13.8 in. long, with chain and ventilating nozzle
3 x lance, each 35 cm/13.8 in. long
1 x shut-off device
1 x foot pump with safety valve
1 x carrying case. dimensions 37 x 35 x 13.5 cm/ 14 x 13 x 5 in.

Weight: 9 kg/20 lbs.

Figure 6: Scope of delivery Vetter 1.5 bar/22 psi. leak-sealing lance set

Technical data Vetter 1.5 bar/22 psi leak-sealing lance

Type Model		Wedge bag 6 Wedge bag 2.4	Wedge bag 8 Wedge bag 3.2	Wedge bag 11 Wedge bag 4.3	Conical bag 7 Conical bag 2.8
Article no.		158 21 000 158 21 000	158 22 000 158 22 000	158 23 000 158 23 000	158 24 000 158 24 000
Bag size (L x W x H)	cm	23 x 6 x 5	23 x 8 x 5,5	23 x 11 x 7	23 x 7 Ø
	in.	9 x 2 x 2	9 x 3 x 2	9 x 4 x 3	9 x 3 x Ø
with coupling (L x W x H)	cm	29 x 6 x 5	29 x 8 x 5,5	29 x 11 x 7	29 x 7 Ø
	in.	9.24 x 2 x 2	9.24 x 3 x 2	9.24 x 4 x 3	9.24 x 3 Ø
Max. working pressure	bar	1.5	1.5	1.5	1.5
	psi.	22	22	22	22
Nominal content	litres	0.6	1.4	3.1	1.15
	cu.ft.	0.02	0.05	0.11	0.04
Weight	kg	0.24	0.28	0.42	0.16
	lbs.	0.5	0.6	0.9	0.4
For leak openings	cm	1.5 - 4.5 width 6-8	1.5 - 4.5 width 8-11	3 - 6 width 11-17	3 - 9
	in.	0.6-1.8 width 2.4-3.1	0.6-1.8 width 2.4-4.3	1.2-2.4 width 4.3-6.7	1.2-3.6

Vetter vacuum leak-draining bags

Vacuum leak-draining bags can only be used on surfaces with a small curvature and smooth structure. The surface of the tank should be clean.

Use only Vetter original fittings with the vacuum leak-draining bags.

The following information relates to the use of compressed-air from compressed-air cylinders 200 or 300 bar/3,000 or 4,500 psi.

Set the back pressure at the pressure reducer to at least 2 bar/28 psi. Check the display at the manometer.

Connect the pressure reducer's hose to the vacuum nozzle, if necessary this can be extended with the 10 m/32 ft. air supply hose, green (accessory). Push nipple into coupling until it catches. Connect and lock the vacuum nozzle with vent hose to the bag's vacuum connection.

Couple the stainless steel ball valve with drain hose to the vacuum leak-draining bag and open the ball valve. Open the shut-off valve of the pressure reducer and the vacuum-valve until air is heard to flow through these.

Press the vacuum leak-draining bag against the wall of the tank so that the drain chamber lies over the centre of the leak (pay attention to the drain chamber diameter of 200 mm/8 in.).

The complete outer rubber lip of the bag must rest against the wall of the tank. You may have to press the vacuum leak-draining bag against the wall of a curved tank with both hands.
Always keep an eye on the vacuum manometer and vacuum leak-draining bag and do not interrupt the flow of air.
The liquid can be drained into a collecting vessel with the ball valve. The vacuum nozzle's vent hose must also end in a tank to safely drain any remaining liquid within the vacuum chamber.

Figure 7: Scope of delivery of Vetter vacuum leak-draining bag set

Example of air requirement
Compressed air cylinder 6 l, 300 bar/4,500 psi. at

Supply pressure	Vacuum	Duration
2 bar 28 psi	0.15 bar 2.1 psi	20 min.
3 bar 42 psi	0.25 bar 3.5 psi	14 min
4 bar 56 psi	0.38 bar 5.3 psi	10 min

Minimum compressor output: 200 l/min at 4 bar/ 56 psi

Use a Y-adapter if a number of compressed-air cylinders are used.

The bag's vacuum can be increased if necessary by wetting the sealing lips with soap or water before use.

Marks on the defective tank facilitate a centring of the vacuum leak-draining bag's drain chamber.

Accessories:

Ball valve, stainless steel, Storz D
Y-adapter

Technical data for Vetter vacuum leak-draining bags

Type Model	LD 50 VAC LD 20 VAC
Article no.	157 05 000 157 05 000
Size	500 mm diameter 20 in. diameter
Size of drain chamber	200 mm diameter 8 in. diameter
Height	40 mm 1.6 in.
Height with fittings	105 mm 4 in.
Weight	5.2 kg 11 lbs.
Max. working pressure	6 bar 87 psi
Air requirements	200 l / min 7 cu.ft.
Drain connection	Storz Size D1", V4A Storz Size D1", V4A

Operating the leak-sealing systems with a foot pump with built-in safety valve

Connect supply hose of foot pump to filling hose of leak-sealing system with nipple.

Push nipple into coupling until it catches.

Fill leak-sealing system with foot pump.

Keep an eye on the manometer and leak-sealing system during filling.

The safety valve blows off if the working pressure exceeds 1.5 bar/22 psi.

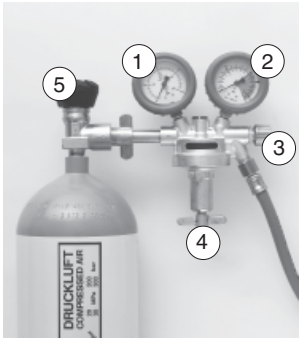
The maximum tolerance for an opening and closing of the safety valve may be ± 10 %.

The manometer at the foot pump shows the pressure in the bag. Open the vent on the head of the safety valve by turning to the left to empty the leak-sealing system.

Operating the leak-sealing systems with compressed-air cylinders 200 or 300 bar/3,000 or 4,500 psi. and 1.5 bar/22 psi. controller and fitting construction

Vetter leak-sealing systems can be operated with compressed-air cylinders 200 or 300 bar/3,000 or 4,500 psi. and 1.5 bar/22 psi. controller and fitting construction.

Connect the controller to the leak-sealing system with the filling hose (blue).



Push nipple into coupling until it catches.

Connect pressure reducer with T-screw to compressed-air cylinder.

Close handwheel (3) of pressure reducer and open cylinder valve (5).

Manometer (1) shows the pressure in the cylinder.

Set the back pressure to max. 3 bar with the adjusting screw (4). Keep an eye on the back pressure manometer.

Connect pressure reducer's supply hose (green) to controller.

Push brass nipple into brass coupling until it catches.

Slowly open the controller's ball valve to fill the leak-sealing system.

Keep an eye on the manometer and leak-sealing system.

The safety valve blows off if the working pressure exceeds 1.5 bar/22 psi.

The maximum tolerance for an opening and closing of the safety valve may be ± 10 %.

The manometer at the controller shows the pressure in the bag. Open the vent on the head of the safety valve by turning to the left to empty the leak-sealing system.

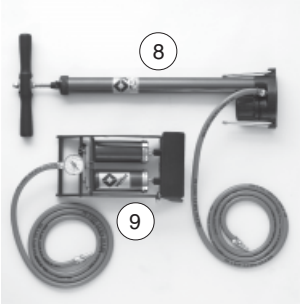
Operating with other compressed-air sources

Vetter leak-sealing systems can also be operated with other compressed-air with a 1.5 bar/22 psi. controller (fitting construction) and filling hose.

The supply pressure of the controller may not exceed 3 bar/44 psi.

Use a series pressure reducer with higher pressures.

Vetter adaptor sets are available for other compressed-air sources.



- Compressed-air mains (3)
- Truck tyre inflator (6)

Warning

Tyre inflation connector must be protected by a safety valve.

- Truck air brake systems (1)

Warning

Seal off control line with the dummy coupling (2). Secure truck with wheel blocks.

- Truck tyre valve (4). For inflation with a normal hand or foot pump.
- Truck tyre valve connector (5). To take air from the spare tyre.
- Building site compressor (7).
- Hand (8) or foot (9) pump with manometer and 2 m/6.6 ft. air supply hose for direct connection to the controller.

Practical tips

Tanks and pipelines up to a max. counterpressure of 1.4 bar/20 psi. can be sealed with Vetter leak-sealing systems.

In special cases the leak-sealing systems can be protected by more resistant materials inserted between the leak-sealing system and tank.

To ensure that the correct side of the leak-sealing device is placed against the tank in unfavourable conditions, e.g. in darkness, the outer face has a fluted surface.

Maintenance and servicing

After every use

- Check Vetter leak-sealing systems and accessories for completeness and perfect condition.
- Clean the bag with luke, warm soapy water and check for damages.
- Remove and replace the acidproof protective envelope if necessary.

After longer periods of storage

- Check Vetter leak-sealing systems and accessories for completeness and perfect condition.

Visual and functional checks

- Hoses: check operability of couplings
- Control organs: check operability of safety valves, couplings and manometer.

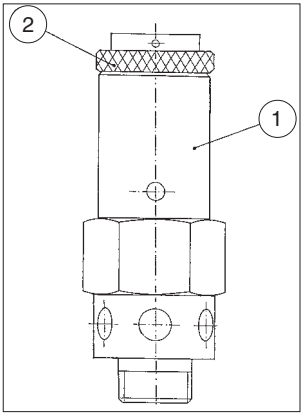
The leak-sealing bags can be cleaned with soap and warm water.

Dry at room temperature.

Troubleshooting

If a safety valve opens prematurely because a foreign body has penetrated the system, open the discharge device (2) at the head of the safety valve briefly by turning anticlockwise so that compressed-air can escape.

If this does not remove the foreign body the top part of the valve must be unscrewed. Use a pipe wrench at point 1.



Carefully remove the valve cone and remove the foreign body in front of the sealing plate.

Screw the top part of the valve back on tight and check for perfect operation.

The pre-set pressure may not be changed.

If the lead or leaded plate on the top part of the valve is removed a safe function can no longer be guaranteed and the device should be returned to the manufacturer.

If this ices up because of an excess atmospheric humidity in connection with low temperatures use a normal defroster (such as is used for car locks).

EC Declaration of Conformity in the intendment of the EC Machine Directive 89 / 392 / EEC

We

Manfred Vetter GmbH & Comp.
Blatzheimer Strasse 10-12
D-53909 Zülpich

hereby declare that the leak-sealing systems

(LD 50/30, LB 5-20, LB 20-48, DLD 50/30, LDK 10/10, LDK 10/225, LDK 20/20, leak-sealing lance, LD 50 VAC) to seal leaks
Serial No.:
Design:
(see ratings plate, to be completed by customer)

comply with the following pertinent regulations in their standard design:

Machine Directive 89 / 392 / EEC
as amended by Directives 91 / 368 / EEC,
93 / 44 / EEC, 94 / 68 / EEC.

Harmonised standards employed:

EN 292 Part 1 / 2

National standards and technical specifications employed:

Pressure Vessel Legislation

Internal measures ensure that the standard leak-sealing systems always comply with the requirements of the latest EC Directives and applicable standards.

Zülpich, October 27, 1995

Resistance list - Material properties

	Pipe-sealing bags (standard) Gully-sealing bags Leak-sealing lances Vacuum leak-draining bags **Material A**	**Mini lifting bags (special) Leak-sealing bags Type W Leak-sealing bandages** **Material B**	**Mini lifting bags (standard) Lifting bags 0.5/1.0 bar/7/14 psi. Pipe-sealing bags (special) Leak-sealing bags Type S Leak-sealing bandages Leak-draining bags Universal gully-sealing bags** **Material C**	**Viton* sealing bags** **Material Viton***
Abrasion resistance	excellent	good	excellent	good
Dielectric properties	excellent	low	good	good
Electrical isolation resistance	good to excellent	low	moderate to good	moderate to good
Resistance to				
• diluted acids	moderate to good	good	excellent	excellent
• concentrated acids	moderate to good	good	good	excellent
Resistance to solvents				
• aliphatic hydrocarbons	low	excellent	moderate to good	excellent
• aromatic hydrocarbons	low	good	moderate	excellent
• oxygenic solvents (ketones, etc.)	moderate to good	low	moderate	low
• paint solvents	low	moderate	moderate	low to moderate
Resistance to				
• swelling in lubricant oils	low	very good	good	excellent
• mineral oils and fuels	low	excellent	low	excellent
• animal/vegetable oils	low to moderate	very good	good	excellent
• ozone	low to moderate	moderate	very good to excel.	outstanding
• sunlight	low	low	very good	outstanding
• heat ageing (upper temp. for permanent use)	85°C/185°F	115°C/240°F	95°C/200°F	85°C/185°F
• flames	low	low	good	excellent
• high temperatures	good	good	very good	outstanding
• cold	excellent	moderate to good	good	good

*Registered trademark DU PONT