14.1

#### 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 IEC 61508
- · Approved for marine applications (GL and LR certified)

#### **Technical data**

Power supply		
	Maximum load with gold-plated con- tacts <sup>1)</sup>	400 mA, 24 V, 10 VA
	Minimum load with gold-plated con- tacts	4 mA, 5 V
	Maximum load with silver-plated con tacts	- 10(4) A, 250 VAC, 50 W, 250 VDC
	Minimum load with silver-plated con- tacts	100 mA, 24 V
Parameters		
	Pressure connection	G ½" A
Ambient conditions		
	Ambient temperature	–2070 °C
Construction		
	Housing	Transparent cover
	Housing material	Impact-proof thermoplastic
	Device plug	Standard female connector for cable of Ø 610 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: 06022
		DSH: SDB ID: 06023
		PED: 2014/68/EU, cat. IV
	Ship-approved	Germanischer Lloyd (GL)
		Lloyds Register (LR)
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
	PED 2014/68/EU	VdTÜV pressure information sheet
		100, cat. IV
		EN 12952-11, EN 12953-9
	Machinery Directive 2006/42/EC	EN ISO 12100:2018
	(according to Appendix II, 1B)	
SIL conformity as per SIL 2	Standards	IEC 61508 parts 1-2 and 4-7





DSL1\*\*F001



# H C SX Protoco

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. The certificates are not valid in the United Kingdom of Great Britain and Northern Ireland.

#### Overview of types

*i* Min. change for reset: Average values

Туре	Setting range	Min. change for reset	Maximum pressure	Admissible sensor tem- perature	Admissible vacuum load- ing	Weight
DSL140F001	02.5 bar	0.4 bar	12 bar	70 °C	-0.7 bar	0.5 kg
DSL143F001	06 bar	0.5 bar	16 bar	70 °C	-0.7 bar	0.5 kg
DSL152F001	616 bar	1.2 bar	30 bar	70 °C	-1.0 bar	0.4 kg
DSH127F001	-15 bar	-0.4 bar	16 bar	110 °C	-1.0 bar	0.5 kg
DSH143F001	0.56 bar	-0.45 bar	16 bar	110 °C	-0.7 bar	0.5 kg
DSH146F001	110 bar	-0.8 bar	18 bar	110 °C	-1.0 bar	0.5 kg
DSH152F001	216 bar	-1.5 bar	60 bar	110 °C	-1.0 bar	0.3 kg
DSH158F001	525 bar	-1.8 bar	60 bar	110 °C	-1.0 bar	0.3 kg
DSH170F001	1540 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	
Туре	Description
0292001000	Setpoint adjuster according to customer's wishes (setting accuracy: $\pm 3\%$ of the setting range, but a minimum of $\pm 0.2$ 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 G1/2"

#### **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 × 10<sup>6</sup> switch strokes.

#### Typical electrical serviceable life

cos φ = 1	cos φ = 0.6	$\cos \phi = 0.3^{4)}$
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 <sup>6</sup> 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 ( $\mu$ 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 Silv

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>&</sup>lt;sup>4)</sup> 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")

<sup>&</sup>lt;sup>5)</sup> TÜV individual certification

Type of sub-system		Туре А		
Hardware error tolerance	HFT	0		
Operating mode		Low demand rate		
Assumed demand rate	n <sub>op</sub>	1/a		
Test interval	Ti	1 a		
Diagnostic degree	DC	0		
Values for 1 of 1 (1001) architecture at	low demand rate			
Assumed demand rate	n <sub>op</sub>	1/a	1.14 × 10 <sup>-04</sup> /h	
Lambda dangerous undetected	λ <sub>DU</sub>	3.56 × 10 <sup>-09</sup> /h	4 FIT	
Probability of failure on demand	PFDavg	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	β factor
1 of 2 (1002)	10%

The following table shows the specific parameters for functional safety:

Safety function	$\lambda_{DU}$ / failure rate		PFD <sub>avg,1001</sub>	PFD <sub>avg,1002</sub>
Reliable switching and holding of the triggered switching point	5.30 × 10 <sup>-08</sup> /h	53 FIT	2.36 × 10 <sup>-04</sup>	2.37 × 10 <sup>-05</sup>
Compliance with external tightness	2.70 × 10 <sup>-08</sup> /h	27 FIT	1.20 × 10 <sup>-04</sup>	1.20 × 10 <sup>-05</sup>
Maximum switching point shift of $\pm 2\%$ of the setting range $\pm 1\%$ of the end value	1.45 × 10 <sup>-07</sup> /h	145 FIT	6.46 × 10 <sup>-04</sup>	6.50 × 10 <sup>-05</sup>

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<sub>d</sub> = 6000
- PFH = 9.51 × 10<sup>-08</sup>

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.



Туре	а	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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