ASM®
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POSIWIRE®

Cable Extension Position Sensors

WS12
Position Sensor

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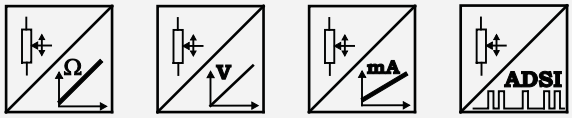
Analog output, SSI output

Sensor features

- **Measurement range up to 3000 mm**
- **Protection class IP67 (with mating connector only)**
- **Analog output, SSI output**



Specifications

Output	**R1K** = Potentiometer 1 kΩ **10V** = Voltage 0 ... 10 V **420A** = Current 4 ... 20 mA, 2 wire **420T** = Current 4 ... 20 mA, 3 wire **PMUI** = Current output, programmable **PMUV** = Voltage output, programmable **ADSI** = Signal conditioner SSI 12 bit,replaced by MSSI12 **ADSI14** = Signal conditioner SSI 14 bit,replaced by MSSI14 **ADSI16** = Signal conditioner SSI 16 bit,replaced by MSSI16
Resolution	Analog: quasi infinite
Linearity	±0.10% f.s. (standard) ±0.05% f.s. (optional)
Sensing device	Precision potentiometer
Housing material	Aluminium, stainless steel and plastic measuring cable: stainless steel
Protection class	IP67 (with mating connector only)
Connection	Connector M12, 8 pin
Temperature range	-20 ... +85 °C
Weight	Up to 1500 mm approx. 1 kg, from 2000 mm approx. 1,5 kg
EMC	DIN EN 61326-1:2013

Cable forces typical at = 20 °C	Measurement range	Maximum pull-out force	Minimum pull-in force
	[mm]	[N]	[N]
	100	5.2	2.8
	125	4.6	2.5
	500	5.9	2.6
	1000	5.5	2.4
	1250	4.8	2.1
	1500	10.4	6.4
	2000	8.1	5.0
	2500	6.7	4.0
	3000	6.2	3.0

Order code

WS12 – 1 – 2 – 3 – 4 – 5

1 Measurement range (in mm)

100 / 125 / 500 / 1000 / 1250 / 1500 / 2000 / 2500 / 3000

2 Output

R1K	= Potentiometer 1 kΩ
10V	= Voltage 0 ... 10 V
420A	= Current 4 ... 20 mA, 2 wire
420T	= Current 4 ... 20 mA, 3 wire
PMUI	= Current output, programmable
PMUV	= Voltage output, programmable
ADSI	= Signal conditioner SSI 12 bit,replaced by MSSI12
ADSI14	= Signal conditioner SSI 14 bit,replaced by MSSI14
ADSI16	= Signal conditioner SSI 16 bit,replaced by MSSI16

3 Linearity

L10	= ±0.10% f.s. (standard)
L05	= ±0.05% f.s. (optional)

4 Cable fixing

M4	= M4 cable fixing
SB0	= cable clip

5 Connection

M12	= Connector M12, 8 pin

Order example

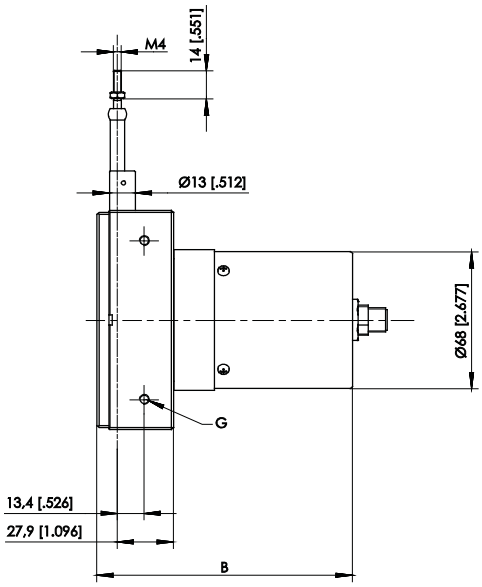
WS12 – 3000 – 10V – L10 – M4 – M12

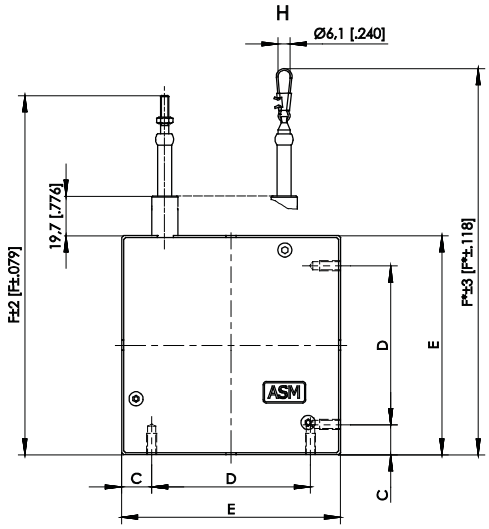
Accessories:

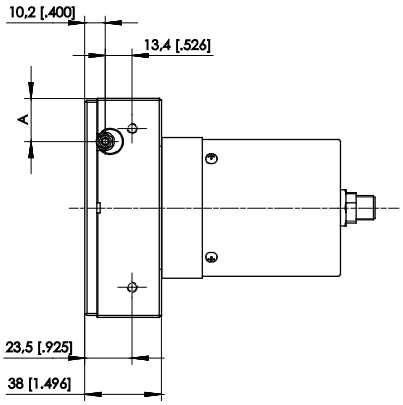
Connector cable (see page 48)

Dimensions

Measurement range 100 … 3000 mm, analog output, SSI output







Dimensions in mm	Measurement range	A	B	C	D	E	F	F*
	100; 500; 1000	18.3	112	14	43	71	141	154
	125; 1250	14.5	112	14	43	71	141	154
	1500	10.7	127	14	43	71	141	154
	2000	21.5	127	15	79	109	179	192
	2500	13.3	127	15	79	109	179	192
	3000	9.2	127	15	79	109	179	192

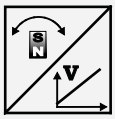
G – 4 x M5 - 10 [.394] deep
H – Option SB0

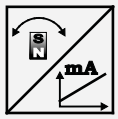
Dimensions in mm [inch]
Dimensions informative only.
For guaranteed dimensions consult factory.

Magnetic encoder, analog output

Sensor features

- **With magnetic absolute encoder**
- **Measurement range up to 3000 mm**
- **Protection class IP67 (with mating connector only)**
- **Analog output**
- **Absolute measurement**





Specifications

Output	**U2** = Voltage 0.5 ... 10 V **U8** = Voltage 0.5 ... 4.5 V **I1** = Current 4 ... 20 mA, 3 wire
Resolution	<0.002% f.s.
Linearity	±0.10% f.s. (standard) ±0.05% f.s. (optional)
Sensing device	Magnetic absolute encoder
Housing material	Aluminium, stainless steel and plastic measuring cable: stainless steel
Protection class	IP67 (with mating connector only)
Connection	Connector M12, 5 pin (standard) Connector M12, 8 pin (optional)
Shock	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
Vibration	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
Temperature range	-20 ... +85 °C
Weight	Up to 1500 mm approx. 1 kg, from 2000 mm approx. 1,5 kg
EMC	DIN EN 61326-1:2013

Order code

WS12 – [1] – [2] – [3] – [4] – [5] – [6]

1 Measurement range (in mm)

500 / 1000 / 1250 / 1500 / 2000 / 2500 / 3000

2 Output

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

3 Signal characterisitics

A	= increasing signal (e.g. 4 ... 20 mA)
D	= decreasing signal (e.g. 20 ... 4 mA)

4 Linearity

L10	= ±0.10% f.s. (standard)
L05	= ±0.05% f.s. (optional)

5 Cable fixing

M4	= M4 cable fixing
SB0	= cable clip

6 Connection

M12A5	= Connector M12, 5 pin (standard)
M12A8	= Connector M12, 8 pin (optional)

Order example

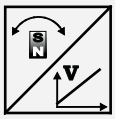
WS12 – 3000 – U2 – A – L10 – M4 – M12A5

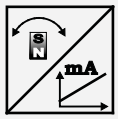
Accessories:
Connector cable (see page 46)

Magnetic encoder, analog output, programmable

Sensor features

- **With magnetic absolute encoder**
- **Measurement range up to 3000 mm**
- **Protection class IP67 (with mating connector only)**
- **Analog output, programmable**
- **Absolute measurement**





Specifications

Output	**U2/PMU** **U8/PMU** **I1/PMU**	= Voltage 0.5 ... 10 V, programmable = Voltage 0.5 ... 4.5 V, programmable = Current 4 ... 20 mA, 3 wire, programmable
Resolution	<0.002% f.s.	
Linearity	±0.10% f.s. (standard) ±0.05% f.s. (optional)	
Sensing device	Magnetic absolute encoder	
Housing material	Aluminium, stainless steel and plastic measuring cable: stainless steel	
Protection class	IP67 (with mating connector only)	
Connection	Connector M12, 5 pin	
Shock	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks	
Vibration	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles	
Temperature range	-20 ... +85 °C	
Weight	Up to 1500 mm approx. 1 kg, from 2000 mm approx. 1,5 kg	
EMC	DIN EN 61326-1:2013	

Order code

WS12 – [1] – [2] – [3] – [4] – [5] – [6]

1 Measurement range (in mm)

500 / 1000 / 1250 / 1500 / 2000 / 2500 / 3000

2 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

3 Signal characteristics

A	= increasing signal (e.g. 4 ... 20 mA)
D	= decreasing signal (e.g. 20 ... 4 mA)

4 Linearity

L10	= ±0.10% f.s. (standard)
L05	= ±0.05% f.s. (optional)

5 Cable fixing

M4	= M4 cable fixing
SB0	= cable clip

6 Connection

M12A5	= Connector M12, 5 pin

Order example

WS12 – 3000 – U2/PMU – A – L10 – M4 – M12A5

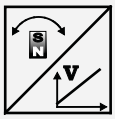
Accessories:

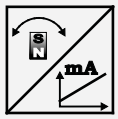
Connector cable (see page 47)

Magnetic encoder, analog output, redundant

Sensor features

- **With magnetic absolute encoder**
- **Measurement range up to 3000 mm**
- **Protection class IP67 (with mating connector only)**
- **Analog output, redundant**
- **Absolute measurement**





Specifications

Output	**U2R** **U8R** **I1R**	= Voltage 0.5 ... 10 V, redundant = Voltage 0.5 ... 4.5 V, redundant = Current 4 ... 20 mA, 3 wire, redundant
Resolution	<0.002% f.s.	
Linearity	±0.10% f.s. (standard) ±0.05% f.s. (optional)	
Sensing device	Magnetic absolute encoder	
Housing material	Aluminium, stainless steel and plastic measuring cable: stainless steel	
Protection class	IP67 (with mating connector only)	
Connection	Connector M12, 8 pin	
Shock	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks	
Vibration	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles	
Temperature range	-20 ... +85 °C	
Weight	Up to 1500 mm approx. 1 kg, from 2000 mm approx. 1,5 kg	
EMC	DIN EN 61326-1:2013	

Order code

WS12 – 1 – 2 – 3 – 4 – 5 – 6

1 Measurement range (in mm)

500 / 1000 / 1250 / 1500 / 2000 / 2500 / 3000

2 Output

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

3 Signal characteristics

A/A	= Output 1 increasing, output 2 increasing
A/D	= Output 1 increasing, output 2 decreasing
D/D	= Output 1 decreasing, output 2 decreasing

4 Linearity

L10	= ±0.10% f.s. (standard)
L05	= ±0.05% f.s. (optional)

5 Cable fixing

M4	= M4 cable fixing
SB0	= cable clip

6 Connection

M12A8	= Connector M12, 8 pin

Order example

WS12 – 3000 – I1R – A/D – L10 – M4 – M12A8

Accessories:

Connector cable (see page 48)

Magnetic encoder, digital output SSI

Sensor features

- **With magnetic absolute encoder**
- **Measurement range up to 3000 mm**
- **Protection class IP67 (with mating connector only)**
- **Digital output SSI**
- **Absolute measurement**

Specifications

Output	**MSSI** = SSI synchronous serial interface
Resolution	10 / 50 / 100
Linearity	±0.10% f.s. (standard) ±0.05% f.s. (optional)
Sensing device	Magnetic absolute encoder
Housing material	Aluminium, stainless steel and plastic measuring cable: stainless steel
Protection class	IP67 (with mating connector only)
Connection	Connector M12, 8 pin
Shock	DIN EN 60068-2-27:2010, 100 g/11 ms, 100 shocks
Vibration	DIN EN 60068-2-6:2008, 20 g 10 Hz-2 kHz, 10 cycles
Temperature range	-20 ... +85 °C
Weight	Up to 1500 mm approx. 1 kg, from 2000 mm approx. 1,5 kg
EMC	DIN EN 61326-1:2013

Order code

WS12 – [1] – [2] – [3] – [4] – [5] – [6]

1 Measurement range (in mm)

500 / 1000 / 1250 / 1500 / 2000 / 2500 / 3000

2 Resolution (in µm)

10 / 50 / 100

3 Output

MSSI	= SSI synchronous serial interface

4 Linearity

L10	= ±0.10% f.s. (standard)
L05	= ±0.05% f.s. (optional)

5 Cable fixing

M4	= M4 cable fixing
SB0	= cable clip

6 Connection

M12A8	= Connector M12, 8 pin

Order example

WS12 – 3000 – 50 – MSSI – L10 – M4 – M12A8

Accessories:
Connector cable (see page 48)

Magnetic encoder, digital output CAN Bus

Sensor features

- **With magnetic absolute encoder**
- **Measurement range up to 3000 mm**
- **Protection class IP67 (with mating connector only)**
- **Digital output CAN Bus**
- **Absolute measurement**
- **Optional redundant CAN Bus**

Specifications

Output	**MCANOP** = CANopen **MCANJ1939** = CAN SAE J1939 **MCANOPR** = CANopen redundant **MCANJ1939R** = CAN SAE J1939 redundant
Resolution	setting via CAN Bus
Linearity	±0.10% f.s. (standard) ±0.05% f.s. (optional)
Sensing device	Magnetic absolute encoder
Housing material	Aluminium, stainless steel and plastic measuring cable: stainless steel
Protection class	IP67 (with mating connector only)
Connection	Connector M12, 5 pin
Temperature range	-20 ... +85 °C
Weight	Up to 1500 mm approx. 1 kg, from 2000 mm approx. 1,5 kg
EMC	DIN EN 61326-1:2013

Cable forces for sensors with magnetic encoder

Cable forces typical at = 20 °C	Measurement range	Maximum pull-out force	Minimum pull-in force
	[mm]	[N]	[N]
	100	5.2	2.8
	125	4.6	2.5
	500	5.9	2.6
	1000	5.5	2.4
	1250	4.8	2.1
	1500	10.4	6.4
	2000	8.1	5.0
	2500	6.7	4.0
	3000	6.2	3.0

Order code

WS12 – [1] – [2] – [3] – [4] – [5]

1 Measurement range (in mm)

500 / 1000 / 1250 / 1500 / 2000 / 2500 / 3000

2 Output

MCANOP	= CANopen
MCANJ1939	= CAN SAE J1939
MCANOPR	= CANopen redundant
MCANJ1939R	= CAN SAE J1939 redundant

3 Linearity

L10	= ±0.10% f.s. (standard)
L05	= ±0.05% f.s. (optional)

4 Cable fixing

M4	= M4 cable fixing
SB0	= cable clip

5 Connection

M12/CAN	= Connector M12, 5 pin

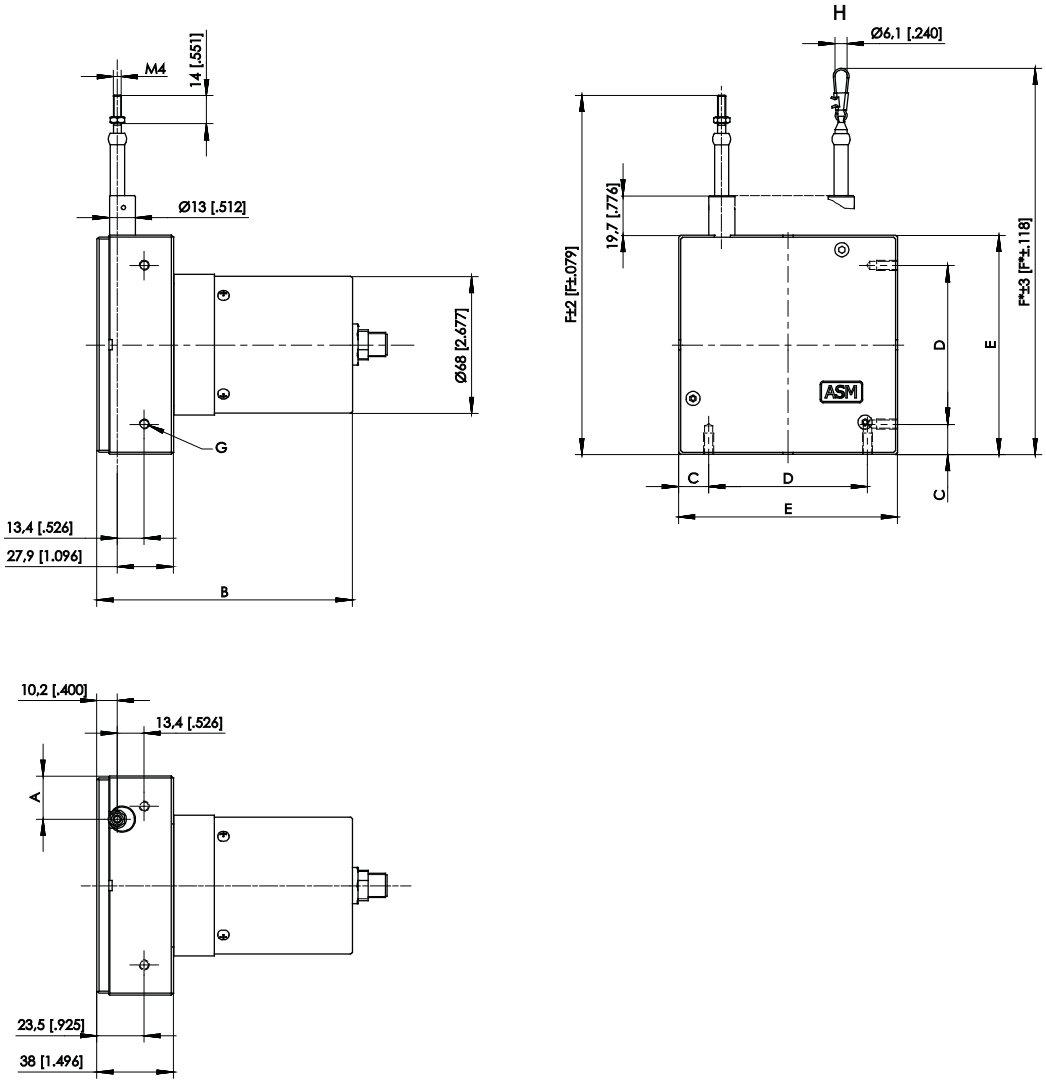
Order example

WS12 – 3000 – MCANOP – L10 – M4 – M12/CAN

Accessories:
Connector cable (see page 49)

Dimensions

Measurement range 500 … 3000 mm, magnetic encoder output



Dimensions in mm	Measurement range	A	B	C	D	E	F	F*
	500; 1000	18.3	112	14	43	71	141	154
	1250	14.5	112	14	43	71	141	154
	1500	10.7	127	14	43	71	141	154
	2000	21.5	127	15	79	109	179	192
	2500	13.3	127	15	79	109	179	192
	3000	9.2	127	15	79	109	179	192

G – 4 x M5 - 10 [.394] deep
H – Option SB0

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

Incremental encoder output

Sensor features

- **Measurement range up to 3000 mm**
- **Protection class IP67 (with mating connector only)**
- **Incremental encoder output**

Specifications

Output	**PP530** = Incremental output 5 ... 30 V **IE41LI** = Incremental encoder TTL compatible **IE41HI** = Incremental encoder HTL compatible
Resolution	10 or 5 pulses / mm (40 or 20 edges / mm)
Linearity	±0.05% f.s.
Sensing device	Incremental encoder
Housing material	Aluminium, stainless steel and plastic measuring cable: stainless steel
Protection class	IP67 (with mating connector only)
Connection	Connector M12, 8 pin
Temperature range	-20 ... +85 °C
Weight	Up to 1500 mm approx. 1 kg, from 2000 mm approx. 1,5 kg
EMC	DIN EN 61326-1:2013

Cable forces Typical at = 20 °C	**Measurement range**	**Maximum pull-out force**	**Minimum pull-in force**
	[mm]	[N]	[N]
	1250	6.6	2.7
	1500	10.6	6.5
	2000	5.7	4.1
	2500	5.7	4.1
	3000	5.8	4.0

Order code

WS12 – [1] – [2] – [3] – [4] – [5]

1 Measurement range (in mm)

1250 / 1500 / 2000 / 2500 / 3000

2 Resolution

10	= 10 pulses / mm (1250, 1500 mm)
05	= 5 pulses / mm (2000, 2500, 3000 mm)

other numbers of pulses on request

3 Output

PP530	= Incremental output 5 ... 30 V
IE41LI	= Incremental encoder TTL compatible
IE41HI	= Incremental encoder HTL compatible

4 Cable fixing

M4	= M4 cable fixing
SB0	= cable clip

5 Connection

M12	= Connector M12, 8 pin

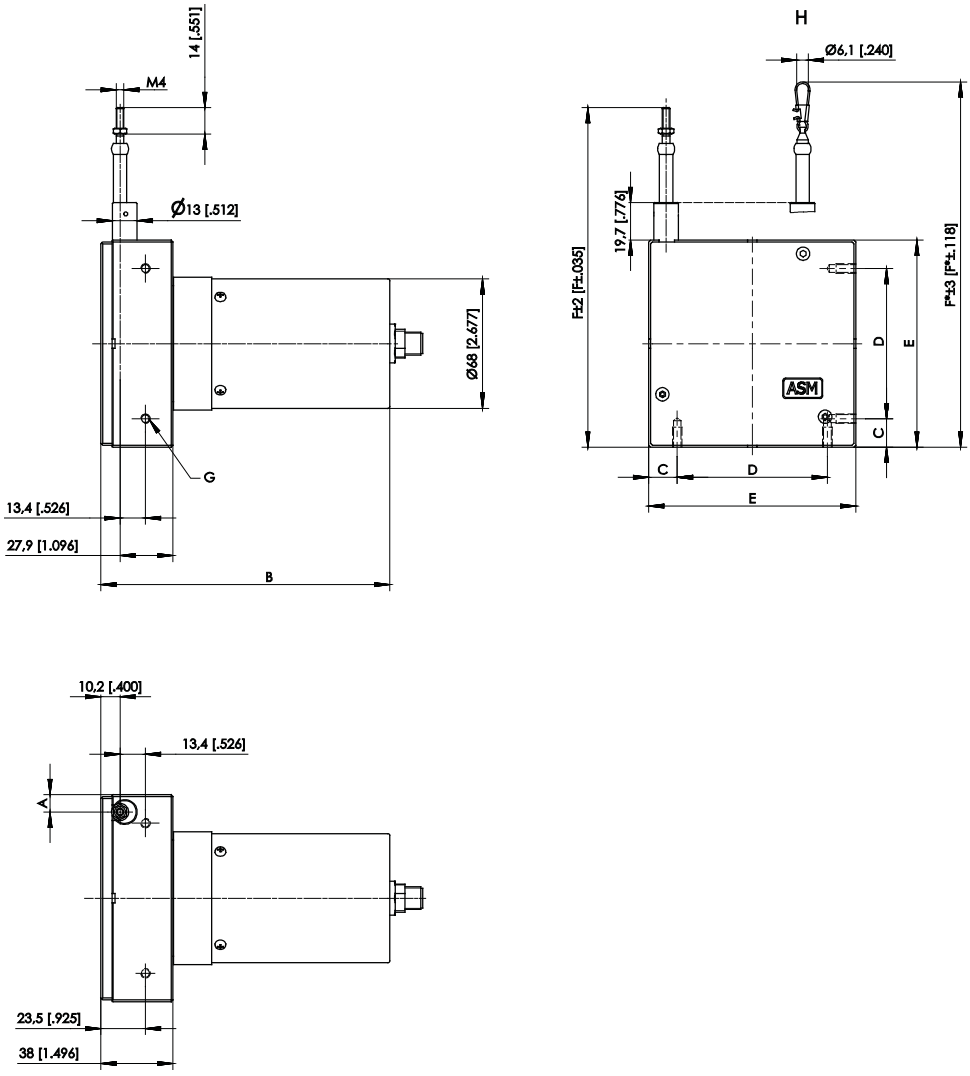
Order example

WS12 – 3000 – 5 – PP530 – M4 – M12

Accessories:
Connector cable (see page 48)

Dimensions

Measurement range 1250 … 3000 mm, incremental encoder output



Dimensions in mm	Measurement range	A	B	C	D	E	F	F*
	1250	18.3	137	14	43	71	141	154
	1500	10.7	152	14	43	71	141	154
	2000	9.2	152	15	79	109	179	192
	2500	9.2	152	15	79	109	179	192
	3000	9.2	152	15	79	109	179	192

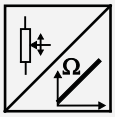
G – 4 x M5 - 10 [.394] deep
H – Option SB0

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

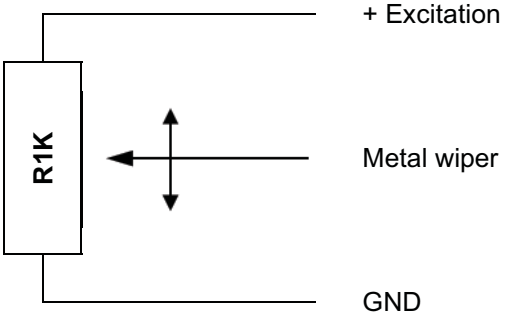
Output specifications

Analog outputs

Voltage divider R1K

Potentiometer 	Excitation voltage	32 V DC max. at 1 kΩ (max. power 1 W)
	Potentiometer impedance	1 kΩ ±10 %
	Thermal coefficient	±25 x 10^{-6} / °C f.s.
	Sensitivity	Depends on the measuring range, individual sensitivity of the sensor is specified on the label
	Voltage divider utilization range	approx. 3 % … 97 %
	Operating temperature	Refer to output specification
	EMC	DIN EN 61326-1:2013

Output signals



Note:

The metal wiper of the potentiometer must be protected against current load!

Electrical current flow impact on the wiper causes linearity errors and shortens the lifetime of the potentiometer.

Additional information:

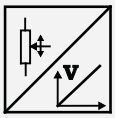
http://www.asm-sensor.com/asm/pdf/pro/ws_poti_technote_en.pdf

Signal wiring

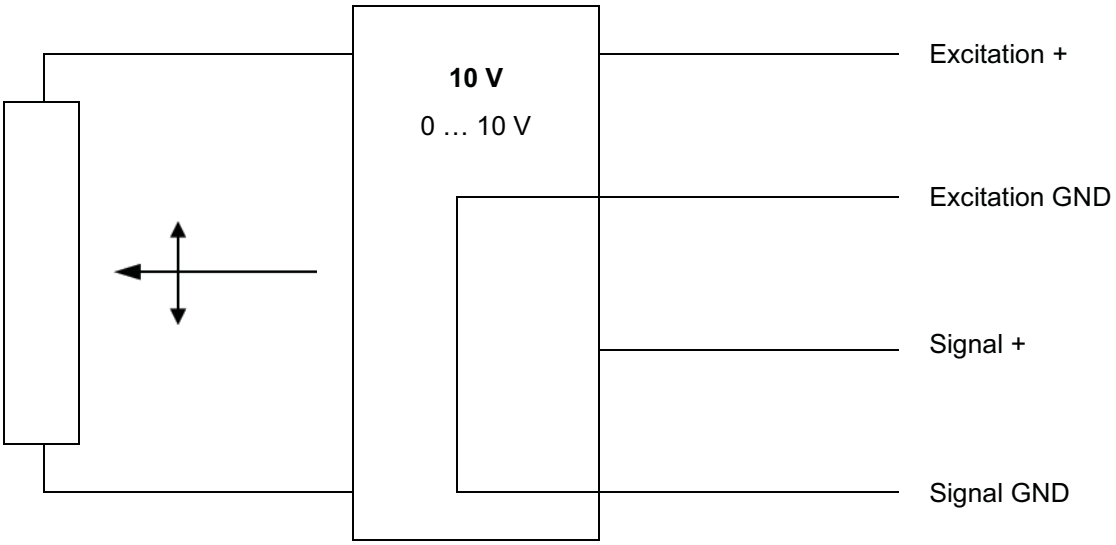
Signal	Connector pin no.	Cable color	Cable color
Poti +	1	white	brown
Poti GND	2	brown	white
Poti slider	3	green	blue
-	4	yellow	black
-	5	grey	-
-	6	pink	-
-	7	blue	-
-	8	red	-

View to sensor connector	 CONN-M12-8F	

Signal conditioner 10V and 10V5

Voltage output 	Excitation voltage	18 ... 27 V DC non stabilized
	Excitation current	20 mA max.
	Output voltage	**10V**: 0 ... 10 V DC; **10V5**: 0.5 ... 10 V DC
	Output current	2 mA max.
	Output load	> 5 kΩ
	Stability (temperature)	±50 x 10^{-6} / °C f.s.
	Protection	Reverse polarity, short circuit
	Output noise	0.5 mV_{RMS}
	Operating temperature	Refer to output specification
	EMC	DIN EN 61326-1:2013

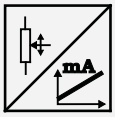
Output signals



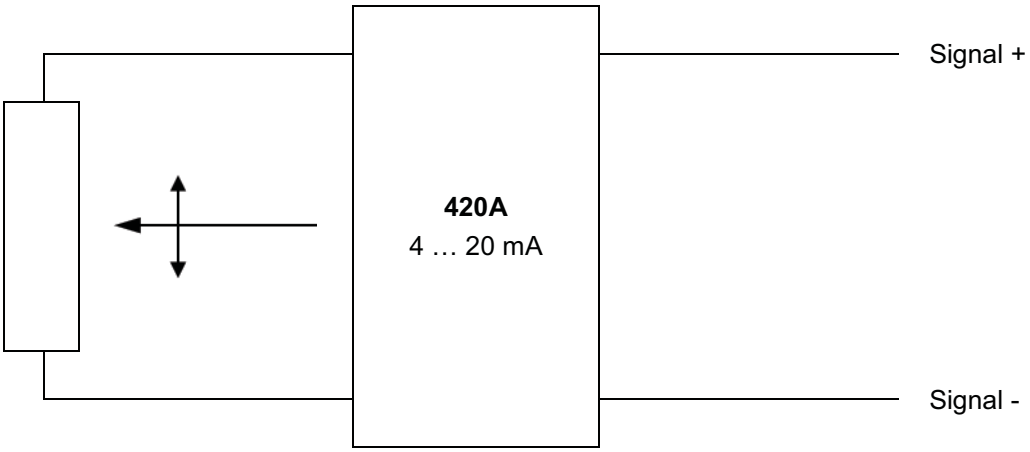
Signal wiring

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
Signal +	3	green	
Signal GND	4	yellow	
Not connected	5	grey	
Not connected	6	pink	
Not connected	7	blue	
Not connected	8	red	CONN-M12-8F

Signal conditioner 420A

Current output (2 wire) 	Excitation voltage	12 ... 27 V DC non stabilized, measured at the sensor terminals
	Excitation current	35 mA max.
	Output current	4 ... 20 mA equivalent for 0 ... 100 % range
	Stability (temperature)	±100 x 10^{-6} / °C f.s.
	Protection	Reversed polarity, short circuit
	Output noise	0.5 mV_{eff}
	Operating temperature	Refer to output specification
	EMC	DIN EN 61326-1:2013

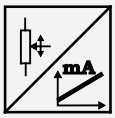
Output signals



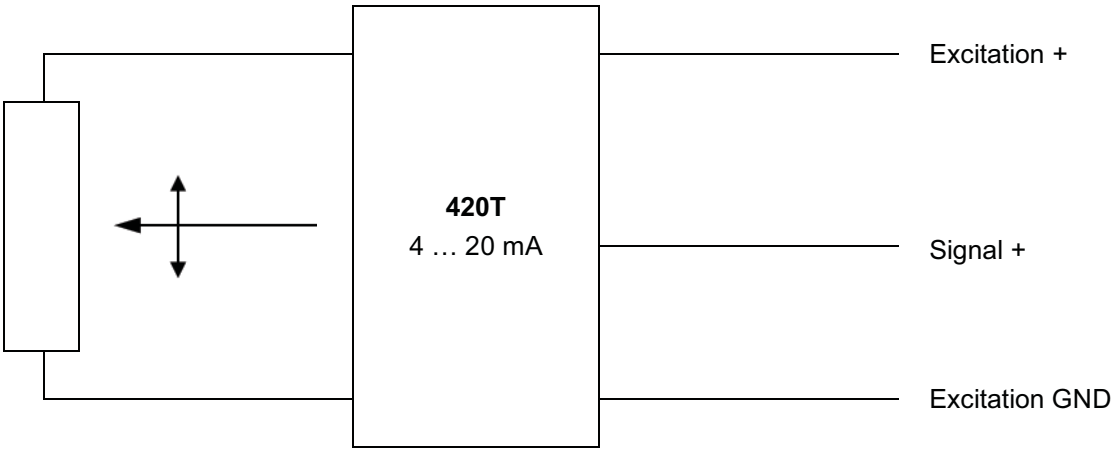
Signal wiring

Signal	Connector pin no.	Cable color	View to sensor connector
Signal +	1	white	
Signal -	2	brown	
Not connected	3	green	
Not connected	4	yellow	
Not connected	5	grey	
Not connected	6	pink	
Not connected	7	blue	
Not connected	8	red	CONN-M12-8F

Signal conditioner 420T

Current output (3 wire) 	Excitation voltage	18 ... 27 V DC non stabilized
	Excitation curren	40 mA max.
	Load resistor	350 Ω max.
	Output current	4 ... 20 mA equivalent for 0 ... 100 % range
	Stability (temperature)	±50 x 10^{-6} / °C f.s.
	Protection	Reverse polarity, short circuit
	Output noise	0.5 mV_{RMS}
	Operating temperature	Refer to output specification
	EMC	DIN EN 61326-1:2013

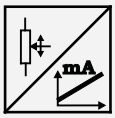
Output signals



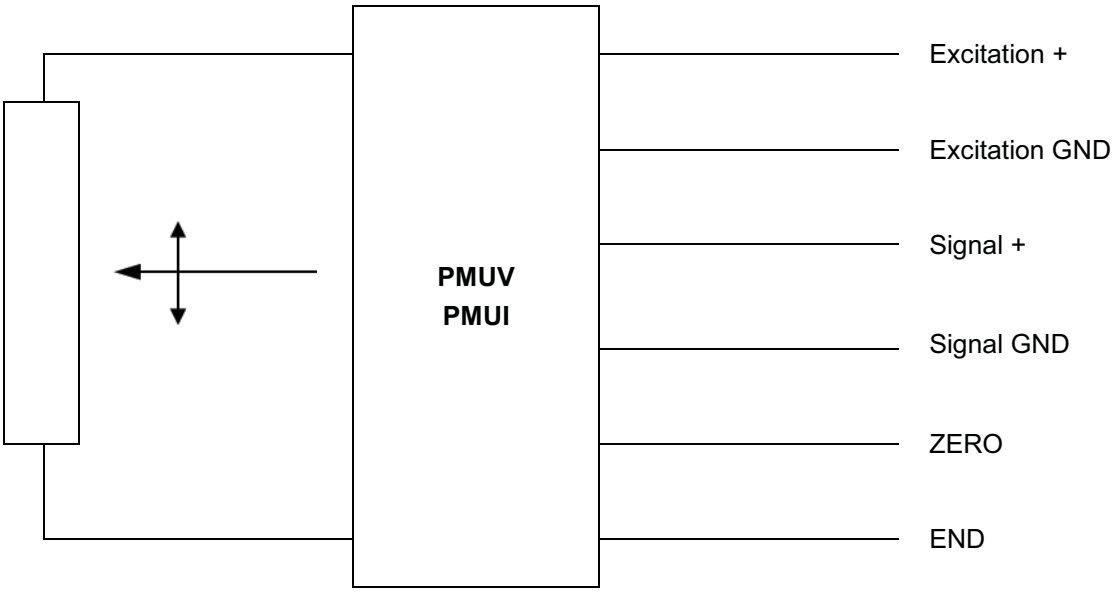
Signal wiring

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
Signal +	3	green	
Not connected	4	yellow	
Not connected	5	grey	
Not connected	6	pink	
Not connected	7	blue	
Not connected	8	red	CONN-M12-8F

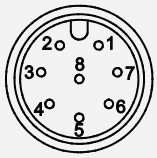
Signal conditioner PMUI / PMUV

Voltage or current output (3 wire) 	Excitation voltage		18 … 27 V DC
	Excitation current		50 mA max.
	Voltage output **PMUV** Output current Output load		0 … 10 V 10 mA max. 1 kΩ min.
	Current output **PMUI** Working resistance		4 … 20 mA (3 wire) 500 Ω max.
	Scaling		
		Activation of offset and gain adjust	Connect with excitation GND (0 V)
		Scalable range	90 % max. f.s.
	Stability (temperature)		±50 x 10^{-6} / °C f.s.
	Operating temperature		Refer to output specification
	Protection		Reversed polarity, short circuit
	EMC		DIN EN 61326-1:2013

Output signals



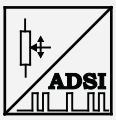
Signal wiring PMUV / PMUI

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
Signal +	3	green	
Signal GND	4	yellow	
Not connected	5	grey	
Not connected	6	pink	
ZERO	7	blue	
END	8	red	CONN-M12-8F

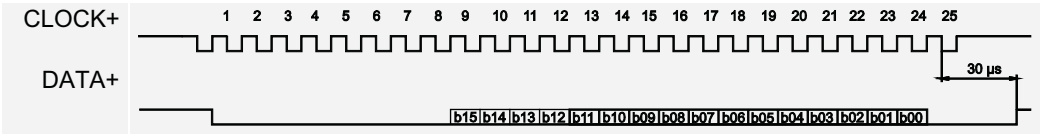
Signal wiring PMUI2

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
Not connected	3	green	
Not connected	4	yellow	
Signal +	5	grey	
Signal GND	6	pink	
ZERO	7	blue	
END	8	red	CONN-M12-8F

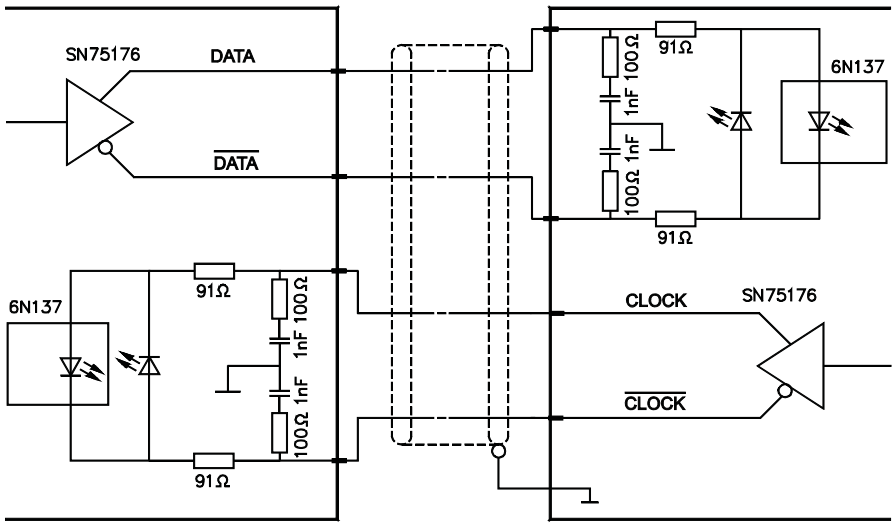
Signal conditioner ADSI

A/D converted synchronous serial 	Excitation volatge	11 ... 27 V DC
	Excitation current	200 mA max.
	Interface	EIA RS422, RS485, short-circuit proof
	Clock frequency	70 ... 500 kHz
	Code	Gray-Code, continuous progression
	Delay between pulse trains	30 µs min.
	Resolution	ADSI16: 16 bit (65536 counts) f.s. ADSI14: 14 bit (16384 counts) f.s. ADSI: 12 bit (4096 counts) f.s.
	Stability (temperature)	±50 x 10^{-6} / °C f.s.
	Operating temperature	-20 ... +85 °C
	EMC	DIN EN 61326-1:2013

Data format
(train of 26 pulses)



Recommended processing circuit



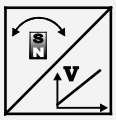
Transmission rate	Cable length	Baud rate
	< 50 m	< 300 kHz
	< 100 m	< 100 kHz

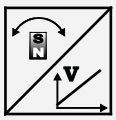
Note:
Extension of the cable length will reduce the maximum transmission rate.

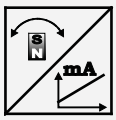
Signal wiring

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND (0 V)	2	brown	
CLOCK	3	green	
$\overline{\text{CLOCK}}$	4	yellow	
DATA	5	grey	
$\overline{\text{DATA}}$	6	pink	
Shield, not connected	7	blue	
Not connected	8	red	CONN-M12-8F

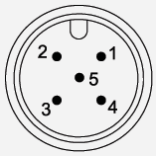
Magnetic encoder, analog output

U2 Voltage output 0.5 ... 10 V 	Excitation voltage	8 … 36 V DC
	Excitation current	20 mA typical at 24 V DC 38 mA typical at 12 V DC max. 50 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	DIN EN 61326-1:2013

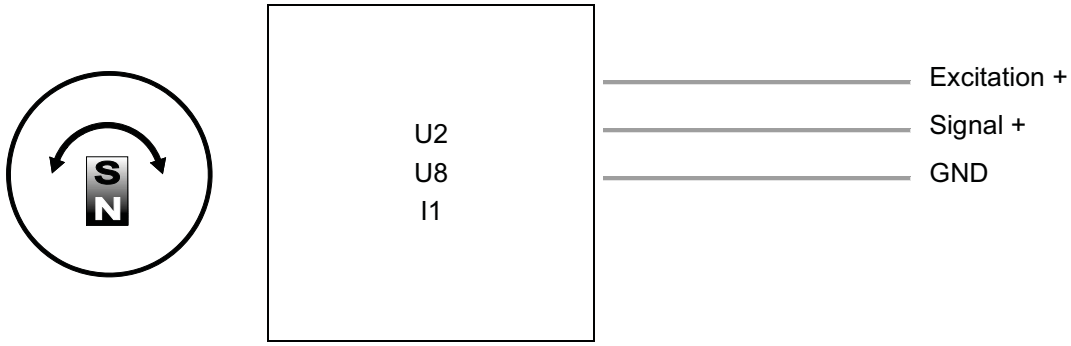
U8 Voltage output 0.5 … 4.5 V 	Excitation voltage	8 … 36 V DC
	Excitation current	17 mA typical at 24 V DC 32 mA typical at 12 V DC 50 mA max.
	Output voltage	0.5 … 4.5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	DIN EN 61326-1:2013

I1 Current output 4 … 20 mA, 3 wires 	Excitation voltage	8 … 36 V DC
	Excitation current	typical 36 mA at 24 V DC typical 70 mA at 12 V DC 120 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	DIN EN 61326-1:2013

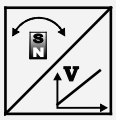
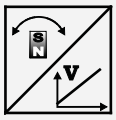
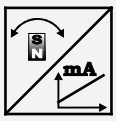
Signal wiring

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)	

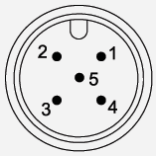
Signal diagram



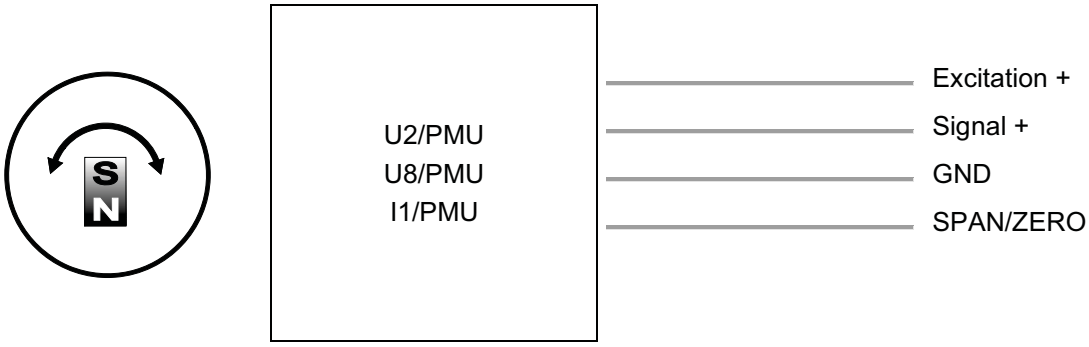
Magnetic encoder, analog output, programmable

U2/PMU Voltage output 0.5 ... 10 V 	Excitation voltage	8 … 36 V DC
	Excitation current	20 mA typical at 24 V DC 38 mA typical at 12 V DC max. 50 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 Voltage output 0.5 … 4.5 V 	Excitation voltage	8 … 36 V DC
	Excitation current	17 mA typical at 24 V DC 32 mA typical at 12 V DC max. 50 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	DIN EN 61326-1:2013
I1/PMU Current output 4 … 20 mA, 3 wires 	Excitation voltage	8 … 36 V DC
	Excitation current	typical 36 mA at 24 V DC typical 70 mA at 12 V DC max. 120 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	DIN EN 61326-1:2013

Signal wiring

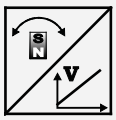
Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	brown	
Signal	2	white	
GND	3	blue	
Do not connect!	4	black	
SPAN/ZERO	5	grey	

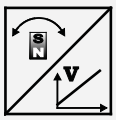
Signal diagram

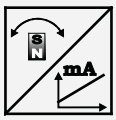


Option -PMU
Programming of the start and end value by the customer
Teach-In of start and end value for the options U2/PMU, I1/PMU, U8/PMU is provided by a binary signal SPAN/ZERO. At the start position connect signal SPAN/ZERO for a period of 2 … 3 seconds to GND via push button. At the end position connect signal SPAN/ZERO for a period of 5 … 6 seconds to GND via a push button. The scaling teached in that way will be stored non-volatile.
To reset the sensor to factory default signal ZERO/END must be connected to ground while powering up the sensor for 2 … 3 seconds. For the option PMZ only teach-in of ZERO position is possible.

Magnetic encoder, analog output, redundant

U2R Voltage output 0.5 ... 10 V 	Excitation voltage	8 … 36 V DC
	Excitation current	20 mA typical at 24 V DC 38 mA typical at 12 V DC max. 50 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 specification of the respective sensor
	EMC	DIN EN 61326-1:2013

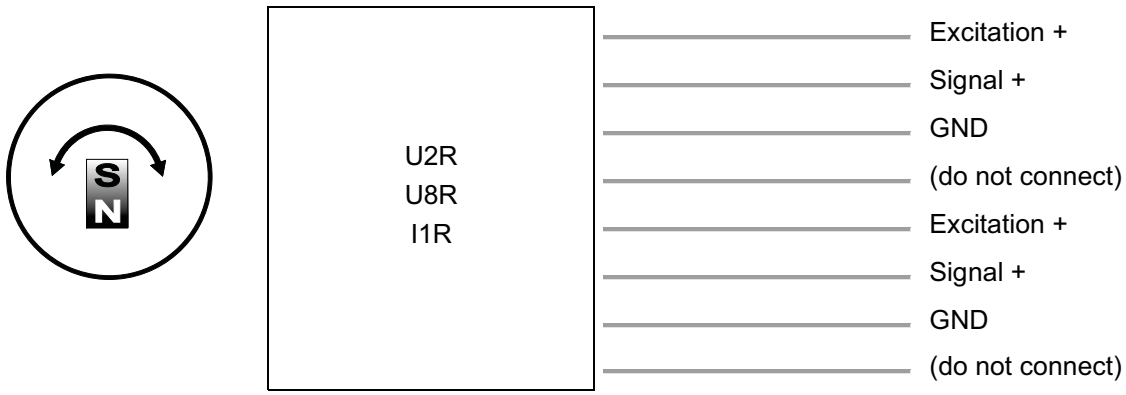
U8R Voltage output 0.5 … 4.5 V 	Excitation voltage	8 … 36 V DC
	Excitation current	17 mA typical at 24 V DC 32 mA typical at 12 V DC max. 50 mA per channel
	Output voltage	0.5 … 4.5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	See specification of the respective sensor
	EMC	DIN EN 61326-1:2013

I1R Current output 4 … 20 mA, 3 wires 	Excitation voltage	8 … 36 V DC
	Excitation current	36 mA typical at 24 V DC 76 mA typical at 12 V DC max. 120 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	DIN EN 61326-1:2013

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	

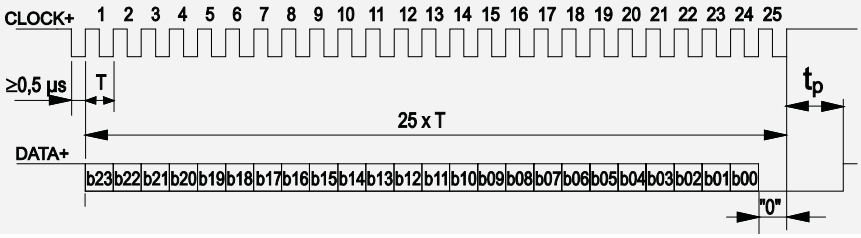
Signal diagram



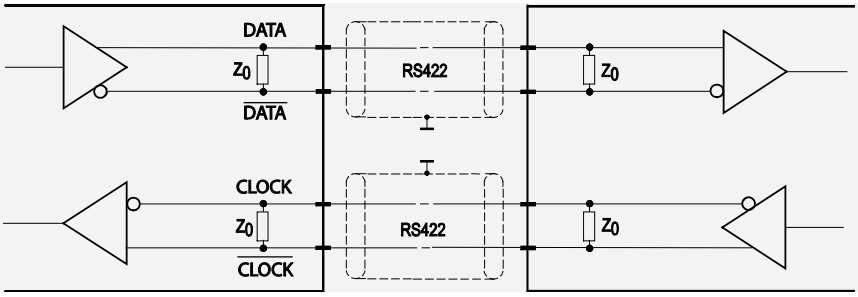
Magnetic encoder, digital output SSI

MSSI Synchronous serial SSI 	Interface	EIA RS-422
	Excitation voltage	8 ... 36 V DC
	Excitation current	19 mA typical at 24 V DC 35 mA typical at 12 V DC max. 80 mA
	Clock frequency	100 kHz ... 500 kHz
	Code	Gray-Code, continuous progression
	Delay between pulse trains (t_p)	30 µs min.
	Stability (temperature)	±50 x 10^{-6} / °C f.s. (typical)
	Operating temperature	See specification of the respective sensor
	Protection	Reverse polarity, short circuit
	EMC	DIN EN 61326-1:2013

Data format
(Train of 26 pulses)



Recommended processing circuit



Transmission rate	Cable length	Baud rate
	50 m	100-400 kHz
	100 m	100-300 kHz

Note:
Extension of the cable length will reduce the maximum transmission rate.

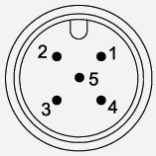
Signal wiring

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
CLOCK	3	green	
$\overline{\text{CLOCK}}$	4	yellow	
DATA	5	grey	
$\overline{\text{DATA}}$	6	pink	
-	7	blue	
-	8	red	

Magnetic encoder, digital output CANopen

MCANOP, CANOPR CANopen	CAN specification	ISO 11898, Basic and Full CAN 2.0 B
	Communication profile	CANopen CiA 301 V 4.02, Slave
	Encoder profile	Encoder CiA 406 V 3.2
	Error Control	Node Guarding, Heartbeat, Emergency Message
	Node ID	Adjustable via LSS or SDO, default: 127
	PDO	3 TxPDO, 0 RxPDO, no linking, static mapping
	PDO Modes	Event-/Time triggered, Remote-request, Sync cyclic/acyclic
	SDO	1 Server, 0 Client
	CAM	8 cams
	Certified	Yes
	Transmission rate	50 kBit bis 1 Mbit, adjustable via LSS or SDO, default: 125 kBit
	Bus connection	M12 conncector, 5 pin
	Integrated bus terminating resistor	120Ω adjustable by the customer
	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	

Magnetic encoder, digital output CAN SAE J1939

MCANJ1939/R CAN SAE J1939	CAN Specification		ISO 11898, Basic and Full CAN 2.0 B
	Transceiver		24V-compliant, not isolated
	Communication profile		SAE J1939
	Baud Rate		250 kbit/s
	Internal termination resistor		120 Ω adjustable by the customer
	Address		Default 247d, configurable

NAME Fields	Arbitrary address capable	1	Yes
	Industry group	0	Global
	Vehicle system	7Fh (127d)	Non specific
	Vehicle system instance	0	
	Function	FFh (255d)	Non specific
	Function instance	0	
	ECU instance	0	
	Manufacturer	145h (325d)	Manufacturer ID
	Identity number	0nnn	Serial number 21 bit

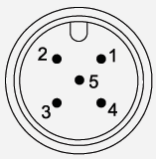
Parameter Group Numbers (PGN)	Configuration data	PGN EF00h	Proprietary-A (PDU1 peer-to-peer)
	Process data	PGN FFnnh	Proprietary-B (PDU2 broadcast); nn Group Extension (PS) configurable

Specifications	Excitation voltage	8 ... 36 V DC
	Excitation current	20 mA typical at 24 V DC 40 mA typical at 12 V DC, max. 80 mA
	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.)
	EMV	EN 61326-1:2013

Signal wiring

Signal	Connector pin no.
Shield	1
Excitiation +	2
GND	3
CAN-H	4
CAN-L	5

View to the sensor connector

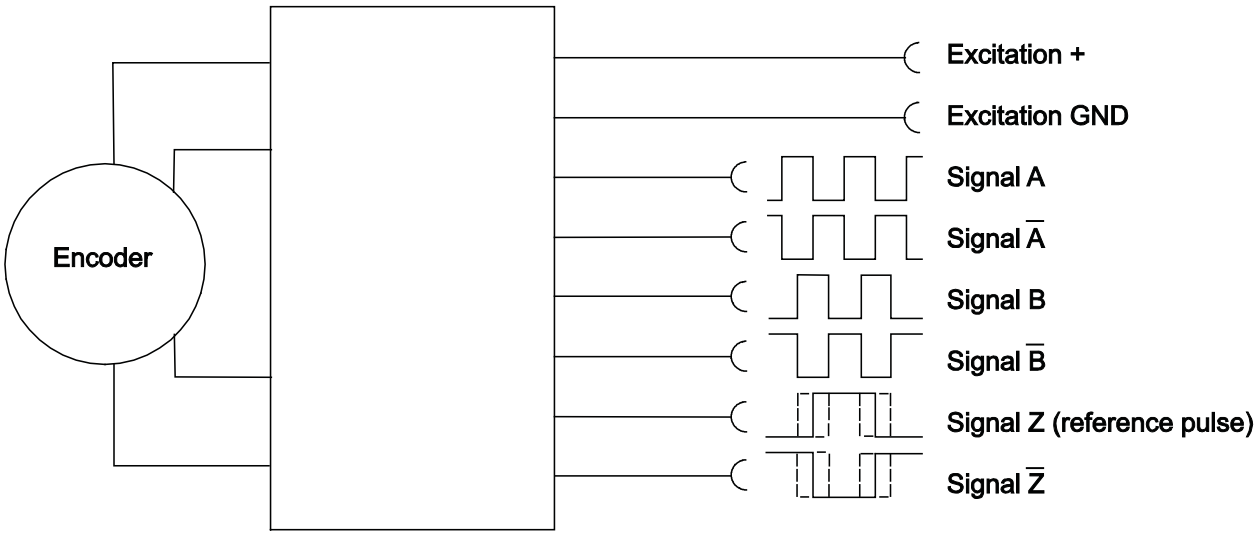


Incremental outputs

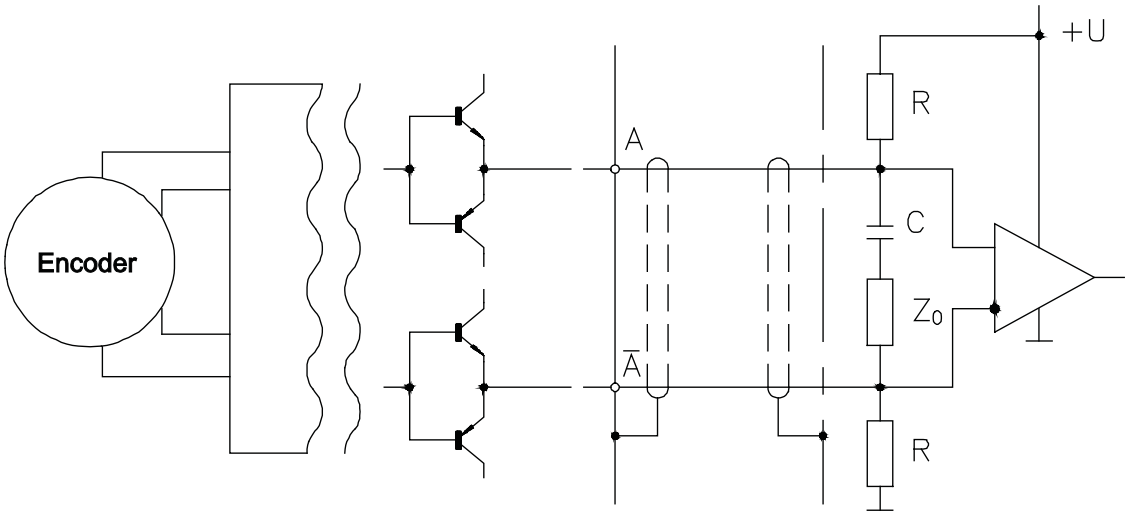
Signal conditioner PP530

Incremental 	Excitation voltage	5 ... 30 V DC
	Excitation current	25 mA typ. (w/o load), 200 mA max.
	Output frequency	200 kHz max.
	Output	Linedriver, Push-Pull, CMOS, TTL and HTL compatible
	Output current	30 mA max.
	Output voltage	Depends on the excitation voltage
	Saturation voltage high/low	I_a < 10 mA, U_b 5 V/24 V: < 0,5 V I_a < 30 mA, U_b 5 V/24 V: < 1 V
	Stability (temperature)	±20 x 10^{-6} / °C f.s. (sensor mechanism)
	Operation temperature	-10 … +70 °C
	Storage temperature	-30 … +80 °C
	Transition time positive edge	< 200 ns
	Transition time negative edge	< 200 ns
	Protection	Reverse polarity, short circuit
	EMC	DIN EN 61326-1:2013

Output signals



Recommended processing circuit



Signal wiring

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
Signal A	4	yellow	
Signal $\overline{A}$	6	pink	
Signal B (A + 90°)	3	green	
Signal $\overline{B}$	5	grey	
Signal Z (reference pulse)	7	blue	
Signal $\overline{Z}$	8	red	CONN-M12-8F

Signal conditioner IE41LI and IE41HI

		IE41LI	IE41HI
Incremental 	Excitation voltage	5 V DC ±10 %	10 … 30 V DC
	Excitation current	150 mA max. (w/o load)	
	Output frequency	300 kHz max.	200 kHz max.
	Output	RS422	Push-pull antivalent
	Output current	±30 mA max.	30 mA
	Output voltage	Depending on the excitation voltage	
	Stability (temperature)	±20 x 10^{-6} / °C f.s. (sensor mechanism)	
	Operating temperature	-10 … +70 °C	
	Protection against short circuit	One channel for 1 s	yes
	EMC	DIN EN 61326-1:2013	

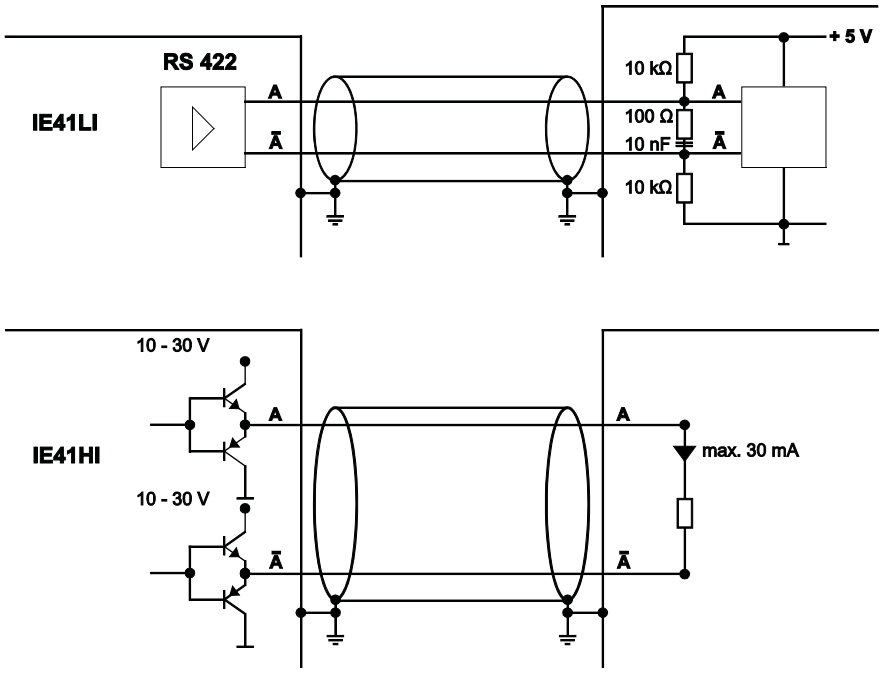
Signal wiring WS10

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
Signal A	4	yellow	
Signal $\overline{A}$	6	pink	
Signal B (A + 90°)	3	green	
Signal $\overline{B}$	5	grey	
Signal Z (reference pulse)	7	blue	
Signal $\overline{Z}$	8	red	CONN-M12-8F

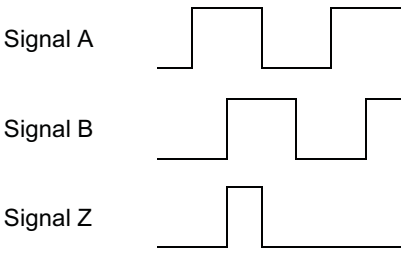
Signal wiring WS12

Signal	Connector pin no.	Cable color	View to sensor connector
Excitation +	1	white	
Excitation GND	2	brown	
Signal A	3	green	
Signal $\overline{A}$	5	grey	
Signal B (A + 90°)	4	yellow	
Signal $\overline{B}$	6	pink	
Signal Z (reference pulse)	7	blue	
Signal $\overline{Z}$	8	red	CONN-M12-8F

Recommended processing circuit



Output signals



Accessories

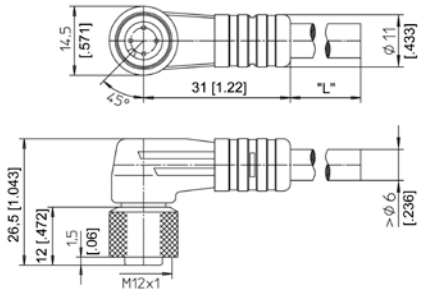
Connector cable M12, 4 pin

(angular coupling)

shielded connector

Suitable for 5-pin sensor connectors

The 4-core screened cable is supplied with a mating 4-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 - M12/4F/W - LITZE
IP69:	**KAB - xM - M12/4F/W/69K - LITZE**

xM = length in m

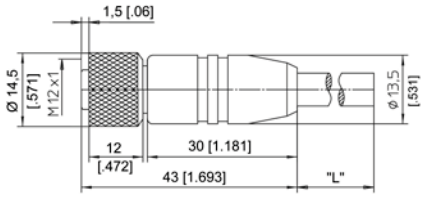
Connector cable M12, 4 pin

(straight coupling)

shielded connector

Suitable for 5-pin sensor connectors

The 4-core screened cable is supplied with a mating 4-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 - M12/4F/G - LITZE
IP69:	**KAB - xM - M12/4F/G/69K - LITZE**

xM = length in m

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

Applicable for cable carriers

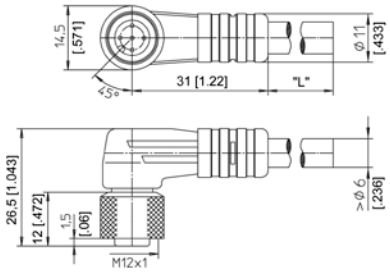
Maximum movement speed	3 m/s
Maximum acceleration	5 m/s^2
Minimum bending radius	10 x cable diameter

Connector cable M12, 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 mm²
Cable diameter: 5.6 ±0.2 mm



Order code

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

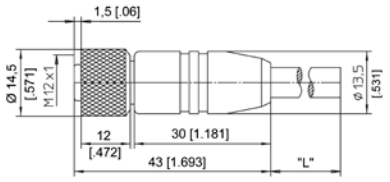
xM = length in m

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 mm²
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

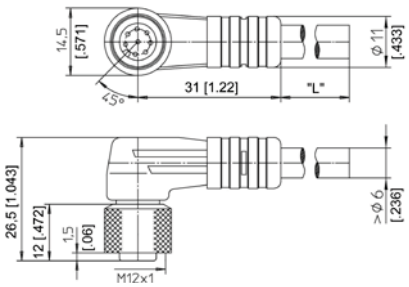
Maximum movement speed	3 m/s
Maximum acceleration	5 m/s²
Minimum bending radius	10 x cable diameter

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**

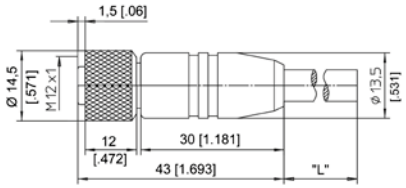
xM = length in m

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

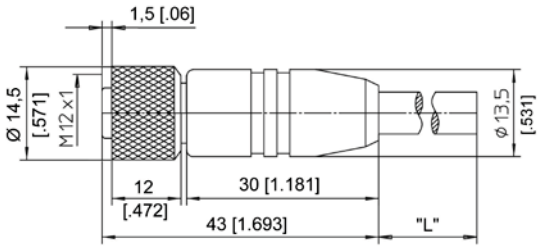
Signal wiring M12, 8 pin	**Plug connection / cable color**							
	1	2	3	4	5	6	7	8
	white	brown	green	yellow	grey	pink	blue	red

Applicable for cable carriers

Maximum movement speed	3 m/s
Maximum acceleration	5 m/s²
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-connector for bus cable M12, 5 pin CAN-Bus

Order code

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

Terminating resistor 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

Plug-in connector M12, 8 pin (straight coupling)

Order code: **CONN-M12-8F-G**

Cable diameter
max. 6 … 8 mm