

R-Series Models RP and RH Sensors CANbus Output (CANopen and CANbasic)



- Rugged industrial sensor
- Linear, absolute measurement
- LEDs for sensor diagnostics
- Non-contact sensing technology
- Superior accuracy, resolution down to 2 μm
- Non-linearity less than 0.01%
- Repeatability within 0.001%
- Direct CAN output, displacement + speed
- Multi-magnet position measurement (up to 15 positions per sensor)

Parameters	Specifications																
Measured variable:	Displacement, speed / optional: multi-magnet measurements (up to 15 magnet positions simultaneous)																
Resolution:	<table border="0"> <tr> <td colspan="2">CANopen:</td> </tr> <tr> <td><u>Displacement</u></td> <td><u>Speed</u></td> </tr> <tr> <td>5 μm</td> <td>0.5 mm/s</td> </tr> <tr> <td>2 μm</td> <td>0.2 mm/s</td> </tr> <tr> <td colspan="2">CANbasic:</td> </tr> <tr> <td><u>Displacement</u></td> <td><u>Speed</u></td> </tr> <tr> <td>5 μm</td> <td>1.0 mm/s</td> </tr> <tr> <td>2 μm</td> <td>0.1 mm/s</td> </tr> </table>	CANopen:		<u>Displacement</u>	<u>Speed</u>	5 μm	0.5 mm/s	2 μm	0.2 mm/s	CANbasic:		<u>Displacement</u>	<u>Speed</u>	5 μm	1.0 mm/s	2 μm	0.1 mm/s
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5 μm	1.0 mm/s																
2 μm	0.1 mm/s																
Non-linearity:	$\pm 0.01\%$ full scale (minimum $\pm 40 \mu\text{m}$)																
Repeatability:	$\pm 0.001\%$ full scale (minimum $\pm 2.5 \mu\text{m}$) Hysteresis $< 4 \mu\text{m}$																
Outputs:	Interface: CAN-Fieldbus system ISO DIS 11898 Data protocol CANopen: CIA standard DS-301 V4.02 encoder profile DS-406 V3.1 CANbasic: CAN 2.0 A Baud rate, kBit/s: 1000 800 500 250 125 50 20 Cable length, m: <25 <50 <100 <250 <500 <1000 <2500 The sensor will be supplied with ordered Baud rate which can be changed by the customer.																
Stroke length:	Profile style: 50 mm (2 in.) to 5080 mm (200 in.) Rod style: 50 mm (2 in.) to 7620 mm (300 in.)																
Operating voltage:	+24 Vdc nominal (-15% or +20%) Polarity protection: up to -30 Vdc Overvoltage protection: up to 36 Vdc Current drain: 100 mA typical Dielectric withstand voltage: 500 Vdc (DC ground to machine ground) Connection type: Single or dual 6-pin male D60 connectors, or integral cable																

Parameters	Specifications (continued)
Operating temperature:	-40 $^{\circ}\text{C}$ (-40 $^{\circ}\text{F}$) to 75 $^{\circ}\text{C}$ (167 $^{\circ}\text{F}$) Relative humidity: 90% no condensation Temperature coefficient $<15 \text{ ppm}/^{\circ}\text{C}$
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 (30 g with HVR option)/ 10-2000 Hz/IEC standard 68-2-6
Update time:	1.0 ms up to 2400 mm, 2.0 ms up to 4800 mm, 4.0 ms up to 7600 mm stroke length

PROFILE STYLE (MODEL RP) SENSOR

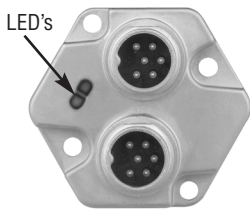
Electronic head:	Aluminum housing Diagnostic display (LED's located beside connector/cable exit)
Sealing:	IP 65
Sensor extrusion:	Aluminum
Mounting:	Adjustable mounting feet or T-slot nut (M5 threads) in base channel
Magnet type:	Captive-sliding magnet or open-ring magnet

ROD STYLE (MODEL RH) SENSOR

Electronic head:	Aluminum housing Diagnostic display (LEDs located beside connector/cable exit)
Sealing:	IP 67 or IP 68 for integral cable model
Sensor rod with flange:	304L Stainless steel
Operating pressure:	350 bar static, 690 bar spike (5000 psi static; 10,000 psi spike)
Mounting:	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, 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.



CANbus interface

Green	Red	Description
ON	OFF	Normal function
ON	Flashing	Magnet out of setup range
ON	ON	Magnet not detected
Flashing	ON	Programming mode

CANbus outputs

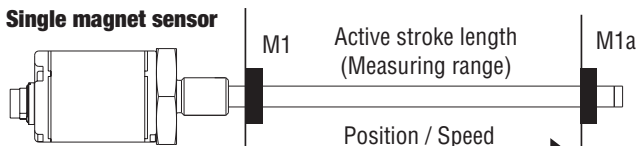
R-Series models RP and RH linear-position sensors, as slave devices, fulfill all requirements of the CANbus (ISO 11898) protocol. The sensor's electronics convert the displacement measurements into bus oriented outputs and transfer this data directly to the controller. The bus interface is appropriate for serial data transfer up to 1Mbps. Sensor integrated software supports bus profiles CANopen, CANbasic and DeviceNet for a comprehensive customized configuration of the sensor-bus system. (Reference separate MTS document for DeviceNet output.)

Operation modes

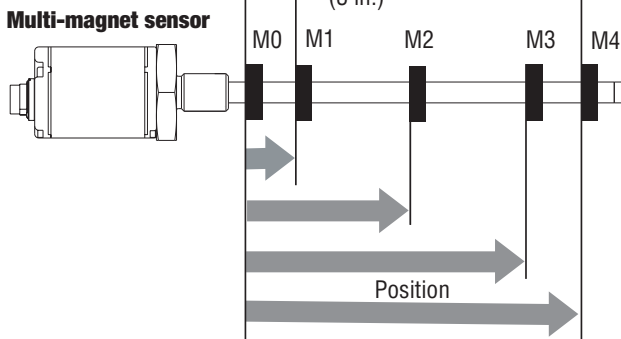
CANbus sensors provide the following single or multi-magnet measurements:

- Standard measurement:
 - CANbasic; Displacement + speed (using one magnet)
 - CANopen; Displacement + speed (using one to four magnets)
- Multi-magnet measurement:
 - CANbasic; Positions for each of two to fifteen magnets simultaneously

Single magnet sensor



Multi-magnet sensor



CANopen

CANopen corresponds to encoder profile DS-406 V3.1 (CIA standard DS-301 V4.02). The CANopen functionality is described by the following three communication objects.

• **Service data object (SDO):**

The SDO is mainly used for sensor configuration. Selectable parameters are:

- Resolution for position + speed
- 4 set points
- Preset of the operation range and the null position for four magnets

• **Process data object (PDO):**

The PDO provides real-time data transfer of sensor measurements in up to 8-byte data blocks. The sensor uses PDOs to relay information about magnet position, speed, limit status, cam control and operation range for up to four magnets.

Data formats are: 32-bits for position, 16-bits for speed, and 8-bits for value limit.

• **PDO transmission type:**

Asynchronous (cycle time of 1 to 65.535 ms) or synchronous.

- Synchronization Object (SYNC)
- Emergency Object
- Nodeguard Object

• **CANopen Configuration**

A software file is used as an Electronic Data Sheet (EDS) for sensor configuration. The EDS file is available on the mini CD that is included with the sensor, as well as, on the MTS website, at www.mtssensors.com.

Note:

Conformance Test Certificate No. CiA199902-301V30/I-004 is given by the CANbus user organization CiA (CAN in Automation) for MTS CANopen sensors.

CANbasic (MTS)

CANbasic allows a simple, flexible adaptation to customized profiles with short bus access. The CANbasic protocol complies with CAN 2.0A standard and includes applications data for single-magnet measurement (position, speed, sensor status and five setpoints).

CANbasic (multi-magnet measurement)

CANbasic provides position measurement on a single sensor using a maximum of fifteen magnets. Setup and operation are accomplished through the on-site control system.

CANopen address programmer accessory

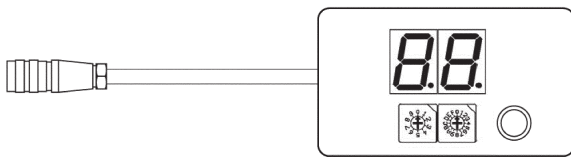
The CANopen address programmer is used to setup the Node-Address for sensors with the CANopen interface. This setup is usually completed by the bus' LMT/LSS-Service. If the master system or customer controller does not support this service, connecting the the CANopen Address Programmer to the sensor will bypass the service and allow direct setup. A 24 Vdc power supply connected to the sensor (customer supplied) is required in order to use the programmer.

CANopen address programmer installation

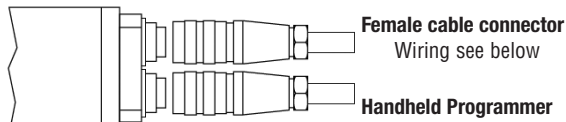
To install and use the CANopen handheld programmer, follow the steps below:

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 node-address displays.
4. Select a new node-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 from 01 to 7F (1 to 127). The factory default is 7F (127).

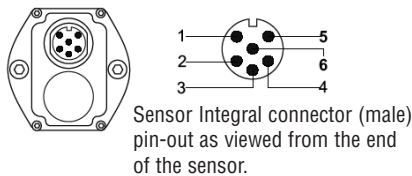
CANbus handheld programmer
(part no. 252382-D62)



CANbus programmer connections



Sensor head, Connector outlet D62



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

Sensor integral connector (for single D60 and for dual D62)

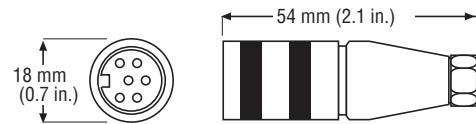
Male Integral D6 connector pin-out as viewed from end of the sensor



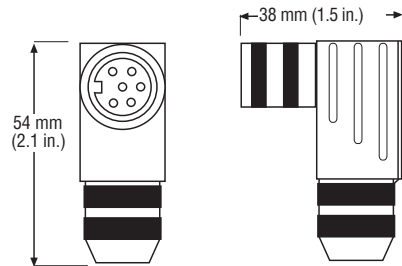
Pin no.	Wire color	Function
1	Gray	CAN (-)
2	Pink	CAN (+)
3	Yellow	n.c.
4	Green	n.c.
5	Red or Brown	+24 Vdc (-15 / + 20%)
6	White	DC Ground (for supply)

Cable connectors (field installed 6-pin D6 female)

D6 straight-exit connector
(PG9 size strain relief for 8 mm max. cable dia.)
part no. 370423

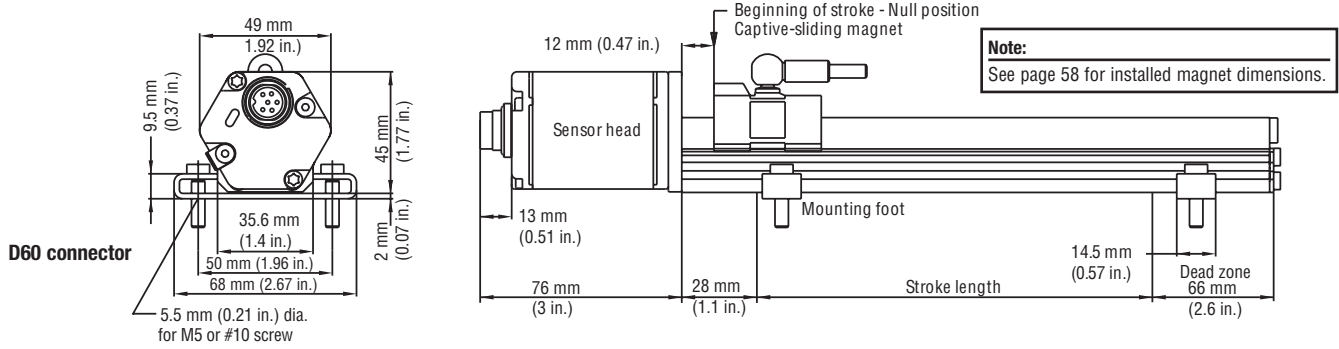


D6 90° connector
part no. 560778



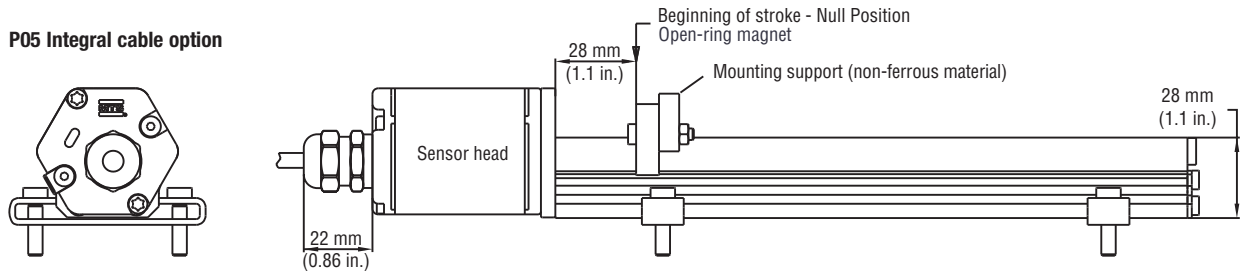
MODEL RP PROFILE-STYLE SENSOR

Captive-sliding magnet



Open-ring magnet

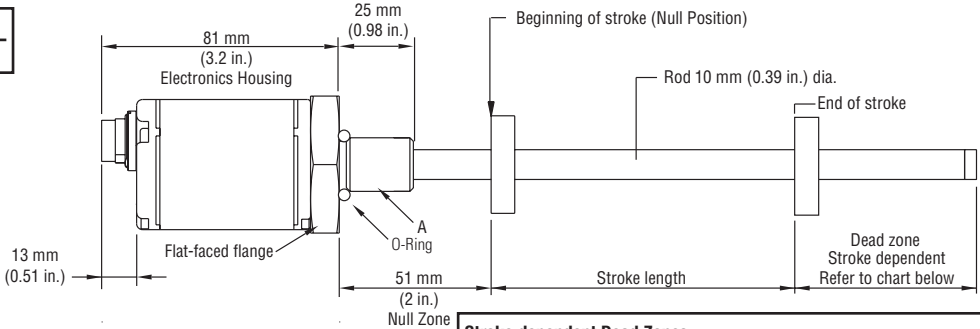
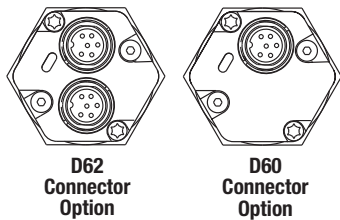
P05 Integral cable option



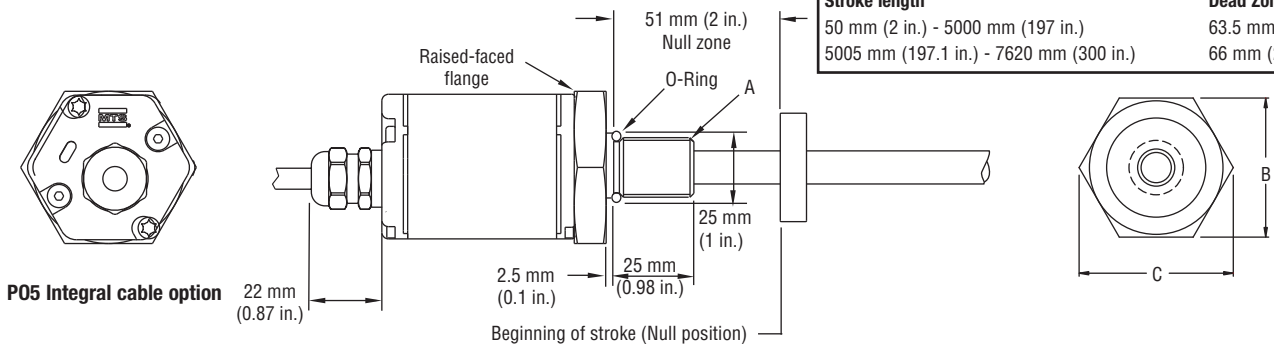
MODEL RH ROD-STYLE SENSOR

The rod-style (Model RH) sensor 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 57 for mounting and magnet details.



Stroke dependent Dead Zones	
Stroke length	Dead Zone
50 mm (2 in.) - 5000 mm (197 in.)	63.5 mm (2.5 in.)
5005 mm (197.1 in.) - 7620 mm (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 flange	3/4"-16 UNF-3A	44.5 mm (1.75 in.)	51 mm (2 in.)
S	US customary threads with flat-faced flange	3/4"-16 UNF-3A	44.5 mm (1.75 in.)	51 mm (2 in.)
M	Metric threads with flat-faced flange	M18 x 1.5	46 mm (1.81 in.)	53 mm (2.1 in.)

HOW TO ORDER

R											1		C								Z		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		

SENSOR MODEL

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

HOUSING STYLE

Model RP profile-style sensor only (magnet included):

- S** = Captive-sliding magnet with joint at top (part no. 252182)
- V** = Captive-sliding magnet with joint at front (part no. 252184)
- M** = Open-ring magnet (part no. 251416-2)

Model RH rod-style sensor only (magnet must be ordered separately):

- T** = US customary threads, raised-faced flange and pressure tube, standard
- S** = US customary threads, flat-faced flange and pressure tube, standard
- U** = Same as option "T", except uses fluoroelastomer seals for the electronics housing
- H** = Same as option "S", except uses fluoroelastomer seals for the electronics housing
- M** = Metric threads, flat-faced flange and pressure tube, standard
- V** = Same as option "M", except uses fluoroelastomer seals for electronics housing
- B** = Sensor cartridge only, no flange and pressure tube, stroke length < 1830 mm (72 in.)

Model RF flex sensor only, (reference page 41 for flex housing style):

magnet must be ordered separately:

- S** = US customary threads, flat-faced flange
- M** = Metric threads, flat-faced flange

STROKE LENGTH

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

Stroke length notes:

1. Profile-style sensor (model RP) stroke length = 50 mm (2 in.) - 5080 mm (200 in.)
2. Rod-style sensor (model RH) stroke length = 50 mm (2 in.) - 7620 mm (300 in.)

CONNECTION TYPE

Integral connector:

- D60** = Single 6-pin DIN (M16), male, standard
- D62** = Dual 6-pin DIN (M16), male

Integral cable:

- P** = PUR Integral cable with pigtail termination, standard.

Cable length:

- = 1 (01) to 30 (30) meters or 1 (01) to 99 (99) ft.
- Encode in meters if using metric stroke length, encode in feet if using US customary stroke length

Cable length note:

MTS recommends the maximum integral cable length to be 10 meters (33 ft.). Cables greater than 10 meters (33 ft.) in length are available, however, proper care must be taken during handling and installation.

INPUT VOLTAGE

- 1** = +24 Vdc (+20%, -15%)
- A** = Same as option "1", except includes the High Vibration-Resistant (HVR) option
Model RH sensor only, stroke length = 50 mm (2 in.) - 2000 mm (78.7 in.) see note

Note:

The High Vibration-Resistant (HVR) option provides the model RH rod-style sensors with increased resistance to shock and vibration for use in heavy duty machinery. Refer to "G-Series and R-Series Sensors for High Shock and Vibration Applications", part no. 551073 for more information.

OUTPUT

- C** = CANbus output (fill in the six blanks with the following codes):
a b c d e f

a, b, c = CANbus hardware and protocol code:

- 101** = Single magnet - CANbasic (MTS)
- 207** = Multi-magnet
- 304** = CANopen

d = Baud rate:

- 1** = 1000 kBit/s
- 2** = 500 kBit/s
- 3** = 250 kBit/s
- 4** = 125 kBit/s

e = Resolution:

- 1** = 0.005 mm (0.0002 in.)
- 2** = 0.002 mm (0.00008 in.)

f = Cycle time:

- 1** = Standard

NUMBER OF MAGNETS

(for multi-position measurement only)

- Z** = Number of magnets for output C207 (range 02 to 15).

Order additional magnets separately for multi-position measurements. More than 15 magnets requires application engineering approval
CANbus EDS files are available on the Temposonics website at www.mtsensors.com.

