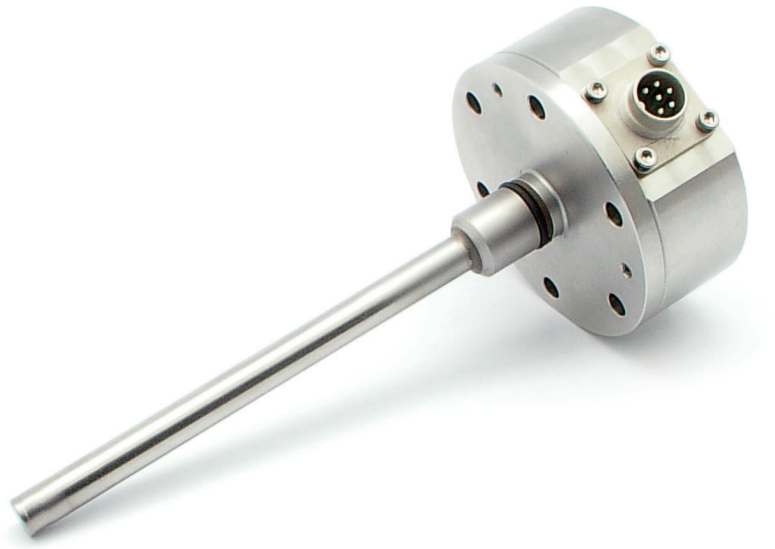
16 series is design for hydraulic cylinder with limited head space or clevis rod ends hydraulic cylinder. Sensing rod is made by stainless steel which installed inside the hydraulic cylinder. It has a wide variety of signal output selection included analog voltage, current, and SSI. It is a perfect combination with hydraulic valve to form a close-loop servo hydraulic system.

It adopts the non-contact magnet-rostrictive measuring technology for precise, accurate, and absolute measurement. The non-contact feature provides exceptional ease of installation and guarantees almost unlimited mechanical life expectancy. The high versatile IP67 profile housing offers full protection against outside agents for use in harsh environments with high contamination and presence of dust.



Order Code

1	6	X	X	X	X	X	X	X	X	X	X	X	X

Output

001 = 0 - 10V 101 = 4 - 20mA
011 = 10 - 0V 111 = 20 - 4mA

Sensor Rod Style

H = Ø18 fitting flange
M = M18 x 1.5 mounting thread

Stroke Length (mm)

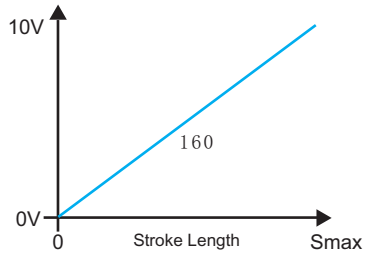
0075, 0100, 0125, 0150, 0175,
0200, 0225, 0250, (25mm increment after)

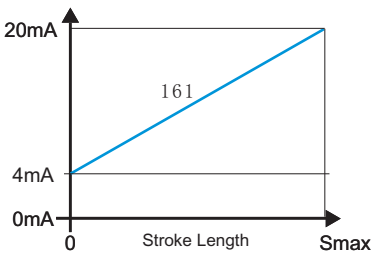
Magnet Type

1 = Dia. 33mm ring 5 = Dia. 32mm ring
2 = Dia. 25mm ring
4 = Dia. 60mm ring

Connection Type

D60 = 6 pin male receptacle M16 (Connector not included)
S32 = 8 pin male receptacle M16 (Connector not included)
D34 = 5 pin male receptacle M12 (Connector not included)
R02 = PVC direct cable, option: R01-R10 (1-10m)
H02 = PUR direct cable, option: H01-H10 (1-10m)
T02 = Teflon direct cable, option: T01-T10 (1-10m)
W02 = Waterproof direct cable, option: W01-W10 (1-10m)

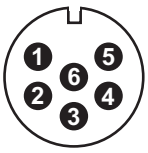




Specifications

Order Code	160	161
Output	Voltage	Current
Measurement Type	Linear displacement	
Resolution	16 Bit D/A, 0.0015% (minimum 1µm)	
Repeatability	< ±0.001% of full scale (minimum ±2.5µm)	
Non-Linearity	< ±0.01% of full scale (minimum ±40µm)	
Update Time	0.5 ms up to 1200 mm / 1.0 ms up to 2400 mm	
	2.0 ms up to 4800 mm / 5.0 ms up to 7600 mm	
Input Voltage	+24Vdc (20.4 - 28.8Vdc)	
Input Protection	Polarity protection up to -30Vdc, Over voltage protection up to 36Vdc	
Power Consumption	100mA (stroke range dependent)	
Dielectric Strength	500Vdc (DC ground to machine ground)	
Connector Type	D60 Male	
Pressure Rating	350 bar / 600 bar peak	
Operation Temp.	-40 to 75°C, Humility 90% non-condensing	
Sealing	IP 67 (with connector)	
Vibration Rating	15g / 10-2000Hz / IEC standard 68-2-6	
Shock Rating	100g single hit per IEC standard 68-2-27	
EMC	Emission EN 68000-6-3, Immunity EN 61000-6-2, EN 61000-4-2/3/4/6	

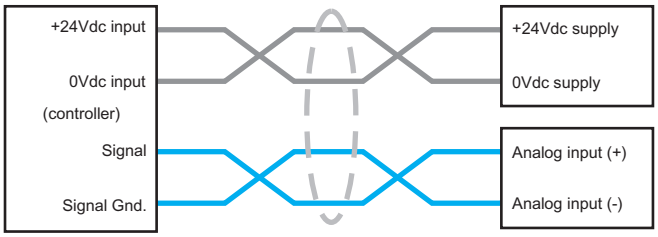
Pin Assignments

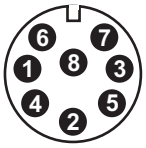


D60

	Cable	D60 Pin
1	Black	Signal
2	White	Signal Gnd
3	Yellow	N.C.
4	Green	N.C.
5	Red	+24 Vdc
6	Blue	0 Vdc

Cable shield connects to connector shell and grounded at controller side.





S32

(View toward sensor pins)

	001	011	101	111
1	N.C.	N.C.	4 - 20mA	20 - 4mA
2	Signal Gnd			
3	N.C.	10 - 0V	N.C.	N.C.
4	N.C.			
5	0 - 10V	N.C.	N.C.	N.C.
6	0 Vdc			
7	+24 Vdc			
8	N.C.			

Cable shield connects to connector shell and grounded at controller side.

5 pins M12

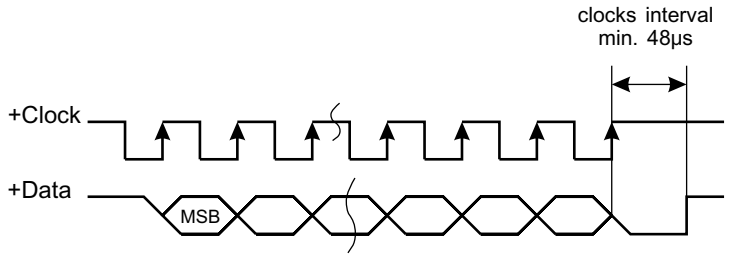
(View toward sensor pins)

	Voltage	Current
1	+24Vdc	+24Vdc
2	0-10V output	Signal output
3	0 Vdc	0 Vdc
4	10-0V output	N.C.
5	DC Gnd	Signal Gnd

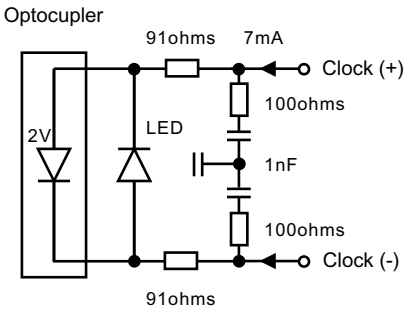
Specifications

Order Code	1 6 2
Output	SSI
Measurement Type	Linear displacement
Data Format	Binary or Grey, optional Parity and Errorbit
Data Length	8 - 32 bits
Data Speed	Length : <3 <50 <100 <200 <400 m
	Baud rate : 1000 <400 <300 <200 <100 kBd
Update Time	Measuring Length : 300 750 1000 2000 5000 mm
	Measurement/sec : 3.7 3.0 2.3 1.2 0.5 kHz
Resolution	Displacement : 1 / 2 / 5 / 10 / 20 / 50 / 100 µm
Repeatability	< ±0.001% of full scale (minimum ±2.5µm)
Non-Linearity	< ±0.01% of full scale (minimum ±40µm)
Update Time	0.5 ms up to 1200 mm / 1.0 ms up to 2400 mm
	2.0 ms up to 4800 mm / 5.0 ms up to 7600 mm
Input Voltage	+24Vdc (20.4 - 28.8Vdc)
Input Protection	Polarity protection up to -30Vdc, Over voltage protection up to 36Vdc
Power Consumption	100mA (stroke range dependent)
Dielectric Strength	500Vdc (DC ground to machine ground)
Connector Type	D70 Male
Pressure Rating	350 bar / 600 bar peak
Operation Temp.	-40 to 75°C, Humility 90% non-condensing
Sealing	IP 67 (with connector)
Vibration Rating	15g / 10-2000Hz / IEC standard 68-2-6
Shock Rating	100g single hit per IEC standard 68-2-27
EMC	Emission EN 68000-6-3, Immunity EN 61000-6-2, EN 61000-4-2/3/4/6

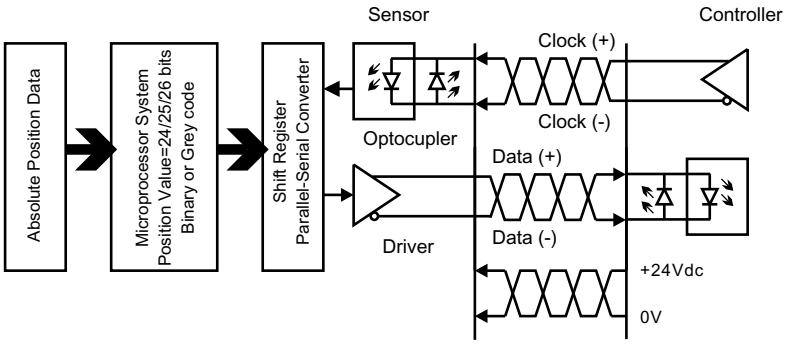
Timing Diagram



Sensor Input



Logic Diagram



Order Code

1 6 2 X X X X X X X X X X X X X X X X

Data Length

1 = 25 bits
2 = 24 bits

Output Format

B = Binary G = Grey Code

Resolution

1 = 5µm 2 = 10µm 3 = 50µm
4 = 100µm 5 = 20µm 6 = 2µm
8 = 1µm

Function

1 = Standard

Options

00 = Measuring direction forward
01 = Measuring direction reverse
02 = Measuring direction forward, synchronized measurement

Sensor Rod Style

H = Ø18 fitting flange
M = M18 x 1.5 mounting thread

Stroke Length (mm)

0075, 0100, 0125, 0150, 0175,
0200, 0225, 0250, 0275, 0300,
(25mm increment after)

Magnet Type

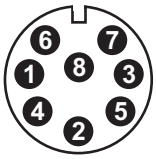
1 = Dia. 33mm ring 4 = Dia. 60mm ring
2 = Dia. 25mm ring 5 = Dia. 32mm ring

Connection Type

D70 = 7 pin male receptacle M16 (Connector not included)
S32 = 8 pin male receptacle M16 (Connector not included)
R02 = PVC direct cable, option: R01-R10 (1-10m)
H02 = PUR direct cable, option: H01-H10 (1-10m)
T02 = Teflon direct cable, option: T01-T10 (1-10m)
W02 = Waterproof direct cable, option: W01-W10 (1-10m)

Remark: Direction forward means position reading become larger while magnet move away from electronic carriage. Direction backward means position reading become smaller while magnet move away from electronic

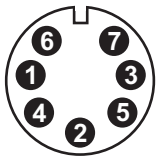
Pin Assignments



(View toward sensor pins)

Cable shield connects to connector shell and grounded at controller side.

	S32 Pin
1	Clock (+)
2	Data (+)
3	Clock (-)
4	N.C.
5	Data (-)
6	0 Vdc
7	24Vdc
8	N.C.

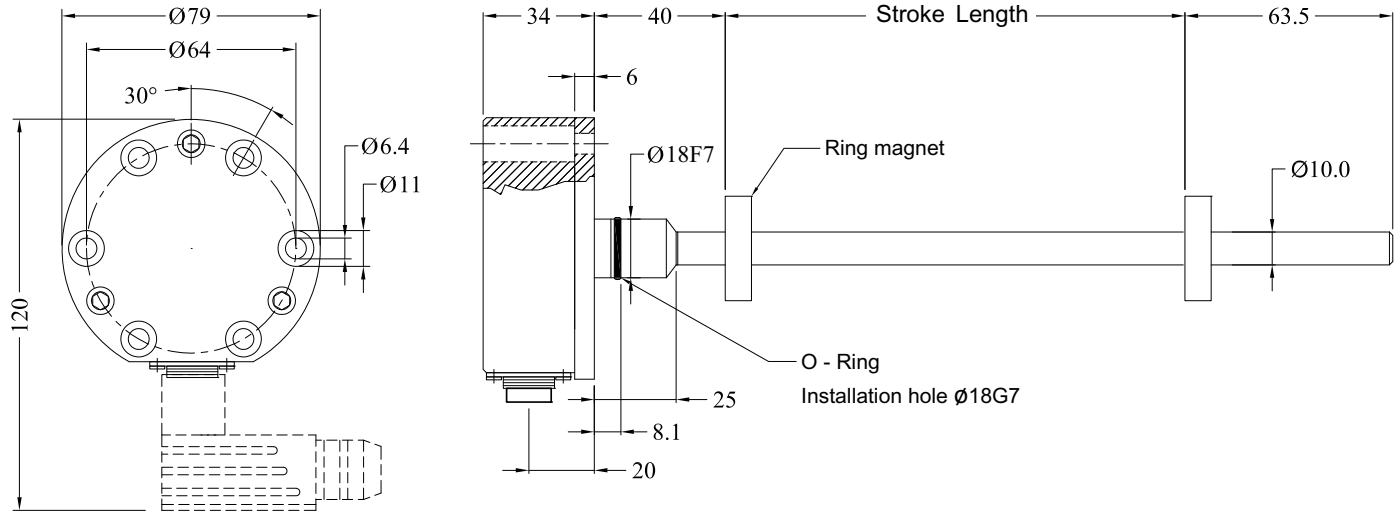


(View toward sensor pins)

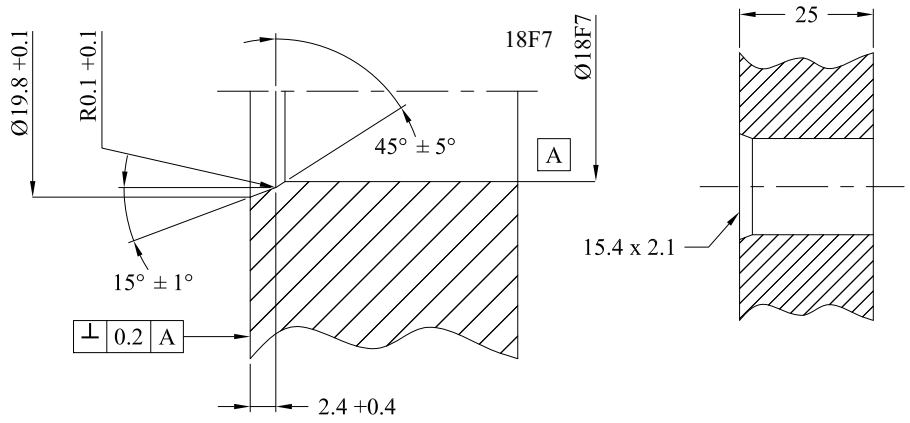
Cable shield connects to connector shell and grounded at controller side.

	D70 Pin	Cable
1	Data (-)	Black
2	Data (+)	White
3	Clock (+)	Yellow
4	Clock (-)	Green
5	+24 Vdc	Red
6	0 Vdc	Blue
7	N.C.	

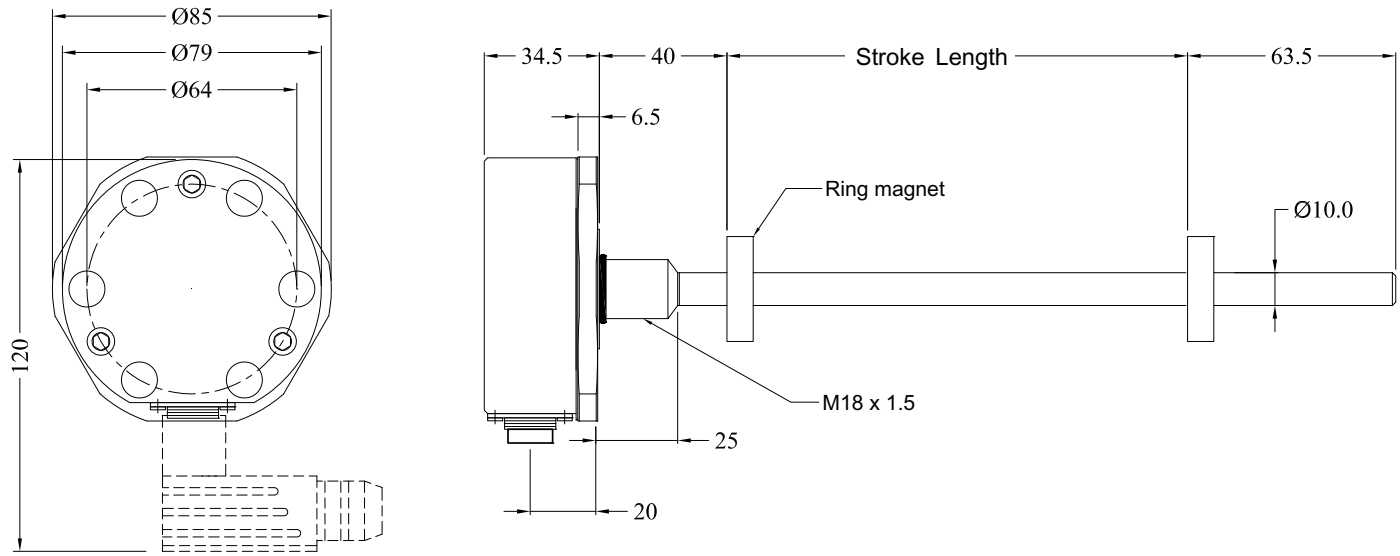
ø18 fitting flange e



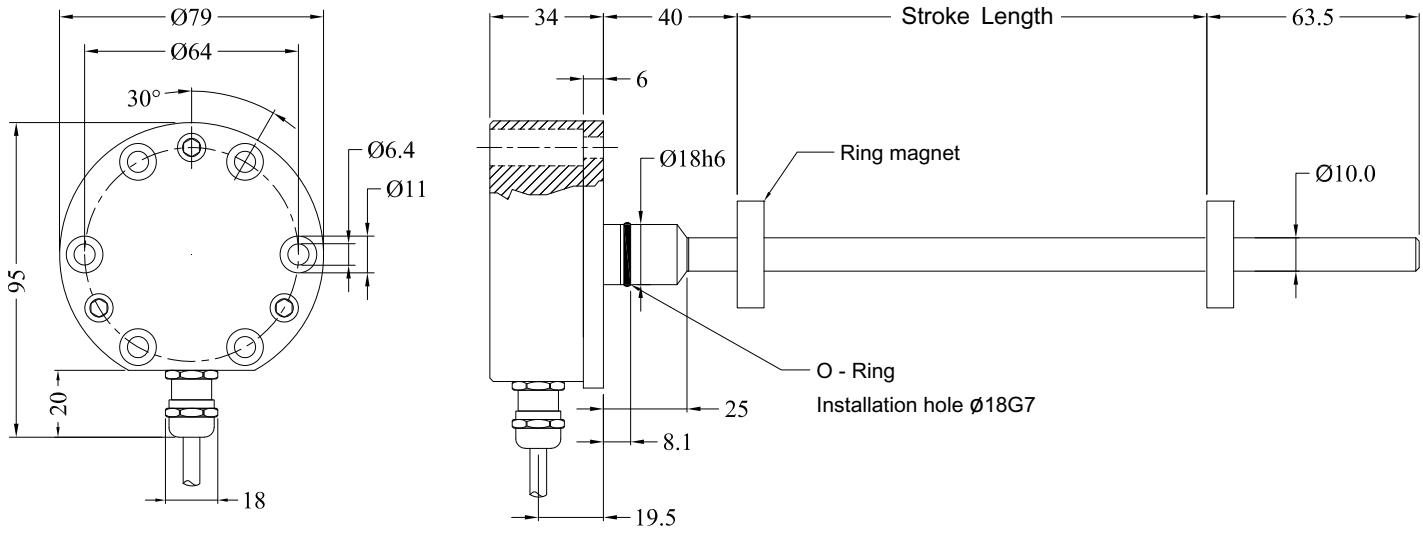
Flange Mounting



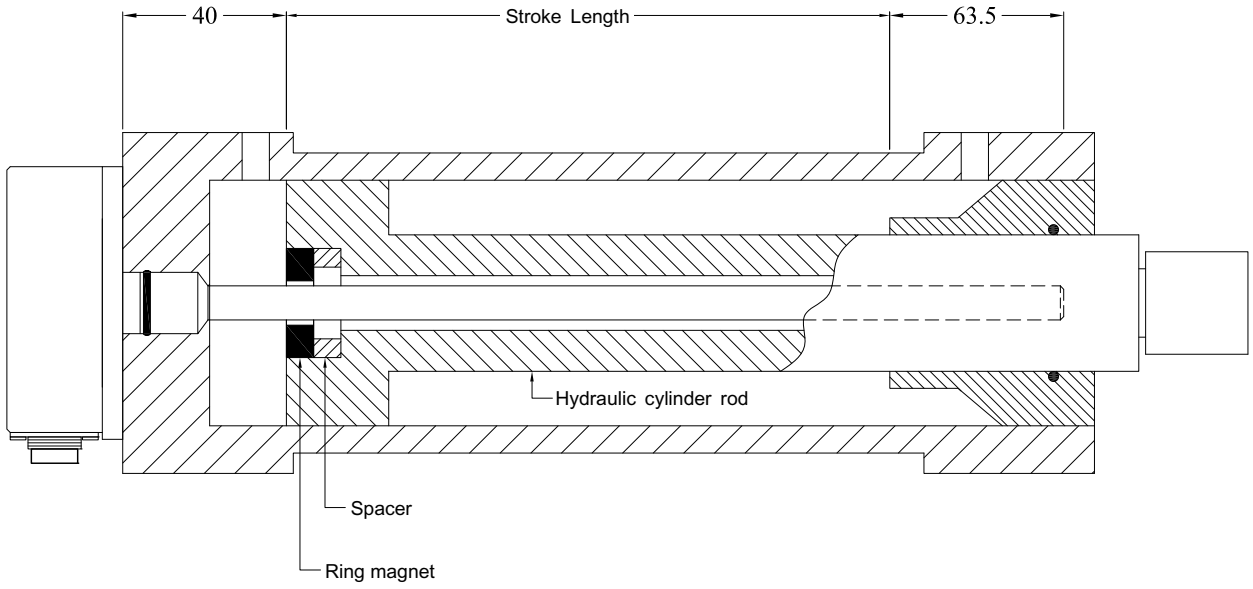
M18 x 1.5 Mounting



Cable Direct



Installation



high precision & reliability...

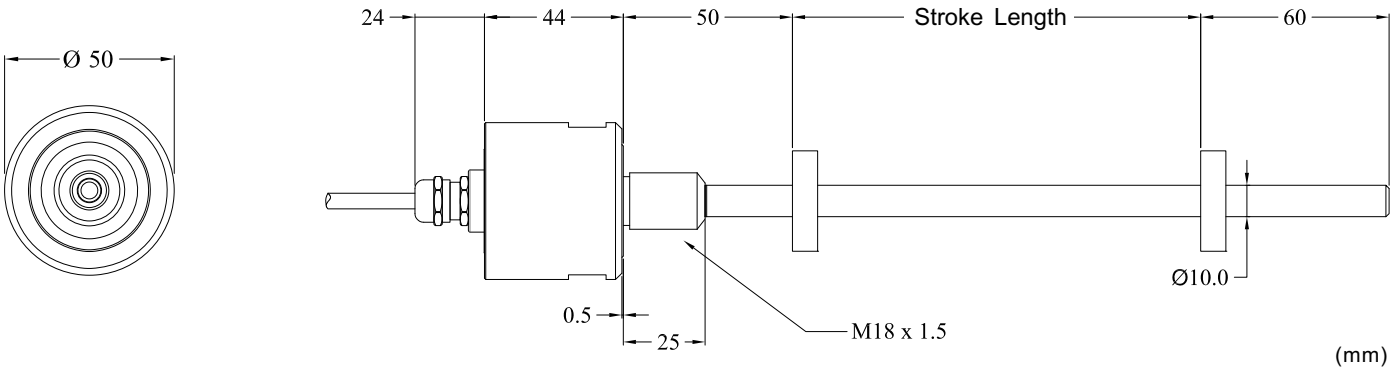
16C series is design for use in extreme harsh environments with high contamination and presence of dust. Sensing element is protected by fully enclosed stainless steel case with IP68 protection rating. It is completely dustproof and resistant to harsh salty air, flooding and powerful water jetting. This unique product is perfect for use in harsh indoor applications and severe outdoor environments.

The core of 16C series adopts the non-contact magnetrostrictive measuring technology for precise, accurate, and absolute measurement. The non-contact feature provides exceptional ease of installation and guarantees almost unlimited mechanical life expectancy.

IP68

- For Harsh Environment
- IP 68 Protection
- Compact Design

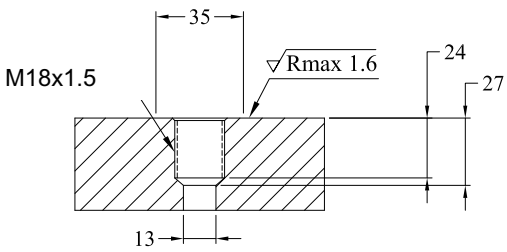
Installation



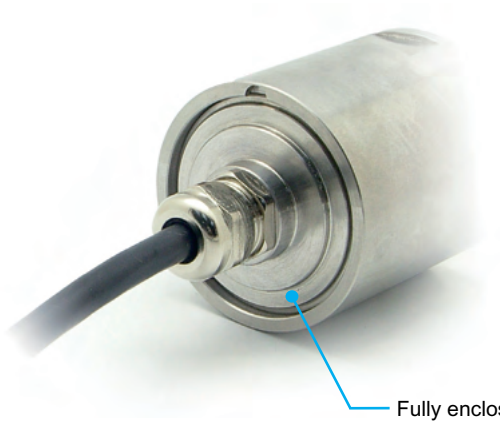
(mm)

Mounting surface requirement

Minimum diameter of mounting surface



Installation hole must be perpendicular with mounting surface and center with sensor rod.

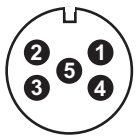


Fully enclosed housing protection type IP 68

Specifications

Order Code	160	161
Output	Voltage	Current
Measurement Type	Linear displacement	
Resolution	16 Bit D/A, 0.0015% (minimum 1µm)	
Repeatability	< ±0.001% of full scale (minimum ±2.5µm)	
Non-Linearity	< ±0.01% of full scale (minimum ±40µm)	
Update Time	0.5 ms up to 1200 mm / 1.0 ms up to 2400 mm	
	2.0 ms up to 4800 mm / 5.0 ms up to 7600 mm	
Input Voltage	+12Vdc	
Input Protection	Polarity protection up to -30Vdc, Over voltage protection up to 36Vdc	
Power Consumption	100mA (stroke range dependent)	
Dielectric Strength	500Vdc (DC ground to machine ground)	
Connector Type	Cable Outlet	
Pressure Rating	350 bar / 600 bar peak	
Operation Temp.	-40 to 75℃, Humility 90% non-condensing	
Sealing	IP 68	
Vibration Rating	15g / 10-2000Hz / IEC standard 68-2-6	
Shock Rating	100g single hit per IEC standard 68-2-27	
EMC	Emission EN 68000-6-3, Immunity EN 61000-6-2, EN 61000-4-2/3/4/6	

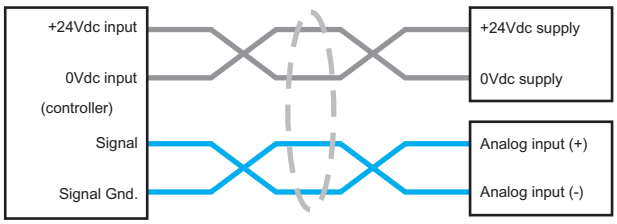
Pin Assignments



5 pins M12 connector
(View toward sensor pins)

1	+24Vdc
2	Signal output
3	0 Vdc
4	N.C.
5	Signal Gnd

Output	Cable
Signal	Black
Signal Gnd	White
N.C.	Yellow
N.C.	Green
+24 Vdc	Red
0 Vdc	Blue



Order Code

1	6	X	X	X	C	X	X	X	X	X	X	X	X

Output

001 = 0 - 10V 101 = 4 - 20mA
011 = 10 - 0V 111 = 20 - 4mA

Stroke Length (mm)

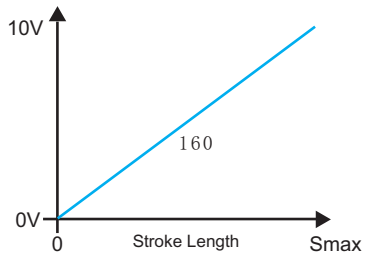
0075, 0100, 0125, 0150, 0175,
0200, 0225, 0250, (25mm increment after)

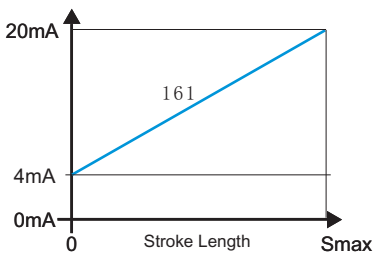
Magnet Type

1 = Dia. 33mm ring 5 = Dia. 32mm ring
2 = Dia. 25mm ring
4 = Dia. 60mm ring

Connection Type

D34 = 5 pins M12 connector (not include 5 pins female connector)
R02 = 2m PVC Direct Cable, Option: R01 - R10 (1 - 10m)
H02 = 2m PUR Direct Cable, Option: H01 - H10 (1 - 10m)

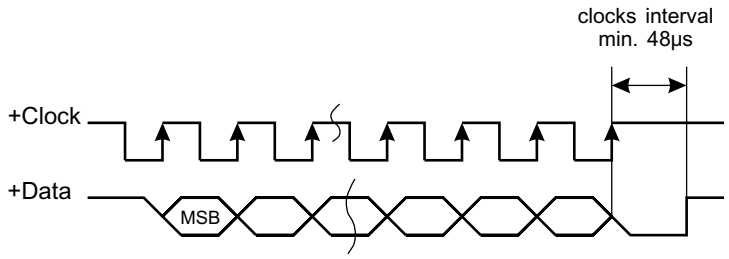




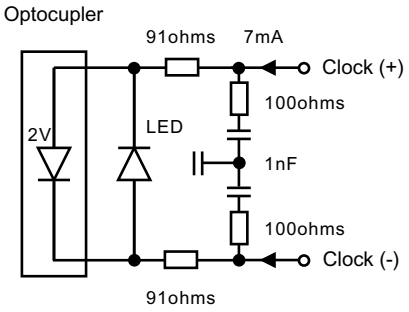
Specifications

Order Code	1 6 2
Output	SSI
Measurement Type	Linear displacement
Data Format	Binary or Grey, optional Parity and Errorbit
Data Length	8 - 32 bits
Data Speed	Length : <3 <50 <100 <200 <400 m
	Baud rate : 1000 <400 <300 <200 <100 kBd
Update Time	Measuring Length : 300 750 1000 2000 5000 mm
	Measurement/sec : 3.7 3.0 2.3 1.2 0.5 kHz
Resolution	Displacement : 1 / 2 / 5 / 10 / 20 / 50 / 100 µm
Repeatability	< ±0.001% of full scale (minimum ±2.5µm)
Non-Linearity	< ±0.01% of full scale (minimum ±40µm)
Update Time	0.5 ms up to 1200 mm / 1.0 ms up to 2400 mm
	2.0 ms up to 4800 mm / 5.0 ms up to 7600 mm
Input Voltage	+24Vdc (20.4 - 28.8Vdc)
Input Protection	Polarity protection up to -30Vdc, Over voltage protection up to 36Vdc
Power Consumption	100mA (stroke range dependent)
Dielectric Strength	500Vdc (DC ground to machine ground)
Connector Type	Cable Outlet
Pressure Rating	350 bar / 600 bar peak
Operation Temp.	-40 to 75°C, Humility 90% non-condensing
Sealing	IP 67 (with connector)
Vibration Rating	15g / 10-2000Hz / IEC standard 68-2-6
Shock Rating	100g single hit per IEC standard 68-2-27
EMC	Emission EN 68000-6-3, Immunity EN 61000-6-2, EN 61000-4-2/3/4/6

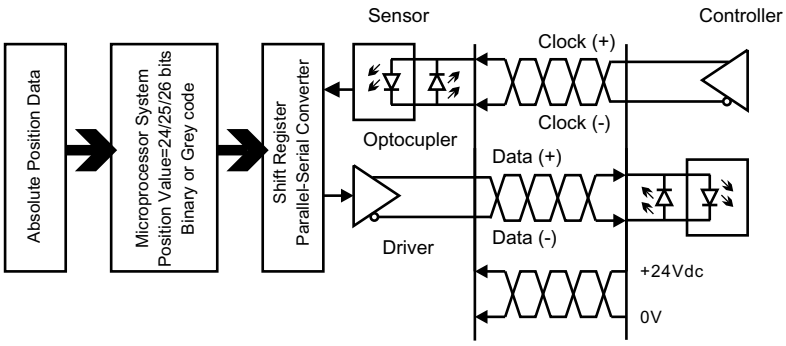
Timing Diagram



Sensor Input



Logic Diagram



Pin Assignments

Cable	Output
Black	Data (-)
White	Data (+)
Yellow	Clock (+)
Green	Clock (-)
Red	+24 Vdc
Blue	0 Vdc

Order Code

1 6 2 X X X X X X C X X X X X X X X

Data Length

1 = 25 bits
2 = 24 bits

Output Format

B = Binary G = Gray Code

Resolution

1 = 5μm 2 = 10μm 3 = 50μm
4 = 100μm 5 = 20μm 6 = 2μm
8 = 1μm

Function

1 = Standard

Options

00 = Measuring direction forward
01 = Measuring direction reverse

Stroke Length (mm)

0075, 0100, 0125, 0150, 0175,
0200, 0225, 0250, 0275, 0300,
0325, 0350, 0375, 0400, 0425,
0450, 0475, (25mm increment after)

Magnet Type

1 = Dia. 33mm ring 5 = Dia. 32mm ring
2 = Dia. 25mm ring
4 = Dia. 60mm ring

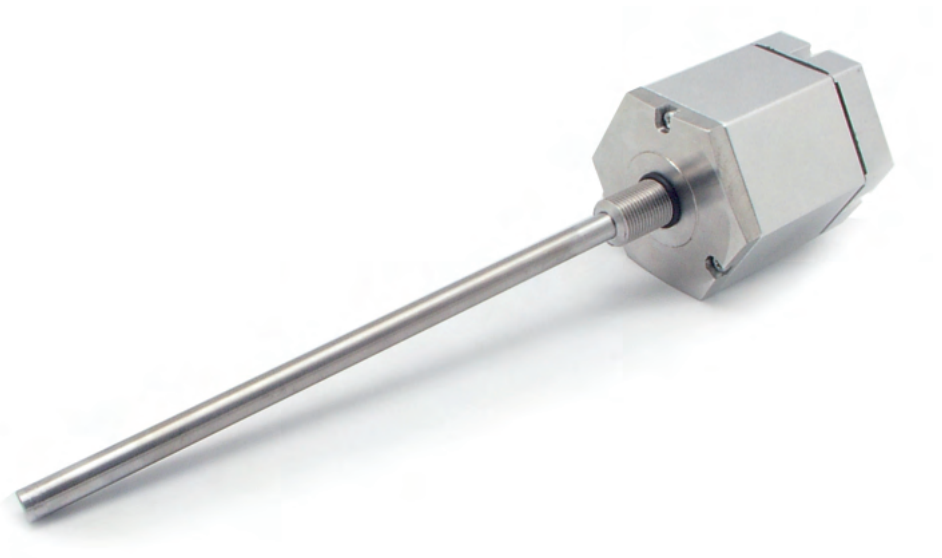
Connection Type

R02 = 2m PVC Direct Cable, Option: R01-R10 (1-10m)
H02 = 2m PUR Direct Cable, Option: H01-H10 (1-10m)

Remark: Direction forward means position reading become larger while magnet move away from electronic carriage. Direction backward means position reading become smaller while magnet move away from electronic

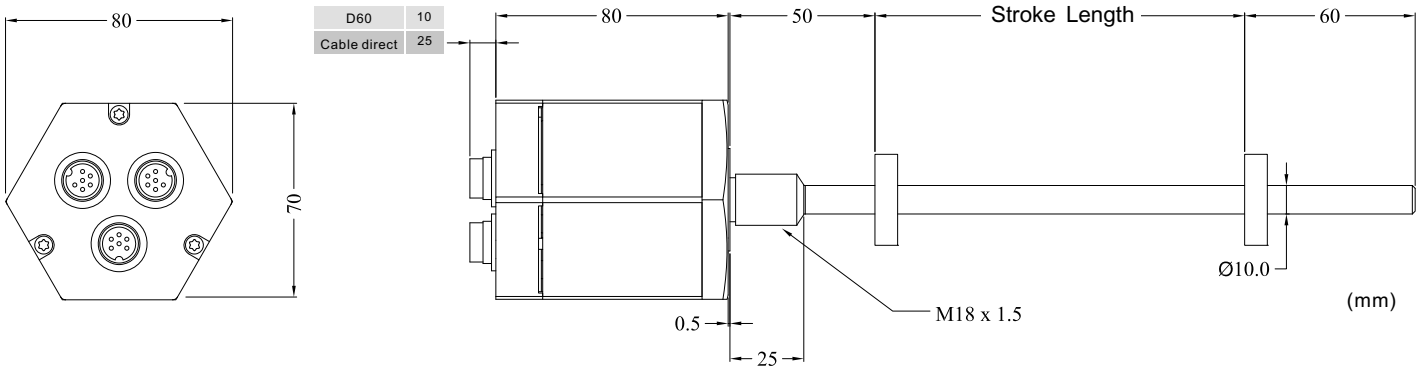
Ship propulsion systems, power plants and tilt technology for trains are challenging application for high safety and effective functioning. For those applications, the redundancy position transducer for mutual monitoring is needed to fulfill superior safety requirement and guarantee non-stop operation. This unique product features multiple individual measurement systems which are housed in a single protective tube. The magnets simultaneously act on both measurement systems to generate two separated position output.

Sensing elements are protected by fully enclosed stainless steel case with IP68 protection rating. It is completely dust proof and resistant to harsh salty air, flooding and powerful water jetting. The core of 16R/T series adopts the non-contact magnetrostrictive measuring technology for precise, accurate, and absolute measurement.

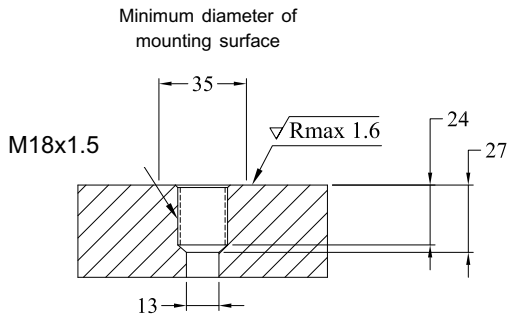


Multiple Individual Position Sensing Systems in one sensor

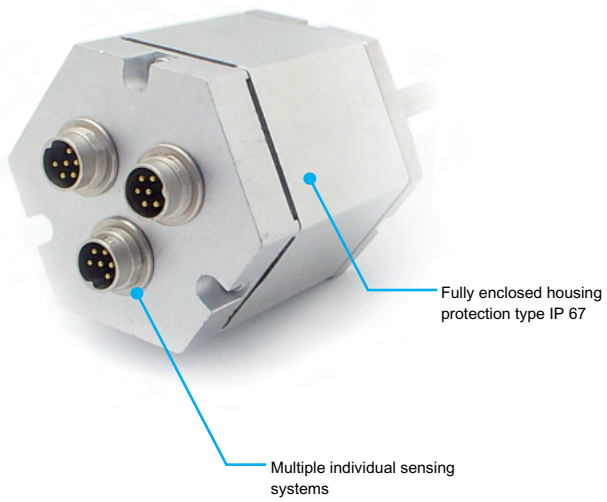
Installation



Mounting surface requirement



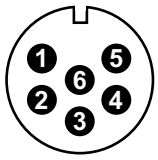
Installation hole must be perpendicular with mounting surface and center with sensor rod.



Specifications

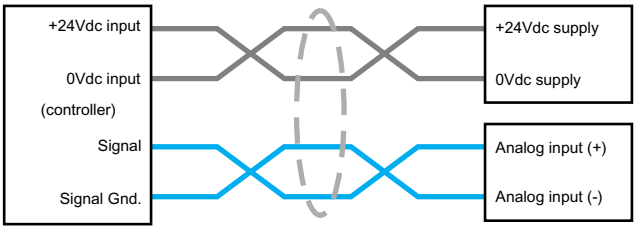
Order Code	160	161
Output	Voltage	Current
Measurement Type	Linear displacement	
Resolution	16 Bit D/A, 0.0015% (minimum 1µm)	
Repeatability	< ±0.001% of full scale (minimum ±2.5µm)	
Non-Linearity	< ±0.01% of full scale (minimum ±40µm)	
Update Time	0.5 ms up to 1200 mm / 1.0 ms up to 2400 mm / 2.0 ms up to 3000 mm	
Input Voltage	+24Vdc (20.4 - 28.8Vdc)	
Input Protection	Polarity protection up to -30Vdc, Over voltage protection up to 36Vdc	
Power Consumption	100mA (stroke range dependent)	
Dielectric Strength	500Vdc (DC ground to machine ground)	
Connector Type	Cable Outlet	
Pressure Rating	350 bar / 600 bar peak	
Operation Temp.	-40 to 75°C, Humility 90% non-condensing	
Sealing	IP 67	
Vibration Rating	15g / 10-2000Hz / IEC standard 68-2-6	
Shock Rating	100g single hit per IEC standard 68-2-27	
EMC	Emission EN 68000-6-3, Immunity EN 61000-6-2, EN 61000-4-2/3/4/6	

Pin Assignments



(View toward sensor pins)

	Cable	D60 Pin
1	Black	Signal
2	White	Signal Gnd
3	Yellow	N.C.
4	Green	N.C.
5	Red	+24 Vdc
6	Blue	0 Vdc



Order Code

1 6 X X X X X X X X X X X X

Output

001 = 0 - 10V 101 = 4 - 20mA
011 = 10 - 0V 111 = 20 - 4mA

Output Model

R = Dual redundant
T = Triple redundant

Stroke Length (mm)

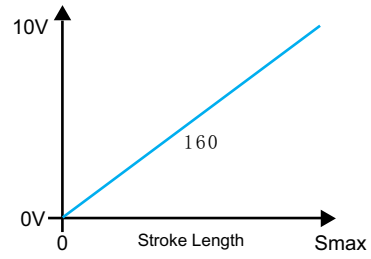
0075, 0100, 0125, 0150, 0175,
0200, 0225, 0250, (25mm increment after)

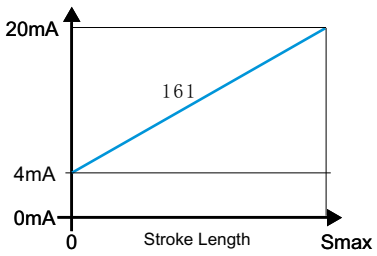
Magnet Type

1 = Dia. 33mm ring 4 = Dia. 60mm ring
2 = Dia. 25mm ring 5 = Dia. 32mm ring

Connection Type

D60 = 6 pins male connector M16
H02 = 2m PUR Direct Cable, Option: H01-H20 (1-20m)



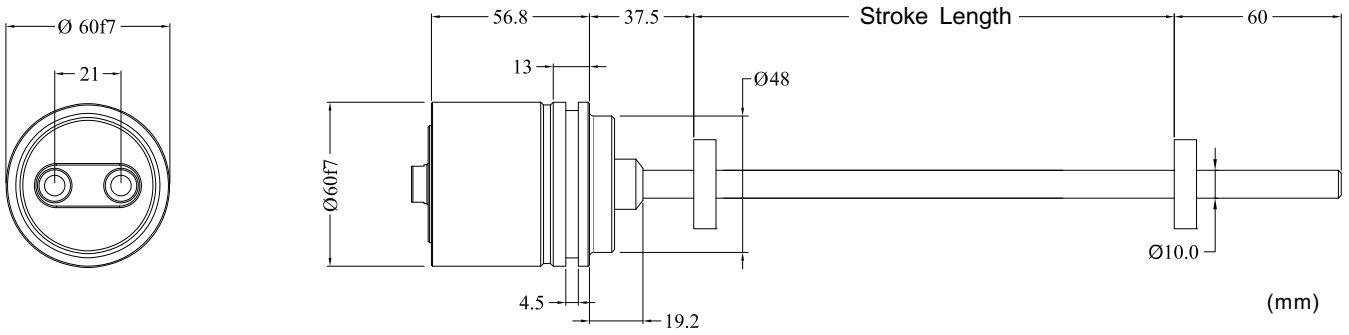


16E series is design for use in extreme harsh environments with high contamination and presence of dust. Sensing element is protected by fully enclosed stainless steel case with IP68 protection rating. It is completely dustproof and resistant to harsh salty air, flooding and powerful water jetting. This unique product is perfect for use in harsh indoor applications and severe outdoor environments.

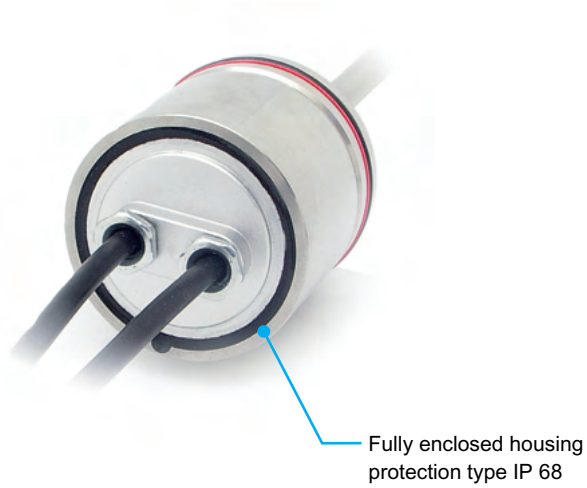
The core of 16E series adopts the non-contact magnetrostrictive measuring technology for precise, accurate, and absolute measurement. The non-contact feature provides exceptional ease of installation and guarantees almost unlimited mechanical life expectancy.

- For Harsh Environment
- IP 68 Protection
- Compact Design

Installation



Mounting surface requirement

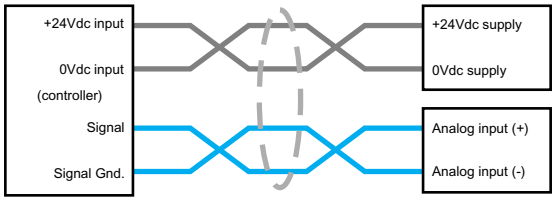


Specifications

Order Code	160	161
Output	Voltage	Current
Measurement Type	Linear displacement	
Resolution	16 Bit D/A, 0.0015% (minimum 1µm)	
Repeatability	< ±0.001% of full scale (minimum ±2.5µm)	
Non-Linearity	< ±0.01% of full scale (minimum ±40µm)	
Update Time	0.5 ms up to 1200 mm / 1.0 ms up to 2400 mm	
	2.0 ms up to 4800 mm / 5.0 ms up to 7600 mm	
Input Voltage	+24Vdc (20.4 - 28.8Vdc)	
Input Protection	Polarity protection up to -30Vdc, Over voltage protection up to 36Vdc	
Power Consumption	100mA (stroke range dependent)	
Dielectric Strength	500Vdc (DC ground to machine ground)	
Connector Type	Cable Outlet	
Pressure Rating	350 bar / 600 bar peak	
Operation Temp.	-40 to 75°C, Humility 90% non-condensing	
Sealing	IP 68	
Vibration Rating	15g / 10-2000Hz / IEC standard 68-2-6	
Shock Rating	100g single hit per IEC standard 68-2-27	
EMC	Emission EN 68000-6-3, Immunity EN 61000-6-2, EN 61000-4-2/3/4/6	

Pin Assignments

Output	Cable
Signal	Black
Signal Gnd	White
N.C.	Yellow
N.C.	Green
+24 Vdc	Red
0 Vdc	Blue



Order Code

1 6 X X X E X X X X X X X X X 1

Output

001 = 0 - 10V 101 = 4 - 20mA
011 = 10 - 0V 111 = 20 - 4mA

Stroke Length (mm)

0075, 0100, 0125, 0150, 0175,
0200, 0225, 0250, (25mm increment after)

Magnet Type

1 = Dia. 33mm ring 5 = Dia. 32mm ring
2 = Dia. 25mm ring 4 = Dia. 60mm ring

Connection Type

R02 = 2m PVC Direct Cable, Option: R01 - R10 (1 - 10m)

Output Model

S = Single output
R = Redundant output