

## DSL, DSH: Specially designed pressure limiter

### How energy efficiency is improved

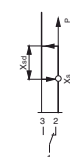
Control and monitoring according to needs and with no auxiliary energy

### Features

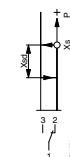
- Switching point can be adjusted
- Sealable
- Pressure sensor made of brass for non-aggressive media (DSL)
- Pressure sensor made of stainless steel for aggressive media (DSH)
- Locking type: With falling pressure (DSL) or with rising pressure (DSH)
- SIL 2 certified as per EN 61508
- Approved for marine applications (GL and LR certified)

### Technical data

Power supply		
	Maximum load with gold-plated contacts <sup>1)</sup>	400 mA, 24 V, 10 VA
	Minimum load with gold-plated contacts	4 mA, 5 V
	Maximum load with silver-plated contacts	10(4) A, 250 V~, 50 W, 250 V=
	Minimum load with silver-plated contacts	100 mA, 24 V
Parameters		
	Pressure connection	G½" male
Ambient conditions		
	Ambient temperature	-20...70 °C
Construction		
	Housing	Transparent cover
	Housing material	Impact-proof thermoplastic
	Device plug	Standard plug with female cable connector for cable of Ø 6...10 mm
Standards and directives		
	Type of protection <sup>2)</sup>	IP65 (EN 60529)
	Protection class	I (IEC 60730)
	Test mark <sup>3)</sup>	TÜV DSL: SDBF ID: 0000006022 DSH: SDB ID: 0000006023 PED: 2014/68/EU, cat. IV
	Ship-approved	Germanischer Lloyd (GL) Lloyds Register
CE conformity according to		
	EMC Directive 2014/30/EU	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4
	Low-Voltage Directive 2014/35/EU PED 2014/68/EU	EN 60730-1, EN 60730-2-6 VdTÜV pressure information sheet 100, cat. IV EN 12952-11, EN 12953-9
	Machinery Directive 2006/42/EC (according to Appendix II, 1B)	EN ISO 12100
SIL-conformity as per SIL 2		
	Standards	IEC 61508 parts 1-2 and 4-7



DSL1\*\*F001



DSH1\*\*F001



<sup>1)</sup> If the contacts are subjected to a load greater than specified, the gold plating will be destroyed. They are then classed merely as silver contacts and lose the properties of gold-plated contacts

<sup>2)</sup> Depending on the fitting position, see the fitting instructions. The devices are not suitable for outdoor applications.

<sup>3)</sup> Certificates can be downloaded from [www.certipedia.com](http://www.certipedia.com)



### Overview of types

#### *i* Min. change for reset: Average values


Type	Setting range	Min. change for reset	Maximum pressure	Admissible sensor temperature	Admissible vacuum loading	Weight
DSL140F001	0...2.5 bar	0.4 bar	12 bar	70 °C	-0.7 bar	0.5 kg
DSL143F001	0...6 bar	0.5 bar	16 bar	70 °C	-0.7 bar	0.5 kg
DSL152F001	6...16 bar	1.2 bar	30 bar	70 °C	-1.0 bar	0.4 kg
DSH127F001	-1...5 bar	-0.4 bar	16 bar	110 °C	-1.0 bar	0.5 kg
DSH143F001	0.5...6 bar	-0.45 bar	16 bar	110 °C	-0.7 bar	0.5 kg
DSH146F001	1...10 bar	-0.8 bar	18 bar	110 °C	-1.0 bar	0.5 kg
DSH152F001	2...16 bar	-1.5 bar	60 bar	110 °C	-1.0 bar	0.3 kg
DSH158F001	5...25 bar	-1.8 bar	60 bar	110 °C	-1.0 bar	0.3 kg
DSH170F001	15...40 bar	-2.0 bar	60 bar	110 °C	-1.0 bar	0.3 kg

 **DSL:** Locks when the pressure falls (SDBF); pressure sensor made of brass for non-aggressive media.

 **DSH:** Locks when the pressure rises (SDB); pressure sensor made of stainless steel.

### Accessories

Type	Description
0259239000	Reduction nipple G½" on 7/16" 20-UNF-2A for copper tubes of Ø 6 mm, brass
0292001000	Setpoint adjuster according to customer's wishes (setting accuracy: ±3% of the setting range, but a minimum of ±0.2 bar)
0292004000	Setpoint adjuster sealed (with accessory 0292001000 only)
0292150001	Fixing bracket for wall mounting
0296936000	Fixing brackets for rail: top-hat rail EN 60715, 35 × 7.5 mm and 35 × 15 mm
0311572000	Screw fitting for copper tubes of Ø 6 mm, brass
0381141001	Profile sealing ring, copper, for G½"

 **0296936000:** With accessory 0292150001 only

### Description of operation

For regulating and monitoring pressure in liquids, gases and vapours, according to VdTÜV pressure information sheet 100. Especially suitable for applications in compact installations, for pipe mounting or wall mounting.

#### Minimum pressure limiter DSL:

When the pressure drops below the lower change-over point (adjustable setpoint  $X_s$ ), the pressure limiter locks mechanically and switches the contact from 1-3 to 1-2.

When the pressure rises by the min. pressure increase  $X_{sd}$  above the lower change-over point, the contact can be switched back from 1-2 to 1-3 by pulling the reset button using a screwdriver.

#### Maximum pressure limiter DSH:

When the pressure rises above the upper change-over point (adjustable setpoint  $X_s$ ), the pressure limiter locks mechanically and switches the contact from 1-2 to 1-3.

When the pressure drops below the upper change-over point by the min. pressure reduction  $X_{sd}$ , the contact can be switched back from 1-3 to 1-2 by pulling the reset button using a screwdriver.

### Intended use

This product is only suitable for the purpose intended by the manufacturer, as described in the "Description of operation" section.

All related product regulations must also be adhered to. Changing or converting the product is not admissible.

## Serviceable life

Mechanical serviceable life of the pressure pads according to pressure  $100 > 2 \times 10^6$  switch strokes.

### Typical electrical serviceable life

$\cos \varphi = 1$	$\cos \varphi = 0.6$	$\cos \varphi = 0.3^{4)}$
10 A, 250,000 switchings	3 A, 400,000 switchings	3 A, 250,000 switchings
5 A, 400,000 switchings		2 A, 400,000 switchings
2 A, approx. $10^6$ switchings		1 A, 700,000 switchings

#### Note



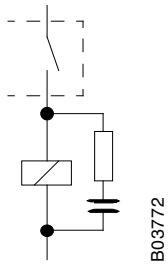
Using the device in SIL applications and as a safety device in machine construction changes its electrical serviceable life.

Typical situation: 10 A, 6,000 switchings

## RC circuitry for inductive load

For the optimum RC circuitry, see the information from manufacturers of gates, relays, etc. If this is not available, the inductive load can be reduced by applying the following rule of thumb:

- Capacity of the RC circuitry ( $\mu\text{F}$ ) equal to or greater than the operating current (A)
- Resistance of the RC circuitry ( $\Omega$ ) approx. the same as the resistance of the coil ( $\Omega$ )



## Materials

The following materials come into contact with the medium:

- DSL: brass, stainless steel, nitrile rubber
- DSH: stainless steel, material no. 1.4104<sup>5)</sup> and 1.4541

### Admissible fluids for pressure switches with a safety function

- Fluid group I, danger potential categories IV or V as per article 13 of Pressure Equipment Directive 2014/68/EU.
- Fluid group II

#### Note



Additionally, the extents of applicability of the TÜV certifications and the standards they contain must be considered. The user must check the compatibility of the fluids used with the materials of the pressure sensor.

## Engineering and fitting notes

The pressure limiters conform to the European Pressure Equipment Directive 2014/68/EU and belong to device category IV as safety components. The devices also conform to Low-Voltage Directive 2014/35/EU and EMC Directive 2014/30/EU. The devices are suitable for use in plants based on TRD 604, sheet 1 and sheet 2.

### Use in safety applications

The devices fulfil the requirements of standard IEC 61508 and can be used in safety applications up to SIL 2.

The information in the related operating instructions and in the safety manual must be considered.

<sup>4)</sup>  $\cos \varphi < 0.3$ : significant reduction in serviceable life. With RC circuitry, serviceable life as with  $\cos \varphi > 0.3$  (also see section "RC circuitry for inductive load")

<sup>5)</sup> TÜV individual certification

Type of sub-system		Type A
Hardware error tolerance	HFT	0
Operating mode		Low demand rate
Assumed demand rate	$n_{op}$	1/a
Test interval	$T_i$	1 a
Diagnostic degree	DC	0

**Values for 1 of 1 (1oo1) architecture at low demand rate**

Assumed demand rate	$n_{op}$	1/a	$1.14 \times 10^{-04}$ /h
Lambda dangerous undetected	$\lambda_{DU}$	$3.56 \times 10^{-09}$ /h	4 FIT
Probability of failure on demand	$PFD_{avg}$	See table below	

**Note**


When the minimum required hardware error tolerance of  $HFT=1$  is considered, the pressure switches fulfil the requirements up to SIL 3 when operated redundantly.

$\beta$  factor: Proportion of failures that can have the same cause.

Architecture	$\beta$ factor
1 of 2 (1oo2)	10%

The following table shows the specific parameters for functional safety:

Safety function	$\lambda_{DU}$ / failure rate		$PFD_{avg,1oo1}$	$PFD_{avg,1oo2}$
Reliable switching and holding of the triggered switching point	$2.36 \times 10^{-07}$ /h	236 FIT	$1.03 \times 10^{-03}$	$1.05 \times 10^{-04}$
Compliance with external tightness	$2.05 \times 10^{-07}$ /h	205 FIT	$8.98 \times 10^{-04}$	$9.08 \times 10^{-05}$
Maximum switching point shift of $\pm 2\%$ of the setting range +1% of the end value	$3.36 \times 10^{-07}$ /h	336 FIT	$1.47 \times 10^{-03}$	$1.50 \times 10^{-04}$

Architectural and structural requirements must be tested by the end user.

**Duration of use and repeat checks**

Approving a duration of use of over five years (plus 1.5 years in storage) is solely the responsibility of the operating company when considering the specific usage conditions and the prescribed test cycles.

The operating mode as per IEC 61508-4, article 3.5.12, has been defined as "operating mode with low demand rate".

To check that the pressure switches are functioning correctly, repeat checks must be performed in the installations. These should be carried out a maximum of twelve times per year, but at least once per year.

**Applications as a safety device in machine construction**

Based on standard ISO 13849-1 and for use in systems with a high demand rate, the following parameters were determined.

- Maximum admissible demand rate: 50 per year
- $B_{10d} = 6000$
- $PFH = 9.51 \times 10^{-08}$

A single pressure monitor or limiter can be used within the operating range of standards EN ISO 13849-1 to PL c. To safeguard against higher risks (PL d, PL e), they must be used redundantly, and in the downstream safety module, the plausibility of the switching states must be monitored continuously. Architectural and structural requirements must be tested by the end user.

**Additional information**

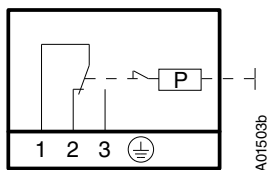
Document	
Fitting instructions	P100014216
Declaration on materials and the environment	MD 23.770
Safety manual	D100237459

### Disposal

When disposing of the product, observe the currently applicable local laws.

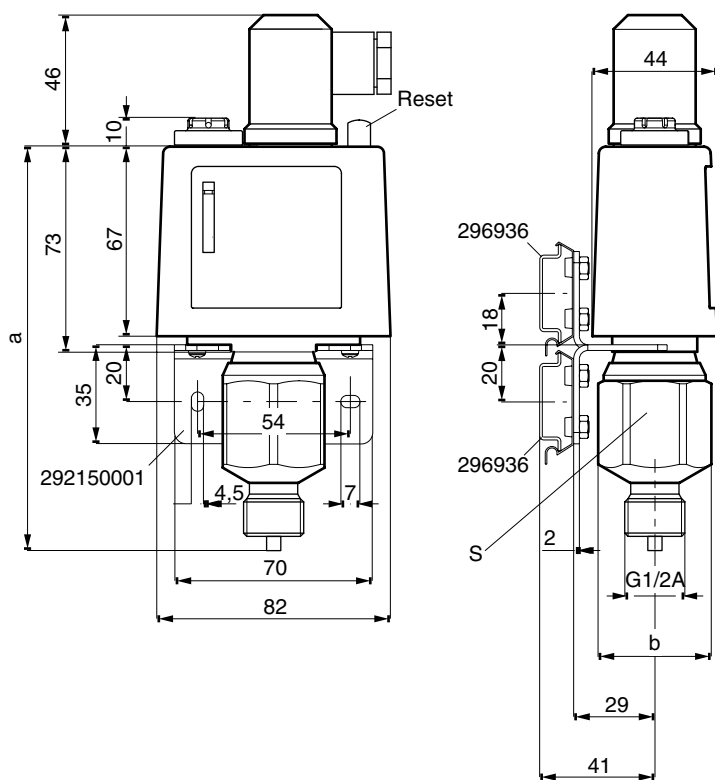
More information on materials can be found in the Declaration on materials and the environment for this product.

### Connection diagram



### Dimension drawings

All dimensions in millimetres.

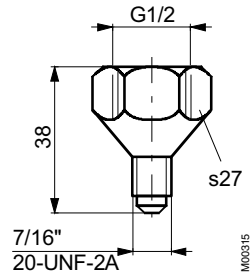


Type	a	b	S
DSL 140, 143, 146	134	40	36
DSH 127, 143, 146			
DSL 152	148	30	27
DSH 152, 158, 170	113	25	22

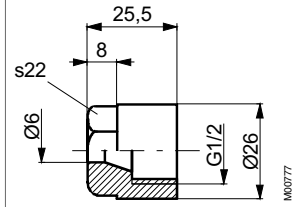
**Accessories**

All dimensions in millimetres.

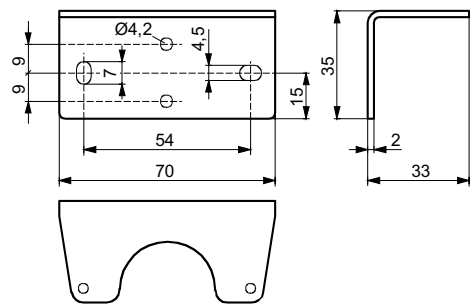
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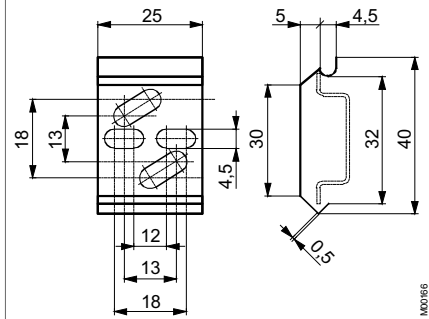
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