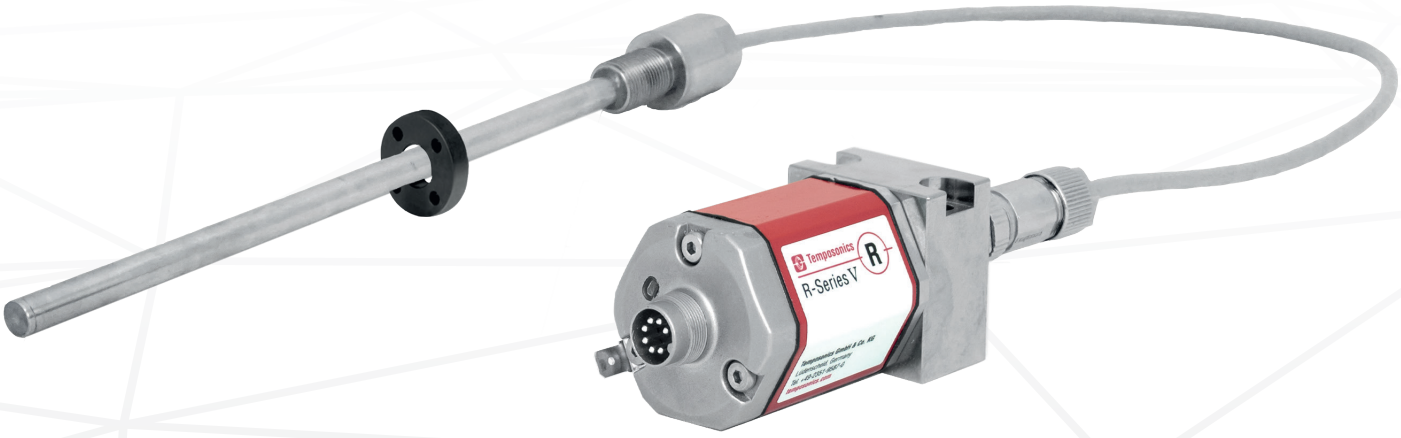
Temposonics
AN AMPHENOL COMPANY

Data Sheet

R-Series V RD5 SSI

Magnetostrictive Linear Position Sensors

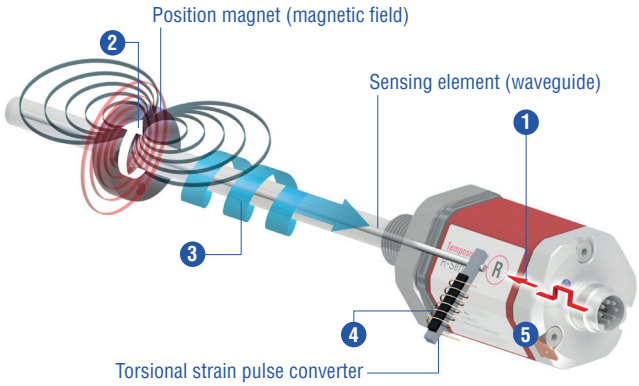
- Space-saving installation due to detached sensor electronics housing
- Distance between sensor rod and sensor electronics up to 20 m (65.6 ft.)
- Field adjustments and diagnostics using the TempoLink® and TempoGate® smart assistants



THE NEW V GENERATION

MEASURING TECHNOLOGY

The absolute, linear position sensors provided by Temposonics rely on the company's proprietary 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 beginning 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.



Measurement cycle

1	Current pulse generates magnetic field
2	Interaction with position magnet field generates torsional strain pulse
3	Torsional strain pulse propagates
4	Strain pulse detected by converter
5	Time-of-flight converted into position

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

R-SERIES V RD5 SSI

The Temposonics® R-Series V brings very powerful sensor performance to meet the many demands of your application. The sensor RD5 is the version of the R-Series V with a detached sensor electronics. The main advantages of the version RD5 are:

Space-saving installation
The detached sensor electronics allow space-saving installation of the compact measuring rod.

Great distance
The sensor electronics can be mounted up to 20 m (65.6 ft.) away from the sensor rod. This offers more mounting locations for the remote electronics for easier installation, serviceability, or increased protection.

Swappable sensor electronics
The sensor electronics can be ordered separately and can be connected to the previously installed RD5 sensor rod without further adaptation. This simplifies service repairs and saves costs.

Protection of the sensor electronics
By separating the robust sensor rod from the complex evaluation electronics improved protection against process influences can be realized.

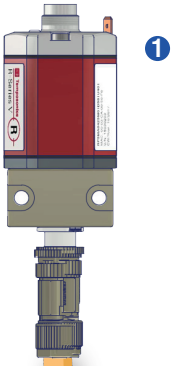
In addition the R-Series V SSI scores with the following features:

Differential measurement between 2 positions
The R-Series V SSI can measure and output the distance between 2 position magnets.

R-Series V SSI
The interface of the R-Series V SSI corresponds to the SSI industry standard for absolute encoders. You can select the configuration of the SSI signal that fits best to your application and also adjust it on site with the smart assistants.

All settings under control with the smart assistants for the R-Series V
The TempoLink® and the TempoGate® smart assistants support you in setup and diagnostics of the R-Series V. For more information of these assistants please see the data sheets:

- TempoLink® smart assistant (Document part number: 552070)
- TempoGate® smart assistant (Document part number: 552110)



RD5: COMPLETE SENSOR OR SEPARATE COMPONENTS – IT'S UP TO YOU

The RD5 sensor consists of 2 main components:

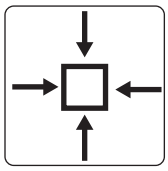
1 Sensor electronics assembly with mounting block and mating connector
2 Sensor rod assembly with cable and connector

The RD5 sensor is the latest version in the RD model line. These sensor models are unique in that their sensor rod is detached from the main electronics components and connected only by a joining cable.

The RD5 sensor is normally ordered as a **complete kit (RD5-K)**. Also, the **sensor rod assembly (RD5-R)** and the **sensor electronics assembly (RD5-E)** can each be ordered separately. This offers added flexibility for ordering just the replacement components needed or for keeping spare components on site for your more critical applications.

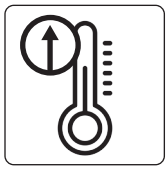
RD5 VERSATILITY FOR SOLVING CHALLENGING APPICATIONS

The RD5 sensor from Temposonics® is characterized by its remote electronics. This allows you to move the sensor electronics away from the sensor rod for protection from harsh environments or when the installation space at the measuring point is too small to fit a RH5 rod version.



Configure the sensor you need to fit your confined space applications
RD5 offers new options for confined installation spaces like a small footprint connector and a compact mounting block.

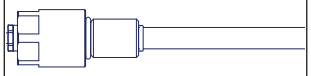
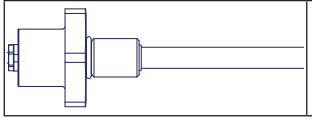
Reduce or eliminate your machine down time
RD5 offers you easy ordering of spare or replacement components if sensor damage does occur.



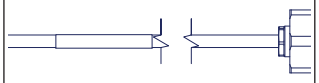
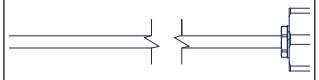
Use at high temperature applications
The sensor rod assembly of RD5 is rated up to 120 °C (248 °F) for stroke lengths up to 2540 mm (100 in.) and up to 105 °C (221 °F) for longer stroke lengths.

THE RD5 OPTIONS – TO BEST FIT YOUR APPLICATION

Sensor rod flange options

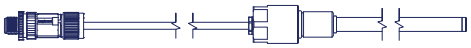
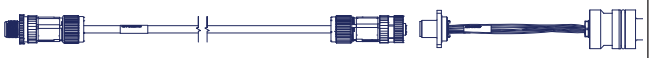
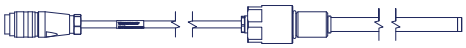
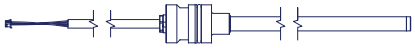
Image	Type	Advantage
	»S«	• Pressure fit for embedding in cylinder
	»M/T«	• Small threaded flange for confined space
	»C/D«	• Large surface hex flange

Sensor rod cable options

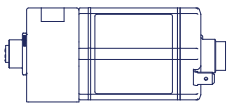
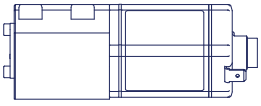
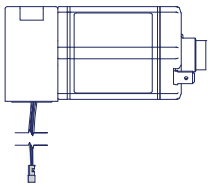
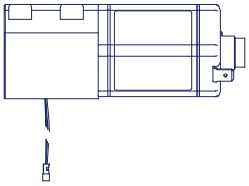
Image	Type	Advantage
	»W«	• Single wires allows small bend radius • For short distances up to 50 cm
	»K«	• PUR cable with min. bend radius of 24 mm • For distances up to 1.15 m
	»J«	• FEP cable with min. bend radius of 57 mm • For great distances up to 20 m

Sensor rod connectors

(for connecting the sensor rod to the sensor electronics)

Image	Type	Advantage
	»G«	• Compact inline M12 connector • Suitable for cable type »J« and »K« • For side connection
	»W«	• Small footprint panel mount M12 connector • Suitable for cable type »W« • Requires joining cable RD5-C • For side connection
	»S«	• Standard inline M16 connector • Suitable for cable type »J« and »K« • For side connection
	»E«	• Compact inline flat connector • Suitable for cable type »J«, »K« and »W« • For bottom connection

Sensor electronics mounting blocks with mating connectors

Image	Type	Advantage
	»G«	• Compact mounting block with side M12 mating connector • For sensor rod connector type »G« or joining cable RD5-C • For reduced mounting space
	»S«	• Classic mounting block with side M16 mating connector • For sensor rod connector type »S«
	»E«	• Compact mounting block with bottom connection and flat mating connector • For sensor rod connector type »E« • For reduced mounting space
	»B«	• Classic mounting block with bottom connection and flat mating connector • For sensor rod connector type »E«

TECHNICAL DATA

Output	
Interface	SSI (Synchronous Serial Interface) – differential signal in SSI standard (RS-485/RS-422)
Data format	Binary or gray
Data length	8…32 Bit
Data transmission rate	70 kBaud [1]…1 MBaud, depending on cable length: Cable length: < 3 m | < 50 m | < 100 m | < 200 m | < 400 m Baud rate: 1 MBd | < 400 kBd | < 300 kBd | < 200 kBd | < 100 kBd
Measured value	Position or velocity/position and temperature in the sensor electronics housing
Measurement parameters	
Resolution: Position	0.1…100 µm (0.0001…0.1 mm)
Resolution: Velocity	0.001 mm/s (determined over 10 measured values)
Update rate [2]	Stroke length: 25 mm | 300 mm | 750 mm | 1000 mm | 2000 mm | 5080 mm Update rate: 10 kHz | 3.4 kHz | 2.7 kHz | 2.1 kHz | 1.2 kHz | 0.5 kHz
Linearity deviation [3, 4]	Stroke length: ≤ 400 mm | > 400 mm Linearity deviation: ≤ ±40 µm | < ±0.01 % F.S.
Repeatability	< ±0.001 % F.S. (minimum ±2.5 µm) typical
Hysteresis	< 4 µm typical
Temperature coefficient	< 15 ppm/K typical
Operating conditions	
Operating temperature	Sensor electronics housing: –40…+85 °C (–40…+185 °F) Sensor rod with »J« type cable: –40…+120 °C (–40…+248 °F) (for stroke lengths up to 2540 mm (100 in.) and up to 105 °C (221 °F) for longer stroke lengths) Sensor rod with »K« type cable: –40…+80 °C (–40…+176 °F) Sensor rod with »W« type single wires: -40...+85 °C (-40...+185 °F)
Humidity	90% relative humidity, no condensation
Ingress protection	Sensor electronics housing: IP67 (with correctly mounted housing and connectors) Sensor rod with »J« or »K« type cable: IP67/IP69K Connector »G« or »S« type: IP67 (correctly mated), Connector »E« type: IP30 Sensor rod with »W« type single wires: IP67 Connector »W« type: IP67 (correctly mounted)
Shock test	150 g/11 ms, IEC standard 60068-2-27
Vibration test	30 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 RD5 sensors fulfill the requirements of the EMC directives 2014/30/EU, UKSI 2016 No. 1091 and TR CU 020/2011 under the condition of an EMC compliant installation. [5]
Operating pressure	350 bar (5076 psi)/700 bar (10,153 psi) peak (at 10 × 1 min) for sensor rod
Magnet movement velocity	Any
Design/Material	
Sensor electronics housing	Aluminum (painted), zinc die cast
Sensor rod with flange	Stainless steel 1.4301 (AISI 304)
RoHS compliance	The used materials are compliant with the requirements of EU Directive 2011/65/EU and EU Regulation 2015/863 as well as UKSI 2022 No. 622 with amendments
Stroke length	25…2540 mm (1…100 in.) for pressure-fit flange »S« 25…5080 mm (1…200 in.) for all threaded flanges

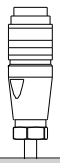
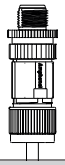
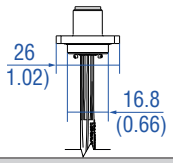
Technical data “Mechanical mounting” and “Electrical connection” on page 6

1/ With standard one shot of 16 µs
2/ Sensor with standard settings. Further information can be found in the operation manual R-Series V SSI (document part number: 552011)
3/ With position magnet # 251 416-2
4/ For rod style »S« the linearity deviation can be higher in the first 30 mm (1.2 in.) of stroke length
5/ The cable between the sensor element and the sensor electronics housing must be mounted in an appropriately shielded environment

Mechanical mounting	
Mounting position	Any
Mounting instruction	Please consult the technical drawings and the operation manual (document part number: 552011)
Electrical connection	
Connection type	1 × M16 male connector (7 pin) or 1 × M12 male connector (8 pin) or cable outlet
Operating voltage	+12…30 VDC ±20 % (9.6…36 VDC); the RD5 sensors must be power supplied via an external Class 2 power source in accordance with the UL approval
Power consumption	1.2 W typical
Dielectric strength	500 VDC (DC ground to machine ground)
Polarity protection	Up to –36 VDC
Overvoltage protection	Up to 36 VDC

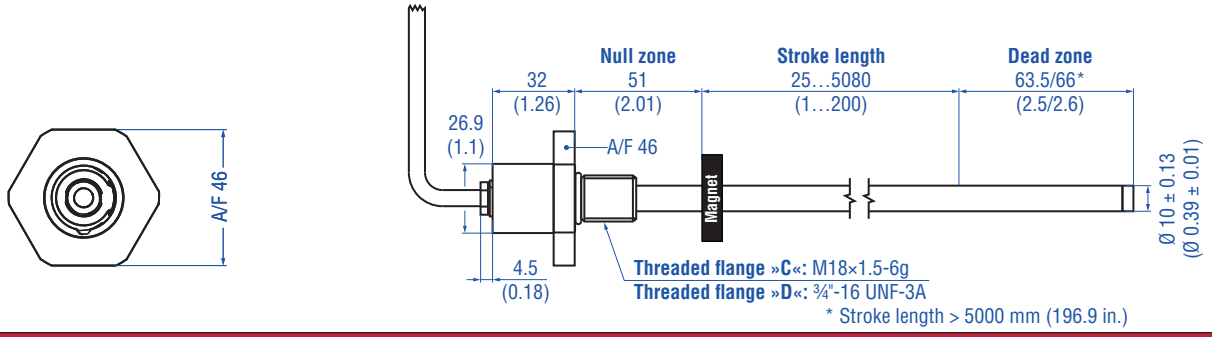
TECHNICAL DRAWING – SENSOR ROD CABLES & CONNECTORS

Cable »J«	Cable »K«	Cable »W«
		
Material: FEP jacket, tan Min. bending radius: 57 mm (2.2 in) Operating temperature: –40…+120 °C (–40…+248 °F) Max. cable length: 20 m (65.6 ft.)	Material: PUR jacket, black Min. bending radius: 24 mm (0.94 in) Operating temperature: –40…+80 °C (–40…+176 °F) Max. cable length: 1.15 m (3.9 ft.)	Single wires, unshielded Min. bending radius: 4 mm (0.16 in.) Operating temperature: –40…+85 °C (–40…+185 °F) Max. cable length: 0.5 m (1.6 ft.)

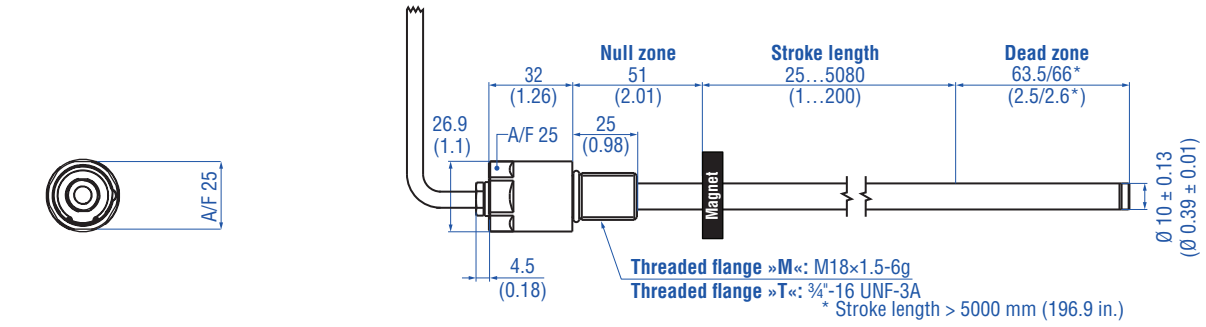
Connector »G«	Connector »S«	Connector »W«	Connector »E«
			
Operating temperature: –40...+105 °C (–40...+221 °F) Ingress protection: IP65/IP67 (correctly fitted) For side connection	Operating temperature: –40...+105 °C (–40...+221 °F) Ingress protection: IP67 (correctly fitted) For side connection	Operating temperature: –40...+85 °C (–40...+185 °F) Ingress protection: IP67 (correctly fitted) For side connection	Operating temperature: –40...+85 °C (–40...+185 °F) Ingress protection: IP30 For bottom connection

TECHNICAL DRAWING – SENSOR ROD FLANGE TYPES

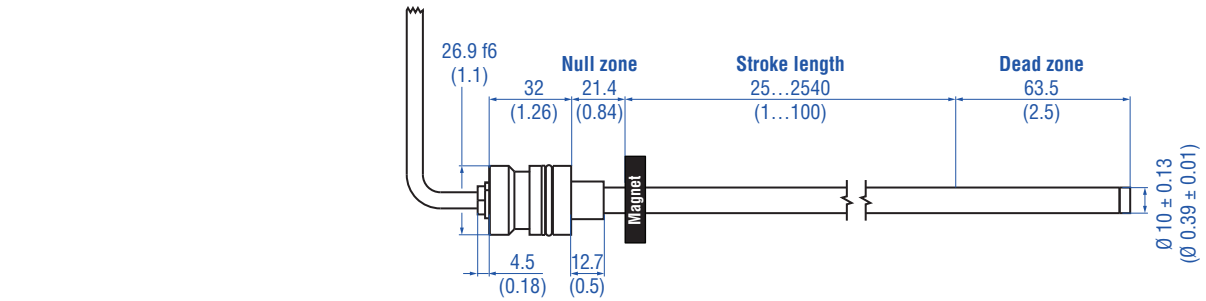
Threaded flange »C« & »D«



Threaded flange »M« & »T«



Pressure fit flange »S«



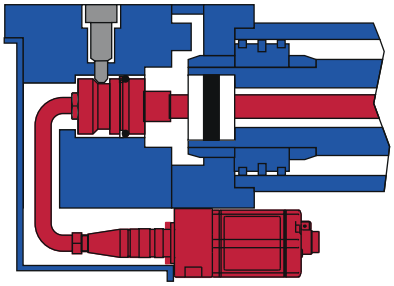
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Fig. 2: Temposonics® RD5 sensor rod flange types

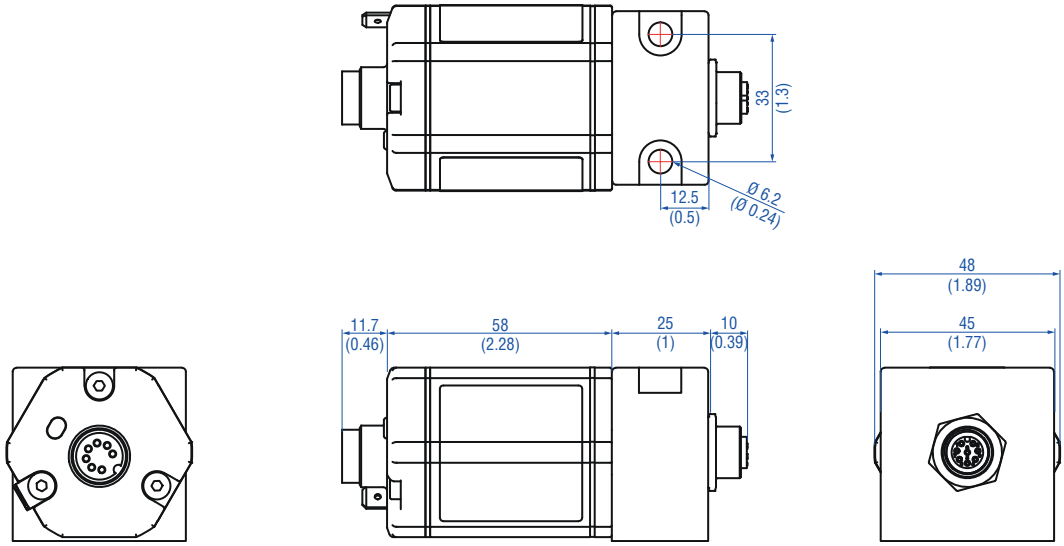
TECHNICAL DRAWING – SENSOR ELECTRONICS HOUSING & MOUNTING BLOCK

RD5 with side connection

The connecting cable between the sensor electronics housing and the rod is connected to the side of the sensor electronics housing.



Compact mounting block with side M12 mating connector, type »G«, example: Connection type D70 (connector outlet)

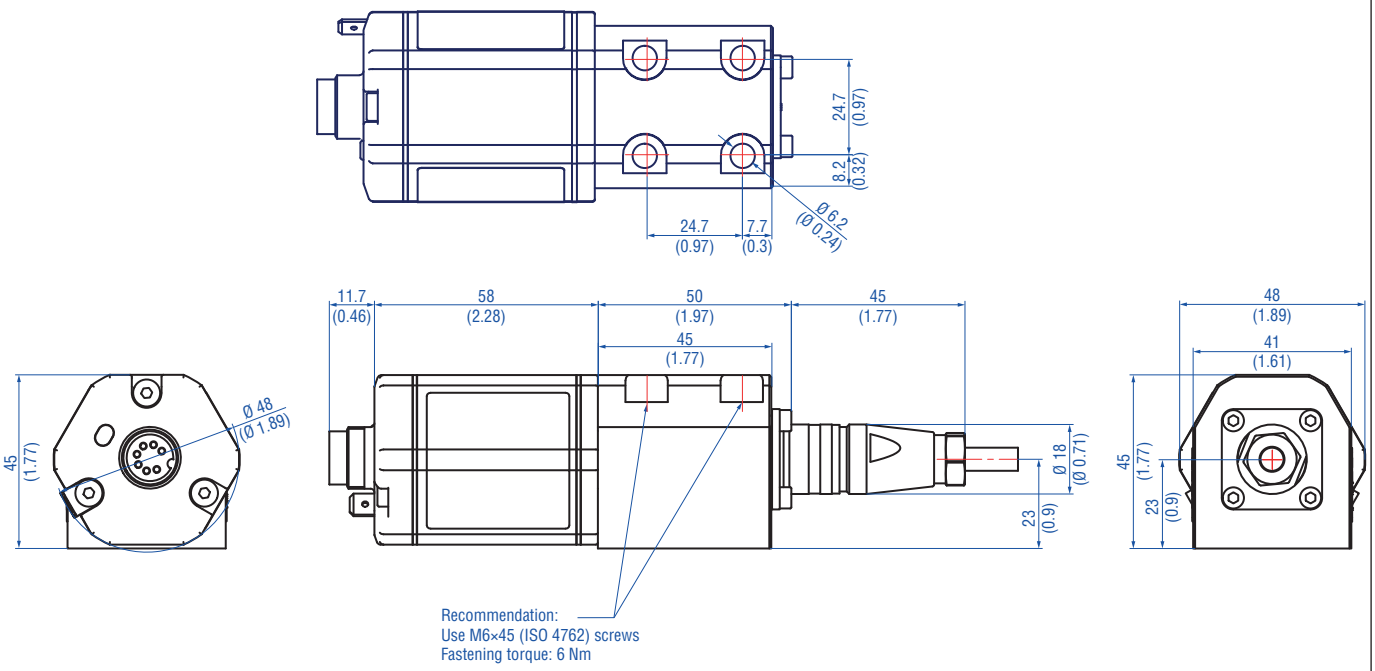


Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Fig. 3: Temposonics® RD5 sensor electronics & mounting block

TECHNICAL DRAWING – SENSOR ELECTRONICS HOUSING & MOUNTING BLOCK

Classic mounting block with side M16 mating connector, type »S«, example: Connection type D70 (connector outlet)



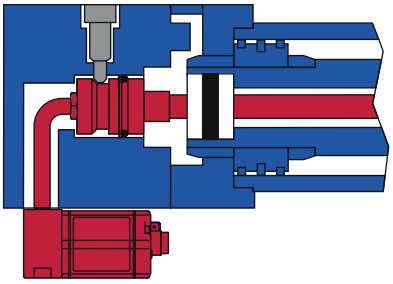
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Fig. 4: Temposonics® RD5 sensor electronics & mounting block

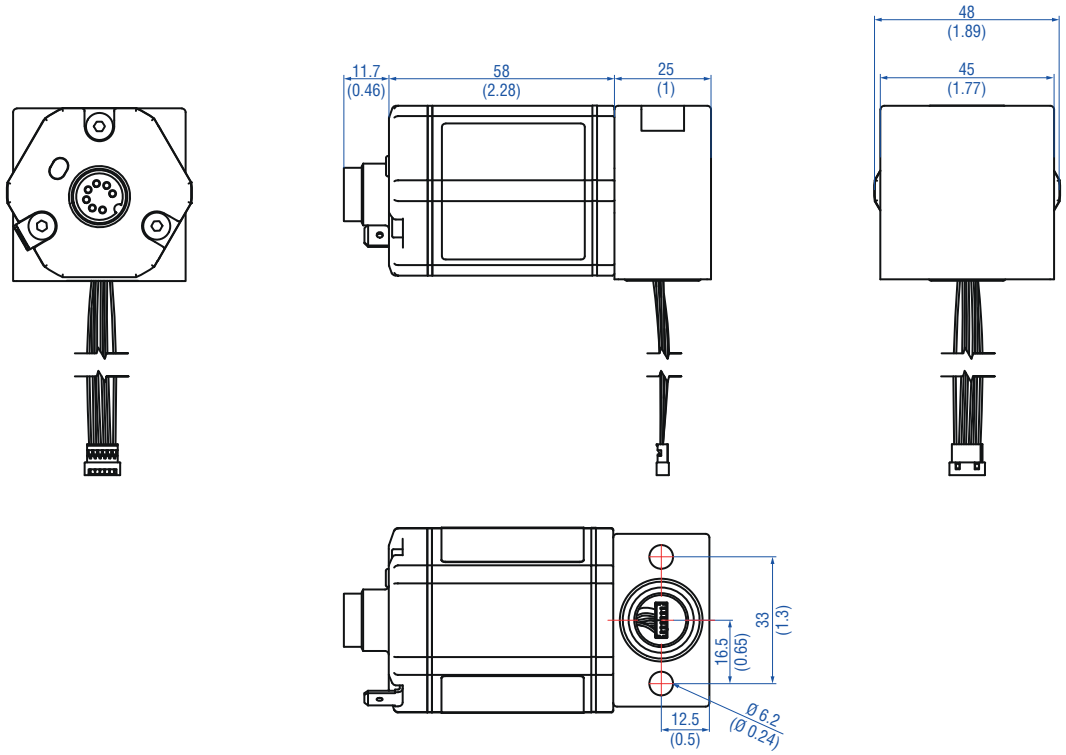
TECHNICAL DRAWING – SENSOR ELECTRONICS HOUSING & MOUNTING BLOCK

RD5 with bottom connection

The connecting cable between the sensor electronics housing and the rod is connected to the bottom of the sensor electronics housing.



Compact mounting block with bottom connection and flat mating connector, type »E«, example: Connection type D70 (connector outlet)

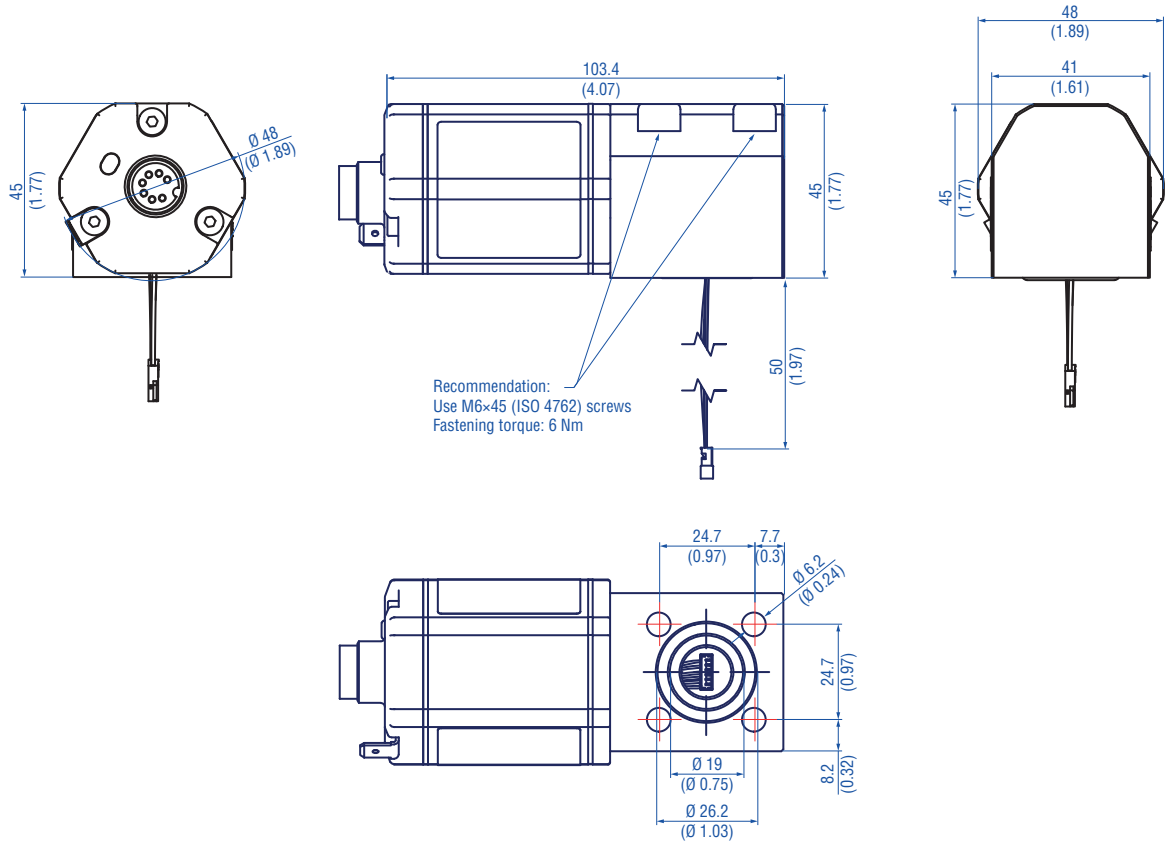


Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Fig. 5: Temposonics® RD5 sensor electronics & mounting block

TECHNICAL DRAWING – SENSOR ELECTRONICS HOUSING & MOUNTING BLOCK

Classic mounting block with bottom connection and flat mating connector, type »B«, example: Connection type D70 (connector outlet)

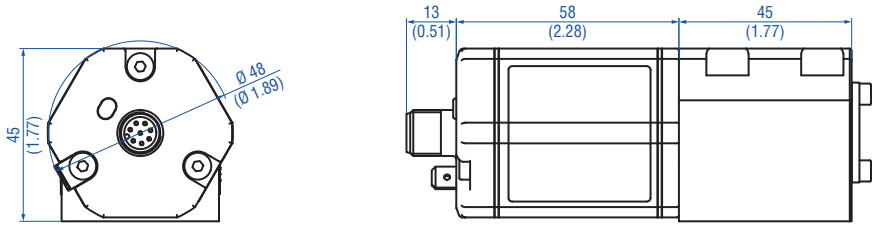


Controlling design dimensions are in millimeters and measurements in ( ) are in inches

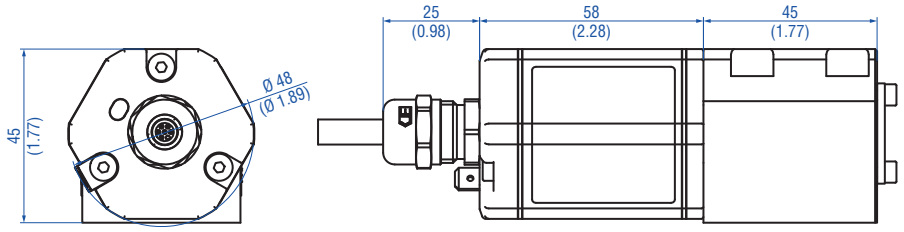
Fig. 6: Temposonics® RD5 sensor electronics & mounting block

RD5-E TECHNICAL DRAWING

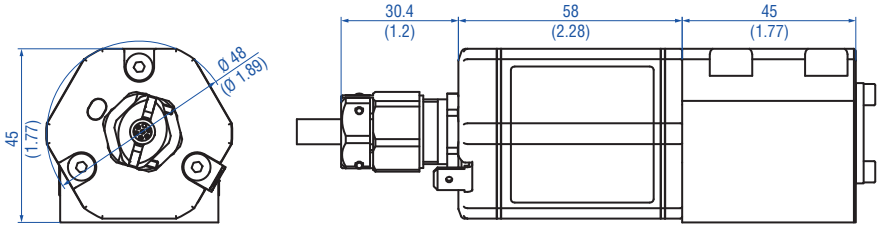
Sensor electronics housing with connector outlet, example: D84



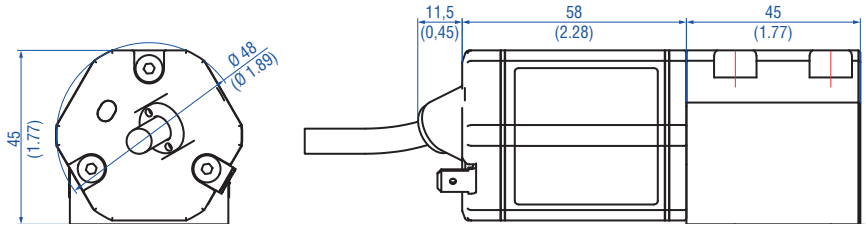
Sensor electronics housing with straight cable outlet, example: HXX/PXX/RXX



Sensor electronics housing with straight cable outlet, example: TXX



Sensor electronics housing with angled cable outlet, example: BXX/EXX/GXX/LXX/UXX



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

Fig. 7: Temposonics® RD5 sensor electronics housing with different outlet options

CONNECTOR WIRING

D70		
Signal + power supply		
M16 male connector	**Pin**	**Function**
 View on sensor	1	Data (–)
	2	Data (+)
	3	Clock (+)
	4	Clock (–)
	5	+12…30 VDC (±20 %)
	6	DC Ground (0 V)
	7	Not connected

Fig. 8: Connector wiring D70

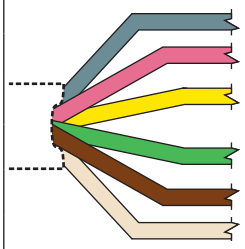
HXX or LXX/PXX or BXX/RXX or EXX/TXX or GXX/UXX		
Signal + power supply		
Cable	**Color**	**Function**
	GY	Data (–)
	PK	Data (+)
	YE	Clock (+)
	GN	Clock (–)
	BN	+12…30 VDC (±20 %)
	WH	DC Ground (0 V)
For cable type TXX, the extra red & blue wires are not used.		

Fig. 10: Connector wiring cable outlet

D84		
Signal + power supply		
M12 male connector (A-coded)	**Pin**	**Function**
 View on sensor	1	Clock (+)
	2	Clock (–)
	3	Data (+)
	4	Data (–)
	5	Not connected
	6	Not connected
	7	+12…30 VDC (±20 %)
	8	DC Ground (0 V)

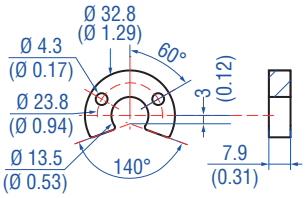
Fig. 9: Connector wiring D84

Straight cable outlet				Cable type		Angled cable outlet			
H	X	X	Part no. 530 052	PUR	➔	L	X	X	Part no. 530 052
P	X	X	Part no. 530 175	PUR	➔	B	X	X	Part no. 530 175
R	X	X	Part no. 530 032	PVC	➔	E	X	X	Part no. 530 032
T	X	X	Part no. 530 112	FEP	➔	G	X	X	Part no. 530 157

Fig. 11: Cable types assignment

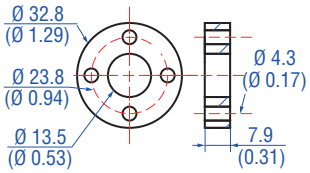
FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Catalog 551444

Position magnets



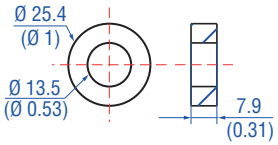
U-magnet OD33
Part no. 251 416-2

Material: PA ferrite GF20
Weight: Approx. 11 g
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm
Operating temperature:
–40…+120 °C (–40…+248 °F)



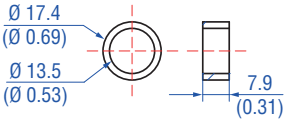
Ring magnet OD33
Part no. 201 542-2

Material: PA ferrite GF20
Weight: Approx. 14 g
Surface pressure: Max. 40 N/mm²
Fastening torque for M4 screws: 1 Nm
Operating temperature:
–40...+120 °C (–40...+248 °F)



Ring magnet OD25.4
Part no. 400 533

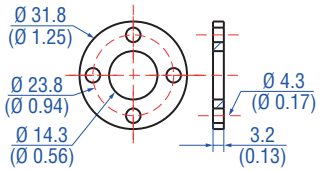
Material: PA ferrite
Weight: Approx. 10 g
Surface pressure: Max. 40 N/mm²
Operating temperature:
–40…+120 °C (–40…+248 °F)



Ring magnet OD17.4
Part no. 401 032

Material: PA neobond
Weight: Approx. 5 g
Surface pressure: Max. 20 N/mm²
Operating temperature:
–40…+105 °C (–40…+221 °F)

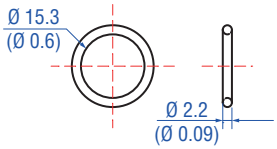
Magnet spacer



Magnet spacer
Part no. 400 633

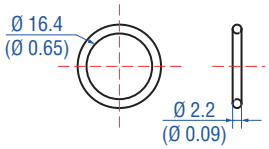
Material: Aluminum
Weight: Approx. 5 g
Surface pressure: Max. 20 N/mm²
Fastening torque for M4 screws: 1 Nm

O-rings



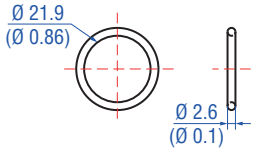
O-ring for threaded flange
M18×1.5-6g
Part no. 401 133

Material: Fluoroelastomer
Durometer: 75 ±5 Shore A
Operating temperature:
–40…+204 °C (–40…+400 °F)



O-ring for threaded flange
¾"-16 UNF-3A
Part no. 560 315

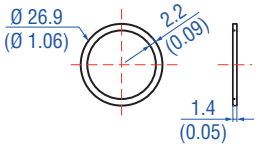
Material: Fluoroelastomer
Durometer: 75 ±5 Shore A
Operating temperature:
–40…+204 °C (–40…+400 °F)



O-ring for pressure fit flange Ø 26.9 mm
Part no. 560 705

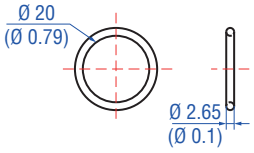
Material: Nitrile rubber
Operating temperature:
–53…+107 °C (–65…+225 °F)

O-rings



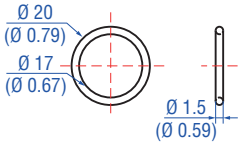
Back-up ring for pressure fit flange
Ø 26.9 mm
Part no. 560 629

Material: Polymyte
Durometer: 90 Shore A



O-ring for classic mounting block with bottom entry »B«
Part no. 561 435

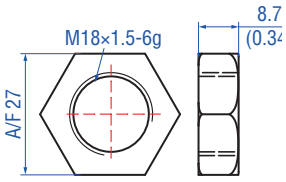
Material: FKM
Durometer: 80± 5 Shore A
Operating temperature:
–15…+200 °C (5…+392 °F)



O-ring for compact mounting block with bottom entry »E«
Part no. 562 405

Material: BUNA
Durometer: 70 Shore A
Operating temperature:
–40…+121 °C (–40…+249,8 °F)

Mounting accessories

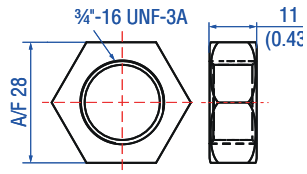


Hex jam nut M18×1.5-6g
Part no. 500 018

Material: Steel, zinc plated

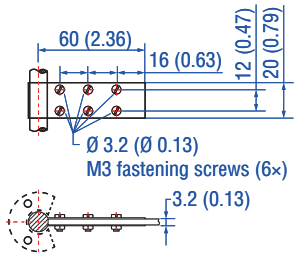
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Mounting accessories



Hex jam nut ¾"-16 UNF-3A
Part no. 500 015

Material: Steel, zinc plated

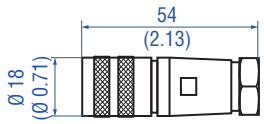


Fixing clip
Part no. 561 481

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

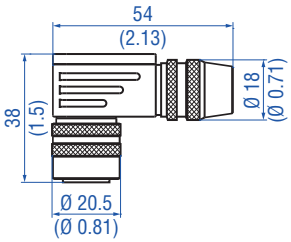
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Cable connectors*



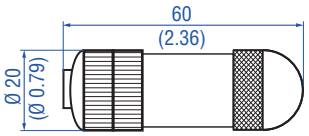
M16 female connector (7 pin), straight
Part no. 370 624

Material: Zinc nickel plated
Termination: Solder
Contact insert: Silver plated
Cable clamp: PG9
Cable Ø: 6…8 mm (0.24…0.31 in.)
Operating temperature:
–40…+100 °C (–40…+212 °F)
Ingress protection: IP65/IP67
(correctly fitted)
Fastening torque: 0.7 Nm



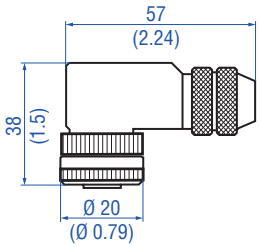
M16 female connector (7 pin), angled
Part no. 560 779

Material: Zinc nickel plated
Termination: Solder
Contact insert: Silver plated
Cable clamp: PG9
Cable Ø: 6…8 mm (0.24…0.31 in.)
Operating temperature:
–40…+100 °C (–40…+212 °F)
Ingress protection: IP65/IP67
(correctly fitted)
Fastening torque: 0.7 Nm



M12 A-coded female connector
(8 pin), straight
Part no. 370 694

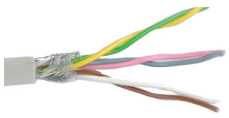
Housing: GD-ZnAL
Termination: Screw
Contact insert: CuZn
Cable Ø: 4…9 mm (0.16…0.35 in.)
Wire: 0.75 mm²
Operating temperature:
–25…+90 °C (–13…+194 °F)
Ingress protection: IP67 (correctly fitted)
Fastening torque: 0.6 Nm



M12 A-coded female connector
(8 pin), angled
Part no. 370 699

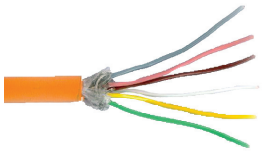
Housing: GD-ZnAL
Termination: Screw
Contact insert: CuZn
Cable Ø: 6…8 mm (0.24…0.31 in.)
Wire: 0.5 mm²
Operating temperature:
–25…+85 °C (–13…+185 °F)
Ingress protection: IP67 (correctly fitted)
Fastening torque: 0.6 Nm

Cables



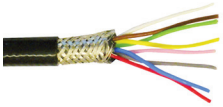
PVC cable
Part no. 530 032

Material: PVC jacket; gray
Features: Twisted pair, shielded, flexible
Cable Ø: 6 mm (0.23 in.)
Cross section: 3 × 2 × 0.14 mm²
Bending radius: 10 × D
(fixed installation)
Operating temperature:
–40…+105 °C (–40…+221 °F)



PUR cable
Part no. 530 052

Material: PUR jacket; orange
Features: Twisted pair, shielded,
highly flexible, halogen free, suitable
for drag chains, mostly oil & flame
resistant
Cable Ø: 6.4 mm (0.25 in.)
Cross section: 3 × 2 × 0.25 mm²
Bending radius: 5 × D
(fixed installation)
Operating temperature:
–20…+80 °C (–4…+176 °F)



FEP cable
Part no. 530 112

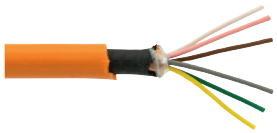
Material: FEP jacket; black
Features: Twisted pair, shielded, flexible,
high thermal resistance, mostly oil &
acid resistant
Cable Ø: 7.6 mm (0.3 in.)
Cross section: 4 × 2 × 0.25 mm²
Bending radius: 8 – 10 × D
(fixed installation)
Operating temperature:
–100…+180 °C (–148…+356 °F)

FEP cable
Part no. 530 157

Material: FEP jacket; black
Features: Twisted pair, shielded
Cable Ø: 6.7 mm (0.26 in.)
Cross section: 3 × 2 × 0.14 mm²
Operating temperature: –40…+180 °C
(–40…+356 °F)

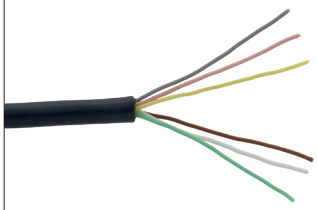
*/ Follow the manufacturer's mounting instructions
Controlling design dimensions are in millimeters and measurements in ( ) are in inches
Color of connectors and cable jacket may change. Color codes for the individual wires and technical properties remain unchanged.

Cables



PUR cable
Part no. 530 175

Material: PUR jacket; orange
Features: Flexible, additional EMC protection
Cable Ø: 6.5 mm (0.26 in.)
Cross section: 6 × 0.14 mm²
Bending radius: 10 × D
(fixed installation)
Operating temperature:
–30…+90 °C (–22…+194 °F)



Silicone cable
Part no. 530 176

Material: Silicone jacket; black
Features: Twisted pair, shielded
Cable Ø: 6.3 mm (0.25 in.)
Cross section: 3 × 2 × 0.14 mm²
Bending radius: 7 × D
(fixed installation)
Operating temperature: –50…+150 °C (–58…+302 °F)

Cable sets

Cable with M12 A-coded female connector (8 pin), straight – pigtail
Part no. 370 789

Material: PUR jacket; orange
Features: Twisted pair, shielded
Cable length: 5 m (16.4 ft)
Ingress protection: IP67/IP69K (correctly fitted)
Operating temperature:
–25…+80 °C (–13…+176 °F)

Cable with M12 A-coded female connector (8 pin), angled – pigtail
Part no. 370 821

Material: PUR jacket; orange
Features: Twisted pair, shielded
Cable length: 5 m (16.4 ft)
Ingress protection: IP67/IP69K (correctly fitted)
Operating temperature:
–25…+80 °C (–13…+176 °F)

Programming tools

TempoLink® kit for Temposonics® R-Series V
Part no. TL-1-0-SD70 (for D70)
Part no. TL-1-0-SD84 (for D84)
Part no. TL-1-0-AS00 (for cable outlet)

- Connect wirelessly via Wi-Fi enabled device or via USB with the diagnostic tool
- Simple connectivity to the sensor via 24 VDC power line (permissible cable length: 30 m)
- User friendly interface for mobile devices and desktop computers
- See data sheet “TempoLink® smart assistant” (document part no.: 552070) for further information

TempoGate® smart assistant for Temposonics® R-Series V
Part no. TG-C-0-D*xx*
(*xx* indicates the number of R-Series V sensors that can be connected (even numbers only))

- OPC UA server for diagnostics of the R-Series V
- For installation in the control cabinet
- Connection via LAN and Wi-Fi
- See data sheet “TempoGate® smart assistant” document part no.: 552110) for further information

Color of connectors and cable jacket may change. Color codes for the individual wires and technical properties remain unchanged.

ORDER CODE FOR COMPLETE SENSOR: RD5 KIT

NOTICE

The RD5 sensor is normally ordered as a kit containing the sensor rod and the sensor electronics housing/mounting block, all in one complete model number. For ordering the kit, use the **RD5-K** model number configurator below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
R	D	5	K														0					1	S		0								
a			b	c	d					e	f					g	h		i			j	k	l	m	n	o	p	q	r			

optional

a	Sensor model
R D 5	Detached sensor electronics

b	Sensor component
K	Kit includes both sensor rod and sensor electronics housing

c	Design
C	Threaded flange M18×1.5-6g (A/F 46)
D	Threaded flange ¾"-16 UNF-3A (A/F 46)
M	Threaded flange M18×1.5-6g (A/F 25)
S	Pressure fit flange Ø 26.9 mm f6
T	Threaded flange ¾"-16 UNF-3A (A/F 25)

d	Sensor rod cable type and length
J X X X X	FEP cable, length in centimeters (range 0007…2000 cm). See historical available*, or select length from: 0020, 0030, 0080, 0300, 0500, 1000, 1500 or 2000 cm.
K X X X X	PUR cable, length in centimeters (range 0007…0115 cm). See historical available*, or select length from: 0020, 0030 or 0080 cm.
W X X X X	6 single wires, length in centimeters (range 0007…0050 cm). Select length from: 0007, 0010, 0015, 0020, 0030, 0040 or 0050 cm.

* Historical lengths available:

0007 cm	0023 cm	0040 cm	0115 cm
0010 cm	0025 cm	0060 cm	
0017 cm	0035 cm	0100 cm	

Non-standard lengths for cable/wires are available; must be encoded in 1 cm increments and within the specified range

e	Sensor rod connector type
E	Flat connector
G	M12 connector (only for sensor rod cable type »J» and »K«)
S	M16 connector (only for sensor rod cable type »J» and »K«)
W	M12 square panel mount connector (only for sensor rod cable type »W«) Requires RD5-C joining cable (ordered separately)

f	Stroke length	
X X X X M	Flange »S«: 0025…2540 mm Flange »C«, »D«, »M«, »T«: 0025…5080 mm	
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…5080 mm		100 mm
X X X X U	Flange »S«: 001.0…100.0 in. Flange »C«, »D«, »M«, »T«: 001.0…200.0 in.	
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.

Non-standard stroke lengths are available;
must be encoded in 5 mm/0.1 in. increments

g	Sensor electronics mounting block with mating connector
B	Classic mounting block with bottom connection and flat mating connector (only for sensor rod connector type »E«)
E	Compact mounting block with bottom connection and flat mating connector (only for sensor rod connector type »E«)
G	Compact mounting block with side M12 mating connector (only for sensor rod connector type »G« and »W«)
S	Classic mounting block with side M16 mating connector (only for sensor rod connector type »S«)

h	Number of magnets
X X	01…02 position(s) (1…2 magnet(s))

i	Connection type	
Connector		
D	7	0	M16 male connector (7 pin)
D	8	4	M12 male connector (8 pin)
Angled cable outlet		
B	X	X	XX m/ft. PUR cable (part no. 530 175) B01…B30 (1…30 m)/ B03...B99 (3...99 ft.) (Note the temperature range of the cable!) See “Frequently ordered accessories” for cable specifications
E	X	X	XX m/ft. PVC cable (part no. 530 032) E01…E30 (1…30 m)/ E03...E99 (3...99 ft.) See “Frequently ordered accessories” for cable specifications
G	X	X	XX m/ft. FEP cable (part no. 530 157) G01…G30 (1…30 m)/ G03...G99 (3...99 ft.) See “Frequently ordered accessories” for cable specifications
L	X	X	XX m/ft. PUR cable (part no. 530 052) L01…L30 (1…30 m)/L03...L99 (3...99 ft.) (Note the temperature range of the cable!) See “Frequently ordered accessories” for cable specifications
U	X	X	XX m/ft. Silicone cable (part no. 530 176) U01…U30 (1…30 m)/U03...U99 (3...99 ft.) See “Frequently ordered accessories” for cable specifications
Straight cable outlet		
H	X	X	XX m/ft. PUR cable (part no. 530 052) H01…H30 (1…30 m)/H03...H99 (3...99 ft.) (Note the temperature range of the cable!) See “Frequently ordered accessories” for cable specifications
P	X	X	XX m/ft. PUR cable (part no. 530 175) P01…P30 (1…30 m)/P03...P99 (3...99 ft.) (Note the temperature range of the cable!) See “Frequently ordered accessories” for cable specifications
R	X	X	XX m/ft. PVC cable (part no. 530 032) R01…R30 (1…30 m)/R03...R99 (3...99 ft.) See “Frequently ordered accessories” for cable specifications
T	X	X	XX m/ft. FEP cable (part no. 530 112) T01…T30 (1…30 m)/T03...T99 (3...99 ft.) See “Frequently ordered accessories” for cable specifications
Encode in meters if using metric stroke length. Encode in feet if using US customary stroke length.		

j	System
1	Standard

k	Output
S	SSI

l	Function
1	Position
2	Differential measurement (2 magnets and 1 output)
3	Velocity
4	Position and temperature in the sensor electronics housing; ***NOTICE*** In this case, only option **2** “24 bit” can be selected under **o** “Data length”.

m	Options
0	Standard

n	Mode
1	Measuring direction forward, asynchronous mode
2	Measuring direction forward, synchronous mode 1
3	Measuring direction forward, synchronous mode 2
4	Measuring direction forward, synchronous mode 3
5	Measuring direction reverse, asynchronous mode
6	Measuring direction reverse, synchronous mode 1
7	Measuring direction reverse, synchronous mode 2
8	Measuring direction reverse, synchronous mode 3

o	Data length*
1	25 bit
2	24 bit
3	26 bit
A	24 bit + alarm bit + parity bit

p	Format
B	Binary
G	Gray

*/ The stroke length of the sensor influences the choice of resolution and data width. See glossary under “Resolution and data width depending on stroke length”

q	Resolution
1	5 µm
2	10 µm
3	50 µm
4	100 µm
5	20 µm
6	2 µm
7	0.1 µm*
8	1 µm
9	0.5 µm

r	Additional options (optional)			
S	0	0	2	FIR filter (2 measurements)
S	0	0	4	FIR filter (4 measurements)
S	0	0	8	FIR filter (8 measurements)
S	0	0	A	No filter, error counter (4 cycles)
S	0	0	C	No filter, error counter (8 cycles)
S	0	0	D	No filter, error counter (10 cycles)
S	0	0	G	FIR filter (8 measurements), error counter (10 cycles)
S	0	0	J	IIR filter (filter grade 4)
S	0	0	K	IIR filter (filter grade 8)
S	0	0	N	IIR filter (filter grade 8), error counter (10 cycles)

NOTICE

- Specify the number of magnets for your application and order the magnets separately.
- The number of magnets is limited by the stroke length. The minimum allowed distance between magnets (i.e. front face of one to the front face of the next one) is 75 mm (3 in.).
- Use magnets of the same type for differential measurement.

*/ The stroke length of the sensor influences the choice of resolution and data width. See glossary under “Resolution and data width depending on stroke length”

DELIVERY

RD5-K-C/D/M/T:
Sensor, O-ring
RD5-K-S:
Sensor, O-ring, back-up ring

Accessories have to be ordered separately.

Manuals, Software & 3D Models available at:
www.temposonics.com

ORDER CODE FOR SENSOR ROD ONLY

NOTICE

The RD5 sensor rod with cable/wires and connector can be ordered separately as a spare or replacement. For ordering just the sensor rod components, use the **RD5-R** model number configurator below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
R	D	5	R												
a			b	c	d					e	f				

a	Sensor model
R D 5	Sensor rod with detached electronics

b	Sensor components
R	Sensor rod assembly with cable and connector

c	Design
C	Threaded flange M18×1.5-6g (A/F 46)
D	Threaded flange ¾"-16 UNF-3A (A/F 46)
M	Threaded flange M18×1.5-6g (A/F 25)
S	Pressure fit flange Ø 26.9 mm f6
T	Threaded flange ¾"-16 UNF-3A (A/F 25)

d	Sensor rod cable type and length
J X X X X	FEP cable, length in centimeters (range 0007…2000 cm). See historical available*, or select length from: 0020, 0030, 0080, 0300, 0500, 1000, 1500, or 2000 cm
K X X X X	PUR cable, length in centimeters (range 0007…0115 cm). See historical available*, or select length from: 0020, 0030, or 0080 cm
W X X X X	6 single wires, length in centimeters (range 0007…0050 cm). Select length from: 0007, 0010, 0015, 0020, 0030, 0040 or 0050 cm
	* Historical lengths available: 0007 cm 0023 cm 0040 cm 0115 cm 0010 cm 0025 cm 0060 cm 0017 cm 0035 cm 0100 cm
Non-standard lengths for cable/wires are available; must be encoded in 1 cm increments and within the specified range	

e	Sensor rod connector type
E	Flat connector
G	M12 connector (only for sensor rod cable type »J« and »K«)
S	M16 connector (only for sensor rod cable type »J« and »K«)
W	M12 square panel mount connector (only for sensor rod cable type »W«) Requires RD5-C joining cable (ordered separately)

f	Stroke length	
X X X X M	Flange »S«: 0025…2540 mm Flange »C«, »D«, »M«, »T«: 0025…5080 mm	
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…5080 mm		100 mm
X X X X U	Flange »S«: 001.0…100.0 in. Flange »C«, »D«, »M«, »T«: 001.0…200.0 in.	
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.
Non-standard stroke lengths are available; must be encoded in 5 mm/0.1 in. increments		

DELIVERY

RD5-R-C/D/M/T:
Sensor rod, O-ring
RD5-R-S:
Sensor rod, O-ring, back-up ring

Accessories have to be ordered separately.

Manuals, Software & 3D Models available at:
www.temposonics.com

ORDER CODE FOR SENSOR ELECTRONICS HOUSING AND MOUNTING BLOCK ONLY

NOTICE

The RD5 sensor electronics housing with mounting block can be ordered separately as a spare or replacement. For ordering just the sensor electronics components, use the **RD5-E** model number configurator below.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
R	D	5	E		0					1	S		0								
a			b	c	d		e			f	g	h	i	j	k	l	m	n			

optional

a	Sensor model
R D 5	Sensor rod with detached electronics

b	Sensor components
E	Sensor electronics assembly with mounting block and mating connector

c	Design
B	Classic mounting block with bottom connection and flat mating connector (only for sensor rod connector type »E«)
E	Compact mounting block with bottom connection and flat mating connector (only for sensor rod connector type »E«)
G	Compact mounting block with side M12 mating connector (only for sensor rod connector type »G« and »W«)
S	Classic mounting block with side M16 mating connector (only for sensor rod connector type »S«)

d	Number of magnets
X X	01…02 position(s) (1…2 magnet(s))

e	Connection type
Connector	
D 7 0	M16 male connector (7 pin)
D 8 4	M12 male connector (8 pin)

e	Connection type
Angled cable outlet	
B X X	XX m* PUR cable (part no. 530 175) B01…B30 (1…30 m) (Note the temperature range of the cable!) See “Frequently ordered accessories” for cable specifications
E X X	XX m* PVC cable (part no. 530 032) E01…E30 (1…30 m) See “Frequently ordered accessories” for cable specifications
G X X	XX m* FEP cable (part no. 530 157) G01…G30 (1…30 m) See “Frequently ordered accessories” for cable specifications
L X X	XX m* PUR cable (part no. 530 052) L01…L30 (1…30 m) (Note the temperature range of the cable!) See “Frequently ordered accessories” for cable specifications
U X X	XX m* Silicone cable (part no. 530 176) U01…U30 (1…30 m) See “Frequently ordered accessories” for cable specifications
Straight cable outlet	
H X X	XX m* PUR cable (part no. 530 052) H01…H30 (1…30 m) (Note the temperature range of the cable!) See “Frequently ordered accessories” for cable specifications
P X X	XX m* PUR cable (part no. 530 175) P01…P30 (1…30 m) (Note the temperature range of the cable!) See “Frequently ordered accessories” for cable specifications
R X X	XX m* PVC cable (part no. 530 032) R01…R30 (1…30 m) See “Frequently ordered accessories” for cable specifications
T X X	XX m* FEP cable (part no. 530 112) T01…T30 (1…30 m) See “Frequently ordered accessories” for cable specifications
* For RD5-E the cable lengths are in meters only. To convert feet to meters use the calculation: # of feet multiplied by 0.305 = # of meters and round up to the next whole meter.	

f	System
1	Standard

g	Output
S	SSI

h	Function
1	Position
2	Differential measurement (2 magnets and 1 output)
3	Velocity
4	Position and temperature in the sensor electronics housing; ***NOTICE*** In this case, only option 2 “24 bit” can be selected under k “Data length”.

i	Options
0	Standard

j	Mode
1	Measuring direction forward, asynchronous mode
2	Measuring direction forward, synchronous mode 1
3	Measuring direction forward, synchronous mode 2
4	Measuring direction forward, synchronous mode 3
5	Measuring direction reverse, asynchronous mode
6	Measuring direction reverse, synchronous mode 1
7	Measuring direction reverse, synchronous mode 2
8	Measuring direction reverse, synchronous mode 3

k	Data length*
1	25 bit
2	24 bit
3	26 bit
A	24 bit + alarm bit + parity bit

l	Format
B	Binary
G	Gray

*/ The stroke length of the sensor influences the choice of resolution and data width. See glossary under “Resolution and data width depending on stroke length”

m	Resolution
1	5 µm
2	10 µm
3	50 µm
4	100 µm
5	20 µm
6	2 µm
7	0.1 µm*
8	1 µm
9	0.5 µm

n	Additional options (optional)			
S	0	0	2	FIR filter (2 measurements)
S	0	0	4	FIR filter (4 measurements)
S	0	0	8	FIR filter (8 measurements)
S	0	0	A	No filter, error counter (4 cycles)
S	0	0	C	No filter, error counter (8 cycles)
S	0	0	D	No filter, error counter (10 cycles)
S	0	0	G	FIR filter (8 measurements), error counter (10 cycles)
S	0	0	J	IIR filter (filter grade 4)
S	0	0	K	IIR filter (filter grade 8)
S	0	0	N	IIR filter (filter grade 8), error counter (10 cycles)

NOTICE

- Specify the number of magnets for your application and order the magnets separately.
- The number of magnets is limited by the stroke length. The minimum allowed distance between magnets (i.e. front face of one to the front face of the next one) is 75 mm (3 in.).
- Use magnets of the same type for differential measurement.

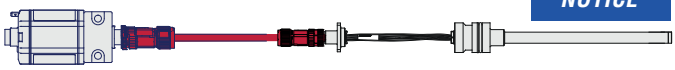
DELIVERY

RD5-E:
As ordered

Accessories have to be ordered separately.

**Manuals, Software & 3D Models available at:
www.temposonics.com**

ORDER CODE FOR RD5 JOINING CABLE – RD5-C



NOTICE

The **RD5-C** joining cable is required when the sensor rod connector is the M12 square panel mount connector, **W**. For ordering the joining cable, use the RD5-C model number configurator below.

1	2	3	4	5	6	7	8	9	10	11
R	D	5	C	J					C	M
a			b	c					e	

a	Sensor model
R D 5	Sensor rod with detached electronics

b	Sensor components
C	Joining cable (M12 to M12)

c	Design
J X X X X	FEP cable Length in centimeters (range 0050...2000 cm) Standard lengths are: 0050, 0100, 0300, 0500, 1000, 1500, 2000 cm
Non-standard lengths for the joining cable are available; must be encoded in 1 cm increments and within the specified range	

d	Unit of measure
C M	Length in centimeters

DELIVERY

RD5-C:
As ordered

Manuals, Software & 3D Models available at:
www.temposonics.com

GLOSSARY

A

Alarm
The alarm bit is set by the sensor if the sensor detects more magnets (extra magnet) or less magnets (magnet status error) than configured.

Asynchronous mode
In asynchronous mode the position data is continuously updated inside the sensor as quickly as the sensor's measurement cycle will allow, independent of the controller. The controller's loop time will determine when the sensor's most recent data is clocked out over the SSI interface. (→ Synchronous mode)

D

Differential measurement
For differential measurement, the distance between the two position magnets is output as a value.

E

Extrapolation
The native measurement cycle time of a sensor increases with the stroke length. With extrapolation, the sensor is able to report data faster than the native cycle time, independent of the stroke length of the sensor. Without extrapolation, if data is requested faster than the native cycle time, the last measured value is repeated.

F

FIR filter
The FIR filter (**F**inite **I**mpulse **R**esponse) is used to smooth the measured position value before output. To determine the output value, only input values corresponding to the window (filter window size) are used for filter calculation. The output value is calculated from these input values in the form of a moving average value. (→ IIR Filter)

I

IIR filter
The IIR filter (**I**nfinite **I**mpulse **R**esponse) is used to smooth the measured position value before output. To determine the output value, the input values corresponding to the filter grade (filter window size) are used for the filter calculation. The previous values are also taken into account when calculating the output value. (→ FIR Filter)

M

Measuring direction
When moving the position magnet, the position and velocity values increase in the measuring direction.
- Forward: Values increasing from sensor electronics housing to rod end/profile end
- Reverse: Values decreasing from sensor electronics housing to rod end/profile end

P

Parity
The parity bit is a check bit that is added to a bit string to detect transmission errors. There are even parity and odd parity. With even parity, the parity bit is set so that the total number of 1-bits in the bit string including the parity bit is even. In case of odd parity, the total number of 1-bits in the bit sequence including the parity bit is odd. Even parity is implemented in the R-Series V SSI.

R

Resolution and data length depending on stroke length
The stroke length of the sensor influences the choice of resolution and data length. The resolution (step size) and data length (number of steps) must be selected so that the stroke length is covered. For example, with a data length of 24 bit and a resolution of 0.5 µm for an RH5 sensor the maximum stroke length of 7620 mm can be represented. You can adjust the resolution and the data length of the R-Series V SSI via the TempoLink® and TempoGate® smart assistants.

S

Synchronous Serial Interface
SSI (**S**ynchronous **S**erial **I**nterface) is a digital interface where the data is transferred serially. The interface of R-Series V SSI corresponds to SSI industry standard for absolute encoders. Its displacement value is encoded in a 24/25/26 bit binary or gray format and transmitted as a differential signal in SSI standard (RS-485/RS-422).

Synchronous mode
In synchronous mode the measurement and output of the sensor is matched to the data request cycle of the controller. The synchronous mode minimizes the time delay between measurement and output. The synchronous mode is required for sophisticated motion control applications. (→ Asynchronous mode)
- **Synchronous mode 1**
  Using synchronous mode 1, the sensor determines the controller's loop timing and when data is being requested. The sensor then determines when to start the next measurement cycle so that it will complete just in time to deliver the freshest data possible.
- **Synchronous mode 2**
  If new position data is required faster than the sensor's measurement cycle time, synchronous mode 2 provides extrapolated data values, calculated on the fly. A measurement value will be calculated and output to the controller whenever the sensor has not yet completed the next measurement cycle.
- **Synchronous mode 3**
  Synchronous mode 3 provides an extrapolation to the high speed update feature of synchronous mode 2. For this mode all measurements values which are output are calculated to fully compensate for the inherent lag time due to the sensor's measurement cycle. (→ Extrapolation)

T

Temperature in the sensor electronics housing
The temperature in the sensor electronics housing is measured in °C. With this option, the transmitted data word has a length of 32 bits, with the highest 8 bits representing the temperature value, followed by 24 bits for the position value. The temperature value is coded in the same format as the position value.

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