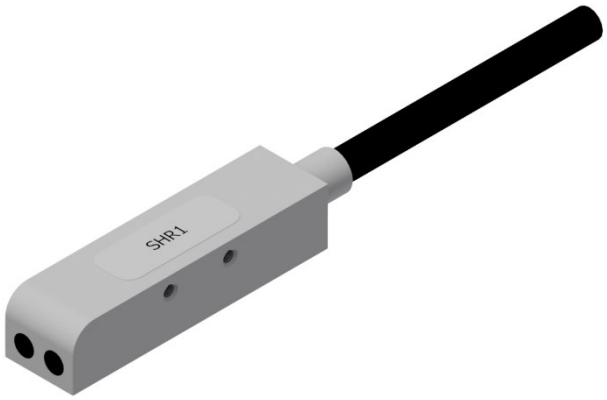
# Datasheet

- magnetic sensor with slimline and super flat scanning unit with 1Volt/pp output
- easy and quick mounting with large alignment tolerances
- high system accuracy
- extremely low-noise sensors
- resistant against dust, humidity and shavings
- protection class IP67




## Mechanical Data

| | |
|---|---|
| Material<br>Housing<br>Sensor Base | <br>aluminium; pressure die-casting<br>stainless steel |
| Cable | 8-wire, respectively shielded twisted pair cable |
| Connector | open standard<br>Sub-D; 9-pole optional<br>M12; 8-pole optional<br>further connectors on request |
| Dimensions<br>Sensor<br>Cable<br>Cable Length<br>Bending Radius | <br>60 x 13 x 16 mm<br>Ø4,5 mm<br><50 m<br>>60 mm |
| Weight | 40 g |
| Pole pitch | 1+1 mm |
| Reference signal TTL | every 1 mm possible |
| Resolution<br>VPP<br>TTL | <br>1000 µm<br>100; 10; 5; 2; 1 µm |
| Distance Sensor-Magnetic Tape<br>without magnetic tape<br>with magnetic tape | <br>0,01 to 0,35 mm<br>0,01 to 0,2 mm |
| Angular Tolerance | ±1° |
| Interpolation Error<br>system error arises from the interpolation error plus measuring tape error | ±2 µm |
| Traverse Speed VPP | < 10 m/s (32 ft/s) |
| Operating Temperature | -40 °C ... +80 °C |

## Electrical Data

| | |
|---|---|
| Power Supply | 5 VDC ±5%<br>10 - 30 VDC (optional with TTL) |
| Power Consumption<br>VPP<br>TTL | <br>35 mA < 70 mA<br>70 mA < 120 mA |
| Output | TTL RS422, square signals (digital)<br>VPP 1 Volt/PP, sinus signals (analog) |
| Vibration EN 60068-2-6 | 300 m/s2 [55 ... 2.000 Hz] |
| Interference protection class IEC 801 | 3 |
| IP-Rating | IP67 |



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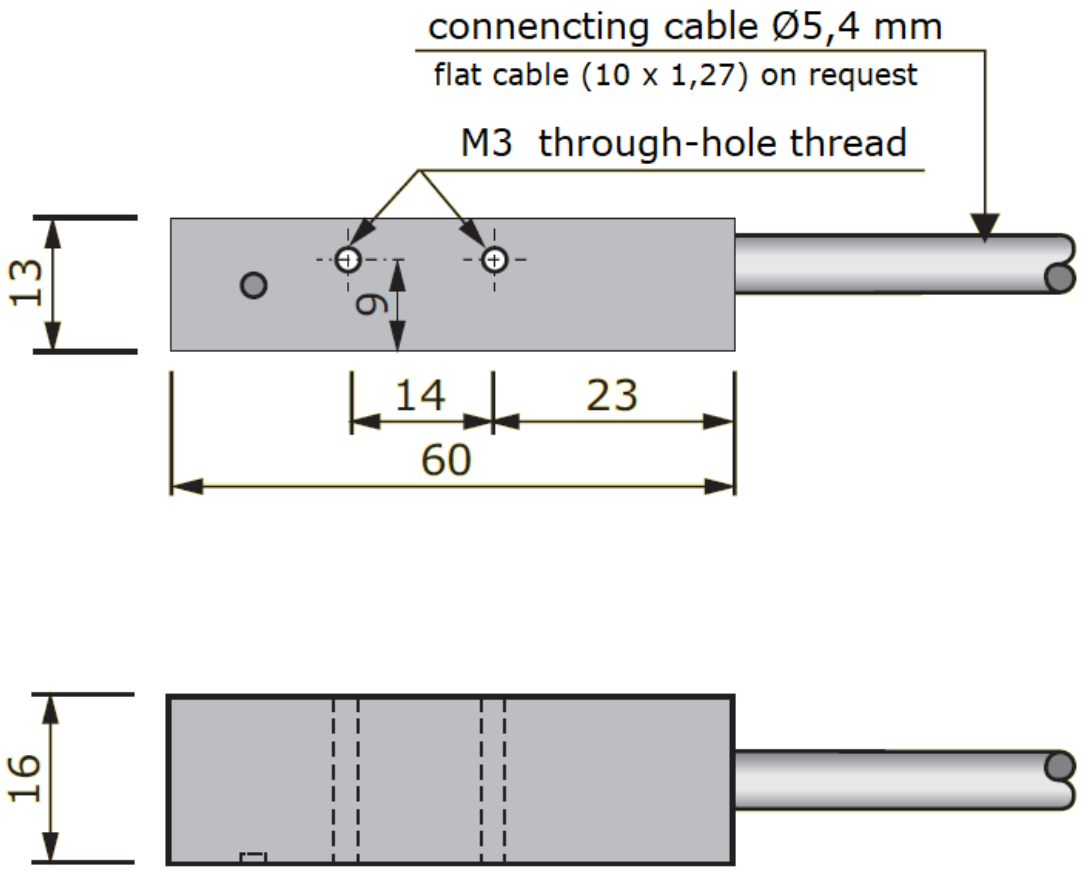
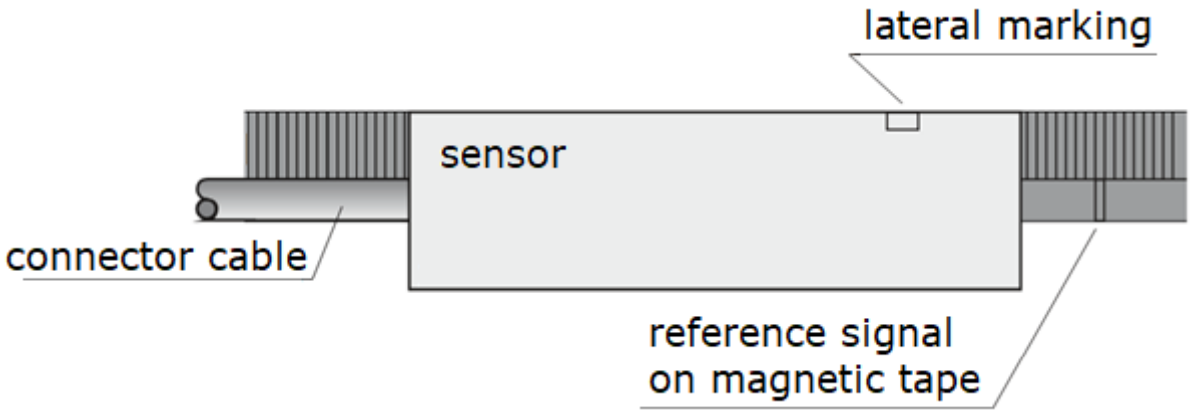
## Dimensions




## Reference Single Signal




The reference single signal is triggered as soon as the lateral marking is at the same level as the reference single signal.



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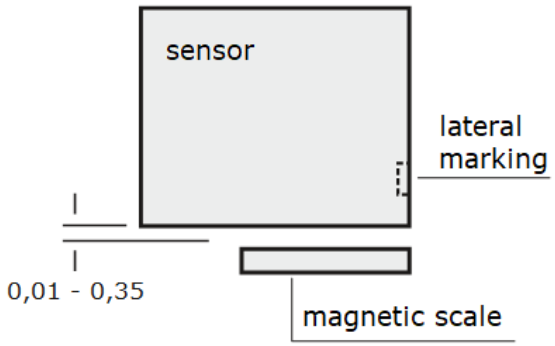
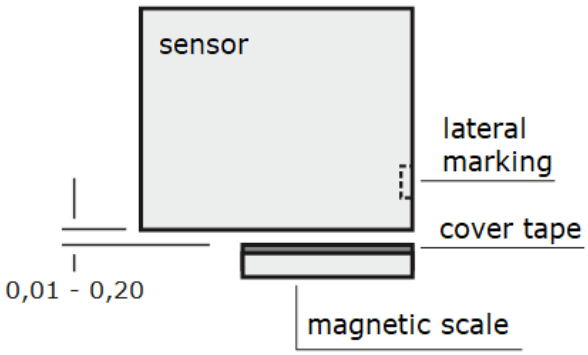
## Mounting Tolerances

### vertical tolerances

**without DB01**

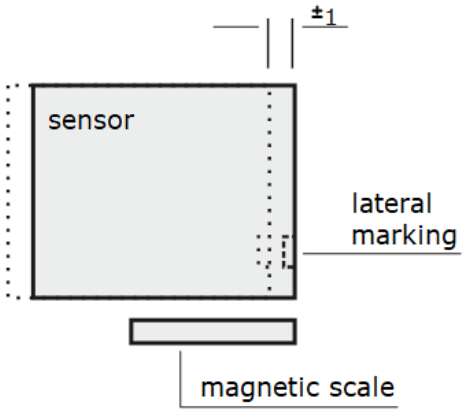



**with DB01**

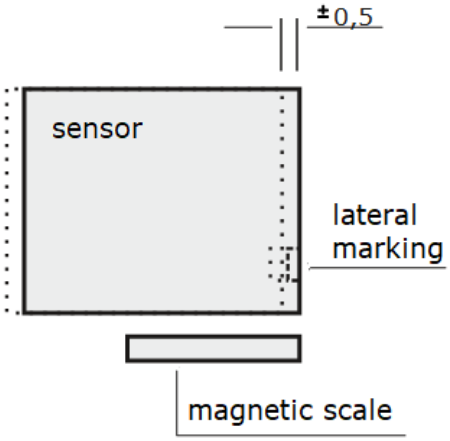



### horizontal tolerances

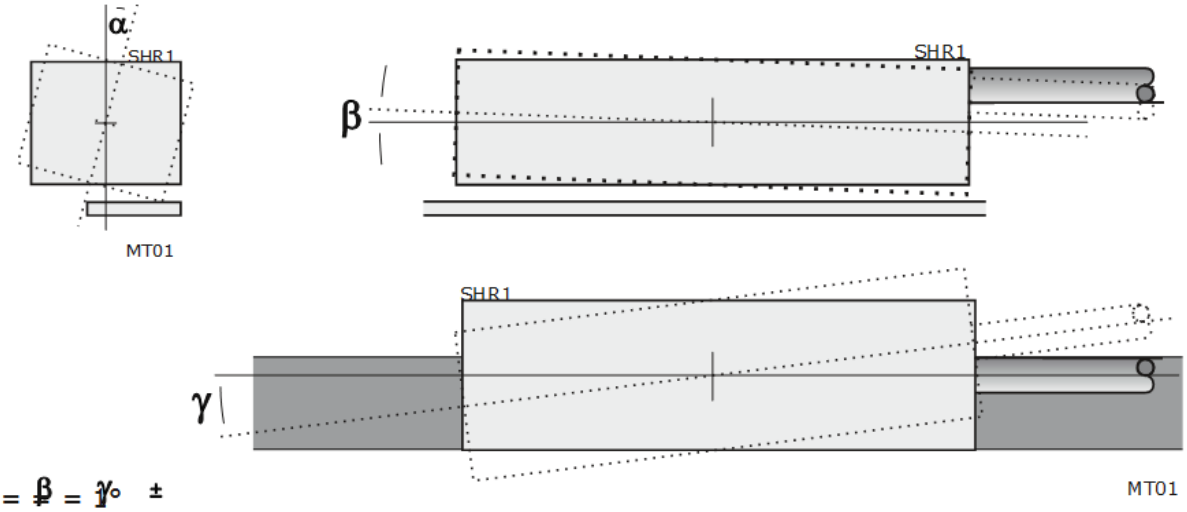
**without reference signal**




**with reference signal**




### angular tolerances




α = β = γ° ±



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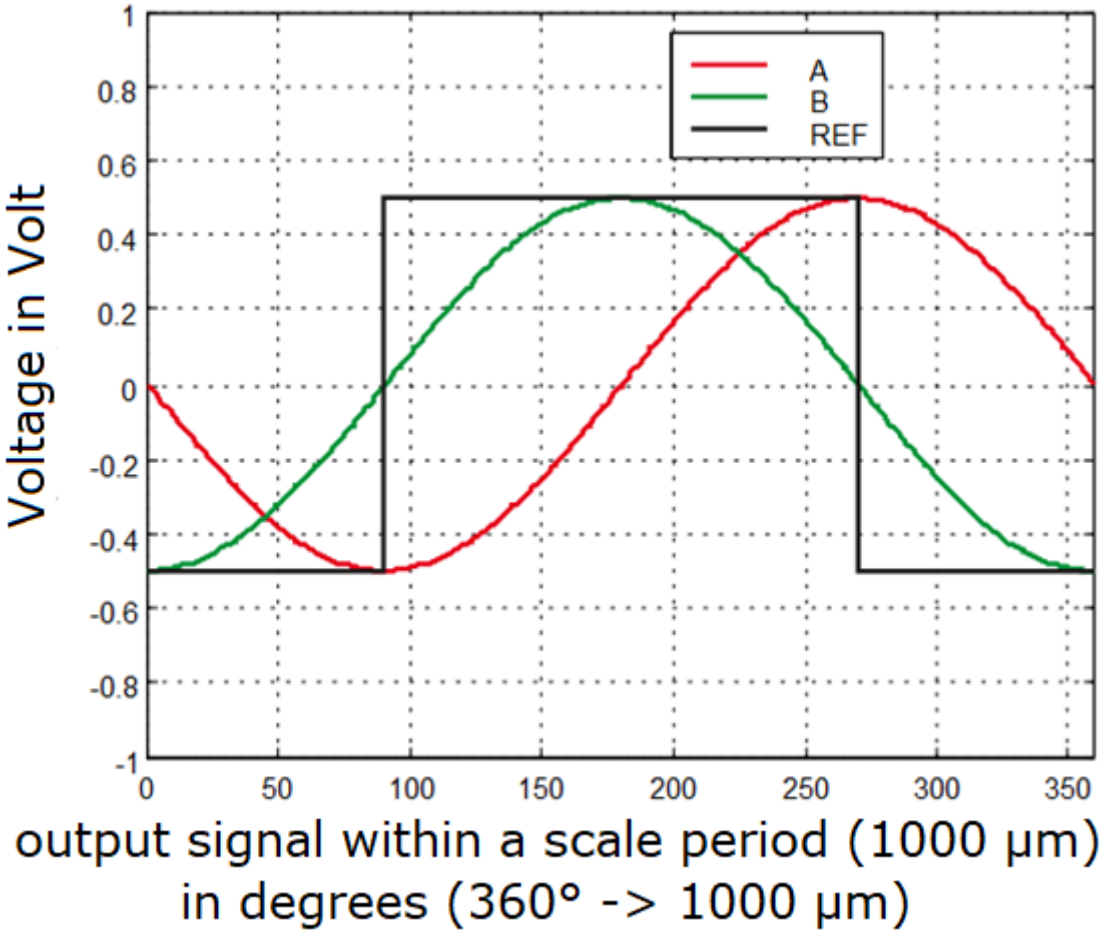
## Interface

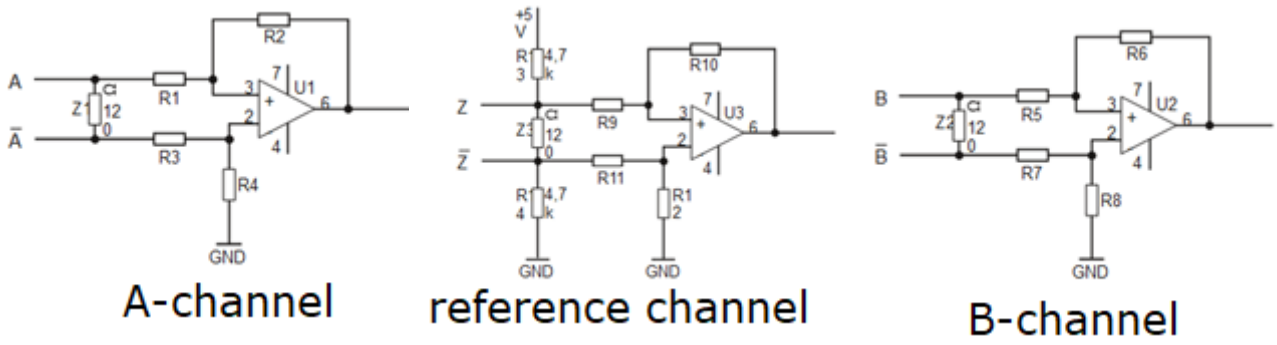
### VPP - analog

Electric signals after the difference input of the subsequent electronic




- The SHR1-interface Sinus 1volts/pp is strictly based on the Siemens specifications.
- The period length of the Sinus output signal is 1000 micrometer.

### Recommended circuit of the subsequent electronic:



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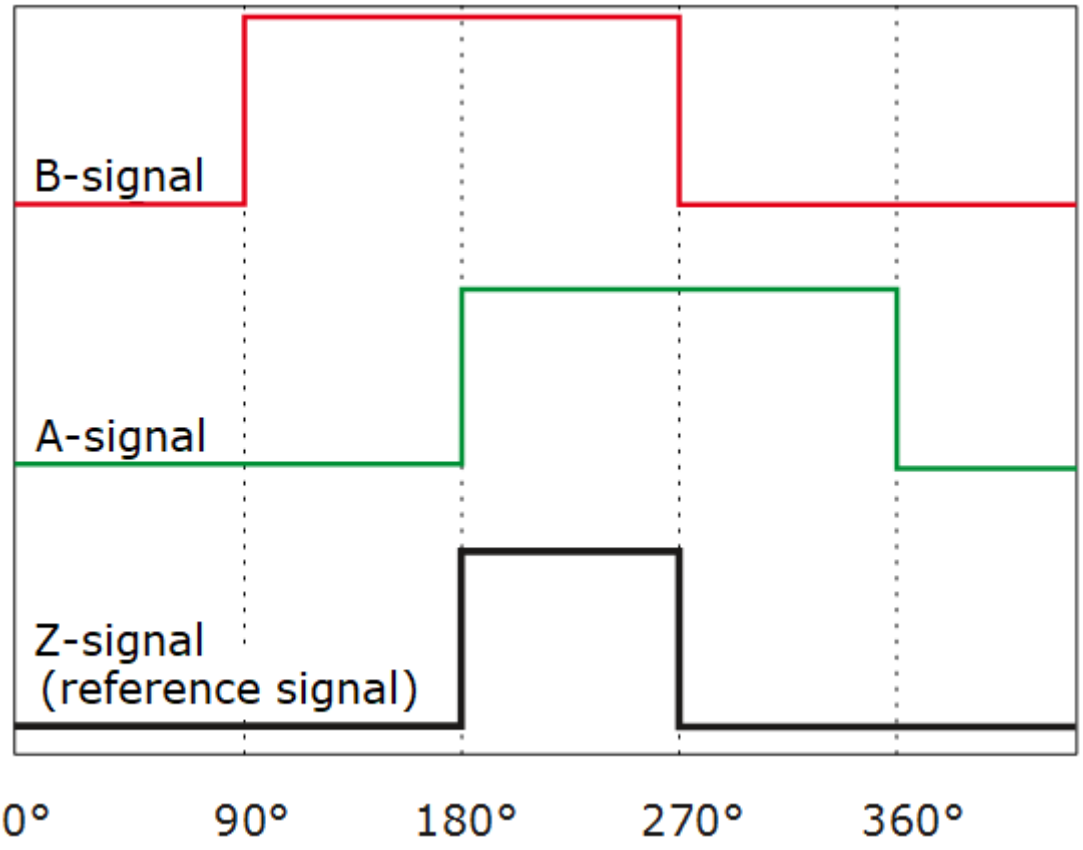
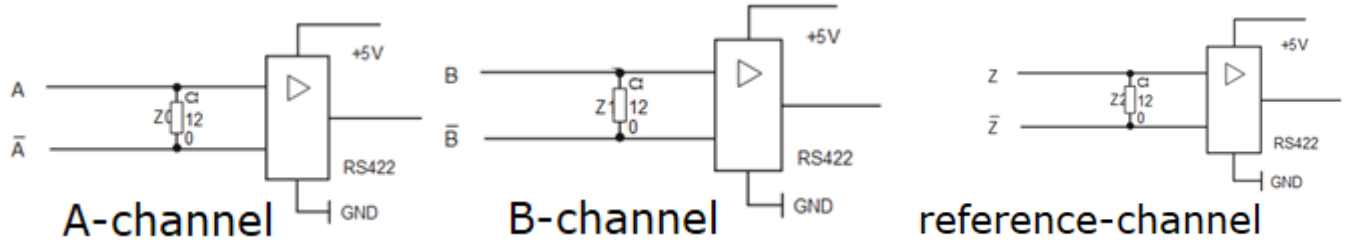
**TTL - digital**




- 90° phase-shifted quadrature signals in accordance with DIN 66259 – RS 422 specification
  Recommended ferrule resistor Z = 120 Ohm
- Output is made differentially as A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$
  Optionally, the reference impulse can be shifted and/or extended.
  Optionally, the minimum impulse width can be limited.

**Recommended circuit of the subsequent electronic:**



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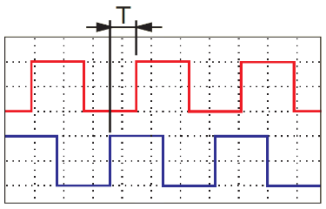
## Relationship between edge distance and travel speed

On the basis of two possible methods to explain the tables:

- The determination of a suitable SHR system with an existing control.
  - ➔ **edge spacing:** min. 1 µs (=1000 ns)
  - ➔ *speed:* max. 2 m/s
  - ➔ **pole pitch**: 1 mm (=SHR1)
    - ⇒ A glance at the table SHR1 enough and you read out of the line at **1000 ns**, the resolution 5 µm as the best possible resolution for this constellation.
- the determination of the required counter frequency, required for the future control.
  - ➔ **resolution**: 1 µm
  - ➔ *speed*: max. 5 m/s
  - ➔ **pole pich**: 1 mm (=SHR1)
    - ⇒ A glance at the table SHR1 enough and you will see that the control of a min. edge separation of 120 ns should (about 8.3 MHz) are safe.




T is the time interval between a signal transition to the next.

| Min Edge Separation T | | accord counter frequency | SHR1 | | | |
|---|---|---|---|---|---|---|
| | | | 0,5 µm | 1 µm | 5 µm | 10 µm |
| 0,12 µs | **120 ns** | ~ 8,30 MHz | *2,500 m/s* | *5,00 m/s* | *10,00 m/s* | *10,00 m/s* |
| 0,29 µs | **290 ns** | ~ 3,40 MHz | *1,000 m/s* | *2,00 m/s* | *10,00 m/s* | *10,00 m/s* |
| 0,48 µs | **480 ns** | ~ 2,10 MHz | *0,600 m/s* | *1,20 m/s* | *6,00 m/s* | *6,00 m/s* |
| 0,68 µs | **680 ns** | ~ 1,50 MHz | *0,400 m/s* | *0,90 m/s* | *4,50 m/s* | *4,50 m/s* |
| 0,80 µs | **800 ns** | 1,25 MHz | *0,400 m/s* | *0,80 m/s* | *4,00 m/s* | *4,00 m/s* |
| 1,00 µs | **1000 ns** | 1,00 MHz | *0,250 m/s* | *0,55 m/s* | *2,80 m/s* | *2,80 m/s* |
| 1,50 µs | **1500 ns** | ~ 670,00 KHz | *0,200 m/s* | *0,40 m/s* | *2,00 m/s* | *2,00 m/s* |
| 2,00 µs | **2000 ns** | 500,00 KHz | *0,150 m/s* | *0,30 m/s* | *1,50 m/s* | *1,50 m/s* |
| 4,00 µs | **4000 ns** | 250,00 KHz | *0,075 m/s* | *0,15 m/s* | *0,75 m/s* | *0,75 m/s* |
| 10,00 µs | **10000 ns** | 100,00 KHz | *0,030 m/s* | *0,06 m/s* | *0,30 m/s* | *0,30 m/s* |

| Min Edge Separation T | | accord counter frequency | SHR1 | | | |
|---|---|---|---|---|---|---|
| | | | 1 µm | 2 µm | 5 µm | 10 µm |
| 0,12 µs | **120 ns** | ~ 8,30 MHz | *5,00 m/s* | *10,00 m/s* | *10,00 m/s* | *10,0 m/s* |
| 0,29 µs | **290 ns** | ~ 3,40 MHz | *2,00 m/s* | *4,00 m/s* | *10,00 m/s* | *10,0 m/s* |
| 0,48 µs | **480 ns** | ~ 2,10 MHz | *1,20 m/s* | *2,40 m/s* | *6,00 m/s* | *10,0 m/s* |
| 0,68 µs | **680 ns** | ~ 1,50 MHz | *0,80 m/s* | *1,80 m/s* | *4,50 m/s* | *9,0 m/s* |
| 0,80 µs | **800 ns** | 1,25 MHz | *0,80 m/s* | *1,60 m/s* | *4,00 m/s* | *8,0 m/s* |
| 1,00 µs | **1000 ns** | 1,00 MHz | *0,50 m/s* | *1,20 m/s* | *2,80 m/s* | *5,8 m/s* |
| 1,50 µs | **1500 ns** | ~ 670,00 KHz | *0,40 m/s* | *0,80 m/s* | *2,00 m/s* | *4,0 m/s* |
| 2,00 µs | **2000 ns** | 500,00 KHz | *0,30 m/s* | *0,60 m/s* | *1,50 m/s* | *3,0 m/s* |
| 4,00 µs | **4000 ns** | 250,00 KHz | *0,15 m/s* | *0,30 m/s* | *0,75 m/s* | *1,5 m/s* |
| 10,00 µs | **10000 ns** | 100,00 KHz | *0,06 m/s* | *0,12 m/s* | *0,30 m/s* | *0,6 m/s* |

For digital models more values are available on request



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## Connector

### M12; 8-pole

| Pin | Color | Signal | | | | Description |
|---|---|---|---|---|---|---|
| | | Analog | | Digital | | |
| | | Reference function | | | | |
| | | with | without | with | without | |
| 1 | white | Z | - | Z | - | reference signal |
| 2 | brown | $\overline{Z}$ | - | $\overline{Z}$ | - | reference signal, inverted |
| 3 | green | B (+cos) | | B | | reference signal, 90° phase-shifted to +A<br>cosine voltage signal |
| 4 | yellow | $\overline{B}$ (-cos) | | $\overline{B}$ | | rectangular signal, 90° phase-shifted to +A, inverted<br>cosine voltage signal, inverted |
| 5 | grey | $\overline{A}$ (-sin) | | $\overline{A}$ | | rectangular signal, inverted<br>sinusoidal voltage signal, inverted |
| 6 | pink | A (+sin) | | A | | rectangular signal<br>sinusoidal voltage signal |
| 7 | blue | GND | | | | mass sensor head (0V) |
| 8 | red | VCC | | | | operating voltage 5 V DC |
| Shield | transparent | PE | | | | PH shield, PE connector housing/ shield |

### Sub-D; 9-pole

| Pin | Color | Signal | | | | Description |
|---|---|---|---|---|---|---|
| | | Analog | | Digital | | |
| | | Reference function | | | | |
| | | with | without | with | without | |
| 1 | brown | $\overline{Z}$ | - | $\overline{Z}$ | - | reference signal, inverted |
| 2 | blue | GND | | | | mass sensor head (0V) |
| 3 | | - | | | | |
| 4 | yellow | $\overline{B}$ (-cos) | | $\overline{B}$ | | rectangular signal, 90° phase-shifted to +A, inverted<br>cosine voltage signal, inverted |
| 5 | grey | $\overline{A}$ (-sin) | | $\overline{A}$ | | rectangular signal, inverted<br>sinusoidal voltage signal, inverted |
| 6 | pink | A (+sin) | | A | | rectangular signal<br>sinusoidal voltage signal |
| 7 | red | VCC | | | | operating voltage 5 V DC |
| 8 | green | B (+cos) | | B | | reference signal, 90° phase-shifted to +A<br>cosine voltage signal |
| 9 | withe | Z | - | Z | - | reference signal |



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Datasheet

## Ordering Example

| Type | SHR1-HP | - | 1 | - | O | - | TTL | - | 1/C08 | - | 5V | - | XX |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**Resolution** [µm]

| | |
|---|---|
| **1** / 2 / 5 / 10 / 100 | TTL |
| 1000 µm | VPP |

**Reference Signal**

| | | |
|---|---|---|
| **O** | = without reference signal | |
| I | = periodic reference signal | (only TTL) |
| S | = single reference signal | |

**Output Signal**

| | |
|---|---|
| TTL | = RS422, square signal (digital) |
| VPP | = 1 Volt/PP, sinus signal (analog) |

**Cable Length** [m]

| | |
|---|---|
| 0.2 | = 0,2 m |
| **1** | = 1,0 m |
| 5 | = 5,0 m |

**/Connector**

| | |
|---|---|
| **C08** | = M12; 8-pin |
| SUBD9 | = Sub-D; 9-pin |
| O | = open cable |

**Output Voltage**

| | | |
|---|---|---|
| 5V | = 5 V | |
| xV | = 10-30 VDC | (only TTL) |

**Frequency** [kHz]
indications as optional



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