perfect in sensors.

POSIHALL®

Magnetic Multiturn Angle Sensors

PH58
Magnetic Multiturn Angle Sensor

Datasheet

Copyright

© ASM GmbH
Am Bleichbach 18-24
85452 Moosinning
Germany

The information presented in this data sheet does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by ASM for any consequence of its use. Publication thereof does not convey nor imply any license under patent or industrial or intellectual property rights. Applications that are described herein for any of these products are for illustrative purpose only.

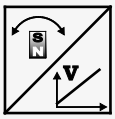
ASM makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

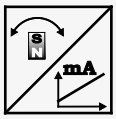
Analog output **4**
Specifications 4
Order code 5
Analog output, programmable **6**
Specifications 6
Order code 7
Analog output, redundant **8**
Specifications 8
Order code 9
Digital output CANopen **10**
Specifications 10
Order code 11
Dimensions **12**
Output specification **14**
Analog output 14
Analog output, programmable 16
Analog output, redundant 18
Digital output CANopen 20
Accessories **21**
Connector cable M12, 5 pin 21
Connector cable M12, 8 pin 22
Connector/bus cable - M12, 5 pin CAN-Bus 23
T-piece for bus cable M12, 5 pin CAN-Bus 23
Terminating resistance M12, 5 pin CAN-Bus 23
Reliability Characteristics 24

Analog output

Sensor features

- **Magnetic Multiturn Angle Sensor in a housing of 58 mm diameter**
- **1 to 255 rotations, programmable**
- **Shaft diameter 6 or 10 mm**
- **Protection class IP67/IP69**
- **Analog output**





Specifications

Output	Voltage 0.5 ... 4.5 V Voltage 0.5 ... 10 V Current 4 ... 20 mA, 3 wire
Measurement range	up to 255 x 360°
Resolution	16384 LSB/revolution
Repeatability	±(2°+ 0,015% f.s.)
Linearity	±2° + 0.0015% f.s.
Protection class	IP67/IP69
Signal characteristics	CW, CCW
Housing material	Stainless steel (shaft), aluminium (housing)
Mounting	Clamps or screws
Connection	5-pin socket M12 axial
Revolutions per minute (mech.)	10.000 r.p.m.
Allowable shaft load	15 N radial / 5 N axial
Temperature range	-40 ... +85 °C
Shock	EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
Vibration	EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
Weight	330 g
EMC	EN 61326-1:2013

Order code

PH58	–	1	–	2	–	3	–	4	–	5

1 Shaft

V20	= shaft 6 mm
V21	= shaft 10 mm

2 Measurement range (in revolutions)

1 ... 2 ... 3 ... 255T

3 Output

U2	= Voltage 0.5 ... 10 V
U8	= Voltage 0.5 ... 4.5 V
I1	= Current 4 ... 20 mA, 3 wire

4 Signal characteristics

CW/CW	= Signal 1 increasing CW / signal 2 increasing CW
CW/CCW	= Signal 1 increasing CCW/ / signal 2 increasing CCW
CCW/CW	= Signal 1 increasing CCW / signal 2 increasing CW
CCW/CCW	= Signal 1 increasing CCW / signal 2 increasing CCW

5 Connection

M12A5	= 5-pin socket M12 axial

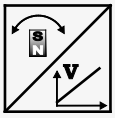
Order example

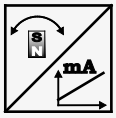
PH58	–	V20	–	255T	–	I1	–	CW	–	M12A5

Analog output, programmable

Sensor features

- **Magnetic Multiturn Angle Sensor in a housing of 58 mm diameter**
- **1 to 255 rotations, programmable**
- **Shaft diameter 6 or 10 mm**
- **Protection class IP67/IP69**
- **Analog output, programmable**





Specifications

Output	Voltage 0.5 ... 4.5 V, programmable Voltage 0.5 ... 10 V, programmable Current 4 ... 20 mA, 3 wire, programmable
Measurement range	up to 255 x 360°
Resolution	16384 LSB/revolution
Repeatability	±(2°+ 0,015% f.s.)
Linearity	±2° + 0.0015% f.s.
Protection class	IP67/IP69
Signal characteristics	CW, CCW
Housing material	Stainless steel (shaft), aluminium (housing)
Mounting	Clamps or screws
Connection	5-pin socket M12 axial
Revolutions per minute (mech.)	10.000 r.p.m.
Allowable shaft load	15 N radial / 5 N axial
Temperature range	-40 ... +85 °C
Shock	EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
Vibration	EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
Weight	330 g
EMC	EN 61326-1:2013

Order code

PH58	–	1	–	2	–	3	–	4	–	5

1 Shaft

V20	= shaft 6 mm
V21	= shaft 10 mm

2 Measurement range (in revolutions)

1 ... 2 ... 3 ... 255T

3 Output

U2/PMU	= Voltage 0.5 ... 10 V, programmable
U8/PMU	= Voltage 0.5 ... 4.5 V, programmable
I1/PMU	= Current 4 ... 20 mA, 3 wire, programmable

4 Signal characteristics

CW/CW	= Signal 1 increasing CW / signal 2 increasing CW
CW/CCW	= Signal 1 increasing CCW/ / signal 2 increasing CCW
CCW/CW	= Signal 1 increasing CCW / signal 2 increasing CW
CCW/CCW	= Signal 1 increasing CCW / signal 2 increasing CCW

5 Connection

M12A5	= 5-pin socket M12 axial

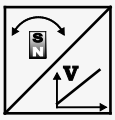
Order example

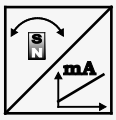
PH58	–	V20	–	255T	–	U2/PMU	–	CW	–	M12A5

Analog output, redundant

Sensor features

- **Magnetic Multiturn Angle Sensor in a housing of 58 mm diameter**
- **1 to 255 rotations, programmable**
- **Shaft diameter 6 or 10 mm**
- **Protection class IP67/IP69**
- **Analog output, redundant**
- **Two independent channels**





Specifications

Output	Voltage 0.5 ... 10 V, two channels, redundant Voltage 0.5 ... 4.5 V two channels, redundant Current 4 ... 20 mA, 3 wire, two channels, redundant
Measurement range	up to 255 x 360°
Resolution	16384 LSB/revolution
Repeatability	±(2°+ 0,015% f.s.)
Linearity	±2° + 0.0015% f.s.
Protection class	IP67/IP69
Signal characteristics	CW, CCW
Housing material	Stainless steel (shaft), aluminium (housing)
Mounting	Clamps or screws
Connection	5-pin socket M12 axial
Revolutions per minute (mech.)	10.000 r.p.m.
Allowable shaft load	15 N radial / 5 N axial
Temperature range	-40 ... +85 °C
Shock	EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
Vibration	EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
Weight	330 g
EMC	EN 61326-1:2013

Order code

PH58	–	1	–	2	–	3	–	4	–	5

1 Shaft

V20	= shaft 6 mm
V21	= shaft 10 mm

2 Measurement range (in revolutions)

2T … 31T

3 Output

U2R	= Voltage 0.5 ... 10 V, two channels, redundant
U8R	= Voltage 0.5 ... 4.5 V two channels, redundant
I1R	= Current 4 ... 20 mA, 3 wire, two channels, redundant

4 Signal characteristics

CW/CW	= Signal 1 increasing CW / signal 2 increasing CW
CW/CCW	= Signal 1 increasing CCW/ / signal 2 increasing CCW
CCW/CW	= Signal 1 increasing CCW / signal 2 increasing CW
CCW/CCW	= Signal 1 increasing CCW / signal 2 increasing CCW

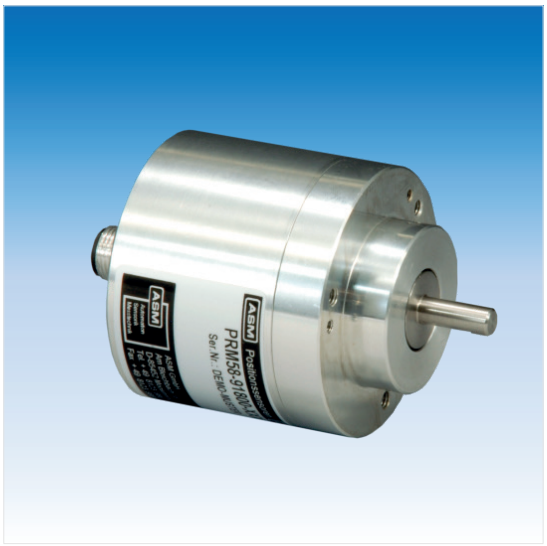
5 Connection

2M12A5	= 5-pin socket M12 axial

Order example

PH58	–	V01	–	31T	–	I1R	–	CW	–	2M12A5

Digital output CANopen



Sensor features

- **Magnetic Multiturn Angle Sensor in a housing of 58 mm diameter**
- **1 to 255 rotations, programmable via CAN-Bus**
- **Protection class IP67/IP69**
- **Digital output CANopen**
- **Redundant version with 1 connector**

Specifications

Output	CANopen (CiA 301-V4.02/406-V3.2) CAN SAE J1939
Measurement range	up to 255 x 360°
Resolution	16384 LSB/revolution
Repeatability	±(2°+ 0,015% f.s.)
Hysteresis	0.1°
Linearity	±2° + 0.0015% f.s.
Protection class	IP67/IP69
Housing material	Stainless steel (shaft), aluminium (housing)
Mounting	Clamps or screws
Connection	5-pin socket M12 axial
Revolutions per minute (mech.)	10.000 r.p.m.
Allowable shaft load	15 N radial / 5 N axial
Life cycle of bearings	100 x 10^6 revolutions (<6000 r.p.m.)
Temperature range	-40 ... +85 °C
Shock	EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
Vibration	EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
Weight	330 g
EMC	EN 61326-1:2013

Order code

PH58	–	1	–	2	–	3	–	4

1 Shaft

V20 = shaft 6 mm
V21 = shaft 10 mm

2 Measurement range (in revolutions)

1 ... 2 ... 3 ... 255T

3 Output

MCANOP = CANopen
MCANJ1939 = CAN SAE J1939

4 Connection

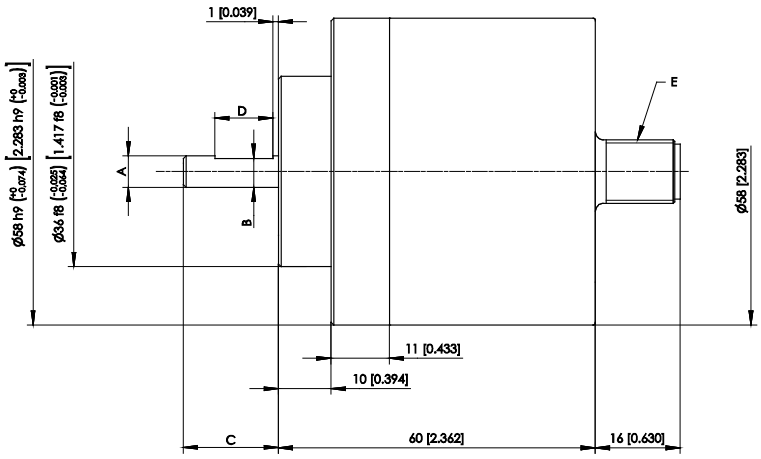
M12A5/CAN = 5-pin socket M12 axial

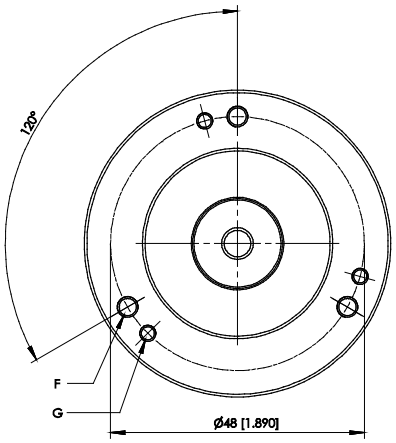
Order example

PH58 – V20 – 255T – MCANOP – M12A5/CAN

Dimensions

Connector M12, axial





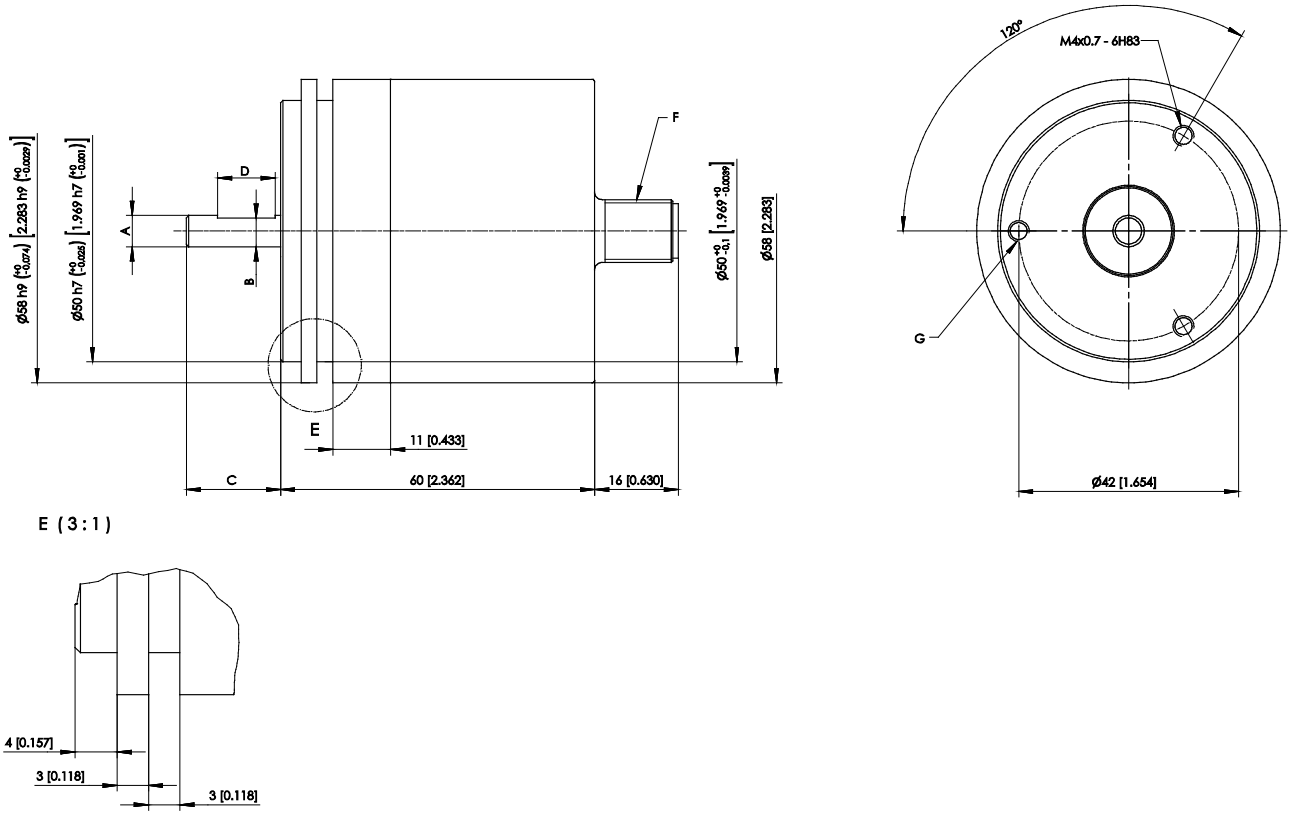
E – Connector M12
F – 3 x M4 – 6 deep
G – 3 x M3 – 6 deep

Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions consult factory.

Dimensions shaft

	V20	V21	V22
Dimension A	Ø6 -0,005 -0,02 [0.236 -0.0002 -0.0008]	Ø10 -0,005 -0,02 [0.394 -0.0002 -0.0008]	Ø12 -0,006 -0,024 [0.394 -0.0002 -0.0009]
Dimension B	5,5	9	11
Dimension C	18	20	20
Dimension D	11	15	15

Connector M12, axial



F – Connector M12
G – M3 – 6 deep

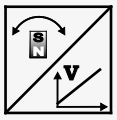
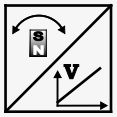
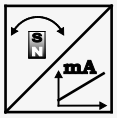
Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions consult factory.

Dimensions shaft

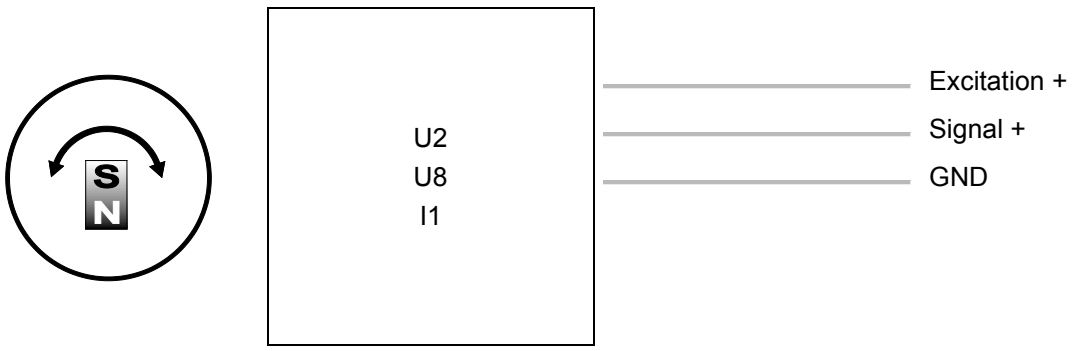
	V23	V24	V25
Dimension A	Ø6 -0,005 -0,02 [0.236 -0.0002 -0.0008]	Ø10 -0,005 -0,02 [0.394 -0.0002 -0.0008]	Ø12 -0,006 -0,024 [0.394 -0.0002 -0.0009]
Dimension B	5,5	9	11
Dimension C	18	20	20
Dimension D	11	15	15

Output specification

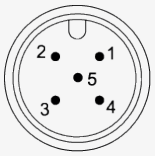
Analog output

U2 Voltage output 0.5 ... 10 V 	Excitation voltage	10 … 36 V DC
	Excitation current	20 mA typical at 24 V DC 38 mA typical at 12 V DC max. 60 mA
	Output voltage	0.5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	EN 61326-1:2013
U8 Voltage output 0.5 … 4.5 V 	Excitation voltage	10 … 36 V DC
	Excitation current	17 mA typical at 24 V DC 32 mA typical at 12 V DC 60 mA max.
	Output voltage	0.5 … 4.5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	EN 61326-1:2013
I1 Current output 4 … 20 mA, 3 wires 	Excitation voltage	10 … 36 V DC
	Excitation current	typical 36 mA at 24 V DC typical 70 mA at 12 V DC 100 mA max.
	Load R_L	500 Ω max.
	Output current	4 … 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	EN 61326-1:2013

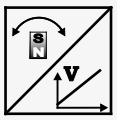
Signal diagram

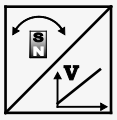


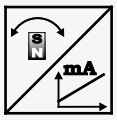
Signal wiring

Signal	Connector pin no.	Cable connection	View to the sensor connector
Excitation +	1	brown	
Signal	2	white	
GND	3	blue	
Do not connect!	4	black	
Do not connect!	5	(grey)	

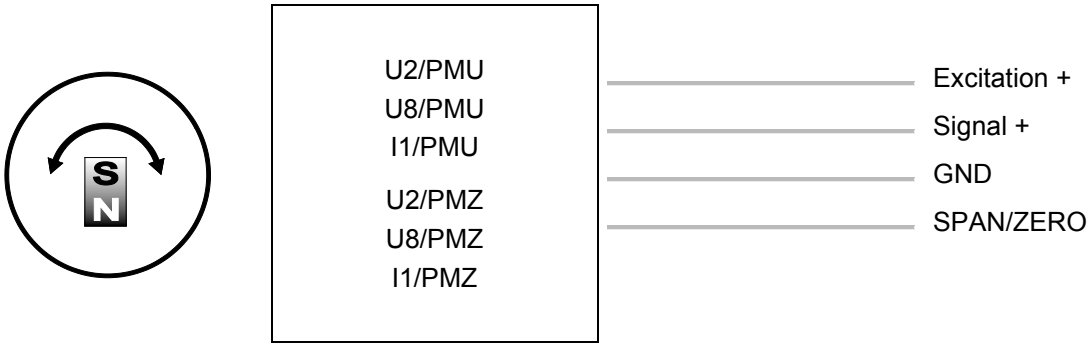
Analog output, programmable

U2/PMU / U2/PMZ Voltage output 0.5 ... 10 V 	Excitation voltage	10 … 36 V DC
	Excitation current	20 mA typical at 24 V DC 38 mA typical at 12 V DC max. 60 mA
	Output voltage	0,5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	EN 61326-1:2013

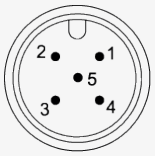
U8/PMU / U8/PMZ Voltage output 0.5 … 4.5 V 	Excitation voltage	10 … 36 V DC
	Excitation current	17 mA typical at 24 V DC 32 mA typical at 12 V DC max. 60 mA
	Output voltage	0.5 … 4.5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stabilität (Temperatur)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	EN 61326-1:2013

I1/PMU / I1/PMZ Current output 4 … 20 mA, 3 wire 	Excitation voltage	10 … 36 V DC
	Excitation current	typical 36 mA at 24 V DC typical 70 mA at 12 V DC max. 100 mA
	Load R_L	500 Ω max.
	Output current	4 … 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	EN 61326-1:2013

Signal diagram



Signal wiring

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	brown	
Signal	2	white	
GND	3	blue	
Do not connect!	4	black	
SPAN/ZERO	5	grey	

Option -PMU

Programming of the start and end value by the customer

Programming of the start value and the end value of the output range is provided by a programming signal SPAN/ZERO available at the connector. This Signal SPAN/ZERO must be connected with GND via a push button, and then the position magnet of the sensor must be moved to the start resp. the end position. Pushing the button between 1 and 4 seconds sets the actual position as start position, pushing the button more than 5 seconds sets the actual position as end position. The values will be stored and are available after switching off the sensor.

To reset the sensor to the factory values the button must be pushed when the sensor is switched on.

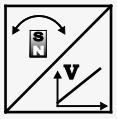
Option -PMZ

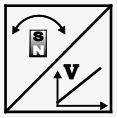
Programming of the start value by the customer

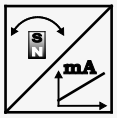
Programming of the start value of the output range for the outputs U2/U8 and I1 is provided by a programming signal ZERO available at the connector. This Signal ZERO must be connected with GND via a push button, and then the position magnet of the sensor must be moved to the start resp. the end position. Pushing the button between 1 and 4 seconds sets the -actual position as start position, pushing the button more than 5 seconds sets the actual position as end position. The values will be stored and are available after switching off the sensor.

To reset the sensor to the factory values the button must be pushed when the sensor is switched on.

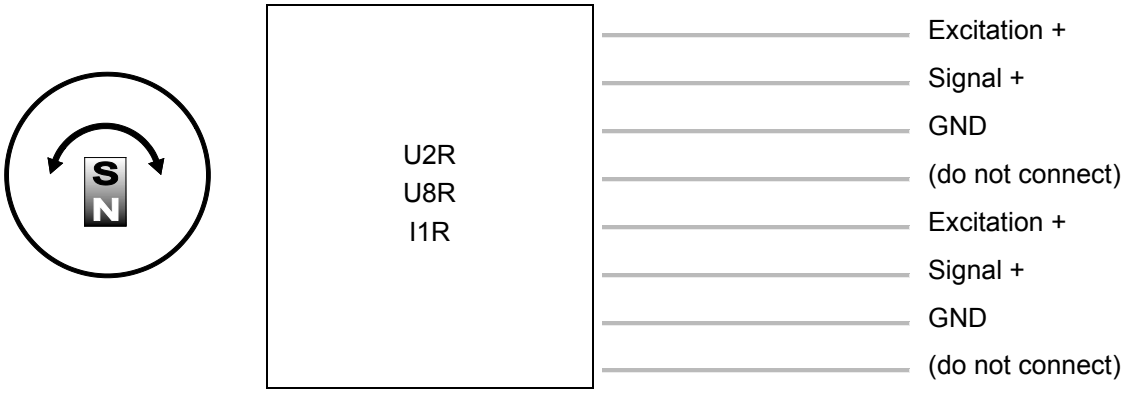
Analog output, redundant

U2R Voltage output 0.5 ... 10 V 	Excitation voltage	10 … 36 V DC
	Excitation current	20 mA typical at 24 V DC 38 mA typical at 12 V DC max. 60 mA per channel
	Output voltage	0.5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See the specification of the respective sensor
	EMC	EN 61326-1:2013

U8R Voltage output 0.5 … 4.5 V 	Excitation voltage	10 … 36 V DC
	Excitation current	20 mA typical at 24 V DC 38 mA typical at 12 V DC max. 60 mA per channel
	Output voltage	0.5 … 4.5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See the specification of the respective sensor
	EMC	EN 61326-1:2013

I1R Current output 4 … 20 mA, 3 wires 	Excitation voltage	10 … 36 V DC
	Excitation current	39 mA typical at 24 V DC 76 mA typical at 12 V DC max. 100 mA per channel
	Load R_L	500 Ω max.
	Output current	4 … 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	EN 61326-1:2013

Signal diagram



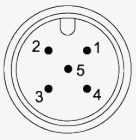
Signal wiring

Channel	Signal	Connector pin no.	Cable color	View to the sensor connector
1	Excitation +	1	white	
1	Signal	2	brown	
1	GND	3	green	
1	Do not connect!	4	yellow	
2	Excitation +	5	grey	
2	Signal	6	pink	
2	GND	7	blue	
2	Do not connect!	8	red	

Digital output CANopen

MCANOP CANopen	CAN Specification	ISO 11898, Basic and Full CAN 2.0 B
	Communication profile	CANopen CiA 301 V 4.02, Slave
	Device profile	Encoder CiA 406 V 3.2
	Configuration services	Layer Setting Service (LSS), CiA Draft Standard 305 (transmission rate, node id)
	Error Control	Node Guarding, Heartbeat, Emergency Message
	Node ID	Default: 127; programmable via LSS or SDO
	PDO	3 TxPDO, 0 RxPDO, static mapping
	PDO Modes	Event-/Time triggered, Remote-request, Sync cyclic/acyclic
	SDO	1 server, 0 Client
	CAM	8 cams
	Certified	Yes
	Transmission rates	50 kBaud to 1 MBaud, default: 125 kBaud; programmable via LSS or SDO
	Bus connection	M12 connector, 5 pin
	Integrated bus terminating resistor	Optional
	Bus, galvanic isolated	No

Specifications	Excitation voltage	8 ... 36 V DC
	Excitation current	20 mA typical at 24 V DC 40 mA typical at 12 V DC, 80 mA max.
	Measuring rate	1 kHz (asynchronous)
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Repeatability	1 LSB
	Operating temperature	See specification of the respective sensor
	Protection	Reverse polarity, short circuit
	Dielectric strength	1 kV (V AC, 50 Hz, 1 min.)
	EMC	EN 61326-1:2013

Signal wiring	**Signal**	**Connector pin no.**	**View to the sensor connector**
	Shield	1	
	Excitation +	2	
	GND	3	
	CAN-H	4	
	CAN-L	5	

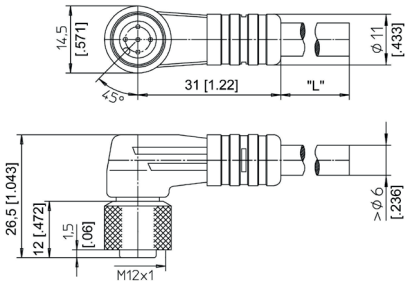
Accessories

Connector cable M12, 5 pin

(angular coupling)

shielded connector

The 5-core screened cable is supplied with a mating 5-pin 90° M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m.
Wire: cross sectional area 0.34 mm^2
Cable diameter: 5.6 ±0.2 mm



Order code

	KAB - xM - M12/5F/W - LITZE
IP69:	**KAB - xM - M12/5F/W/69K - LITZE**

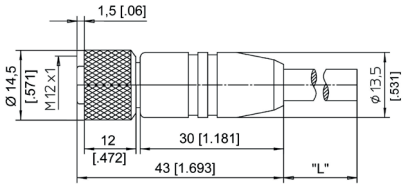
xM = length in m

Connector cable M12, 5 pin

(straight coupling)

shielded connector

The 5-core screened cable is supplied with a mating 5-pin M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m.
Wire: cross sectional area 0.34 mm^2
Cable diameter: 5.6 ±0.2 mm



Order code

	KAB - xM - M12/5F/G - LITZE
IP69:	**KAB - xM - M12/5F/G/69K - LITZE**

xM = length in m

Signal wiring M12, 5 pin	**Plug connection / Cable color**				
	1	2	3	4	5
	brown	white	blue	black	grey

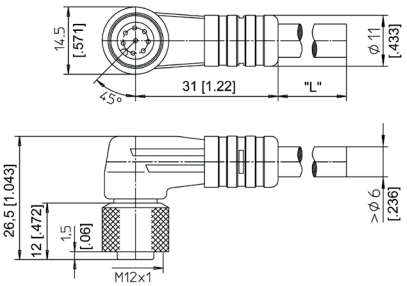
Applicable for cable carriers

Maximum movement speed	3 m/s
Maximum acceleration	5 m/s^2
Minimum bending radius	10 x cable diameter

Connector cable M12, 8 pin
(angular coupling)

shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin 90° M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m.
Wire: cross sectional area 0.25 mm²
Cable diameter: 6.3 ±0.2 mm



Order code

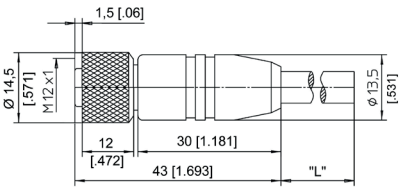
	KAB - xM - M12/8F/W - LITZE
IP69:	**KAB - xM - M12/8F/W/69K - LITZE**

xM = length in m

Connector cable M12, 8 pin
(straight coupling)

shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m.
Wire: cross sectional area 0.25 mm²
Cable diameter: 6.3 ±0.2 mm



Order code

	KAB - xM - M12/8F/G - LITZE
IP69:	**KAB - xM - M12/8F/G/69K - LITZE**

xM = length in m

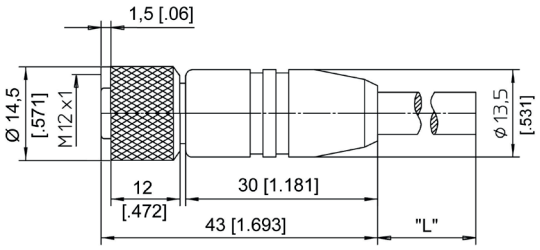
Signal wiring M12, 8 pin	**Plug connection / cable color**							
	1	2	3	4	5	6	7	8
	white	brown	green	yellow	grey	pink	blue	red

Applicable for cable carriers

Maximum movement speed	3 m/s
Maximum acceleration	5 m/s^2
Minimum bending radius	10 x cable diameter

Connector/bus cable - M12, 5 pin CAN-Bus

The 5-lead shielded cable is supplied with a female 5 pin M12 connector at one end and a male 5 pin M12 connector at the other end.
Available lengths are 0.3 m, 2 m, 5 and 10 m.
Cable diameter: 6.7 ±0.2 mm



Order code:

	KAB - xM - M12/5F/G - M12/5M/G - CAN
IP69:	**KAB - xM - M12/5F/G/69K - M12/5M/G/69K - CAN**

xM = length in m

T-piece for bus cable M12, 5 pin CAN-Bus

Order code:

KAB - TCONN - M12/5M - 2M12/5F - CAN

Terminating resistance M12, 5 pin CAN-Bus

Order code:

KAB - RTERM - M12/5M/G - CAN

Applicable for cable carriers

Maximum movement speed	3 m/s
Maximum acceleration	5 m/s^2
Minimum bending radius	10 x cable diameter

Reliability Characteristics

Models	PH36, PH58, PH68, PH68K, PH68KR	
Outputs	**single-channel**	
	U2	Voltage output 0,5 ... 10 V
	U8	Voltage output 0,5 ... 4,5 V
	I1	Current output 4 ... 20 mA
	MCANOP	CAN-BUS (CANopen)
	dual-channel	
	U2R	Voltage output 0,5 ... 10 V, redundant
	U8R	Voltage output 0,5 ... 4,5 V, redundant
	I1R	Current output 4 ... 20 mA, redundant
	MCANOPR	CAN-BUS, redundant (CANopen)
Characteristics	Device type	B
	Life period (electronics) $MTTF_d$	320 years / channel*)
	Probability of failure PFH (λ_{DU})	350 Fit / channel
	Working life	10 years
	Life period (mechanics) B_{10}	$1.2^* 10^9$ revolutions
	Probability of failure (mechanics) λ_{MECH}	0,1* Ch / B100,1 * Ch / B_{10} Ch = cycles per hour
	Allowable shaft load (10 mm solid shaft, 6 mm hollow shaft)	100 N radial, 100 N axial
Standards	Functional Safety	IEC 61508-1, -2, -6
	Safety of machinery	ISO 13849-1
	Failure rate of electronic components (Siemens)	SN 29500

*) = Reference Conditions: Reference Supply Voltage UBREF= 24 V, Reference Temperature ϑREF= 60 °C