

**Properties:**

- ✓ 2-dimensional 45° tilt switch
- ✓ High resolution and accuracy
- ✓ Switching output for **positive** and **negative** tilt for each axis
- ✓ Robust, easy-to-mount metal housing
- ✓ Suitable for industrial use
  - IP rating: IP65/67
  - CE mark

**Areas of application:**

- ✓ Lifting platforms and access equipment
- ✓ Agricultural and forestry machinery
- ✓ Commercial vehicles, tail lifts
- ✓ Crane and lifting technology



**Function:** The tilt switch HNSC-D-02 measures tilt deviations from the horizontal around 2 axes (x-axis and y-axis). If a deviation occurs on one axis that is greater than the set switching point, the corresponding switching output activates, and the associated indicator LED signals the switching state. The switch distinguishes between positive and negative deviations.

In the case of a positive deviation, the output XS+/YS+ activates, while for a negative deviation, the output XS-/YS- activates. The switching output will only return to its regular operating state once the deviation falls below the switching point.

The switching hysteresis between the on and off points can be adjusted via the rotary potentiometer P1 between approximately 0.05° and 2°. The cutoff frequency can be adjusted via the rotary potentiometer P2 between approximately 2 Hz and 50 Hz.

**Variant Normally Closed:** The tilt switch **HNSC-D-02-S** is a normally closed switch. In the regular operating state (no tilt deviation), the outputs are open (low level) and the LEDs do not light up.

**Variant Normally Open:** The tilt switch **HNSC-D-02-O** is a normally open switch. In the regular operating state (no tilt deviation), the outputs are closed (high level) and the LEDs are lit.

**Adjust switching points:** When the supply voltage is turned on and switch S1.1 is set to ON, the tilt switch enters the adjustment mode. The following measurement points can be adjusted:

Adjust zero point	→ S1.2 to ON
Adjust X switching point	→ S1.3 to ON
Adjust Y switching point	→ S1.4 to ON

The zero point, X switching point, and Y switching point can each be set individually or all at once in a single adjustment process.

**Adjust zero point:** Initially, LED2 blinks slowly. Now the zero point of the X-axis can be set. To do this, position the device in the X-zero position. Then set switch S1.2 to OFF. The device will take the current value as the X-zero point. LED2 will now blink quickly. Now set the zero point of the Y-axis. To do this, position the device in the Y-zero position. Set switch S1.2 to ON. The device will take the Y-zero point. LED2 will turn off, indicating that the zero point adjustment has been completed.

**Adjusting the X switching point:** LED3 blinks slowly. Now the X switching point can be set. To do this, position the device in the X position where it should be activated. Then set switch S1.3 to OFF. The device will take the current value as the X activation point. The setting can be performed for either negative or positive tilt deviation. The same value will be taken—symmetrically to the zero point—for the other side. LED3 will turn off, indicating that the adjustment of the X switching point has been completed.

**Adjusting the Y switching point:** Same procedure as for X-axis, but with switch S1.4 and indicator LED4.

**End adjustment:** Set S1.1 to OFF. The switch will return to normal operating mode.

**Mechanical Daten:**

Material housing: Aluminium  
Protection class: IP65/IP67  
Size: 64 x 58 x 34 mm

**Measuring range:**

Measuring range X-axis: -90°...+90°  
Measuring range Y-axis: -90°...+90°  
Switching point X-axis: 0° < φ<sub>x</sub> < 45°, adjustable  
Switching point Y-axis: 0° < φ<sub>y</sub> < 45°, adjustable  
Hysteresis: ≈0,05°...2,00°, adjustable  
Cut-off frequency: ≈2...50 Hz, adjustable

**Accuracy:**

Resolution: 0.025°  
Calibration of the zero point<sup>1)</sup>: +/- 0.05°  
Calibration accuracy of zero point<sup>1)</sup>: +/- 0.05° + 1% of the switching range

	Min.	Typ.	Max.	
Temperature drift (relative):	0.001	0.004	0.010	[°/K]
Temperature drift at 0° C:	0.025	0.100	0.250	[°]
Temperature drift at 50° C:	0.025	0.100	0.250	[°]
Temperature drift at -25° C:	0.050	0.200	0.500	[°]
Temperature drift at 85° C:	0.060	0.240	0.600	[°]

<sup>1)</sup> at room temperature (25°C)

**Electrical Data:**

Operating voltage V<sub>s</sub>: 9-28 VDC  
Ripple max.: < 10 %  
Current consumption: < 40 mA  
Switching output: open collector  
Voltage output: > V<sub>s</sub> - 1,5 V  
Max. output current: 250 mA per output, 500 mA max. output load (all outputs simultaneously)

**Connections:**

Connection: M12 round plug, 8-pin  
or: Cable, shielded, 6-core (on request)

**Status display:**

LED1, yellow: Adjustment mode/X-warning  
LED2, yellow: Adjustment zero position/X-alarm  
LED3, yellow: X-adjustment/Y-warning  
LED4, yellow: Y-adjustment/Y-alarm

**Operating condition:**

Ambient temperature -25°C ... 85°C

**EMC:**

EU Directives: 2014/30/EU EMC-Directive, 2011/65/EU RoHS-Directive  
Applied Standards: EN 61000-6-3:2007 + A1:2011/ AC:2012 (emitted interference for residential, commercial and light-industrial environments), EN 61000-6-2:2005 + AC:2005-09 (immunity for industrial environments)

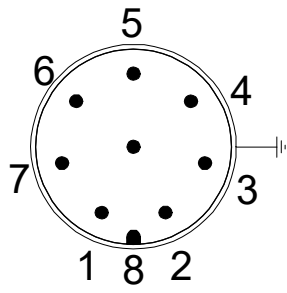
**Functional safety:**

MTTFd: 699 Jahre  
Service life: 20 Jahre

The MTTFd/service life values do not constitute binding quality and/or service life commitments; they are merely empirical values without binding character.

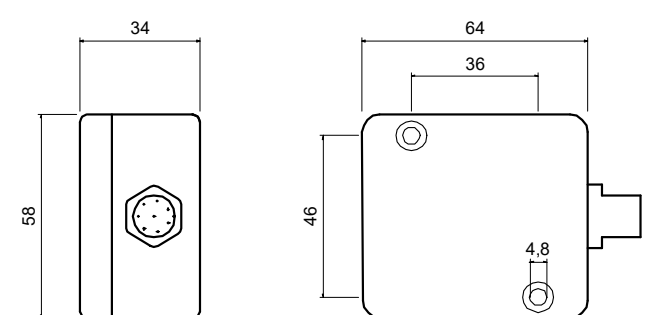
These values do not extend the limitation period for claims for defects or otherwise affect them in any way.

### Pin assignment

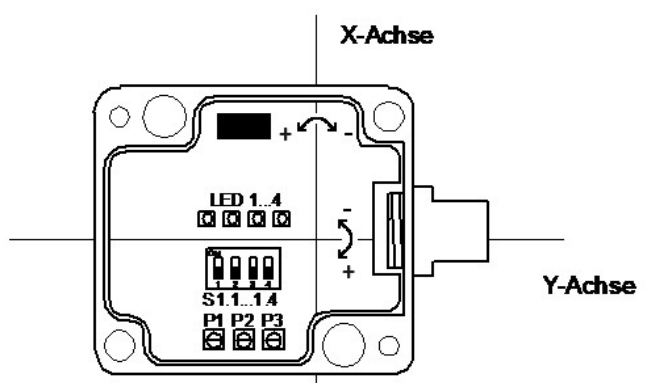


	Assignment	Color assignment when using the cable HKS-S115-PU/HKS-S116-PU
7	VS+	blue
5	VS-	gray
8	Output warning X	red
6	Output alarm X	pink
4	Output warning Y	yellow
2	Output alarm Y	brown
3	NC (Not Connected)	green
1	NC (Not Connected)	white

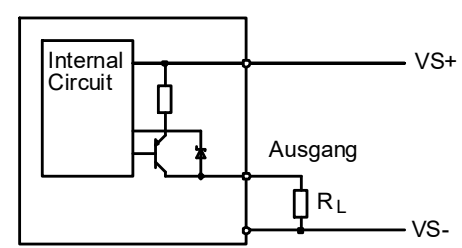
### Installation dimensions



### Operating elements



### Wiring of outputs (Diviation -X, Diviation +X, Diviation -Y, Diviation +Y)



PNP

Internal Circuit

VS+

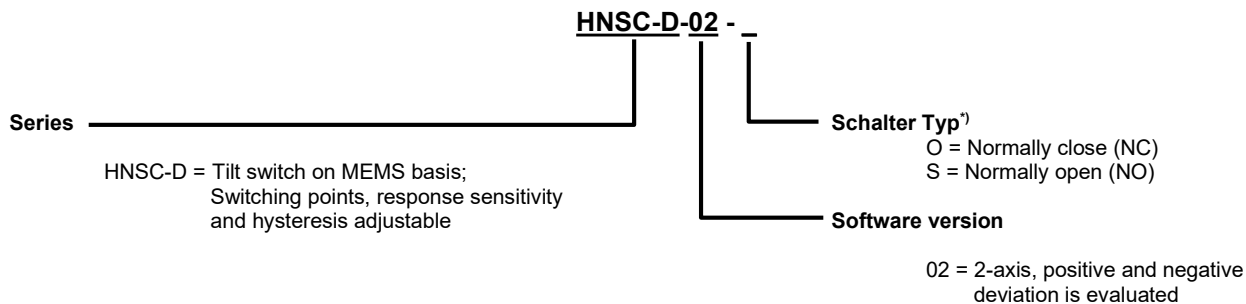
Ausgang

VS-

$R_L$

Voltage supply: 9...28 V DC  
Output current: max. 250mA  
Voltage drop at 50 mA: < 1,5V

**Order Code:**



**Accessories:**

Type		Order designation
Connector plug, straight	without cable	HKS-S115-00
Connector plug, straight	with cable, (for pin assignment see above)	HKS-S115-PU-...
Connector plug, 90° angled	with cable, (for pin assignment see above)	HKS-S116-PU-....

The connection cables are available in different lengths: 2m, 5m, 10m, 15m, 20m, 25m.  
Example: HKS-S115-PU-02, order designation for 2m; HKS-S116-PU-05, order designation for 5m

<sup>1)</sup> Specify cable length when ordering