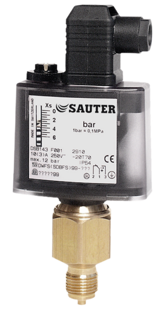
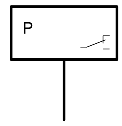
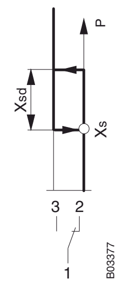
DSB, DSF: Pressure monitors and pressure switches



DSB1F001**





How energy efficiency is improved

Control and monitoring according to needs and with no auxiliary energy

Features

- For regulating and monitoring pressure in liquids, gases and vapours
- Adjustable lower switching point
- Adjustable switching difference
- Sealable
- Pressure sensor made of brass for non-aggressive media (DSB)
- Pressure sensor made of stainless steel for aggressive media (DSF)
- 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[1]	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 Ø 6…10 mm
Standards, directives		
	Type of protection[2]	IP65 (EN 60529)
	Protection class	I (IEC 60730)
	Test mark[3]	TÜV DWFS (SDBFS) ID: 0000006024
	PED 2014/68/EU	VdTÜV pressure information sheet 100 cat. IV (as SDBFS) EN 12952-11, EN 12953-9
	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	EN 60730-1, EN 60730-2-6
	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

1) *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*

2) *Depending on the fitting position, see the fitting instructions. The devices are not suitable for outdoor applications.*

3) *DWFS (SDBFS): As a safety pressure limiter when an external electrical locking facility is fitted downstream in the circuit. Certificates can be downloaded from www.certipedia.com*

Overview of types

Type	Setting range	Switching difference	Maximum pressure	Max. sensor temp.	Admissible vacuum loading	Weight
DSB138F001	0...1.6 bar	0.25...0.65 bar	12 bar	70 °C	-0.7 bar	0.5 kg
DSB140F001	0...2.5 bar	0.25...0.75 bar	12 bar	70 °C	-0.7 bar	0.5 kg
DSB143F001	0...6 bar	0.3...1.6 bar	16 bar	70 °C	-0.7 bar	0.5 kg
DSB146F001	0...10 bar	0.8...3.7 bar	30 bar	70 °C	-1 bar	0.4 kg
DSB152F001	6...16 bar	1...4 bar	30 bar	70 °C	-1 bar	0.4 kg
DSB158F001	0...25 bar	1...7.5 bar	60 bar	70 °C	-1 bar	0.4 kg
DSB170F001	5...40 bar	1.4...7.5 bar	60 bar	70 °C	-1 bar	0.4 kg
DSF125F001	-1...1.5 bar	0.25...0.75 bar	12 bar	110 °C	-1 bar	0.5 kg
DSF127F001	-1...5 bar	0.3...1.5 bar	16 bar	110 °C	-1 bar	0.5 kg
DSF135F001	0...0.6 bar	0.12...0.60 bar	12 bar	110 °C	-1 bar	0.5 kg
DSF138F001	0...1.6 bar	0.25...0.7 bar	12 bar	110 °C	-1 bar	0.5 kg
DSF140F001	0...2.5 bar	0.25...0.75 bar	12 bar	110 °C	-1 bar	0.5 kg
DSF143F001	0...6 bar	0.3...1.5 bar	16 bar	110 °C	-1 bar	0.5 kg
DSF146F001	0...10 bar	0.8...3.0 bar	18 bar	110 °C	-1 bar	0.5 kg
DSF152F001	0...16 bar	1.2...3.8 bar	60 bar	110 °C	-1 bar	0.3 kg
DSF158F001	0...25 bar	1.5...8.0 bar	60 bar	110 °C	-1 bar	0.3 kg
DSF170F001	15...40 bar	1.7...8.2 bar	60 bar	110 °C	-1 bar	0.3 kg

DSB: Pressure sensor made of brass for non-aggressive media; X_S = lower switching point.

DSF: Pressure sensor made of stainless steel for aggressive media; X_S = lower switching point.

The switching difference must be within the setting range of the switching point. The minimum values of the switching difference are only possible in the lower setting range.

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)
0292002000	Switching difference according to customers' wishes (setting accuracy: ±5% of the setting range, but a minimum of ±0.05 bar, with accessory 0292001000 only)
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.

When the pressure falls below the lower change-over point (adjustable setpoint X_S), the contacts switch from 1-3 to 1-2.

When the pressure exceeds the lower change-over point by the amount of the switching difference X_{Sd}, the contacts switch from 1-2 to 1-3.

The switching difference can be set from outside using a grub screw: One revolution changes the switching difference by approx. 20% of the total switching difference range.

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 × 10^6 switch strokes.

Typical electrical serviceable life

cos φ = 1	cos φ = 0.6	cos φ = 0.3[4)]
10 A, 250,000 switchings 5 A, 400,000 switchings 2 A, approx. 10^6 switchings	3 A, 400,000 switchings	3 A, 250,000 switchings 2 A, 400,000 switchings 1 A, 700,000 switchings

Note

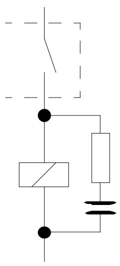
Using the device in SIL applications and as a safety device in machine construction changes its electrical serviceable life.

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 (µF) equal to or greater than the operating current (A)
- Resistance of the RC circuitry (Ω) approx. the same as the resistance of the coil (Ω)



Effect on the switching difference

The switching difference depends slightly on the setpoint. The switching differences specified in the PDS sheet are typical values for the start of the range. The effect of the setpoint on the switching difference increases the switching difference by: ΔX_{sd} = (setpoint X_S – start of the range) × 0.04.

Materials

The following materials come into contact with the medium:

- DSB: brass, stainless steel, nitrile rubber
- DSF: stainless steel, material no. 1.4104 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 devices are safety pressure limiters (SDBFS) and thus conform to the European Pressure Equipment Directive 2014/68/EU. As safety components, they belong to device category IV. The devices also conform to Low-Voltage Directive 2014/35/EU and EMC Directive 2014/30/EU. SDBFS devices are suitable for use in installations based on TRD 604, sheet 1 and sheet 2.

The devices can be used as SDBFS for falling or increasing pressure when an electrical interlock circuit is used (see application examples) and the requirements of DIN 57116 and VDE 0116 are fulfilled. The electrical plant devices must adhere to VDE 0660 or VDE 0435.

[4)] *cos φ < 0.3: significant reduction in serviceable life. With RC circuitry, serviceable life as with cos φ > 0.3 (also see section “RC circuitry for inductive load”)*

Use in safety applications SIL

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.

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	Ti	1 a	
Diagnostic degree	DC	0	
Values for 1 of 1 (1oo1) architecture at low demand rate			
Assumed demand rate	n_{op}	1/a	1.14×10^{-04} /h
Lambda dangerous undetected	λ_{DU}	3.56×10^{-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.
β factor: Proportion of failures that can have the same cause.

Architecture	β factor
1 of 2 (1oo2)	10%

The following table shows the specific parameters for functional safety:

Safety function	λ_{DU} / failure rate		$PFD_{avg,1oo1}$	$PFD_{avg,1oo2}$
Safe closing and opening of an electrical contact	2.36×10^{-07} /h	236 FIT	1.03×10^{-03}	1.05×10^{-04}
Compliance with external tightness	2.05×10^{-07} /h	205 FIT	8.98×10^{-04}	9.08×10^{-05}
Maximum switching point shift of ±2% of the setting range +1% of the end value	3.69×10^{-07} /h	369 FIT	1.62×10^{-03}	1.65×10^{-04}

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

Duration of use and repeat checks SIL

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
- $B10_d$ = 6000
- PFH = 9.51×10^{-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.

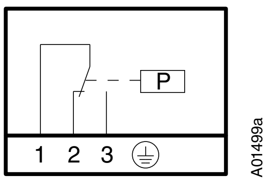
Additional information

Document	
Fitting instructions	P100014216
Declaration on materials and the environment	MD 23.760
Safety manual	D100237459

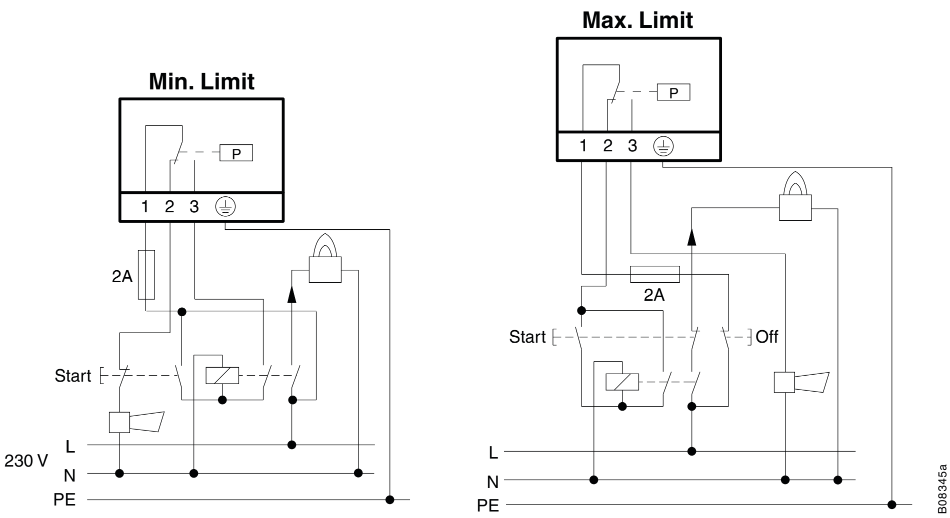
Disposal

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



Connection as safety pressure limiter (SDBFS)

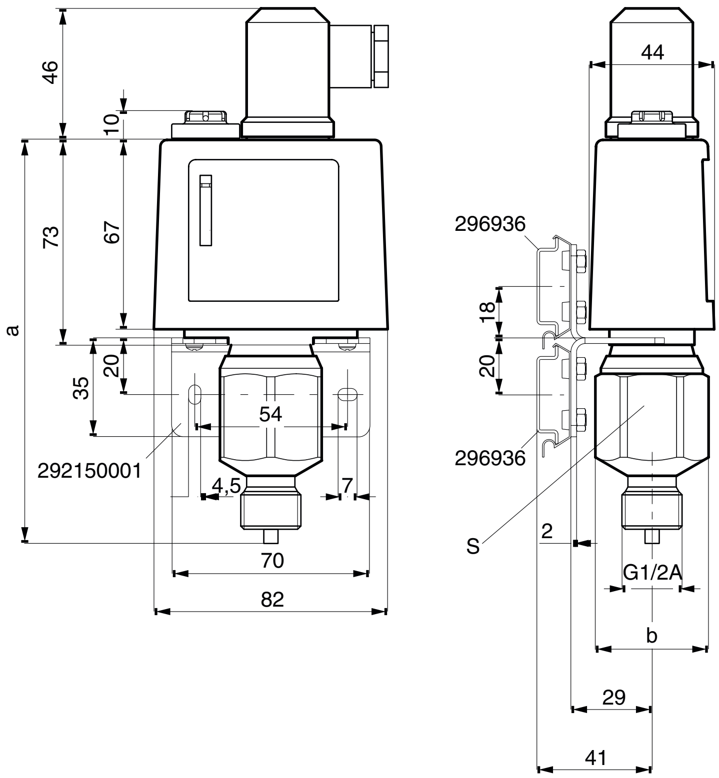


Pressure monitor as SDBFS
for falling pressure

Pressure monitor as SDBFS
for increasing pressure

Dimension drawings

All dimensions in millimetres.



Type	a	b	S
DSB 138, 140, 143 DSF 125, 127, 135, 138 DSF 140, 143, 146	134	40	36
DSB 146, 152, 158, 170	148	30	27
DSF 152, 158, 170	113	25	22

Accessories

All dimensions in millimetres.

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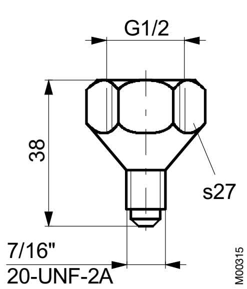	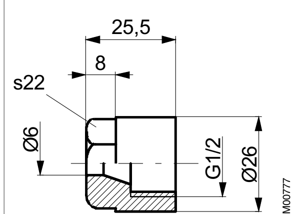

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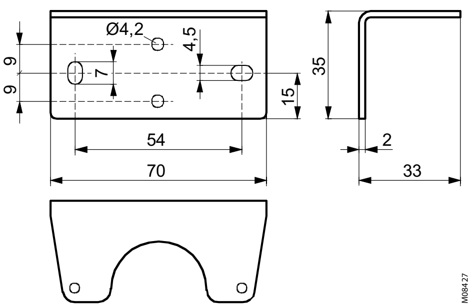

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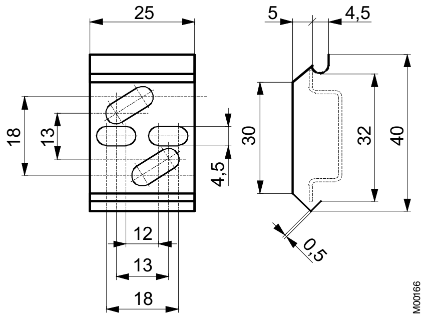

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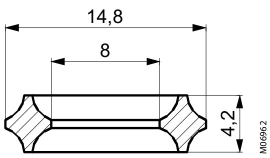

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