

# Rotary position sensor with ohmic signal output or voltage output



Measuring principle	Change in resistance on the voltage divider, hall-effect
Measuring range	<b>Type R1:</b> 50° ... 360° in 10° steps (linear acquisition angle) <b>Type U2:</b> 50° ... 360° in 10° steps (linear acquisition angle)
Rotation angle	360° without mechanical limitation
Output signal	<b>Type R1:</b> 2 signal outputs: 0 ... 2 kΩ <b>Type U2:</b> 2 signal outputs: 2 ... 10 VDC, crossed characteristic curves
Operating temperature	-40 ... 70 °C
Protection class	IP66 & IP68 as per DIN EN 60529
Electrical connection	Design Q1: Push-in terminals for max. 2.5 mm <sup>2</sup> , with M20 screw connection as per DIN EN 50262 for cable diameter 9 to 13 mm Design Q2: 4x 2x 0.5 mm <sup>2</sup> fixed connection cables, 3 m in length, with M16 screw connection as per DIN EN 50262



Rotary position sensor DWA-Q



In preparation

## Scope of application

The type DWA-Q rotary position sensors are robust, maintenance-free sensors that are particularly used in the Shipbuilding industry and machinery and plant engineering industry to convert the mechanical rotation angle of a shaft into an electrical signal (e.g. for measuring the rudder angle or adjusting the pitch).

## Measuring principle

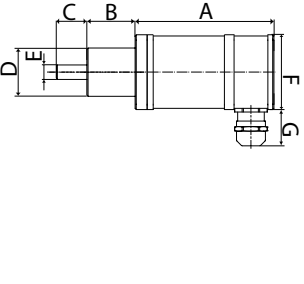
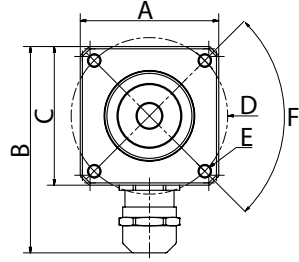
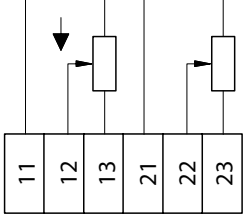
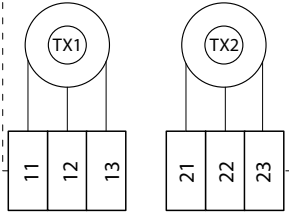
The instrument shaft is connected to a double sensor. Depending on requirements, the angle position that can be acquired electronically (50° ... 360° in 10° steps (linear acquisition angle)) must be selected and adjusted within a mechanical revolution. The version with ohmic resistor connection provides a passive electrical signal; the version with analogue current output provides an active electrical signal.

## Special features

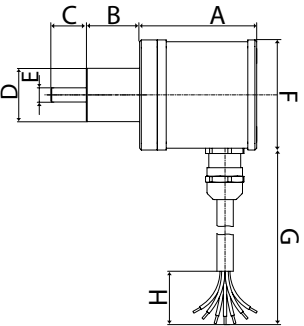
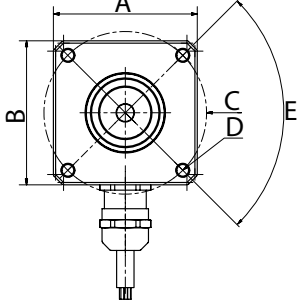
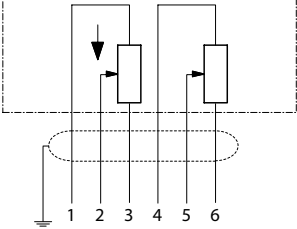
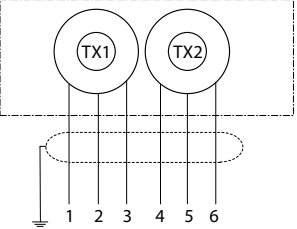
- Reference position mark
- Maintenance-free operation
- No reference run necessary
- Potential-separated channels

# Dimensioned drawing, connection and wiring diagrams

## DWA-Q1 (design Q1) dimensions and wiring diagram for push-in terminals up to max. 2.5 mm<sup>2</sup>

			
<p>A: Length 115 mm                  B: Length 40 mm                  C: Length 25 mm                  D: Ø 40<sup>h7</sup> mm                  E: Ø 12<sup>h7</sup> mm                  F: 62x62 mm                  G: Length 30 mm</p>	<p>A: Length 62 mm                  B: Length 92 mm                  C: Length 62 mm                  D: Ø 70 mm                  E: 4 x M6x7 mm                  F: 90°</p>	<p><b>Wiring diagram for ohmic resistor connection</b></p> <p>11: R10                  12: R1M                  13: R11                  21: R20                  22: R2M                  23: R21</p> <p><b>Information on the connection diagram:</b>                  Tap-off point on the voltage divider in arrow direction when the drive shaft is rotating clockwise (looking at the shaft)</p>	<p><b>Wiring diagram for analogue voltage output</b></p> <p>11: U<sub>B1</sub> + (24V)                  12: AO<sub>1</sub>                  13: U<sub>B1</sub> - (0V)                  21: U<sub>B2</sub> + (24V)                  22: AO<sub>2</sub>                  23: U<sub>B2</sub> - (0V)</p>

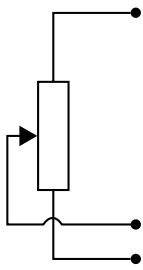
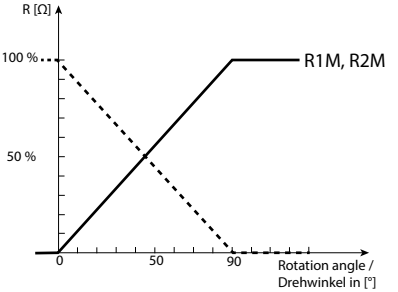
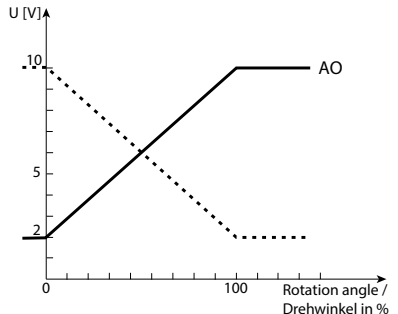
## DWA-Q2 (design Q2) dimensions and wiring diagram with fixed connection cable

			
<p>A: Length 66 mm                  B: Length 30 mm                  C: Length 20 mm                  D: Ø 30<sup>h7</sup> mm                  E: Ø 8<sup>h7</sup> mm                  F: 62x62 mm                  G: Length approx. 3 m                  H: 100 mm</p>	<p>A: Length 62 mm                  B: Length 62 mm                  C: Ø 70 mm                  D: 4 x M6x7 mm                  E: 90°</p>	<p><b>Wiring diagram for ohmic resistor connection</b></p> <p>1: White; R10                  2: Green; R1M                  3: Brown; R11                  4: Grey; R20                  5: Blue; R2M                  6: Pink; R21</p> <p><b>Information on the connection diagram:</b>                  Tap-off point on the voltage divider in arrow direction when the drive shaft is rotating clockwise (looking at the shaft)</p>	<p><b>Wiring diagram for analogue voltage output</b></p> <p>1: White; U<sub>B1</sub> + (24V)                  2: Green; AO<sub>1</sub>                  3: Brown; U<sub>B1</sub> - (0V)                  4: Grey; U<sub>B2</sub> + (24V)                  5: Blue; AO<sub>2</sub>                  6: Pink; U<sub>B2</sub> - (0V)</p>

### Type DWA-Q...-R1 in version with ohmic signal output, passive electrical signal

A centre-tapped potentiometer serves as the measuring element. The change in resistance corresponds linearly to the angle position within the electrical acquisition range. A power supply is not necessary for this. The ohmic signal for the respective acquisition range of the DWA can be converted into a standard 2–10 V DC signal by means of a signal amplifier (e.g. NORIS SA502-3G) (see following figures).

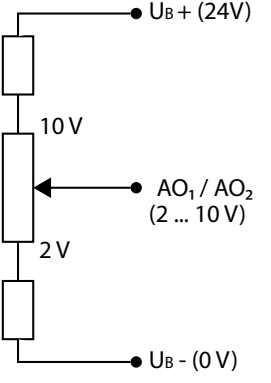
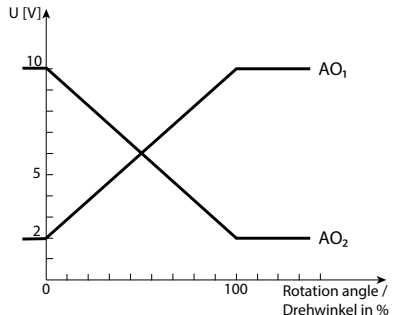
#### Diagram of the DWA-Q...-R1 range

		
<p>Electrical equivalent wiring diagram of the ohmic signal output</p>	<p>Example: DWA90 signal output, ohm / rotation angle (90° corresponds to 100% of the rotation angle); depending on the connection, the relationship of resistance / rotation angle is unidirectional to the right/left or in opposite directions.</p>	<p>Example: Output with SA502-3G signal amplifier, voltage / rotation angle; depending on the connection, the relationship of voltage / rotation angle is inverted.</p>

### Type DWA-Q...-U2, version with analogue voltage output, active electrical signal

A hall-effect sensor with active small-signal amplification serves as the measuring element. The change in voltage at the output corresponds linearly to the angle position within the electrical acquisition range. The characteristic curves of the output signal are crossed. An external power supply is required (see technical data).

#### Diagram of the DWA-Q...-U2 range

		
<p>Electrical equivalent diagram of the type -U2 signal output</p>		<p>Example: DWA90 signal output, voltage / rotation angle with clockwise rotation (locking at the shaft); 90 correspond to 100% of the rotation angle and to an output signal of 10V</p>

## Technical data

Common technical data	
Measuring principle	Change in resistance on the voltage divider, hall-effect
Rotation angle	360° without mechanical limitation
Vibration resistance	4 g DIN IEC 60068-6 increased stress, characteristic curve 2 (2 ... 100 Hz)
Shock resistance (impact)	15 m/s <sup>2</sup> at 11 ms dwell time DIN IEC 60068-27
Climatic test	DIN IEC 60068-30
Operating temperature	-40 ... 70 °C
Storage temperature	-40 ... 70°C (max. peak values within 30 days/year at relative humidity of 5–95%)
Humidity	RH max. 96%
Insulation voltage	1 kV, 1 min.
Protection class	IP66 & IP68 as per DIN EN 60529
Electrical connection	Design Q1: Push-in terminals for max. 2.5 mm <sup>2</sup> , with M20 screw connection as per DIN EN 50262 for cable diameter 9 to 13 mm Design Q2: 4x 2x 0.5 mm <sup>2</sup> fixed connection cables, 3 m in length, with M16 screw connection as per DIN EN 50262
Service life	> 5 million revolutions / speed < 160 rpm
Installation position	Any
Weight	Design Q1: approx. 800 g; Design Q2: approx. 500 g (without cable)
Approvals	CE, ABS, BV, DNV-GL, MED, KR (in preparation)

Technical data for type -R1 with ohmic resistor connection	
Output signal	2 signal outputs: 0 ... 2 kΩ
Measuring range	50° ... 360° in 10° steps (linear acquisition angle)
Resolution	∞
Linearity tolerance	< +/- 3%
Load rating	0.28 W per channel (24 V at 2 kΩ @ 40°C); centre tap max. 1 μA
Max. / recommended wiper current	10 μA / <2 μA

Technical data for type -U2 signal output (analogue voltage output)	
Output signal	2 signal outputs: 2 ... 10 VDC, crossed characteristic curves
Measuring range	50° ... 360° in 10° steps (linear acquisition angle)
Supply voltage	15 ... 30 VDC
Current consumption	< 40 mA per channel
Resolution	12 bit
Repetition rate	1 ms
Linearity tolerance	< +/- 0.5%
Load rating	> 5 kΩ

# Type code

Type code structure			
<b>DWA</b>	<b>90</b>	<b>-Q1</b>	<b>-U2</b> <b>Example: DWA90-Q1-U2</b>
	Rotation angle		
	Design		
	Signal output		

DWA... type code				
<b>Rotation angle</b>	<b>50</b>	Rotation angle 50°		✱
	<b>70</b>	Rotation angle 70°		✱
	<b>90</b>	Rotation angle 90°		
	<b>180</b>	Rotation angle 180°		
	<b>240</b>	Rotation angle 240°		
	<b>320</b>	Rotation angle 320°		
	<b>xxx</b>	Customised rotation angle: 10° ... 360° in 10° steps (special type)		
<b>Design</b>	<b>-Q1</b>	62 x 62 x 115 mm design with terminals and Ø 40 mm connection pin		✱
	<b>-Q2</b>	62 x 62 x 66 mm design with cable and Ø 30 mm connection pin		✱
<b>Output signal</b>	<b>-R1</b>	Dual potentiometer 2 kΩ		✱
	<b>-U2</b>	2 x voltage output 2 ... 10 VDC, crossed characteristic curves		✱
<b>DWA</b>	<b>__</b>	<b>-__</b>	<b>-__</b> <b>Example: DWA70-Q1-U2 (Preferred type)</b>	

### Preferred types

Features marked with a ✱ symbol at the end of the line are preferred features. If you select a preferred feature for each placeholder, the device is specified as preferred type. Preferred types are available quickly from stock. Other types will be delivered according to scheduled appointments.

### Special types

If our standard types do not correspond with your expectations, we are pleased to develop a special solution together with you.