

## DSB, DSF: Pressure monitors and pressure switches

### 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 IEC 61508<sup>1)</sup>
- Approved for marine applications (GL- and LR-certified)

### Technical data

Power supply		
	Maximum load with gold-plated contacts <sup>2)</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 VAC, 50 W, 250 VDC
	Minimum load with silver-plated contacts	100 mA, 24 V
Parameters		
	Pressure connection	G 1/2" A
Ambient conditions		
	Ambient temperature	-20...70 °C
Construction		
	Housing	Transparent cover
	Housing material	Impact-proof thermoplastic
	Device plug	Standard female connector for cable Ø 6...10 mm
Standards, directives		
	Type of protection <sup>3)</sup>	IP65 (EN 60529)
	Protection class	I (IEC 60730)
	Test mark <sup>4)</sup>	TÜV DWFS (SDBFS) ID: 06024
	Ship-approved	Germanischer Lloyd (GL) Lloyds Register (LR)
CE/UKCA conformity <sup>5)</sup>		
	LVD 2014/35/EU (CE)	EN 60730-1, EN 60730-2-6
	EESR-2016 (UKCA)	EN 60730-1, EN 60730-2-6
	EMC-D 2014/30/EU (CE)	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4
	EMC-2016 (UKCA)	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4
	Machinery-D 2006/42/EC (CE)	EN ISO12100:2018

<sup>1)</sup> SIL 2 approval is not valid in the United Kingdom (UK).

<sup>2)</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

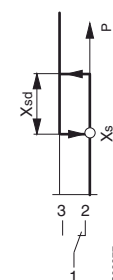
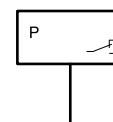
<sup>3)</sup> Depending on the fitting position, see the fitting instructions. The devices are not suitable for outdoor applications.

<sup>4)</sup> For the EU: 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](http://www.certipedia.com).  
For the United Kingdom (UK): Use as a safety pressure limiter is not permitted. The use of an electrical interlock is not permitted.

<sup>5)</sup> Explanation of abbreviations in the "Additional information" section of this product data sheet and in the appendix to SAUTER's product catalogues



DSB1\*\*F001



SMSR-2008 (UKCA)	EN ISO12100:2018
RoHS-D 2011/65/EU & 2015/863/EU (CE)	EN IEC 63000:2018
RoHS-2012 (UKCA)	EN IEC 63000:2018
PED 2014/68/EU (CE)	VdTÜV pressure information sheet 100, sheet 1, cat. IV EN 12952-11, EN 12953-9
PESR-2016 (UKCA) <sup>6)</sup>	Article 8.3 of the Reg. AD 2000 Rulebook
SIL conformity as per SIL 2	Standards <sup>7)</sup>
	IEC 61508 parts 1-2 and 4-7

### 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 G $\frac{1}{2}$ " on 7/16" 20-UNF-2A for copper tubes of $\varnothing$ 6 mm, brass
0292001000	Setpoint adjuster according to customer's wishes (setting accuracy: $\pm 3\%$ of the setting range, but a minimum of $\pm 0.2$ bar)
0292002000	Switching difference according to customers' wishes (setting accuracy: $\pm 5\%$ of the setting range, but a minimum of $\pm 0.05$ 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 $\varnothing$ 6 mm, brass
0381141001	Profile sealing ring, copper, for G $\frac{1}{2}$ "

⚡ 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.

<sup>6)</sup> SIL 2 approval is not valid in the United Kingdom (UK).

<sup>7)</sup> SIL 2 approval is not valid in the United Kingdom (UK).

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 allowed to be used in HVAC building systems for control and regulation purposes. Other uses require the prior consent of the manufacturer.

The section "Description of operation" and all product instructions in this data sheet must be observed.

Modifying or converting the product is not permitted.

### Improper use

The pressure switch is not suitable for:

- Safety applications in the United Kingdom (UK)
- Transport applications and at altitudes above 2000 metres
- Use outdoors and in areas where there is a risk of condensation

### Serviceable life

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

#### Typical electrical serviceable life

$\cos \varphi = 1$	$\cos \varphi = 0.6$	$\cos \varphi = 0.3^{8)}$
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

#### Notice



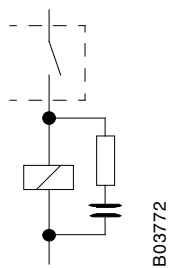
Using the device in SIL applications and as a safety device in machine construction changes its electrical serviceable life.<sup>9)</sup>

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 ( $\Omega$ )



### 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:  $\Delta X_{sd} = (\text{setpoint } X_S - \text{start of the range}) \times 0.04$ .

<sup>8)</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>9)</sup> SIL 2 approval is not valid in the United Kingdom (UK).

## 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 PED 2014/68/EU.
- Fluid group II



#### Notice

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

**For the EU: 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.

**For the United Kingdom (UK): SIL 2 approval is not valid in the United Kingdom (UK). Use as a safety pressure limiter is not permitted. The use of an electrical interlock is not permitted.**

### 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.

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 (1001) 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	



#### Notice

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 (1002)	10%

The following table shows the specific parameters for functional safety:

Safety function	$\lambda_{DU}$ / failure rate		$PFD_{avg,1001}$	$PFD_{avg,1002}$
Safe closing and opening of an electrical contact	$2.36 \times 10^{-07} /h$	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	$3.69 \times 10^{-07} /h$	369 FIT	$1.62 \times 10^{-03}$	$1.65 \times 10^{-04}$

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
- $B10_d = 6000$
- $PFH = 9.51 \times 10^{-08}$

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 23.760
Safety manual	D100237459

### Abbreviations used

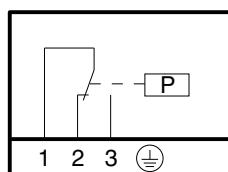
PED	Pressure Equipment Directive 2014/68/EU
EESR-2016	Electrical Equipment (Safety) Regulations 2016
EMC-2016	Electromagnetic Compatibility Regulations 2016
EMC-D	Electromagnetic Compatibility Directive 2014/30/EU
Machinery-D	Machinery Directive 2006/42/EC
LVD	Low-Voltage Directive 2014/35/EU
PESR-2016	Pressure Equipment (Safety) Regulations 2016 (UK)
RoHS-D	RoHS Directives 2011/65/EU and 2015/863/EU
RoHS-2012	Restriction of Hazardous Substances (RoHS) Regulations 2012
MSMR-2008	Supply of Machinery (Safety) Regulations 2008 (UK)

## Disposal

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

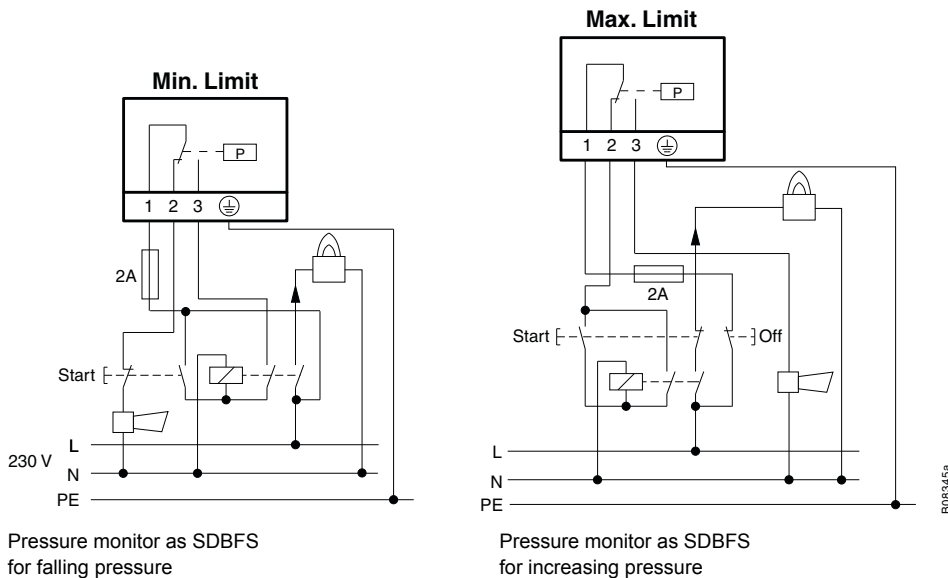
More information on materials can be found in the Declaration on materials and the environment for this product.

## Connection diagram



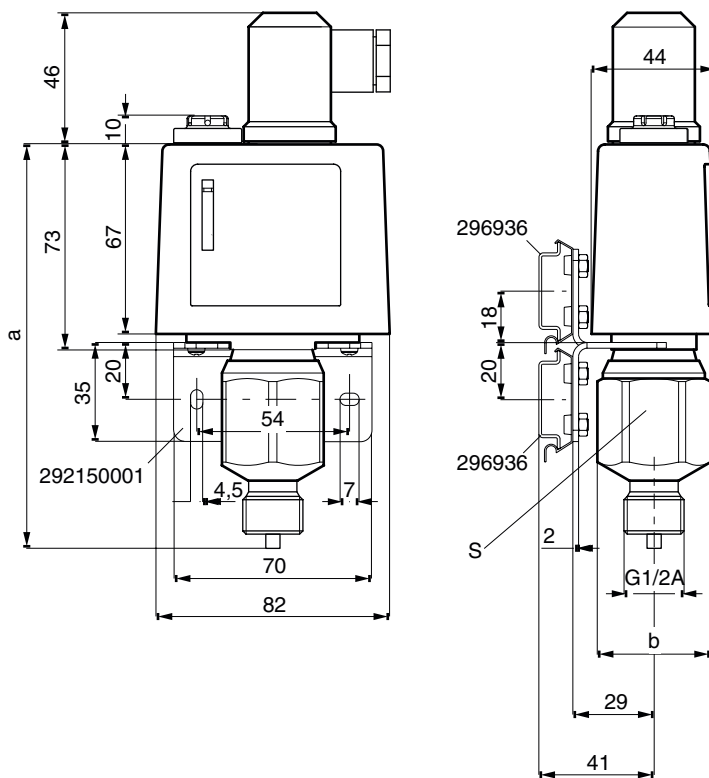
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Connection as safety pressure limiter (SDBFS)<sup>10)</sup>



### Dimension drawings

All dimensions in mm.



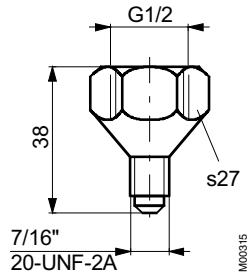
Type	a	b	S
DSB 138, 140, 143	134	40	36
DSF 125, 127, 135, 138			
DSF 140, 143, 146			
DSB 146, 152, 158, 170	148	30	27
DSF 152, 158, 170	113	25	22

<sup>10)</sup> For the United Kingdom (UK): Use as a safety pressure limiter is not permitted. The use of an electrical interlock is not permitted.

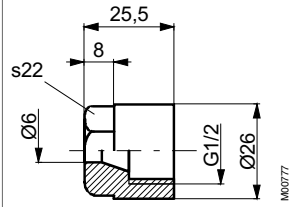
Accessories

All dimensions in mm.

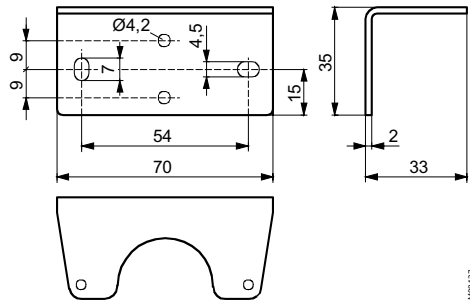
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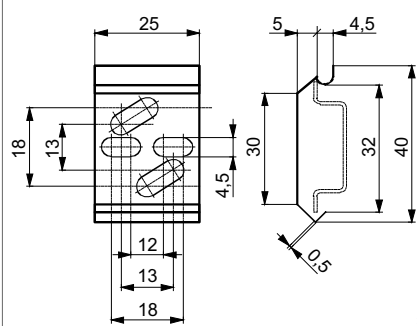
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