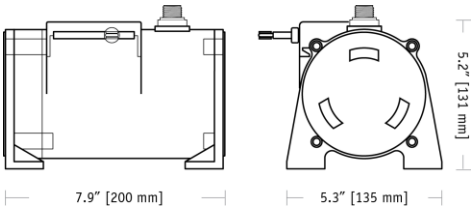
PT9CN

Cable Actuated Sensor
Heavy Industrial • J1939 CANbus

Linear Position/Velocity to 550 inches (1400 cm)

Aluminum or Stainless Steel Enclosure Options

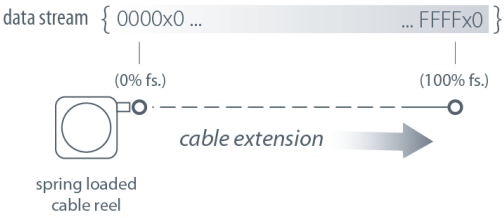
IP67 • NEMA 6 Protection



The PT9CN communicates linear position feedback via the CANbus SAE J1939 interface. The PT9CN has been designed for factory and harsh environment applications requiring full stroke ranges up to 550".

As a member of Celesco's innovative family of NEMA 4 rated cable-extension transducers, the PT9CN installs in minutes by simply mounting its body to a fixed surface and attaching its cable to the movable object. Perfect parallel alignment not required.

Output Signal



General

Full Stroke Range	0-75 to 0-550 inches
Electrical Interface	CANbus SAE J1939
Protocol	Proprietary B
Accuracy	± 0.10% full stroke
Repeatability	± 0.02% full stroke
Resolution	± 0.003% full stroke
Measuring Cable Options	nylon-coated stainless steel or thermoplastic
Enclosure Material	powder-painted aluminum or stainless steel
Sensor	plastic-hybrid precision potentiometer
Potentiometer Cycle Life	≥ 250,000 cycles
Maximum Retraction Acceleration	see ordering information
Maximum Velocity	see ordering information
Weight, Aluminum (Stainless Steel) Enclosure	8 lbs. (16 lbs.), max.

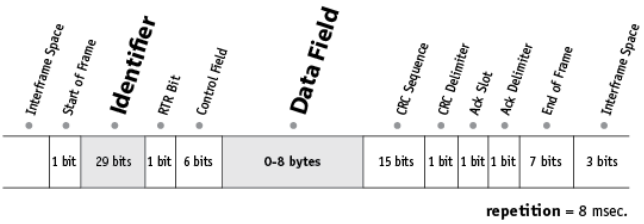
Electrical

Input Voltage	7 - 18 VDC
Input Current	60 mA max.
Address Setting (Node ID)	0...63 set via DIP switches
Baud Rate	125K, 250K or 500K set via DIP switches
Update Rate	10 ms. (20 ms. available, contact factory)

Environmental

Enclosure	NEMA 4/4X/6, IP 67
Operating Temperature	-40° to 200°F (-40° to 90°C)
Vibration	up to 10 g to 2000 Hz maximum

I/O Format and Settings



• Identifier

	Message Priority			Future Use		J1939 Reference Proprietary B								Data Field Type*								Not Used		Node ID**					
Example –	1	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	1	0	0	1	1	0	0	1	1	1	1	1	1
Identifier Bit No. –	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Hex Value –		0				F				F				5				3				3				F			

*Sensor field data can be factory set to customer specific value. **Customer defined, set via Dips 1-6. Bit values shown for example only, see **Address Setting** below.

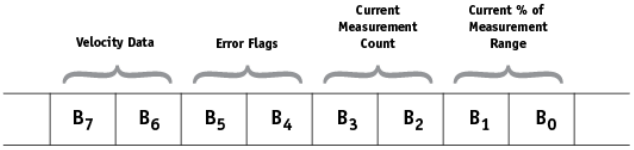
• Data Field

B_0 = LSB current % of measurement range byte
B_1 = MSB current % of measurement range byte

B_2 = LSB current measurement count byte
B_3 = MSB current measurement count byte

B_4 = error flag
B_5 = error flag

B_6 = LSB velocity data byte
B_7 = MSB velocity data byte



Current Measurement Count

The **C**urrent **M**easurement **C**ount (**CMC**) is the output data that indicates the present position of the measuring cable. The CMC is a 16-bit value that occupies bytes B_2 and B_3 of the data field. B_2 is the **LSB** (least significant byte) and B_3 is the **MSB** (most significant byte).

The **CMC** starts at **0x0000** with the measuring cable fully retracted and continues upward to the end of the stroke range stopping at **0xFFFF**. This holds true for all ranges.

Converting CMC to Linear Measurement

To convert the current measurment count to inches or millimeters, simply divide the count by 65,535 (total counts over the range) and then multiply that value by the full stroke range:

$$\left(\frac{\text{current measurement count}}{65{,}535}\right) \text{X} \text{ full stroke range}$$

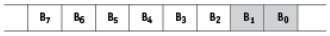
Sample Conversion:

If the full stroke range is **30 inches** and the current position is **0x0FF2** (4082 Decimal) then,

$$\left(\frac{4082}{65{,}535}\right) \text{X } 30.00 \text{ inches} = 1.87 \text{ inches}$$

If the full stroke range is **625 mm** and the current position is **0x0FF2** (4082 Decimal) then,

$$\left(\frac{4082}{65{,}535}\right) \text{X } 625 \text{ mm} = 39 \text{ mm}$$



Current % of Measurement Range

The Current % of Measurement Range is a 2-byte value that expresses the current linear position as a percentage of the entire full stroke range. Resolution is **.1 %** of the full stroke measurement range.

This value starts at **0x0000** at the beginning of the stroke and ends at **0x03E8**.

Example:

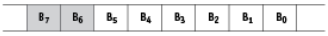
Hex	Decimal	Percent
0000	0000	0.0%
0001	0001	0.1%
0002	0002	0.2%
...	...	...
03E8	1000	100.0%

Error Flags

0x55 (yellow LED on controller board) indicates that the sensor has begun to travel beyond the calibrated range of the internal position potentiometer.

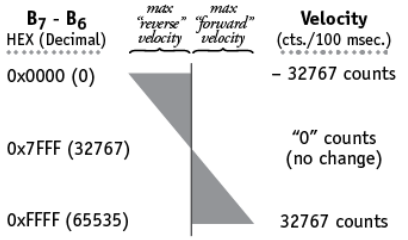
0xAA (red LED on controller board) indicates that the sensor has moved well beyond the calibrated range of the internal position potentiometer.

If either error flag occurs within the full stroke range of the sensor, the unit should be returned to the factory for repair and recalibration.



Velocity

Data in bytes B_7 - B_6 is the change in the **CMC** (current measurement count) over a 100 msec time period. This data can then be used to calculate velocity in a post processing operation.



Velocity Calculation

$$\left(\frac{\text{count change} - 32767}{.1 \text{ sec. time period}}\right) \text{X} \left(\frac{\text{full stroke range}}{65{,}535}\right)$$

Sample Calculations

Cable Extension (positive direction):

B_7–B_6 = 0x80C6 (32966 Dec), **full stroke = 200 in.**

$$\left(\frac{32966 - 32767}{.1 \text{ sec}}\right) \text{X} \left(\frac{200 \text{ in.}}{65{,}535}\right) = 6.07 \text{ in./sec.}$$

Cable Retraction (negative direction):

B_7–B_6 = 0x7F1A (32538 Dec), **full stroke = 200 in.**

$$\left(\frac{32538 - 32767}{.1 \text{ sec}}\right) \text{X} \left(\frac{200 \text{ in.}}{65{,}535}\right) = -6.99 \text{ in./sec.}$$

Setting the Address (Node ID) and Baud Rate

Address Setting (Node ID)

The Address Setting (Node ID) is set via 6 switches located on the 8-pole DIP switch found on the DeviceNET controller board located inside the transducer.

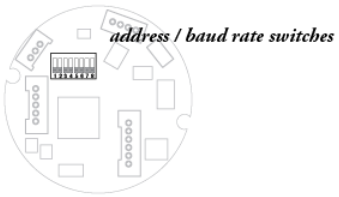
The DIP switch settings are binary starting with switch number **1** (= 2^0) and ending with switch number **6** (= 2^5).

Baud Rate

The transmission baud rate may be either factory preset at the time of order or set manually at the time of installation.

The baud rate can be set using switches **7** & **8** on the 8-pole DIP switch found on the DeviceNET controller board located inside the transducer.

CANBus Controller Board



DIP-1 (2^0)	DIP-2 (2^1)	DIP-3 (2^2)	DIP-4 (2^3)	DIP-5 (2^4)	DIP-6 (2^5)	*address* (decimal)
0	0	0	0	0	0	0
1	0	0	0	0	0	1
0	1	0	0	0	0	2
...	...	...	...	...	...	...
1	1	1	1	1	1	63

DIP-7	DIP-8	baud rate
0	0	125k
1	0	250k
0	1	500k
1	1	125k

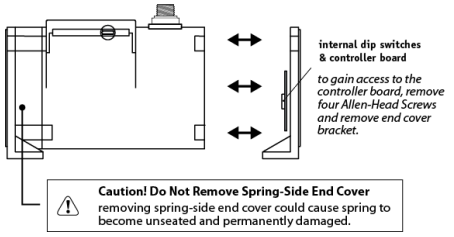
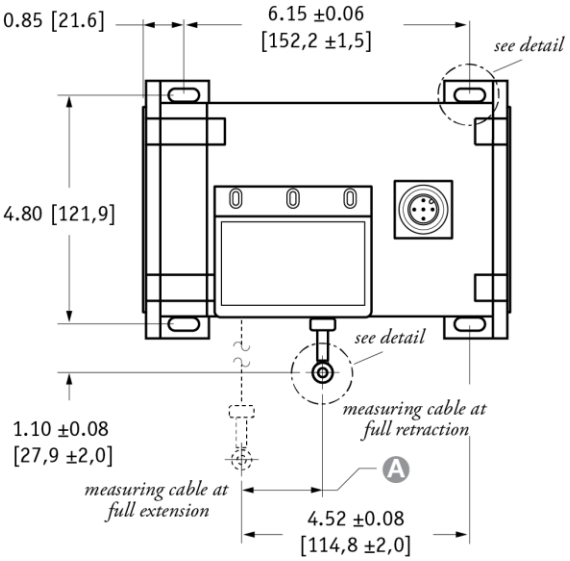
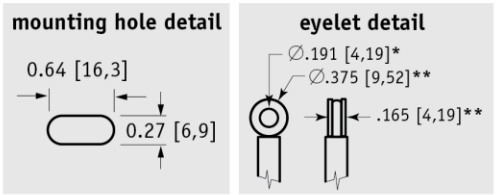


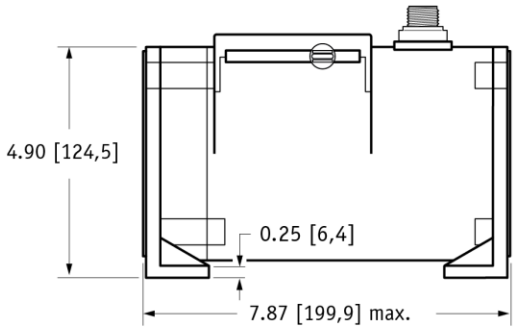
Fig. 1 – Outline Drawing (18 oz. cable tension only)

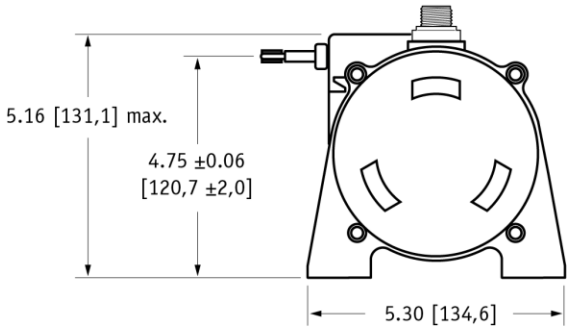




A DIMENSION (INCHES)

RANGE	MEASURING CABLE Ø.031 in.	Ø.034 in.	Ø.047 in.	Ø.062 in.
75	n/a	0.22	0.29	0.37
100	n/a	0.29	0.39	0.49
150	n/a	0.44	0.59	0.73
200	n/a	0.58	0.79	0.98
250	n/a	0.73	0.98	1.22
300	n/a	0.88	1.18	1.47
350	n/a	1.02	1.38	1.71
400	n/a	1.17	1.57	1.96
450	n/a	1.31	1.77	n/a
500	n/a	1.46	1.97	n/a
550	1.61	1.61	n/a	n/a

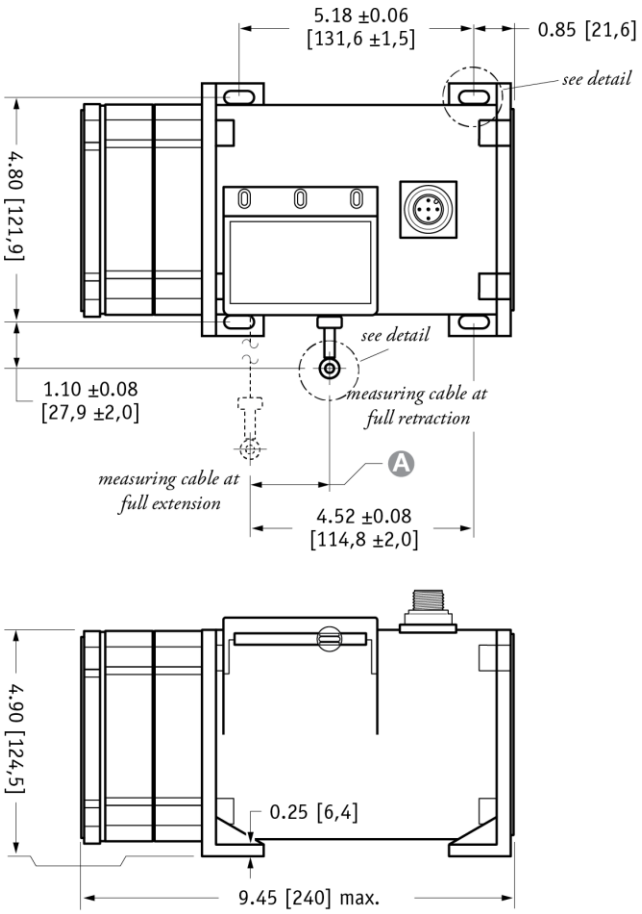


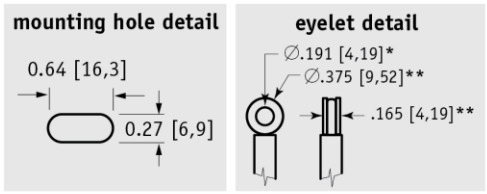


DIMENSIONS ARE IN INCHES [MM]
tolerances are 0.03 IN. [0.5 MM] unless otherwise noted.

* tolerance = +.005 –.001 [+.13 –.03]
** tolerance = +.005 –.005 [+.13 –.13]

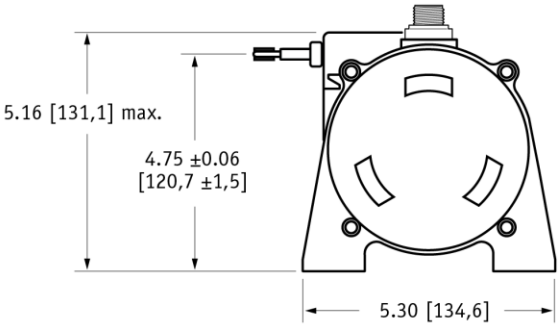
Fig. 2 – Outline Drawing (36 oz. cable tension only)





A DIMENSION (INCHES)

	MEASURING CABLE			
RANGE	**∅.031 in.**	**∅.034 in.**	**∅.047 in.**	**∅.062 in.**
75	n/a	0.22	0.29	0.37
100	n/a	0.29	0.39	0.49
150	n/a	0.44	0.59	0.73
200	n/a	0.58	0.79	0.98
250	n/a	0.73	0.98	1.22
300	n/a	0.88	1.18	1.47
350	n/a	1.02	1.38	1.71
400	n/a	1.17	1.57	1.96
450	n/a	1.31	1.77	n/a
500	n/a	1.46	1.97	n/a
550	1.61	1.61	n/a	n/a



DIMENSIONS ARE IN INCHES [MM]
tolerances are 0.03 IN. [0.5 MM] unless otherwise noted.

* tolerance = +.005 –.001 [+.13 –.03]
** tolerance = +.005 –.005 [+.13 –.13]

Ordering Information

Model Number:

PT9CN - _____ ____ ____ ____ ____ - **J** ____ ____ ____ ____
order code: Ⓡ Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ Ⓗ

Sample Model Number:

PT9CN - 200ALN3426FR - J50032SC5

Ⓡ	range:	**200**	(200 inches)
Ⓐ	enclosure	**AL**	(aluminum)
Ⓑ	measuring cable:	**N34**	(.034 nylon-coated stainless)
Ⓒ	measuring cable tension:	**26**	(26 oz.)
Ⓓ	cable exit:	**FR**	(front)
Ⓔ	interface:	**J**	(CANbus SAE J1939)
Ⓕ	baud rate:	**500**	(500k bits/sec.)
Ⓖ	node ID:	**32**	(32 decimal)
Ⓗ	electrical connection:	**SC5**	(5-meter cordset with straight plug)

Full Stroke Range:

Ⓡ order code:	75	100	150	200	250	300	350	400	450*	500*	550*
full stroke range, min:	75 in.	100 in.	150 in.	200 in.	250 in.	300 in.	350 in.	400 in.	450 in.	500 in.	550 in.

** – 36 oz. cable tension strongly recommended*

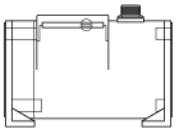
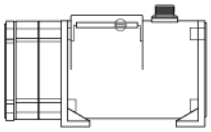
Enclosure Material:

Ⓐ order code:	AL	SS
	powder-painted aluminum	303 stainless

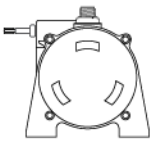
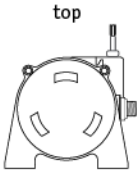
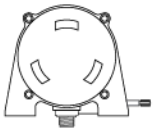
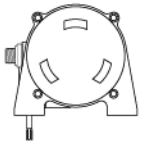
Measuring Cable:

Ⓑ order code:	N34	S47	S31	V62
cable construction:	Ø.034-inch nylon-coated stainless steel rope	Ø.047-inch bare stainless steel rope	Ø.031-inch bare stainless steel rope	Ø.058-inch PVC jacketed vectra fiber rope
available ranges:	*all ranges*	*all ranges up to 500 inches*	*550 inch range only*	*all ranges up to 400 inches*
general use:	indoor	outdoor, debris, high temperature	outdoor, debris, high temperature	high voltage or magnetic field

Measuring Cable Tension:

Ⓒ order code:	26		52	
tension (30%):	18 oz.		36 oz.	
enclosure material:	*aluminum*	*stainless steel*	*aluminum*	*stainless steel*
max. acceleration:	1 g	1 g	5 g	5 g
max. velocity:	60 inches/sec	60 inches/sec	200 inches/sec	200 inches/sec
	 standard housing *see fig 1.*		 dual-spring housing *see fig 2.*	

Cable Exit:

Ⓓ order code:	FR	UP	BK	DN
	front	top	back	down
				

Baud Rate:

Ⓔ order code:	125	250	500
	125 kbaud	250 kbaud	500 kbaud

Node ID:

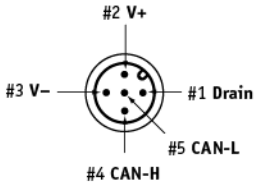
Ⓕ order code:	0	1	2	3	...	61	62	63
	select address (0 - 63 Decimal)							

Electrical Connection:

order code:

blank

5-pin micro-connector
(no mating plug supplied)

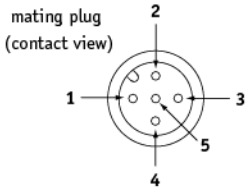


connector
(contact view)

MC5

5-pin micro-connector
w/ mating plug

0.16" - 0.32" OD Cable (THIN)



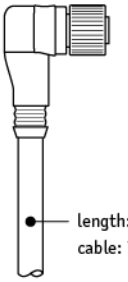
SC5

5-pin micro-connector
and 5 meter length cordset
w/straight mating plug

length: 16ft [5M]
cable: Thin

NC5

5-pin micro-connector
and 5 meter length cordset
w/90° mating plug



length: 16ft [5M]
cable: Thin

pin	signal	wire color
1	drain	brown
2	V+	white
3	V-	blue
4	Can-H	black
5	Can-L	grey