Temposonics
AN AMPHENOL COMPANY

Data Sheet

R-Series V RP5 PROFINET IO RT & IRT

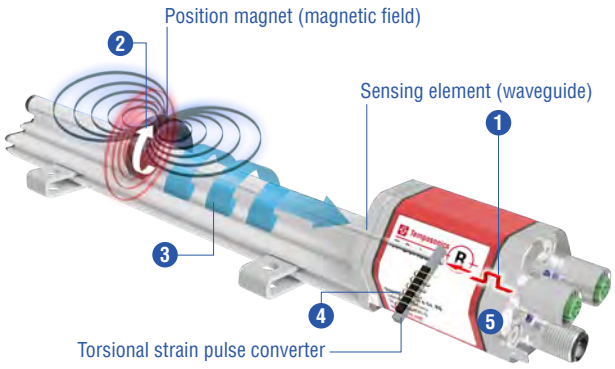
Magnetostrictive Linear Position Sensors

- Minimum position resolution 0.5 µm
- Position and velocity measurements for up to 30 magnets
- Field adjustments and diagnostics using the new TempoLink® smart assistant

DIE NEUE 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 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.



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 PROFINET

Temposonics® R-Series V brings very powerful sensor performance to meet the many demands of your application. This series is the long term solution for harsh environments that have high levels of shock and vibration. The sensors are available with PROFINET RT (Real Time) and IRT (Isochronous Real Time). PROFINET IRT offers a synchronized communication with a minimum cycle time of 250 µs. For time-critical applications R-Series V with linear extrapolation enables synchronized controller communication for any stroke length of the sensor. In addition, the sensors are available with internal linearization which offers improved linearity for overall higher accuracy of the position measurement values. In addition to the measured position value via the PROFINET protocol further data about the current sensor status, such like the total distance travelled, the internal temperature and the total operating hours, can be displayed for diagnostic purposes.

With many outstanding features the R-Series V sensors are fit for a very broad range of applications.

TempoLink YOUR SMART ASSISTANT

The TempoLink smart assistant is an accessory for the R-Series V family of sensors that supports setup and diagnostics. Depending on the sensor protocol it enables the adjustment of parameters like measurement direction, resolution and filter settings. For diagnostics and analysis of operational data the R-Series V sensors continuously track values such as total distance traveled by the positon magnet, internal temperature of the sensor and the quality of the position signal. This additional information can be read out via TempoLink smart assistant even while the sensor remains operational in the application.
TempoLink smart assistant is connected to the sensor via the power connection, which now adds bidirectional communication for setup and diagnostics. The TempoLink smart assistant is operated using a graphical user-interface that will be displayed on your smartphone, tablet, laptop or PC. Just connect your Wi-Fi-enabled device to TempoLink Wi-Fi access point and go to the website URL for the user-interface.

Fig. 2: R-Series V sensor with TempoLink smart assistant

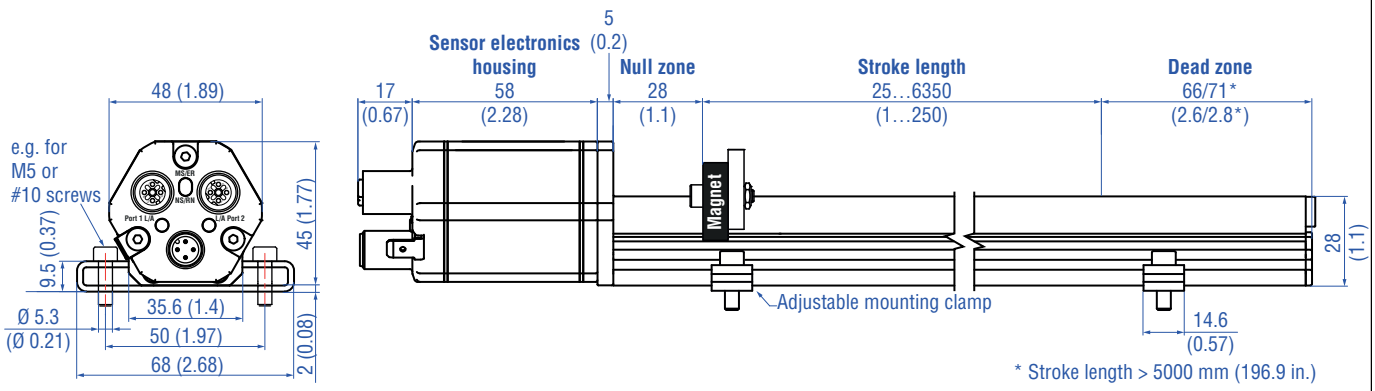
TECHNICAL DATA

Output	
Interface	PROFINET RT PROFINET IRT version 2.3
Data protocol	MTS Profile and Encoder Profile V4.2
Data transmission rate	100 MBit/s (maximum)
Measured value	Position, velocity/option: Simultaneous multi-position and multi-velocity measurements up to 30 magnets
Measurement parameters	
Resolution: Position	0.5…100 µm (selectable)
Cycle time	Stroke length: ≤ 50 mm | ≤ 715 mm | ≤ 2000 mm | ≤ 4675 mm | ≤ 6350 mm Cycle time: 250 µs | 500 µs | 1000 µs | 2000 µs | 4000 µs
Linearity deviation [1]	Stroke length: ≤ 500 mm | > 500 mm Linearity deviation: ≤ ±50 µm | < 0.01 % F.S. Optional internal linearization: Linearity tolerance (Applies for the first magnet for multi-position measurement) Stroke length: 25…300 mm | 300…600 mm | 600…1200 mm | 1200…3000 mm | 3000…5000 mm | 5000…6350 mm typical: ±15 µm | ±20 µm | ±25 µm | ±45 µm | ±85 µm | ±95 µm maximum: ±25 µm | ±30 µm | ±50 µm | ±90 µm | ±150 µm | ±190 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…+85 °C (–40…+185 °F)
Humidity	90 % relative humidity, no condensation
Ingress protection	IP67 (connectors correctly fitted)
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 sensor meets the requirements of the EC directives and is marked with CE
Magnet movement velocity	Magnet slider: Max. 10 m/s; U-magnet: Any; block magnet: Any
Design / Material	
Sensor electronics housing	Aluminum (painted), zinc die cast
Sensor profile	Aluminum
Stroke length	25…6350 mm (1…250 in.)
Mechanical mounting	
Mounting position	Any
Mounting instruction	Please consult the technical drawings on page 4 and the operation manual (document number: 551973)
Electrical connection	
Connection type	2 × M12 female connectors (D-coded), 1 × M12 male connector (A-coded) 2 × M12 female connectors (D-coded), 1 × M8 male connector
Operating voltage	+12…30 VDC ±20 % (9.6…36 VDC)
Power consumption	Less than 4 W typical
Dielectric strength	500 VDC (DC ground to machine ground)
Polarity protection	Up to –36 VDC
Overvoltage protection	Up to 36 VDC

1/ With position magnet # 252 182

TECHNICAL DRAWING

RP5-M-A/-V, example: Connection type D58 (connector output)



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

Fig. 3: Temposonics® RP5 with U-magnet

CONNECTOR WIRING

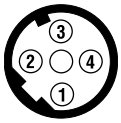
D58		
Port 1 – Signal		
M12 female connector (D-coded)	**Pin**	**Function**
 View on sensor	1	Tx (+)
	2	Rx (+)
	3	Tx (–)
	4	Rx (–)
Port 2 – Signal		
M12 female connector (D-coded)	**Pin**	**Function**
 View on sensor	1	Tx (+)
	2	Rx (+)
	3	Tx (–)
	4	Rx (–)
Power supply		
M12 male connector (A-coded)	**Pin**	**Function**
 View on sensor	1	+12…30 VDC (±20 %)
	2	Not connected
	3	DC Ground (0 V)
	4	Not connected

Fig. 4: Connector wiring D58

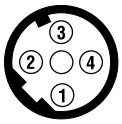
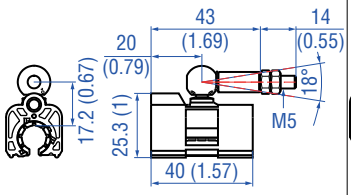
D56		
Port 1 – Signal		
M12 female connector (D-coded)	**Pin**	**Function**
 View on sensor	1	Tx (+)
	2	Rx (+)
	3	Tx (–)
	4	Rx (–)
Port 2 – Signal		
M12 female connector (D-coded)	**Pin**	**Function**
 View on sensor	1	Tx (+)
	2	Rx (+)
	3	Tx (–)
	4	Rx (–)
Power supply		
M8 male connector	**Pin**	**Function**
 View on sensor	1	+12…30 VDC (±20 %)
	2	Not connected
	3	DC Ground (0 V)
	4	Not connected

Fig. 5: Connector wiring D56

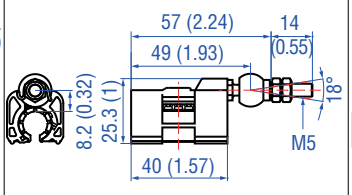
FREQUENTLY ORDERED ACCESSORIES – Additional options available in our Accessories Guide 551444

Position magnets



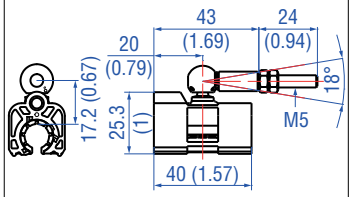
Magnet slider S, joint at top
Part no. 252 182

Material: GRP, magnet hard ferrite
Weight: Approx. 35 g
Operating temperature:
–40…+85 °C (–40…+185 °F)



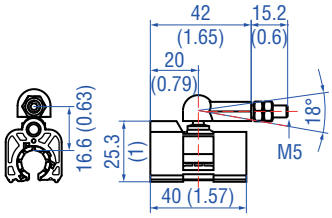
Magnet slider V, joint at front
Part no. 252 184

Material: GRP, magnet hard ferrite
Weight: Approx. 35 g
Operating temperature:
–40…+85 °C (–40…+185 °F)



Magnet slider N
longer ball-joint arm
Part no. 252 183

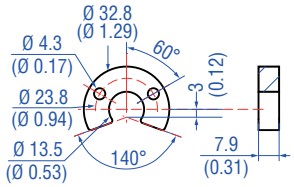
Material: GRP, magnet hard ferrite
Weight: Approx. 35 g
Operating temperature:
–40…+85 °C (–40…+185 °F)



Magnet slider G, backlash free
Part no. 253 421

Material: GRP, magnet hard ferrite
Weight: Approx. 25 g
Operating temperature:
–40…+85 °C (–40…+185 °F)

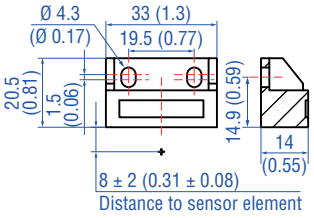
Position magnets



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…+105 °C (–40…+221 °F)

Marked version for sensors with internal linearization: Part no. 254 226

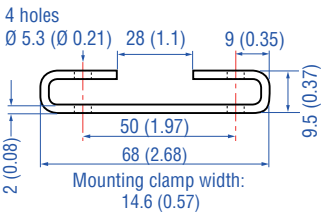


Block magnet L
Part no. 403 448

Material: Plastic carrier with hard ferrite magnet
Weight: Approx. 20 g
Fastening torque for M4 screws: 1 Nm
Operating temperature:
–40…+75 °C (–40…+167 °F)

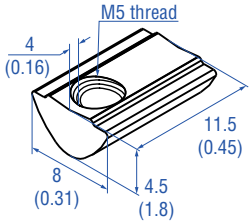
This magnet may influence the sensor performance specifications for some applications.

Mounting accessories



Mounting clamp
Part no. 400 802

Material: Stainless steel (AISI 304)

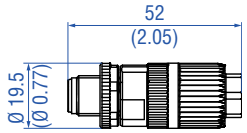


T-nut
Part no. 401 602

Fastening torque for M5 screw: 4.5 Nm

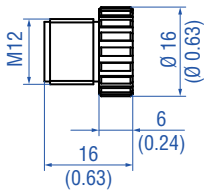
Controlling design dimensions are in millimeters and measurements in ( ) are in inches

Cable connectors* – Signal



M12 D-coded male connector (4 pin), straight
Part no. 370 523

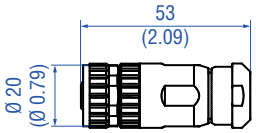
Material: Zinc nickel-plated
Termination: Insulation-displacement
Cable Ø: 5.5…7.2 mm (0.2…0.28 in.)
Wire: 24 AWG – 22 AWG
Operating temperature:
–25…+85 °C (–13…+185 °F)
Ingress protection: IP65 / IP67 (correctly fitted)
Fastening torque: 0.6 Nm



M12 connector end cap
Part no. 370 537

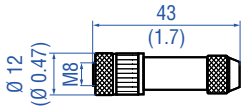
Female connectors M12 should be covered by this protective cap
Material: Brass nickel-plated
Ingress protection: IP67 (correctly fitted)
Fastening torque: 0.39…0.49 Nm

Cable connectors* – Power



M12 A-coded female connector (4 pin/5 pin), straight
Part no. 370 677

Material: GD-Zn, Ni
Termination: Screw
Contact insert: CuZn
Cable Ø: 4…8 mm (0.16…0.31 in.)
Wire: 1.5 mm²
Operating temperature:
–30…+85 °C (–22…+185 °F)
Ingress protection: 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 mm²
Operating temperature:
–40…+85 °C (–40…+185 °F)
Ingress protection: IP67 (correctly fitted)
Fastening torque: 0.5 Nm

Programming kit

TempoLink® kit for Temposonics® R-Series V
Part no. TL-1-0-EM08 (D56) Part no. TL-1-0-EM12 (D58)

- 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

Cables

PUR signal cable
Part no. 530 125

Material: PUR jacket; green
Features: Cat 5, highly flexible, halogen free, suitable for drag chains, mostly oil & flame resistant
Cable Ø: 6.5 mm (0.26 in.)
Cross section: 2 × 2 × 0.35 mm² (22 AWG)
Operating temperature:
–20…+60 °C (–4…+140 °F)

Signal 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)

Signal 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)

*/ Follow the manufacturer‘s mounting instructions

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

Cables

PVC power cable
Part no. 530 108

Material: PVC jacket; gray
Features: Shielded, flexible, mostly flame resistant
Cable Ø: 4.9 mm (0.19 in.)
Cross section: 3 × 0.34 mm²
Bending radius: 10 × D
Operating temperature: –30…+80 °C (–22…+176 °F)

Power cable with M8 female connector (4 pin), straight – pigtail
Part no. 530 066 (5 m (16.4 ft.))
Part no. 530 096 (10 m (32.8 ft.))
Part no. 530 093 (15 m (49.2 ft.))

Material: PUR jacket; gray
Features: Shielded
Cable Ø: 8 mm (0.3 in.)
Operating temperature: –40…+90 °C (–40…+194 °F)

ORDER CODE

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
R	P	5										D	5		1	U	4		
a			b	c	d					e		f			g	h			

a	Sensor model
R P 5	Profile

b	Design
G	Magnet slider backlash free (part no. 253 421), suitable for internal linearization
L	Block magnet L (part no. 403 448)
M	U-magnet OD33 (part no. 251 416-2), suitable for internal linearization
N	Magnet slider longer ball-jointed arm (part no. 252 183), suitable for internal linearization
O	No position magnet
S	Magnet slider joint at top (part no. 252 182), suitable for internal linearization
V	Magnet slider joint at front (part no. 252 184), suitable for internal linearization

c	Mechanical options
A	Standard
V	Fluorelastomer seals for the sensor electronics housing

d	Stroke length
X X X X M	0025…6350 mm

Standard stroke length (mm)	Ordering steps
25… 500 mm	25 mm
500…2500 mm	50 mm
2500…5000 mm	100 mm
5000…6350 mm	250 mm

X X X X U	001.0…250.0 in.

Standard stroke length (in.)	Ordering steps
1… 20 in.	1.0 in.
20…100 in.	2.0 in.
100…200 in.	4.0 in.
200…250 in.	10.0 in.

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

e	Number of magnets
X X	01…30 position(s) (1…30 magnet(s))

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

f	Connection type
D 5 8	2 × M12 female connectors (D-coded), 1 × M12 male connector (A-coded)
D 5 6	2 × M12 female connectors (D-coded), 1 × M8 male connector

g	System
1	Standard

h	Output
U 4 0 2	PROFINET RT & IRT, position and velocity, MTS profile (1…30 position(s))
U 4 0 1	PROFINET RT & IRT, position and velocity, encoder profile (1 position)
U 4 1 2	PROFINET RT & IRT, position and velocity, MTS profile, internal linearization (1…30 position(s))
U 4 1 1	PROFINET RT & IRT, position and velocity, encoder profile, internal linearization (1 position)

NOTICE

- Select the MTS profile (U402 or U412) in **h** "Output" for multi-position measurement.
- For RP5, the magnet selected in **b** "Design" is included in the scope of delivery. Specify the number of magnets for your application. For multi-position measurements with more than 1 magnet order the other 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 multi-position measurement, e.g. 2 × U-magnet (part no. 251 416-2).
- If the option for internal linearization (U411, U412) in **h** "Output" is chosen, select a suitable magnet.

DELIVERY

- Sensor
- Position magnet (not valid for RP5 with design »O«)
- 2 mounting clamps up to 1250 mm (50 in.) stroke length + 1 mounting clamp for each 500 mm (20 in.) additional stroke length

Accessories have to be ordered separately.

GLOSSARY

E

Encoder Profile
The encoder profile corresponds to the specification of the encoder profile V4.2 (PNO no. 3.162). With this profile, the position and the velocity of one magnet can be measured and transferred simultaneously. (→ MTS Profile)

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.

G

GSDML
The properties and functions of a PROFINET IO field device are described in a GSDML file (**G**eneral **S**tation **D**escription). The XML-based GSDML file contains all relevant data that are important for the implementation of the device in the controller as well as for data exchange during operation. The GSDML file of the R-Series V PROFINET is available on the homepage www.mtssensors.com.

I

Internal Linearization
The internal linearization offers an improved linearity for an overall higher accuracy of the position measurement. The internal linearization is set for the sensor during production.

IRT Filter
With PROFINET IRT (**I**sochronous **R**eal **T**ime) a clock-synchronous data transmission takes place. The application, the data transmission as well as the device cycle are synchronous. IRT enables a clock-synchronous data exchange with a minimum cycle time of 250 µs in the network. The R-Series V PROFINET supports PROFINET RT and IRT. (→ RT)

M

MTS Profile
The MTS profile was developed by MTS Sensors and is tailored to the characteristics of magnetostrictive position sensors. With this profile, the positions and velocities of up to 30 magnets can be reported and transfered simultaneously. (→ Encoder Profile)

Multi-position measurement
During the measurement cycle, the positions of every magnet on the sensor are simultaneously reported. The velocity is continuously calculated based on these changing position values as the magnets are moved.

P

PROFINET
PROFINET (**Pro**cess **F**ield **Net**work) is an Industrial Ethernet interface and is managed by the **P**ROFIBUS **N**utzer**o**rganiation e.V. (PNO). The R-Series V PROFINET and its corresponding GSDML file are certitified by the PNO.

R

RT
With PROFINET RT (**R**eal **T**ime) the data exchange is without clock synchronization. In this case, the application, the data transmission and the field devices operate according to their own processing cycle. The R-Series V PROFINET supports PROFINET RT and IRT. (→ IRT)

Temposonics
AN AMPHENOL COMPANY

UNITED STATES
Temposonics, LLC
Americas & APAC Region
3001 Sheldon Drive
Cary, N.C. 27513
Phone: +1 919 677-0100
E-mail: info.us@temposonics.com

GERMANY
Temposonics
GmbH & Co. KG
EMEA Region & India
Auf dem Schüffel 9
58513 Lüdenscheid
Phone: +49 2351 9587-0
E-mail: info.de@temposonics.com

ITALY
Branch Office
Phone: +39 030 988 3819
E-mail: info.it@temposonics.com

FRANCE
Branch Office
Phone: +33 6 14 060 728
E-mail: info.fr@temposonics.com

UK
Branch Office
Phone: +44 79 21 83 05 86
E-mail: info.uk@temposonics.com

SCANDINAVIA
Branch Office
Phone: +46 70 29 91 281
E-mail: info.sca@temposonics.com

CHINA
Branch Office
Phone: +86 21 2415 1000 / 2415 1001
E-mail: info.cn@temposonics.com

JAPAN
Branch Office
Phone: +81 3 6416 1063
E-mail: info.jp@temposonics.com

Document Part Number:
551961 Revision B (EN) 02/2026

UK CA c UL us CE ISO 9001 CERTIFIED PROFINET INDUSTRIAL ETHERNET

temposonics.com