

# DRAW WIRE SENSOR

Links to further documents for this series:

[Cable wiring](#)



## HX SERIES

### Key-Features:

- Measurement ranges 50 mm up to 50.8 m
- Intrinsically safe model (UL, CSA certified)
- Linearity up to  $\pm 0.1\%$
- Output: Analog, TTL
- 2 designs, depending on the full scale
- Easy installation
- Stainless steel wire
- Operating temperature max.  $-40\dots+95\text{ }^{\circ}\text{C}$
- Protection class IP68

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## TECHNICAL DATA

		HX-PA	HX-P420	HX-P510	HX-EP
Measurement range MR		50 mm up to 50.8 m (see Mechanical Data below)			
Linearity <sup>1)</sup>	[%]	MR ≤150: ±0.25 MR 250...640: ±0.15 MR ≥750: ±0.1	MR ≤150: ±0.3 MR 250...640: ±0.2 MR ≥750: ±0.15		±0.03
Repeatability	[%]	±0.015			
Resolution		theoretically infinite <sup>2)</sup>			see „Description HX-EP“
Output signal		1 kΩ ±10 %	4...20 mA	0...5 V, 0...10 V, ±5 V, ±10 V	TTL
Power supply		max. 30 V (AC, DC)	9...35 VDC	4.9...30 VDC	5 or 8...28 VDC
Protection class		IP65 / optional: IP68			
Humidity	[%]	100			
Operating temperature	[°C]	-40...+95		-40...+85	-20...+95
Storage temperature	[°C]	-55...+100	-40...+95	-55...+100	-40...+100
Shock resistance		50 g, 0.1 ms max.			
Vibration resistance		15 g, 0.1 ms max.			

<sup>1)</sup> measurement ranges listed in mm

<sup>2)</sup> depending on the quality of the power supply

## MECHANICAL DATA

Measure- ment range	Order code	Measurement range available for HX-...		Draw wire tension [N]	Draw wire diameter [mm]	Sensor weight [kg]	Housing	Lifespan (full cycles resp. metres)
		PA, P420, P510	EP					
50 mm	2	x		9.4	0.4	0.9	stainless steel and anodised aluminium	5,000,000 fc
75 mm	3	x		6.7	0.4	0.9		5,000,000 fc
100 mm	4	x		6.7	0.4	0.9		5,000,000 fc
125 mm	5	x		5.3	0.4	0.9		5,000,000 fc
150 mm	6	x		6.7	0.4	0.9		5,000,000 fc
250 mm	10	x	x	9.4	0.4	0.9		500,000 fc
390 mm	15	x		6.7	0.4	0.9		500,000 fc
500 mm	20	x		6.7	0.4	0.9		500,000 fc
640 mm	25	x	x	5.3	0.4	0.9		500,000 fc
750 mm	30	x		6.7	0.4	0.9		250,000 fc
1000 mm	40	x		6.7	0.4	0.9		250,000 fc
1250 mm	50	x	x	5.3	0.4	0.9		250,000 fc
1500 mm	60	x	x	6.7	0.4	0.9		250,000 fc
2000 mm	80	x	x	5.8	0.4	0.9		250,000 fc
2.5 m	100	x	x	10	0.6	3.1	stainless steel mounting base and corrosion-free thermoplastic housing	250,000 fc
3 m	120	x	x	10	0.6	3.1		250,000 fc
3.8 m	150	x	x	10	0.6	3.1		250,000 fc
5 m	200	x	x	10	0.6	3.1		250,000 fc
6.3 m	250	x	x	10	0.6	3.1		250,000 fc
7.5 m	300	x	x	10	0.6	3.1		250,000 fc
8.8 m	350	x	x	10	0.6	3.1		250,000 fc
10 m	400	x	x	10	0.6	3.1		250,000 fc
12.7 m	500	x	x	10	0.6	3.9		5,000,000 m
15.2 m	600	x	x	10	0.6	3.9		5,000,000 m
20.3 m	800	x	x	10	0.6	3.9		5,000,000 m
25.4 m	1000	x	x	10	0.6	5.4		5,000,000 m
30.4 m	1200	x	x	10	0.6	5.6		5,000,000 m
40.6 m	1600	x	x	10	0.6	6.4		5,000,000 m
45.7 m	1800	x	x	10	0.6	7.2		5,000,000 m
50.8 m	2000	x	x	10	0.5	7.4		5,000,000 m



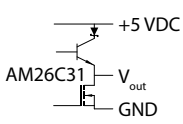
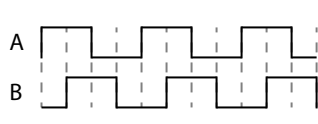
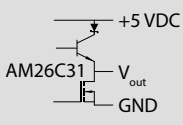
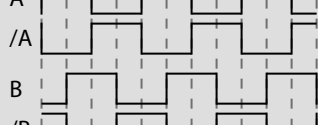
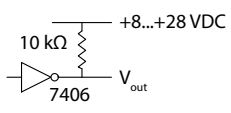
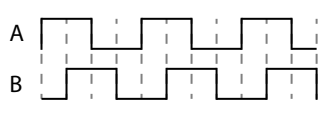
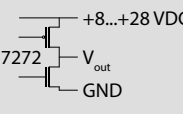
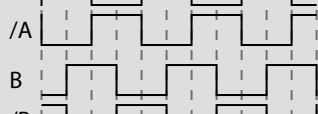
## DESCRIPTION HX-EP

### Resolution

Order code		HX-EP-10-...	HX-EP-25-...	HX-EP-50-...	HX-EP-60-...	HX-EP-80-...	HX-EP-...
Measurement range	[mm]	250	640	1250	1500	2000	≥2500
Resolution <sup>1)</sup>	[Pulses/mm]	19.69	9.84		8.1	6.11	3.26
Resolution tolerance	[%]	±0.3			±0.2		

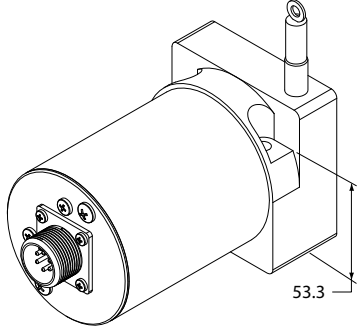
<sup>1)</sup> The resolution shown is a calculated number based on the capstan diameter, the rope wire diameter and the line count of the encoding device.

### Outputs

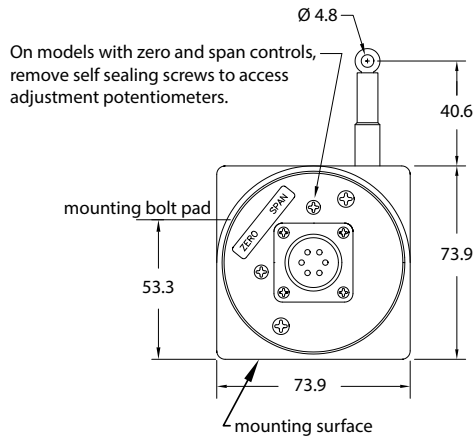
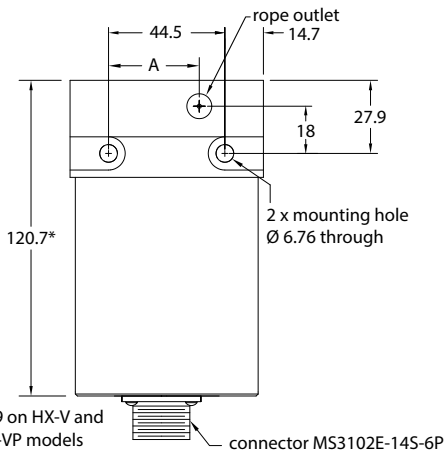
Option	Description	Output stage	Waveform	Pin assignment												
10	<b>TTL compatible, Open Collector, current sinking</b> Power supply: 5 VDC Signals: A, B			<table border="1"> <tr><td>+V<sub>in</sub></td><td>A</td></tr> <tr><td>GND</td><td>B</td></tr> <tr><td>Signal A</td><td>C</td></tr> <tr><td>Signal B</td><td>D</td></tr> <tr><td></td><td>E</td></tr> <tr><td></td><td>F</td></tr> </table>	+V <sub>in</sub>	A	GND	B	Signal A	C	Signal B	D		E		F
+V <sub>in</sub>	A															
GND	B															
Signal A	C															
Signal B	D															
	E															
	F															
30	<b>Push-Pull differential Line Driver</b> current sinking and current sourcing, compliant with the requirements of TIA/EIA-422-B Power supply: 5 VDC Signals: A, /A, B, /B			<table border="1"> <tr><td>+V<sub>in</sub></td><td>A</td></tr> <tr><td>GND</td><td>B</td></tr> <tr><td>Signal A</td><td>C</td></tr> <tr><td>Signal /A</td><td>D</td></tr> <tr><td>Signal B</td><td>E</td></tr> <tr><td>Signal /B</td><td>F</td></tr> </table>	+V <sub>in</sub>	A	GND	B	Signal A	C	Signal /A	D	Signal B	E	Signal /B	F
+V <sub>in</sub>	A															
GND	B															
Signal A	C															
Signal /A	D															
Signal B	E															
Signal /B	F															
50	<b>current sinking output</b> with internal pullup resistors 10 kΩ Power supply: 8...28 VDC Signals: A, B			<table border="1"> <tr><td>+V<sub>in</sub></td><td>A</td></tr> <tr><td>GND</td><td>B</td></tr> <tr><td>Signal A</td><td>C</td></tr> <tr><td>Signal B</td><td>D</td></tr> <tr><td></td><td>E</td></tr> <tr><td></td><td>F</td></tr> </table>	+V <sub>in</sub>	A	GND	B	Signal A	C	Signal B	D		E		F
+V <sub>in</sub>	A															
GND	B															
Signal A	C															
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70	<b>Push-Pull differential Line Driver</b> current sinking and current sourcing Power supply: 8...28 VDC Signals: A, /A, B, /B			<table border="1"> <tr><td>+V<sub>in</sub></td><td>A</td></tr> <tr><td>GND</td><td>B</td></tr> <tr><td>Signal A</td><td>C</td></tr> <tr><td>Signal /A</td><td>D</td></tr> <tr><td>Signal B</td><td>E</td></tr> <tr><td>Signal /B</td><td>F</td></tr> </table>	+V <sub>in</sub>	A	GND	B	Signal A	C	Signal /A	D	Signal B	E	Signal /B	F
+V <sub>in</sub>	A															
GND	B															
Signal A	C															
Signal /A	D															
Signal B	E															
Signal /B	F															

# TECHNICAL DRAWING

## Measurement ranges up to 2 m

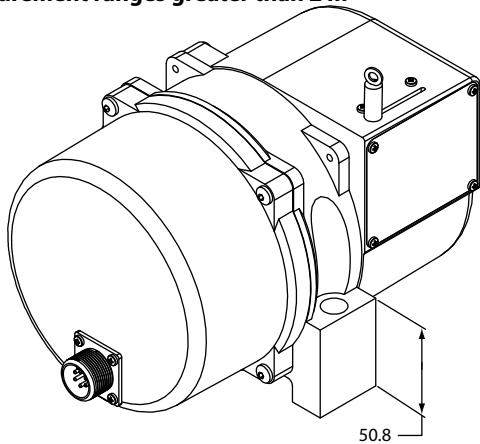


Measurement range [mm]	A [mm]
50 / 250	30.7
75 / 390 / 750	34.8
100 / 500 / 1000	38.9
125 / 640 / 1250	42.9
1500	46.7
2000	52.8



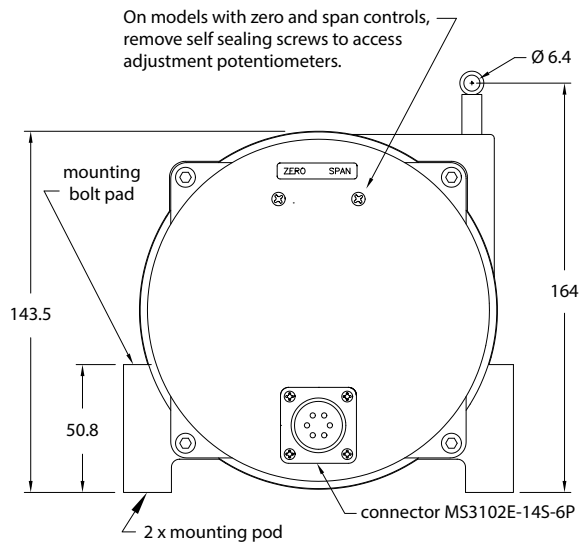
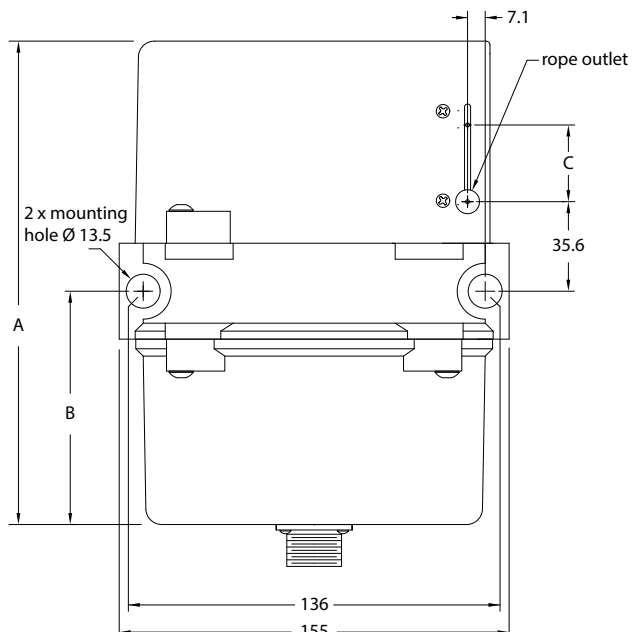
**Note:** Sensor mounts with M6 cylinder head screws.

## Measurement ranges greater than 2 m



Measurement range [m]	A [mm]	B [mm]
≤20.3	196	97
≥25.4	280	142

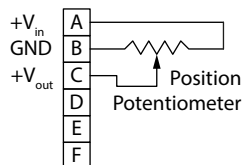
Dimension "C" is the cable offset that occurs as the cable is extended from the transducer.  
C = 0.0016 mm x E, where E = extension in mm.



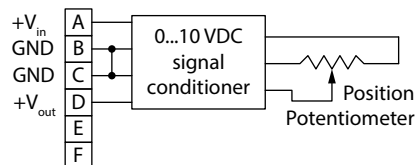
**Note:** Sensor mounts with M12 cylinder head screws.

## ELECTRICAL CONNECTION

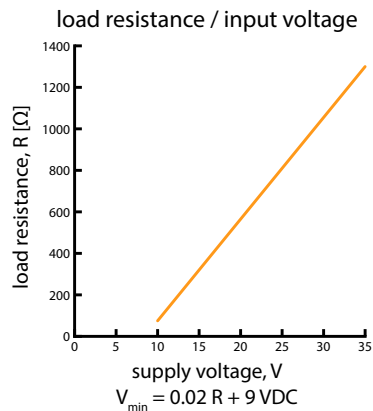
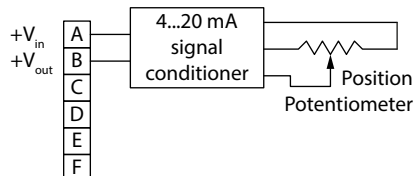
### HX-PA



### HX-P510



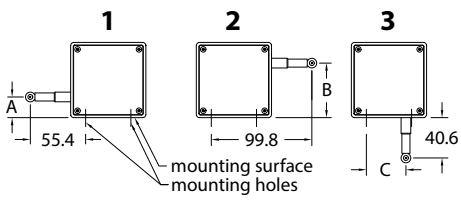
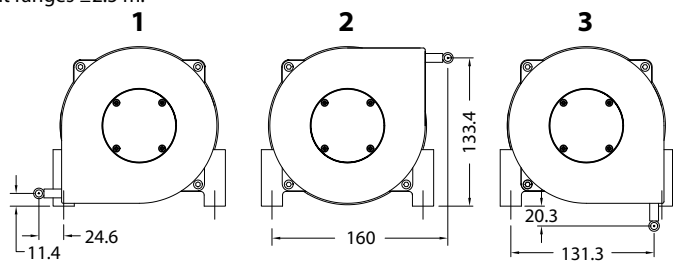
### HX-P420



## WARNING NOTICES

- Don't let the rope snap back. If the rope is retracted freely, this may lead to injuries (whiplash effect) and the device may be damaged.
- Caution when unhooking and retracting the rope into the sensor.
- Never exceed the specified measurement range when extracting the rope!
- Do not try to open the device. The stored energy of the spring drive may lead to injuries when being mishandled.
- Do not touch the rope when operating the sensor.
- Avoid guiding the rope over edges or corners. Use a deflection pulley instead.
- Do not operate the sensor if the rope is buckled or damaged. A ripping of the rope may lead to injuries or a damaging of the sensor.

## OPTIONS

Option	Order code	Description																												
Nylon jacketed draw wire (measurement ranges $\leq 2$ m)	N	Replaces standard stainless steel wire rope with $\varnothing 0.46$ mm nylon jacketed wire rope. This option increases wire life dramatically but may increase non-linearity by as much as $\pm 0.05\%$ of full scale.																												
Nylon jacketed draw wire (measurement ranges 2.5...12.7 m)	J	Replaces standard stainless steel wire rope with $\varnothing 0.94$ mm nylon jacketed wire rope. This option increases wire life dramatically but may increase non-linearity by as much as $\pm 0.05\%$ of full scale.																												
Inverted output signal	R	Output is at maximum when wire rope is fully retracted. Output decreases as wire rope is extended. (Does not apply to speed signal)																												
Protection class IP68 (only cable output)	2	Connector is replaced with a bulkhead fitting and a designated length of urethane jacketed, shielded twisted pair cable. Retraction mechanism and electrical components are sealed according to IP68.																												
Increased corrosion protection + IP68 (only cable output)	3	All external anodised aluminium parts of sensor are replaced with stainless steel and corrosion resistant plastic. Sensor is sealed according to IP68. Urethane jacketed, shielded twisted pair cable exits unit.																												
Different potentiometer resistance (MR $\geq 250$ mm, HX-PA only)	3, 4	3 = 5 k $\Omega$ 4 = 10 k $\Omega$ This option changes linearity as followed: Measurement ranges $\leq 640$ mm = $\pm 0.5\%$ Measurement ranges $\geq 750$ mm = $\pm 0.25\%$																												
Changed rope outlet	1, 2, 3	<p>Measurement ranges <math>\leq 2</math> m:</p>  <table border="1" data-bbox="1066 672 1508 958"> <thead> <tr> <th>Measurement range [mm]</th> <th>A [mm]</th> <th>B [mm]</th> <th>C [mm]</th> </tr> </thead> <tbody> <tr> <td>50 / 250</td> <td>28.4</td> <td>45.5</td> <td>30.7</td> </tr> <tr> <td>75 / 390 / 750</td> <td>24.4</td> <td>49.5</td> <td>34.8</td> </tr> <tr> <td>100 / 500 / 1000</td> <td>20.3</td> <td>53.6</td> <td>38.9</td> </tr> <tr> <td>125 / 640 / 1250</td> <td>16.3</td> <td>57.7</td> <td>42.9</td> </tr> <tr> <td>150 / 1500</td> <td>12.4</td> <td>61.5</td> <td>46.7</td> </tr> <tr> <td>2000</td> <td>6.4</td> <td>67.6</td> <td>52.8</td> </tr> </tbody> </table> <p>Measurement ranges <math>\geq 2.5</math> m:</p> 	Measurement range [mm]	A [mm]	B [mm]	C [mm]	50 / 250	28.4	45.5	30.7	75 / 390 / 750	24.4	49.5	34.8	100 / 500 / 1000	20.3	53.6	38.9	125 / 640 / 1250	16.3	57.7	42.9	150 / 1500	12.4	61.5	46.7	2000	6.4	67.6	52.8
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2000	6.4	67.6	52.8																											
Hazardous area protection (HX-P420 MR $\leq 20.3$ m only)	X	UL, CSA intrinsically safe Class 1, Division 1, Groups A, B, C, D Class 2, Groups E, F, G Class III, hazardous locations																												

## ORDER CODE HX-PA

HX-PA - [ ] - [ ] - [ ] - [ ] - N [ ] - [ ] - [ ] - [ ] - [ ]

<b>Measurement range MR</b> see „Mechanical Data“	
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<b>Draw wire</b> Standard stainless steel	S
Nylon jacketed (MR ≤ 2 m)	N
Nylon jacketed (MR 2.5...12.7 m)	J

<b>Draw wire tension</b> Standard	1
Reduced (MR ≤ 2 m)	2

<b>Rope outlet</b> Standard top	0
Left side	1
Right side	2
Bottom	3

<b>Potentiometer resistance</b> Standard 1 kΩ	1
5 kΩ (MR ≥ 250 mm)	3
10 kΩ (MR ≥ 250 mm)	4

<b>Output signal</b> Standard	S
Inverted	R

C	<b>Connector type IP65</b> Connector with mating connector Con. without mating connector
K	
N	<b>Connector type IP68</b> Cable with open ends Cable with connector at cable end
K	

B	<b>Connection type IP65</b> Connector output, 6-polig
P	<b>Connection type IP68</b> Cable output (0.3 m) Cable output (3 m) Cable output (4 m) Cable output (5 m) Cable output (6 m) Cable output (7 m)
3	
4	
5	
6	
7	

	<b>Housing option</b> Standard IP65 IP68 Corrosion protection + IP68
1	
2	
3	

## ORDER CODE HX-P420

HX-P420 - [ ] - [ ] - [ ] - [ ] - 0 [ ] - [ ] - [ ] - [ ]

<b>Measurement range MR</b> see „Mechanical Data“	
--	--

<b>Draw wire</b> Standard stainless steel	S
Nylon jacketed (MR ≤ 2 m)	N
Nylon jacketed (MR 2.5...12.7 m)	J

<b>Draw wire tension</b> Standard	1
Reduced (MR ≤ 2 m)	2

<b>Rope outlet</b> Standard top	0
Left side	1
Right side	2
Bottom	3

<b>Hazardous area protection</b> without	N
UL, CSA intrin. safe (MR ≤ 20.3 m)	X

<b>Output signal</b> Standard	S
Inverted	R

C	<b>Connector type IP65</b> Connector with mating connector Con. without mating connector
K	
N	<b>Connector type IP68</b> Cable with open ends Cable with connector at cable end
K	

B	<b>Connection type IP65</b> Connector output, 6-polig
P	<b>Connection type IP68</b> Cable output (0.3 m) Cable output (3 m) Cable output (4 m) Cable output (5 m) Cable output (6 m) Cable output (7 m)
3	
4	
5	
6	
7	

	<b>Housing option</b> Standard IP65 IP68 Corrosion protection + IP68
1	
2	
3	

## ORDER CODE HX-P510

HX-P510 - [ ] - [ ] - [ ] - [ ] - N 0 [ ] - [ ] - [ ] - [ ]

<b>Measurement range MR</b> see „Mechanical Data“	[ ]
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<b>Draw wire</b> Standard stainless steel	S
Nylon jacketed (MR ≤ 2 m)	N
Nylon jacketed (MR 2.5...12.7 m)	J

<b>Draw wire tension</b> Standard	1
Reduced (MR ≤ 2 m)	2

<b>Rope outlet</b> Standard top	0
Left side	1
Right side	2
Bottom	3

<b>Output signal</b> Standard	S
Inverted	R

C	<b>Connector type IP65</b> Connector with mating connector Con. without mating connector
K	
N	<b>Connector type IP68</b> Cable with open ends Cable with connector at cable end
K	

B	<b>Connection type IP65</b> Connector output, 6-polig
P	<b>Connection type IP68</b> Cable output (0.3 m) Cable output (3 m) Cable output (4 m) Cable output (5 m) Cable output (6 m) Cable output (7 m)
3	
4	
5	
6	
7	

1	<b>Housing option</b> Standard IP65 IP68 Corrosion protection + IP68
2	
3	

## ORDER CODE HX-EP

HX-EP - [ ] - [ ] - [ ] - [ ] - N [ ] - [ ] - [ ] - [ ]

<b>Measurement range MR</b> see „Mechanical Data“	[ ]
--	-----

<b>Draw wire</b> Standard stainless steel	S
Nylon jacketed (MR ≤ 2 m)	N
Nylon jacketed (MR 2.5...12.7 m)	J

<b>Draw wire tension</b> Standard	1
Reduced (MR ≤ 2 m)	2

<b>Rope outlet</b> Standard top	0
Left side	1
Right side	2
Bottom	3

<b>Output signal</b> Standard	S
Inverted	R

C	<b>Connector type IP65</b> Connector with mating connector Con. without mating connector
K	
N	<b>Connector type IP68</b> Cable with open ends Cable with connector at cable end
K	

B	<b>Connection type IP65</b> Connector output, 6-polig
P	<b>Connection type IP68</b> Cable output (0.3 m) Cable output (3 m) Cable output (4 m) Cable output (5 m) Cable output (6 m) Cable output (7 m)
3	
4	
5	
6	
7	

1	<b>Housing option</b> Standard IP65 IP68 Corrosion protection + IP68
2	
3	

## ACCESSORIES

### Connection cable for HX with IP65

10119-3M	3 m, with mating connector
10119-4M	4 m, with mating connector
10119-5M	5 m, with mating connector
10119-6M	6 m, with mating connector
10119-7M	7 m, with mating connector

### Connection cable for HX with IP68 and connector type K

10424-3M	3 m, with mating connector
10424-4M	4 m, with mating connector
10424-5M	5 m, with mating connector
10424-6M	6 m, with mating connector
10424-7M	7 m, with mating connector

Subject to change without prior notice.

**WayCon Positionsmesstechnik GmbH**

Email: [info@waycon.de](mailto:info@waycon.de)

Internet: [www.waycon.biz](http://www.waycon.biz)

**WayCon**

Positionsmesstechnik

**Headquarters Munich**

Siemensstr. 5

85521 Ottobrunn

Tel. +49 (0)89 67 97 13-0

**Office Cologne**

Auf der Pehle 1

50321 Brühl

Tel. +49 (0)89 67 97 13-100