R-Series Model RP and RH Sensors
Profibus-DP Output

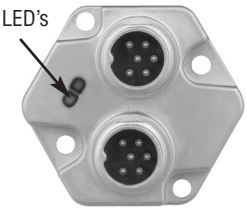
- **Rugged industrial sensor**
- **Linear, absolute measurement**
- **LEDs for sensor diagnostics**
- **Non-contact sensing technology**
- **Superior accuracy, resolution up to 5 µm**
- **Non-linearity less than 0.01%**
- **Repeatability within 0.001%**
- **Direct Profibus-DP output, displacement + speed**
- **Multi-magnet position measurement (up to 15 positions per sensor)**

Parameter	Specification
Measured variable:	Displacement, speed / optional: multi-magnet measurements (up to 15 magnet positions or 5 positions + velocities)
Resolution:	Displacement: 5 µm / other values selectable via GSD-file Speed: For 5 µm displacement resolution; 0.64 mm/s up to 500 / 0.43 mm/s up to 2000 / 0.21 mm/s up to 4500 / 0.14 mm/s up to 7600 mm stroke length
Update time (one magnet)**:**	0.5 ms at 500 mm / 1 ms at 2000 mm / 2 ms at 4500 mm / 3.1 ms at 7600 mm stroke length. Each additional magnet add 0.05 ms. Add 0.03 ms for approximate values for speed measurements.
Non-linearity:	< ± 0.01% full scale (minimum ± 50 µm)
Repeatability:	< ± 0.001% full scale (minimum ± 2.5 µm) Hysteresis: < 4 µm
Outputs:	Interface: Profibus-DP system ISO 74498 Data format: Profibus-DP (EN 50 170) Data transmission rate: 12 Mbit/s max.
Measuring range:	Profile style: 50 to 5080 mm (2 to 200 in.) Rod style: 50 to 7620 mm (2 to 300 in.)
Operating voltage:	+24 Vdc nominal (-15 or +20%) Polarity protection: up to -30 Vdc Overvoltage protection: up to 36 Vdc Current drain: 90 mA typical Dielectric withstand voltage: 500 V (DC ground to machine ground)
Operating conditions:	Temperature: - 40 to +75 °C, (-40 to +167 °F) Relative humidity: 90% no condensation Temperature coefficient: < 15 ppm / °C

Parameter	Specification (continued)
EMC test:	Emissions IEC/EN 50081-1, Immunity IEC/EN 50082-2, IEC/EN 61000-4-2/3/4/6, level 3/4 criterium A, CE qualified
Shock rating:	100 g (single hit)/IEC standard 68-2-27 (survivability)
Vibration rating:	15 g/10-2000 Hz/IEC standard 68-2-6
Connection type:	D63 option: 2 x 6-pin connectors (M16) one male, one female. D53 option: 2 x 5-pin connectors (M12) one male, one female, plus 1 x 4-pin connector (M8) male.
PROFILE STYLE (RP MODEL)	
Electronic head:	Aluminum housing Diagnostic display (LED's beside connectors)
Sealing:	IP 65
Sensor extrusion:	Aluminum (Temposonics profile style)
Mounting:	Adjustable mounting feet or T-slot nut (M5 threads) in base channel
Magnet type:	Captive-sliding magnet or floating (open ring) magnet
ROD STYLE (RH MODEL)	
Electronic head:	Aluminum housing Diagnostic display (LED's beside connectors)
Sealing:	IP 67
Sensor rod with flange:	304L Stainless steel
Operating pressure:	350 bar static, 690 bar spike (5000 psi static; 10,000 psi spike)
Mounting:	Any orientation. Threaded flange M18 x 1.5 or 3/4-16 UNF-3A
Typical mounting torque:	45 N-m (33 ft. - lbs.)
Magnet type:	Ring magnet, floating (open ring) magnet, or magnet float

Sensor status and diagnostic display

Integrated LEDs (green/red) provide basic visual feedback for normal sensor operation and troubleshooting.



Profibus interface

Green	Red	Description
ON	OFF	Normal function
ON	ON	Magnet not detected or wrong quantity of magnets
Flashing	OFF	Waiting for master parameters
Flashing	ON	Programming mode

Profibus -DP interface

Temposonics R-Series models RP and RH linear-position sensors fulfill all requirements of Profibus-DP (EN 50170) protocol. The sensor achieves absolute position measuring with direct transmission of serial, bit synchronous data in RS-485 standard to control units in a baud rate of 12 Mbps maximum. The Profibus-DP interface includes the Siemens bus controller SPC3.

In addition to applications transmission, Profibus-DP provides powerful functionality for diagnostics and configuration, which is loaded into the bus when using the GSD electronic device data sheet.

Sensor Output / Parameters

Profibus-DP sensors correspond to DP-slave Class 2 with the following features:

- Sensor output:
  - Absolute position measurement
  - Speed measurement
  - Sensor status
  - Error detection (e.g. magnet status)

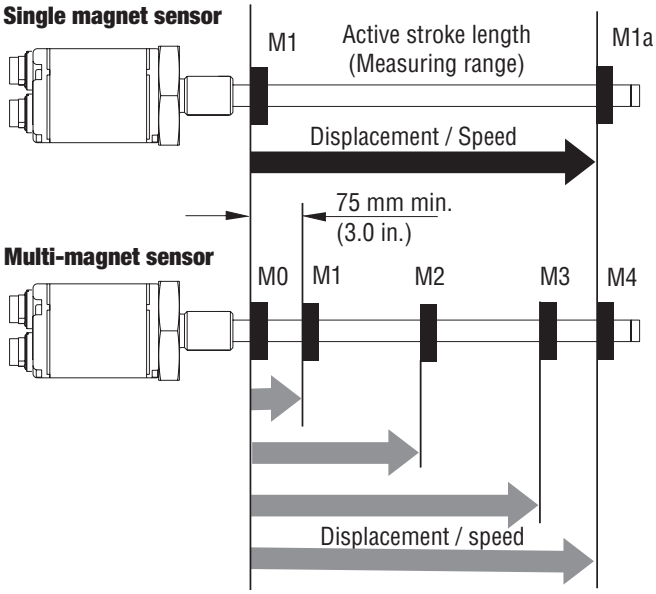
- Selectable parameters:
  - Offset / preset for each magnet
  - Measuring direction; forward/reverse
  - Different data formats

Profibus operation modes

Profibus sensors provide measurements using one or multiple magnets. The following operation modes are available:

- Standard measurement:
  - Position measurement (using one magnet)

- Multi-magnet measurement:
  - Position measurement of up to fifteen magnets simultaneously.
  - Position and speed of five magnets maximum.



Data exchange

With multi-magnet measurement, 1 status byte and 3 bytes of position data for each position are transmitted. The status byte consists of two modes, magnet on (0 hex) or magnet off/missing magnet (8 hex). Dependent of sensor parameters, sensor data can be transferred in different data formats, (e.g. Intel® or Motorola®).

Profibus address programmer accessory

The Profibus address programmer is used to setup the sensor's slave address. Addressing is usually performed by the Profibus SetSlaveAddress command. If the master system or controller does not support this service, connecting the Profibus Address Programmer to the sensor will bypass the service and allow direct setup.

Profibus address programmer installation

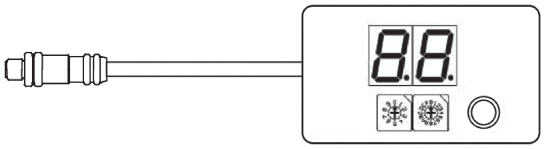
To install and use the Profibus-DP D63 or D53 programmer, follow the steps below:

1. Disconnect the bus wiring and power supply.
2. Connect the handheld programmer to the sensor.
3. Connect the power supply to the sensor. The slave address displays.
4. Select a new slave address and apply the new setting by pressing the button.
5. Disconnect the power and programmer.
6. Displaying and programming must be completed in hexadecimal values. Programming is limited to the legal values of 03 to 7D, (3 to 125)

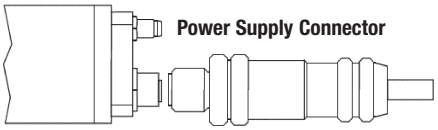
Profibus sensors are supplied with the setup address of 7D, (125).

Profibus address programmer installation (continued)

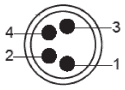
D53 programmer part no. 252173-D53



D53 connections



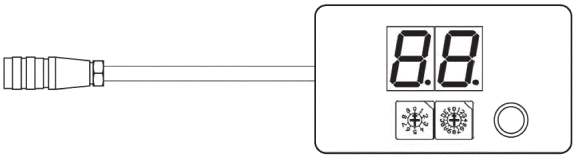
Sensor head



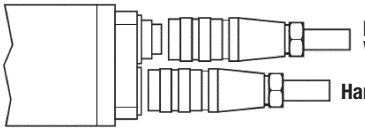
Sensor's Integral connector (4-pin male), pin-out as viewed from the end of the sensor.

Pin	Power Supply
1	+24 Vdc (+20% / -15%)
2	n.c
3	DC Ground
4	n.c.

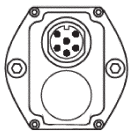
D63 programmer part no. 252173-D63

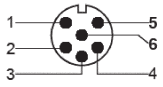


D63 connections



Sensor head





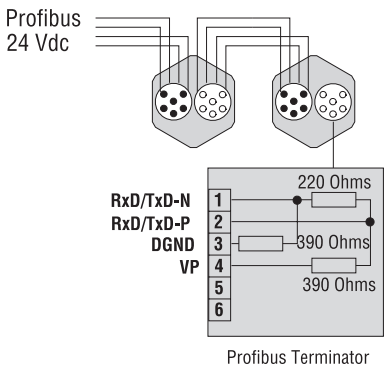
Sensor's Integral connector (6-pin male), pin-out as viewed from the end of the sensor.

Pin	Function
1	n.c.
2	n.c
3	n.c.
4	n.c.
5	+24 Vdc
6	DC Ground

Bus connections

D63 connector option

A shielded hybrid cable is used for both bus and supply voltage connections. This provides convenient daisy-chain connections for multiple Profibus sensors.

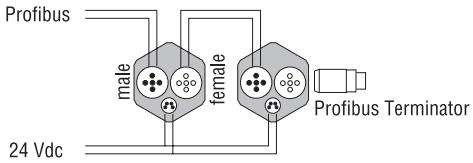


Profibus Terminator

Bus connections (continued)

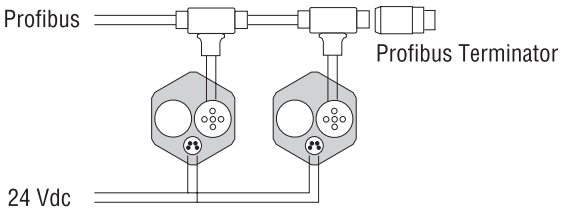
D53 connector option

A separate cable is used for the bus and for the supply voltage.



D53 connector option with the "T" connector

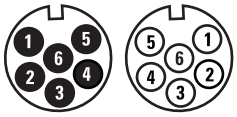
A "T" connector is used with the separate bus cable to enable the bus to remain active when a sensor is disconnected.



D63 cable connector and wiring diagram

Pin-out/wire color code, D63
(Shielded hybrid cable for bus and input voltage)

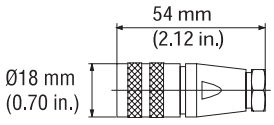
Integral D63 connector (male/female) as viewed from end of sensor



Pin-out/wire color code

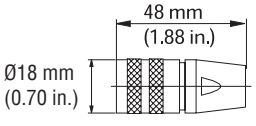
Pin no.	Wire color	Function
1	Green	RxD/TxD-N (Bus)
2	Red	RxD/TxD-P (Bus)
3	N/A	DGnd (Bus termination)*
4	N/A	VP (Bus termination)*
5	Black	+24 Vdc (-15 / +20%)
6	Blue	DC Ground (0V)
N/A	Yellow/Green	Shielding, machine ground
		* Signal connections for the sensor's female connector only

Cable connectors, (Field-installed D63)



1) 6-pin DIN female connector with PG9 strain relief Part number 370423

2) 6-pin DIN male connector with PG9 strain relief Part number 370427

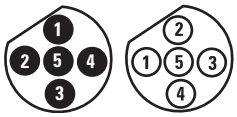


6-pin Profibus Bus terminator Part number 252347

D53 Bus connector and wiring diagram

Pin-out/wire color code, D53

Integral D53 Bus connector (male/female) as viewed from end of sensor



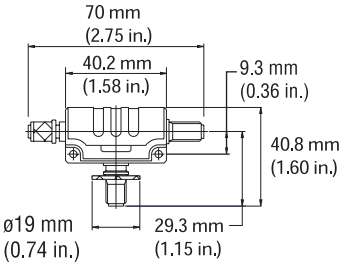
Pin-out/wire color code

Pin no.	Wire color	Function
1	N/A	VP+5 (Bus termination)*
2	Green	RxD/TxD-N (Bus)
3	N/A	DGnd (Bus termination)*
4	Red	RxxD / TxD-P (Bus)
5	Shield	Shield
		* Signal connections for the sensor's female connector only

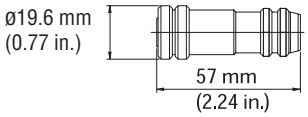
Input voltage

Pin no.	Wire color	Function
1	Brown	+24V Vdc (-15 / +20%)
2	White	n.c.
3	Blue	DC Ground (0V)
4	Black	n.c.

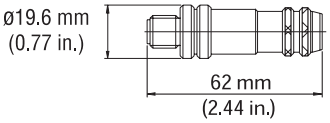
Cable connectors, (field-installed D53)



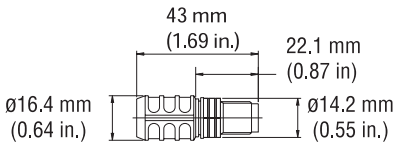
5-pin Profibus T-connector M12
Part number 560887



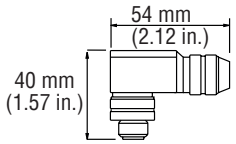
5-pin Profibus female connector (M12)
Part number 560885



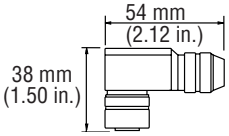
5-pin Profibus male connector (M12)
Part number 560884



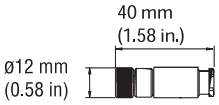
5-pin Profibus Bus terminator (M12)
Part number 560888



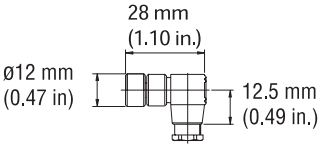
5-pin male connector (M12)
90° exit connector
Part number 370515



5-pin female connector (M12)
90° exit connector
Part number 370514



4-pin female connector (M8)
Straight exit connector
input voltage
Part number 370504

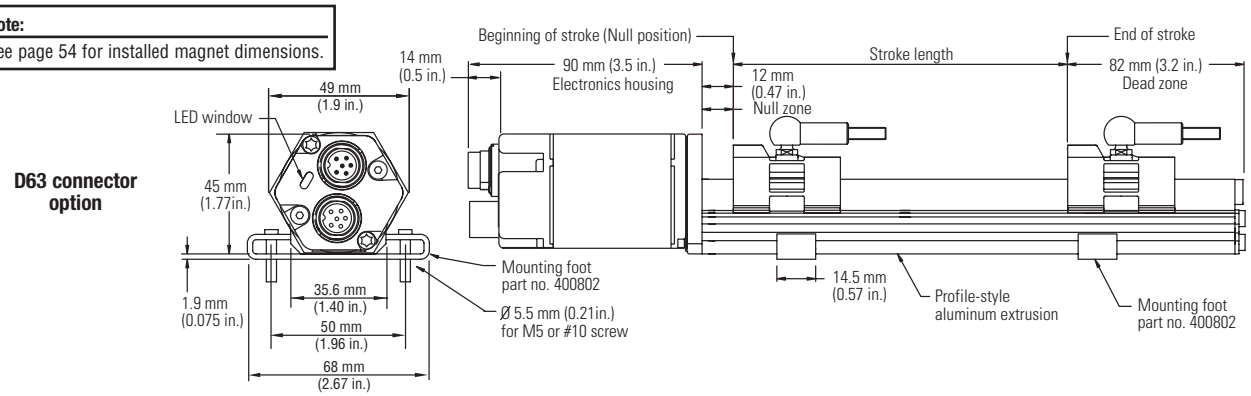


4-pin female connector (M8)
input voltage (insert adjustable in 90° positions)
Part number 560886

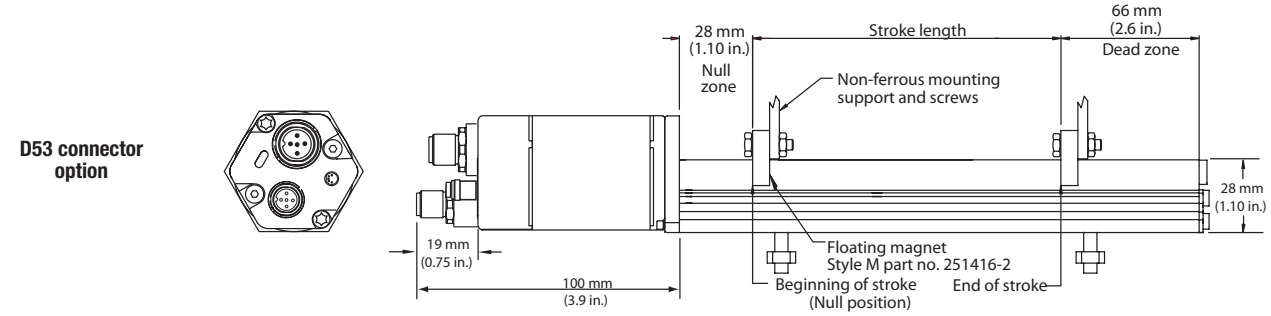
MODEL RP PROFILE-STYLE SENSOR

Captive-sliding magnet

Note:
See page 54 for installed magnet dimensions.



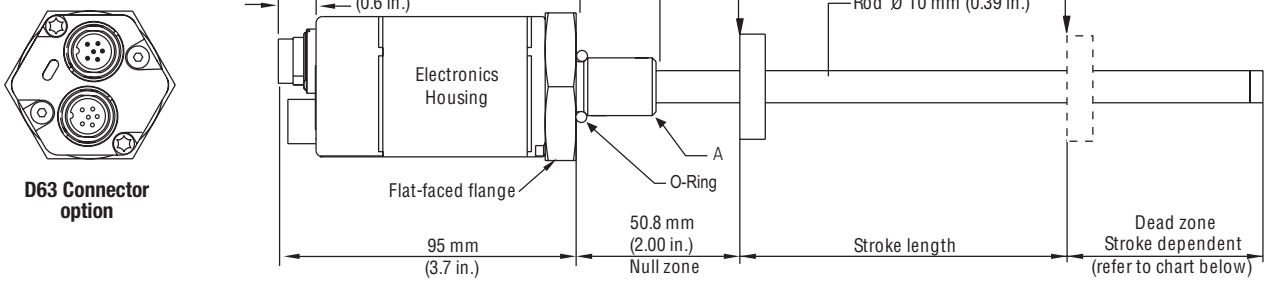
Floating magnet (open ring)

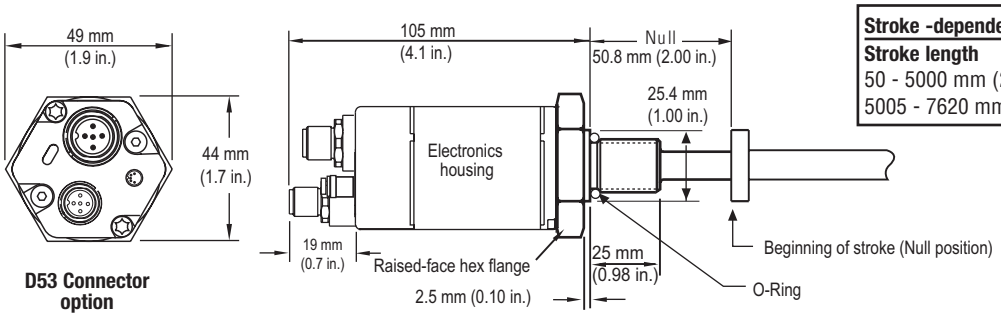


MODEL RH ROD-STYLE SENSOR

The Temposonics R-Series rod-style sensor (Model RH) offers modular construction, flexible mounting configurations, and easy installation. It is designed for internal mounting in applications where high pressure conditions exist, (5000 psi continuous, 10,000 psi spike), such as hydraulic cylinders. The Model RH sensor may also be mounted externally in many applications.

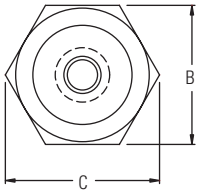
Note:
See page 53 for mounting and magnet details.



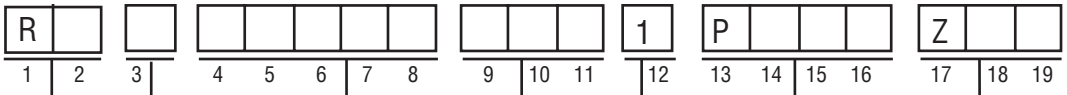


Stroke -dependent Dead Zones	
Stroke length	**Dead Zone**
50 - 5000 mm (2 - 197 in.)	63.5 mm (2.5 in.)
5005 - 7620 mm (197.1 - 300 in.)	66 mm (2.6 in.)

Housing style Flange type	Description	A Flange threads	B Dimensions	C Dimensions
T	US customary threads with raised-face hex	3/4"-16 UNF-3A	44.5 mm (1.75 in.)	51 mm (2.0 in.)
S	US customary threads with flat-faced hex	3/4"-16 UNF-3A	44.5 mm (1.75 in.)	51 mm (2.0 in.)
M	Metric threads with flat-faced hex	M18 x 1.5	46 mm (1.81 in.)	53 mm (2.1 in.)



HOW TO ORDER



SENSOR MODEL

RP = Profile style
RH = Hydraulic rod style
RF = Flexible style

HOUSING STYLE

Model RP sensor only (magnet included):
S = Captive-sliding magnet with joint at top (part number 252182)
V = Captive-sliding magnet with joint at front (part number 252184)
M = Floating magnet open ring (part number 251416-2)

Models RH and LF sensors only (magnet must be ordered separately):
T = US customary threads, raised-faced hex, and pressure tube
S = US customary threads, flat-faced hex, and pressure tube
M = Metric threads, flat-faced hex, and pressure tube
B = Sensor cartridge only (No pressure tube, stroke lengths ≤ 72 in.).

Model RF sensor only, (reference section on flex housing style), magnet must be ordered separately:
S = US customary threads, flat-faced hex
M = Metric threads, flat-faced hex

STROKE LENGTH

_ _ _ _ **M** = Millimeters (Encode in 5 mm increments)
_ _ _ . _ **U** = Inches and tenths (Encode in 0.1 in. increments)

Stroke length notes:
RH stroke range = 50 - 7620 mm (2 - 300 in.)
RP stroke range = 50 - 5080 mm (2 - 200 in.)

CONNECTION TYPE

D63 = 2 x 6 pin DIN, male/female (M16) standard
D53 = 2 x 5 pin, male/female (M12), plus 4-pin male (M8).

INPUT VOLTAGE

1 = +24 Vdc (+20%, -15%)

OUTPUT

P_ _ _ = Profibus protocol (Fill in the three blanks with the following codes):

101 = Multi-magnet (multi-position measurement) max. 15 positions.
102 = Single magnet (standard)
103 = Position, velocity (max. 5 positions//velocities)

NUMBER OF MAGNETS

(For multi-position measurement only)
Z _ _ = Number of magnets for output P101 (range 02 to 15), or for output P103 (range 02 to 05).
Order additional magnets separately for multi-position measurement.