

Temposonics®

Magnetostrictive Linear Position Sensors

RH Powerlink V2 Data Sheet

- Rugged industrial sensor
- Suitable for hydraulic cylinder integration
- Diagnostics LEDs



MEASURING TECHNOLOGY

The absolute, linear position sensors provided by MTS Sensors rely on the company's proprietary Temposonics® magnetostrictive technology, which can determine position with a high level of precision and robustness. Each Temposonics® position sensor consists of a ferromagnetic waveguide, a position magnet, a strain pulse converter and supporting electronics. The magnet, connected to the object in motion in the application, generates a magnetic field at its location on the waveguide. A short current pulse is applied to the waveguide. This creates a momentary radial magnetic field and torsional strain on the waveguide. The momentary interaction of the magnetic fields releases a torsional strain pulse that propagates the length of the waveguide. When the ultrasonic wave reaches the end of the waveguide it is converted into an electrical signal. Since the speed of the ultrasonic wave in the waveguide is precisely known, the time required to receive the return signal can be converted into a linear position measurement with both high accuracy and repeatability.

RH SENSOR

Robust, non-contact and wear-free, the Temposonics® linear position sensors provide the best durability and accurate position measurement solutions in harsh industrial environments. The position measurement accuracy is tightly controlled by the quality of the waveguide which is manufactured by MTS Sensors. The position magnet is mounted on the moving machine part and travels contactlessly over the sensor rod with the built-in waveguide.

Temposonics® RH is a robust, high-performance rod-style sensor for installation into a hydraulic cylinder. The sensor is suitable for long-term operation under harsh industrial environments such as steel industry and metalworking plants.

POWERLINK V2 INTERFACE

Temposonics® position sensors fulfil the requirements of the Ethernet Powerlink Standardization Group (EPG). Ethernet Powerlink V2 is an open protocol based on the Ethernet-standard according to IEEE 802.3. It is an extension to the Ethernet protocol which allows real-time data communication. Within the Ethernet Powerlink protocol a CANopen based communication protocol for user data is specified. Powerlink is the only Ethernet protocol that meets the high real-time requirements with a software-only concept. No special Powerlink hardware is needed.

Delivered information:

- Absolute position
- Velocity
- Status

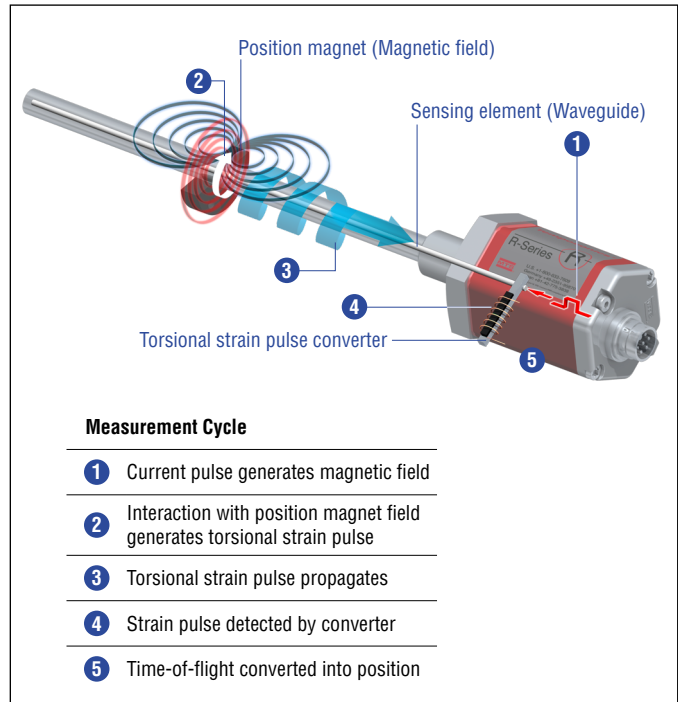


Fig. 1: Time-of-flight based magnetostrictive position sensing principle



Fig. 2: Typical application: Steel industry

TECHNICAL DATA

Output				
Interface	Ethernet POWERLINK			
Data protocol	POWERLINK V2 according to IEEE 802.3			
Measured value	Position, velocity / option: Multi-position measurement (2...4 positions) ¹			
Measurement parameters				
Resolution	1 µm, 2 µm, 5 µm, 10 µm, 50 µm or 100 µm (selectable)			
Cycle time	Stroke length	up to 2400 mm	up to 4800 mm	up to 7620 mm
	Cycle time	1.0 ms	2.0 ms	4.0 ms
Linearity ²	< ±0.01 % F.S. (minimum ±50 µm)			
Repeatability	< ±0.001 % F.S. (minimum ±2.5 µm) typical			
Hysteresis	< 4 µm typical			
Temperature coefficient	< 15 ppm/K typical			
Operating conditions				
Operating temperature	-40...+75 °C (-40...+167 °F)			
Humidity	90 % relative humidity, no condensation			
Ingress protection ³	IP67 (correctly fitted)			
Shock test	100 g (single shock), IEC standard 60068-2-27			
Vibration test	15 g / 10...2000 Hz, IEC standard 60068-2-6 (excluding resonant frequencies)			
EMC test	Electromagnetic emission according to EN 61000-6-3			
	Electromagnetic immunity according to EN 61000-6-2 The sensor meets the requirements of the EU directives and is marked with CE			
Operating pressure	350 bar (5076 psi) / 700 bar (10,153 psi) peak (at 10 × 1 min), RH-J: 800 bar (11,603 psi)			
Magnet movement velocity	Any			
Design / Material				
Sensor electronics housing	Aluminum			
Sensor flange	Stainless steel 1.4305 (AISI 303)			
Sensor rod	Stainless steel 1.4306 (AISI 304L) / RH-J: Stainless steel 1.4301 (AISI 304)			
Stroke length	25...7620 mm (1...300 in.)			
Mechanical mounting				
Mounting position	Any			
Mounting instruction	Please consult the technical drawings and the operation manual (document number: 551657)			
Electrical connection				
Connection type	2 × M12 female connector (5 pin), 1 × M8 male connector (4 pin)			
Operating voltage ⁴	+24 VDC (-15 / +20 %); UL recognition requires an approved power supply with energy limitation (UL 61010-1), or Class 2 rating according to the National Electrical Code (USA) / Canadian Electrical Code.			
Ripple	≤ 0.28 V _{pp}			
Current consumption ⁴	110 mA typical			
Dielectric strength	500 VDC (DC ground to machine ground)			
Polarity protection	Up to -30 VDC			
Overvoltage protection	Up to 36 VDC			

1/ The number of magnets depends on the stroke length

2/ With position magnet # 251 416-2

3/ The IP rating is not part of the UL approval

4/ Power supply must be able to provide current of 1 A for power up process

TECHNICAL DRAWINGS

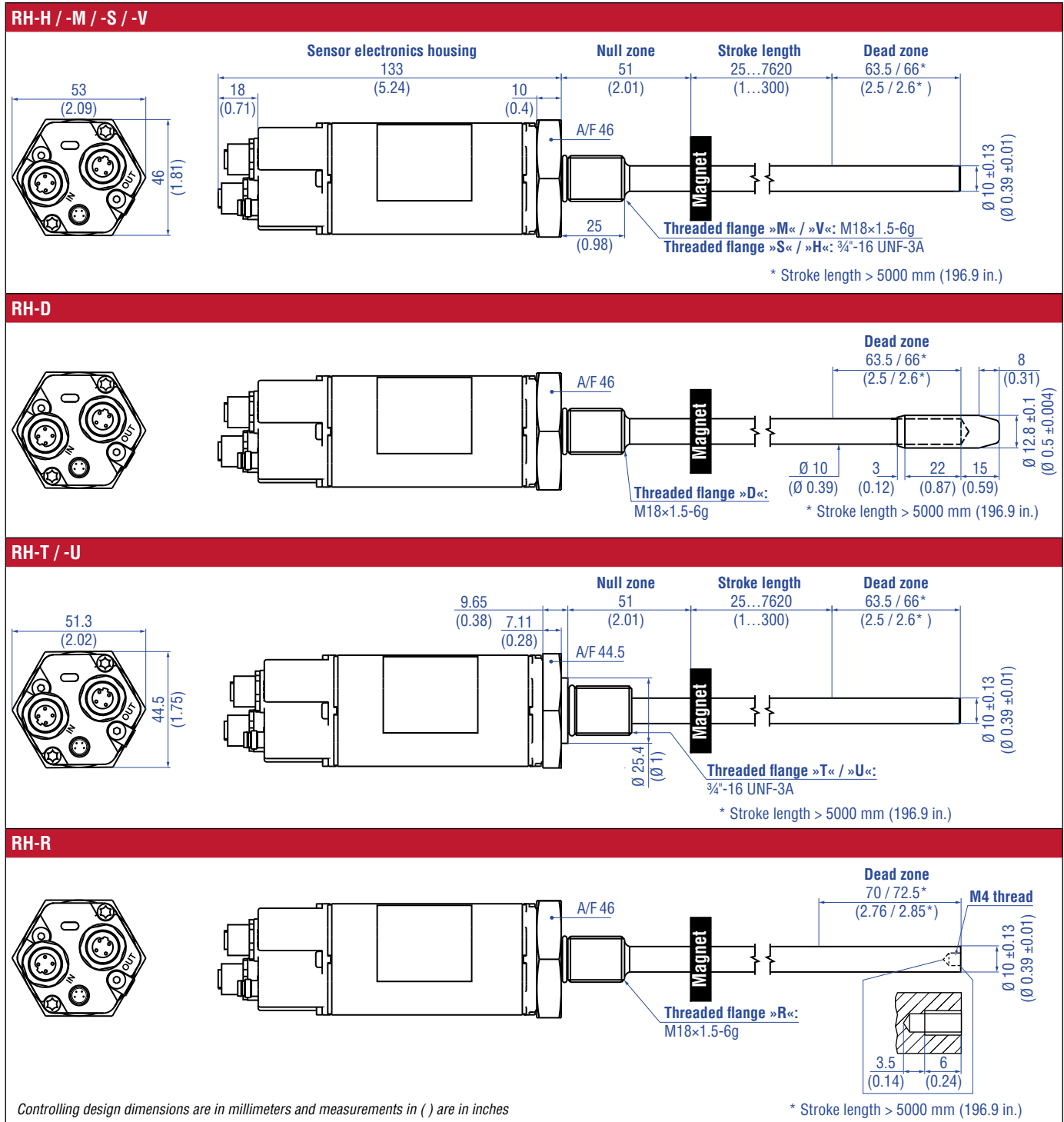


Fig. 3: Temposonics® RH with ring magnet, part 1

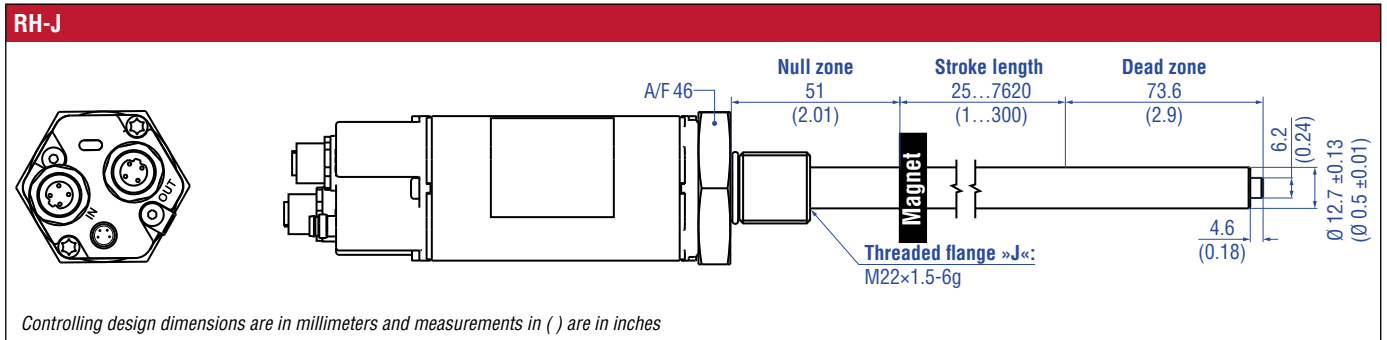


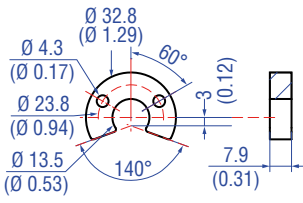
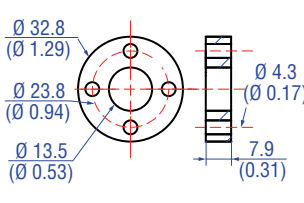
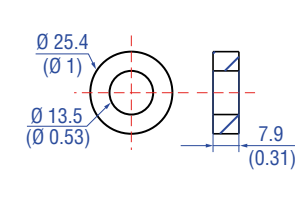
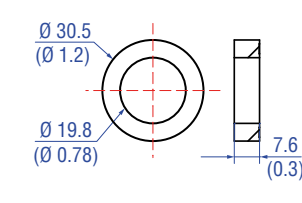
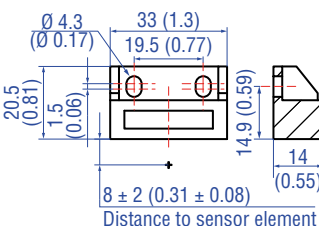
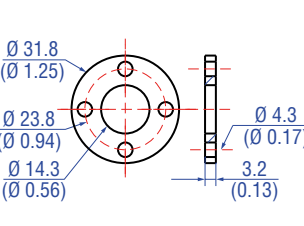
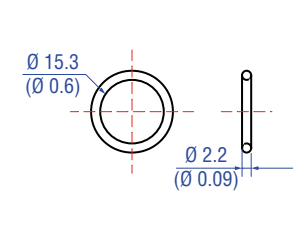
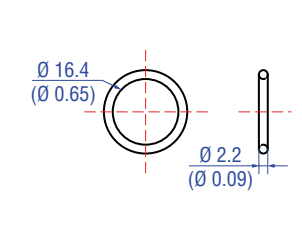
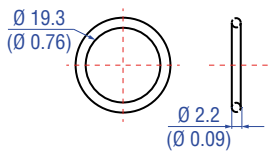
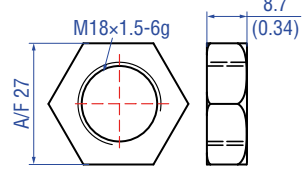
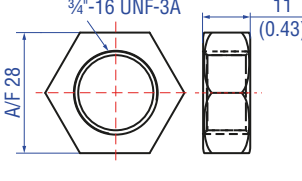
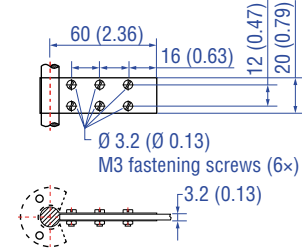
Fig. 4: Temposonics® RH with ring magnet, part 2

CONNECTOR WIRINGS

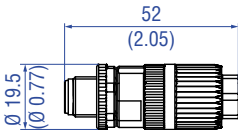
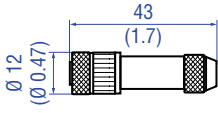
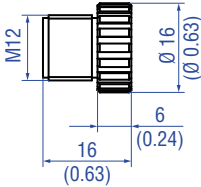
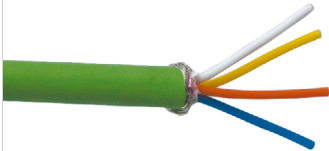
D56		
Signal		
M12 female connector (D-coded)	Pin	Function
<p>View on sensor</p>	1	Tx (+)
	2	Rx (+)
	3	Tx (-)
	4	Rx (-)
	5	Not connected
M12 female connector (D-coded)	Pin	Function
<p>View on sensor</p>	1	Tx (+)
	2	Rx (+)
	3	Tx (-)
	4	Rx (-)
	5	Not connected
Power supply		
M8 male connector	Pin	Function
<p>View on sensor</p>	1	+24 VDC (-15 / +20 %)
	2	Not connected
	3	DC Ground (0 V)
	4	Not connected




Fig. 5: Connector wirings D56

FREQUENTLY ORDERED ACCESSORIES – Additional options available in our [Accessories Guide](#) [551444](#)

Position magnets			
			
<p>U-magnet OD33 Part no. 251 416-2</p> <p>Material: PA ferrite GF20 Weight: Approx. 11 g Surface pressure: Max. 40 N/mm² Fastening torque for M4 screws: 1 Nm Operating temperature: -40...+105 °C (-40...+221 °F)</p>	<p>Ring magnet OD33 Part no. 201 542-2</p> <p>Material: PA ferrite GF20 Weight: Approx. 14 g Surface pressure: Max. 40 N/mm² Fastening torque for M4 screws: 1 Nm Operating temperature: -40...+105 °C (-40...+221 °F)</p>	<p>Ring magnet OD25.4 Part no. 400 533</p> <p>Material: PA ferrite Weight: Approx. 10 g Surface pressure: Max. 40 N/mm² Operating temperature: -40...+105 °C (-40...+221 °F)</p>	<p>Ring magnet Part no. 402 316</p> <p>Material: PA ferrite coated Weight: Approx. 13 g Surface pressure: Max. 20 N/mm² Operating temperature: -40...+100 °C (-40...+212 °F)</p>
Position magnet		Magnet spacer	
			
<p>Block magnet L Part no. 403 448</p> <p>Material: Hard ferrite Weight: Approx. 20 g Fastening torque for M4 screws: 1 Nm Operating temperature: -40...+75 °C (-40...+167 °F)</p> <p>This magnet may influence the sensor performance specifications for some applications.</p>	<p>Magnet spacer Part no. 400 633</p> <p>Material: Aluminum Weight: Approx. 5 g Surface pressure: Max. 20 N/mm² Fastening torque for M4 screws: 1 Nm</p>	<p>O-ring for threaded flange M18×1.5-6g Part no. 401 133</p> <p>Material: Fluoroelastomer Durometer: 75 ± 5 Shore A Operating temperature: -40...+204 °C (-40...+400 °F)</p>	<p>O-ring for threaded flange ¾"-16 UNF-3A Part no. 560 315</p> <p>Material: Fluoroelastomer Durometer: 75 ± 5 Shore A Operating temperature: -40...+204 °C (-40...+400 °F)</p>
O-ring		Mounting accessories	
			
<p>O-ring for threaded flange M22×1.5-6g</p> <p>Material: FPM Durometer: 75 Shore A Operating temperature: -20...+200 °C (-6...+392 °F)</p>	<p>Hex jam nut M18×1.5-6g Part no. 500 018</p> <p>Material: Steel, zinc, plated</p>	<p>Hex jam nut ¾"-16 UNF-3A Part no. 500 015</p> <p>Material: Zinc plated with nylon insert</p>	<p>Fixing clip for rod with Ø 10 mm Part no. 561 481</p> <p>Application: Used to secure sensor rods (Ø 10 mm (Ø 0.39 in.)) when using an U-magnet or block magnet Material: Brass, non-magnetic</p>

Controlling design dimensions are in millimeters and measurements in () are in inches

Cable connectors *		Cable	
			
M12 D-coded male connector (4 pin), straight Part no. 370 523 Material: Zinc nickel-plated Termination: Insulation-displacement Cable Ø: 5.5...7.2 mm (0.2...0.28 in.) Wire: 24 AWG – 22 AWG Operating temperature: –25...+85 °C (–13...+185 °F) Ingress protection: IP65 / IP67 (correctly fitted) Fastening torque: 0.6 Nm	M8 female connector (4 pin), straight Part no. 370 504 Material: CuZn nickel plated Termination: Solder Cable Ø: 3.5...5 mm (0.14...0.28 in.) Wire: 0.25 mm ² Operating temperature: –40...+85 °C (–40...+185 °F) Ingress protection: IP67 (correctly fitted) Fastening torque: 0.5 Nm	M12 connector end cap Part no. 370 537 Female connectors M12 should be covered by this protective cap Material: Brass nickel-plated Ingress protection: IP67 (correctly fitted) Fastening torque: 0.39...0.49 Nm	PUR cable Part no. 530 125 Material: PUR jacket; green Features: Cat 5, highly flexible Cable Ø: 6.5 mm (0.26 in.) Cross section: 2 × 2 × 0.35 mm ² (22/7 AWG) Operating temperature: –20...+60 °C (–4...+140 °F)

Cables		
		
PVC cable Part no. 530 108 Material: PVC jacket; gray Features: Shielded, flexible Cable Ø: 4.9 mm (0.19 in.) Cross section: 3 × 0.34 mm ² Operating temperature: –30...+80 °C (–22...+176 °F)	Cable with M12 D-coded male connector (4 pin), straight – M12 D-coded, male connector (4 pin), straight Part no. 530 064 Material: PUR jacket; green Features: Cat 5e Cable length: 5 m (16.4 ft) Cable Ø: 6.5 mm (0.26 in.) Ingress protection: IP65, IP67, IP68 (correctly fitted) Operating temperature: –30...+70 °C (–22...+158 °F)	Cable with M12 D-coded male connector (4 pin), straight – RJ45 male connector, straight Part no. 530 065 Material: PUR jacket; green Features: Cat 5e Cable length: 5 m (16.4 ft) Cable Ø: 6.5 mm (0.26 in.) Ingress protection M12 connector: IP67 (correctly fitted) Ingress protection RJ45 connector: IP20 (correctly fitted) Operating temperature: –30...+70 °C (–22...+158 °F)

Controlling design dimensions are in millimeters and measurements in () are in inches

NOTICE

* Follow the manufacturer's mounting instructions

ORDER CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
R	H							D	5	6	1	U	3	0	1			
a		b	c					d			e	f				g		

optional

a	Sensor model
R H	Rod

b	Design
B	Base unit (only for replacement) ⁵
D	Threaded flange M18×1.5-6g (bushing on rod end)
H	Threaded flange ¾"-16 UNF-3A (with fluoroelastomer housing-seal)
J	Threaded flange M22×1.5-6g (rod Ø 12.7 mm, 800 bar)
M	Threaded flange M18×1.5-6g (standard)
R	Threaded flange M18×1.5-6g thread M4 at rod end
S	Threaded flange ¾"×16UNF - 3A (standard)
T	Threaded flange ¾"×16UNF - 3A (with raised-face)
U	Threaded flange ¾"-16 UNF-3A (with raised-face & fluoroelastomer housing-seal)
V	Threaded flange M18×1.5-6g (with fluoroelastomer housing-seal)

c	Stroke length	
X X X X M	0025...7620 mm	
Standard stroke length (mm)*		Ordering steps
25... 500 mm		5 mm
500... 750 mm		10 mm
750...1000 mm		25 mm
1000...2500 mm		50 mm
2500...5000 mm		100 mm
5000...7620 mm		250 mm
X X X X U	001.0...300.0 in.	
Standard stroke length (in.)*		Ordering steps
1... 20 in.		0.2 in.
20... 30 in.		0.4 in.
30... 40 in.		1.0 in.
40...100 in.		2.0 in.
100...200 in.		4.0 in.
200...300 in.		10.0 in.

d	Connection type
D 5 6	2 × M12 female connectors (5 pin), 1 × M8 male connector (4 pin)

e	Operating voltage
1	+24 VDC (-15 / +20 %)

f	Output
U 3 0 1	Powerlink V2

Optional:

g	Magnet number for multi-position measurement ⁶
Z 0 2	2 magnets
Z 0 3	3 magnets
Z 0 4	4 magnets

NOTICE

Use magnets of the same type for multi-position measurement, e.g. 2 × U-magnets (part no. 251 416-2).

DELIVERY



RH-B:

- Base unit
- 2 socket screws M4

Accessories have to be ordered separately.

RH-D / -H / -J / -M / -R / -S / -T / -U / -V:

- Sensor
- O-ring

* / Non standard stroke lengths are available; must be encoded in 5 mm / 0.1 in. increments
5 / For more information see operation manual R-Series Powerlink (document number: 551657)

6 / Note: Specify magnet numbers for your sensing application and order separately

Manuals, Software & 3D models available at:
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