FBGB Explosion-Proof Displacement Sensor

Technical Characteristics

Non-wear, non-contact measurement method
Rugged and fully enclosed design
Linear measurement, absolute position output
Low power consumption design effectively reduces system heating
Sealing grade up to IP67
Pressure resistance and explosion-proof, high explosion-proof grade
Strong anti-interference performance and high reliability
Multiple interfaces are available: Analog、SSI、CANopen

Product Parameters

• Input

Measurement data	Position Magnet ring
Stroke length	25mm~5500mm，customized according to customer needs
Number of measurements	1

• Output

Interface	Analog、SSI、CANopen
Resolution	Analog：16-bit D/A or 0.0015% of full scale (min. 1μm) Bital quantity：0.5 / 1 / 2 / 5 / 10 / 20 / 40 / 50 / 100 μm
Nonlinearity	< ± 0.01% of full scale, Min. ± 50μm
Repetition accuracy	< ± 0.001% of full scale, Min. ± 1μm
Hysteresis	＜10μm
Update time	1KHz（range≤1m） 500Hz（1m＜range≤2m） 250Hz（2m＜range≤3m），customizable
Temperature coefficient	＜30ppm/℃

• Working conditions

Magnet ring velocity	Arbitrary
Protection level	IP67
Operating temperature	-40℃ ~ +85℃
Humidity/dew point	The humidity is 90, and dew cannot be condensed
Shock index	GB/T2423.5 100g(6ms)
Vibration index	GB/T2423.10 20g/10~2000Hz
EMC test	GB/T17626.2/3/4/6/8，Grade 4/3/4/3/3，Class A, CE Certification
Certified Exd Ⅱ BT6	Comply with GB3836.1-2010 and GB3836.2-2010 standards Temperature range: T6 (85℃ surface)

• Electrical Connection

Input voltage	+24Vdc±20%
operating current	＜90mA（varying with range）
Polarity protection	Max.-30Vdc
Overpressure protection	Max.36Vdc
Insulation resistance	＞10MΩ
Insulation strength	500V

• Structure and materials

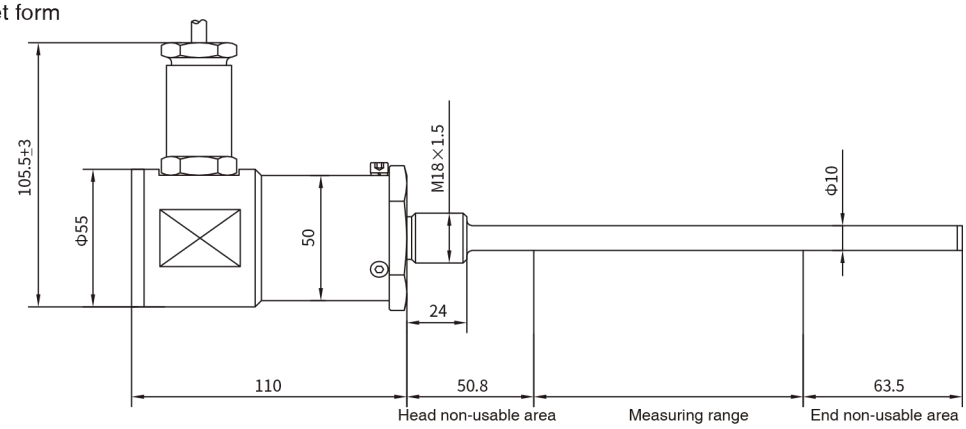
Electronic bin	304 stainless steel
Measuring rod	304/316 L stainless steel
Outer tube pressure	35MPa (continuous)/70MPa (peak) or 350ba (continuous)/700ba (peak)
Position magnet	Standard Magnet ring and various magnet rings
Mounting thread form	M18×1.5、M20×1.5、3/4"-16UNF-3A（customizable）
Installation direction	Any direction
Cable outlet mode	Special cable outlet(flameproof cable lead-in device)

Installation and Use Instructions

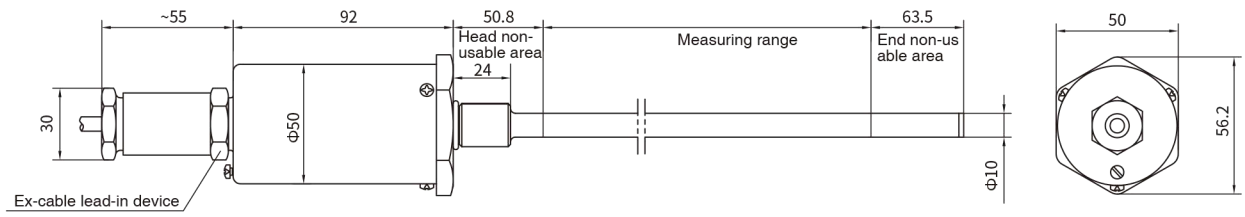
Dimensions of FBGB explosion-proof sensors

FBGB series explosion-proof shell sensor is an explosion-proof structure composed of shell, electronic bin, sensor and lead-in device. It is designed for cylinder built-in installation under harsh environment. The working pressure is 35MPa continuous, flexible and simple installation mode. The Mounting thread form M18×1.5 or M20×1.5 or inch 3/4”-16UNF-3A.

Side outlet form



Cable outlet form



FBGB Explosion - Proof Displacement Sensor

X x Selection Guide-Analog Quantity

F	B	G	B	–	M					–	S		–					–					–		
01	02	03	04		05	06	07	08	09		10	11		12	13	14	15		16	17	18	19		20	21

01 - 04 Sensor shell form

F B G B	Explosion-proof flameproof sensor

05 - 09 Measuring range

Four digits, less than four digits are preceded by zero, M means metric system, unit mm

10 - 11 Magnet ring type/mounting thread form

S 1	M18×1.5，measuring rod diameter 10mm, 304 material
S 2	M20×1.5，measuring rod diameter 10mm, 304 material
S 3	3/4"-16UNF-3A，measuring rod diameter 10mm, 304 material

12 - 15 Connection form

12 - 13 Cable outlet line type

D H	Cable outlet, PUR sheath, orange,-20~90℃, end scattered
D U	Cable outlet, PVC sheath, orange,-20~105℃, end scattered
S H	Side outlet, PUC sheath, orange,-20~90℃, end scattered
S U	Side outlet, PVR sheath, orange,-20~105℃, end scattered

14 - 15 Cable outlet mode: cable length, 01~99 meters

Note: For supporting cables, please refer to Analog/Start-Stop Cable Accessories Selection

16 - 19 Signal output mode

16 - 17 Output form and direction

A 0	Current output，4 ~ 20mA
A 1	Current output，20 ~ 4mA
A 2	Current output，0 ~ 20mA
A 3	Current output，20 ~ 0mA
V 0	Voltage output，0 ~ 10V
V 1	Voltage output，10 ~ 0V
V 2	Voltage output，-10 ~ +10V
V 3	Voltage output，+10 ~ -10V
V 4	Voltage output，0 ~ 5V
V 5	Voltage output，5 ~ 0V
V 6	Voltage output，-5 ~ +5V
V 7	Voltage output，+5 ~ -5V

18 Number of Magnet rings

1	Single Magnet ring

19 No Magnet ring state

A	Keep the original value
B	Max. value
C	Min. value

20 - 21 Non-usable area at head and end, customizable

S 0	50.8mm+63.5mm
B 0	30mm+60mm

- Note: The forward output of the sensor means that when the Magnet ring moves away from the electronic bin, the output value increases and decreases when the Magnet ring moves in the reverse direction.

- Selection examples: FBGB-M0300-S2-DH02-A01B-B0

  Indicates: the installation mode of the ordered product is built-in explosion-proof steel structure, with an stroke length of 300mm, mounting thread is M20×1.5, cable outlet, cable length is 2m (PUR sheath, orange,-20~90℃, end scattered), a 4-20mA output, a Max. output value without magnet ring, a forward output of single magnet ring, a non-usable area of 30mm at the head and a non-usable area of 60mm at the end.

FBGB Explosion - Proof Displacement Sensor

X X Selection Guide-SSI

F	B	G	B	–	M					–			–					–	S						–		
01	02	03	04		05	06	07	08	09		10	11		12	13	14	15		16	17	18	19	20	21		22	23

01 - 04 Sensor shell form

F B G B	Explosion-proof flameproof sensor

05 - 09 Measuring range

Four digits, less than four digits are preceded by zero, M means metric system, unit mm

10 - 11 Magnet ring type/mounting thread form

S 1	M18×1.5，measuring rod diameter 10mm, 304 material
S 2	M20×1.5，measuring rod diameter 10mm, 304 material
S 3	3/4"-16UNF-3A，measuring rod diameter 10mm, 304 material

12 - 15 Connection form

12 - 13 Cable outlet mode

D H	Cable outlet, PUR sheath, orange,-20~90℃, end scattered
D U	Cable outlet, PVC sheath, orange,-20~105℃, end scattered
S H	Side outlet, PUC sheath, orange,-20~90℃, end scattered
S U	Side outlet, PVR sheath, orange,-20~105℃, end scattered

14 - 15 Cable outlet mode: cable length, 01~99 meters

Note: See SSI cable Accessories selection for supporting cables

16 - 21 Signal output mode

17 Data length

1	24bit	2	25bit	3	26bit *

* 26-bit are parity bits and 25-bit are status bits

18 Data format

B	Binary	G	Gray code

19 Resolution

1	0.1mm	2	0.05mm
3	0.02mm	4	0.01mm
5	0.005mm	6	0.002mm
7	0.001mm	8	0.04mm
9	0.0005mm	0	0.0001mm

20 Direction

0	Forward	1	Reverse

21 Mode

0	Regular	1	Synchronization	2	High update rate

22 - 23 Non-usable area at head and end, customizable

S 0	50.8mm+63.5mm
B 0	30mm+60mm

FBGB Explosion - Proof Displacement Sensor

XX Selection Guide-CAN Output

F	B	G	B	–	M					–			–					–	C					–		
01	02	03	04		05	06	07	08	09		10	11		12	13	14	15		16	17	18	19	20		21	22

01 - 04 Sensor shell form

F B G B	Explosion-proof flameproof sensor

05 - 09 Measuring range

Four digits, less than four digits are preceded by zero, M means metric system, unit mm

10 - 11 Magnet ring type/mounting thread form

S 1	M18×1.5，measuring rod diameter 10mm, 304 material
S 2	M20×1.5，measuring rod diameter 10mm, 304 material
S 3	3/4"-16UNF-3A，measuring rod diameter 10mm, 304 material

12 - 15 Connection form

12 - 13 Cable outlet mode

D H	Cable outlet, PUR sheath, orange,-20~90℃, end scattered
D U	Cable outlet, PVC sheath, orange,-20~105℃, end scattered
S H	Side outlet, PUC sheath, orange,-20~90℃, end scattered
S U	Side outlet, PVR sheath, orange,-20~105℃, end scattered

14 - 15 Cable outlet mode: cable length, 01~99 meters

0 D R 1	PVC sheath, length 150mm, end 5-pin male connector

Note: For supporting cables, please refer to CAN bus cable Accessories selection

16 - 20 Signal output mode

16 Interface

C	CAN bus

17 Protocol type

1	CANopen	2	CANBasic

18 Baud

1	1000kBit/s	2	800kBit/s
3	500kBit/s	4	250kBit/s
5	125kBit/s	6	100kBit/s
7	50kBit/s	8	20kBit/s

19 Resolution

1	0.1mm	2	0.05mm
3	0.02mm	4	0.01mm
5	0.005mm	6	0.002mm
7	0.001mm		

20 Number of Magnet rings (1~9 optional)

21 - 22 Non-usable area at head and end, customizable

S 0	50.8mm+63.5mm
B 0	30mm+60mm

Wiring Mode

when the sensor is cable outlet cable output, refer to the cable color definition in the following table for connection mode

• Analog

Cable color 1*	Cable color 2*	Pin/wire function definition
Blue	Grey	No.1 Magnet position signal(+)
Green	Pink	Position signal of No.1 Magnet(-)
Yellow	Yellow	Reservation
White	Green	Reservation
Red	Brown	+24Vdc power supply (-20%~+20%)
Black	White	0 Vdc (power supply circuit)

* Cable color 1: Cable PUR sheath, orange,-20-90℃
* Cable color 2/3: Cable PVC sheath, orange,-20-105℃

• Analog

Cable color3*	Pin/wire function definition
Yellow	Current output
Grey	0Vdc(Current/Voltage Loop)
Pink	Reservation
-	Reservation
Green	0...10V
Blue	0 Vdc（power supply circuit）
Brown	+24Vdc power supply (-20%~+20%)
White	Reservation

• SSI

Cable color 1*	Cable color 2*	Pin/wire function definition
White	Grey	Data (-)
Yellow	Pink	Data (+)
Blue	Yellow	Clock (+)
Green	Green	Clock (-)
Red	Brown	+24Vdc power supply (-20%~+20%)
Black	White	0 Vdc
-	-	Do not connect

Note: * Cable color 1: Cable PUR sheath, orange,-20-90℃
* Cable color 2/3: Cable PVC sheath, orange,-20-105℃

• SSI

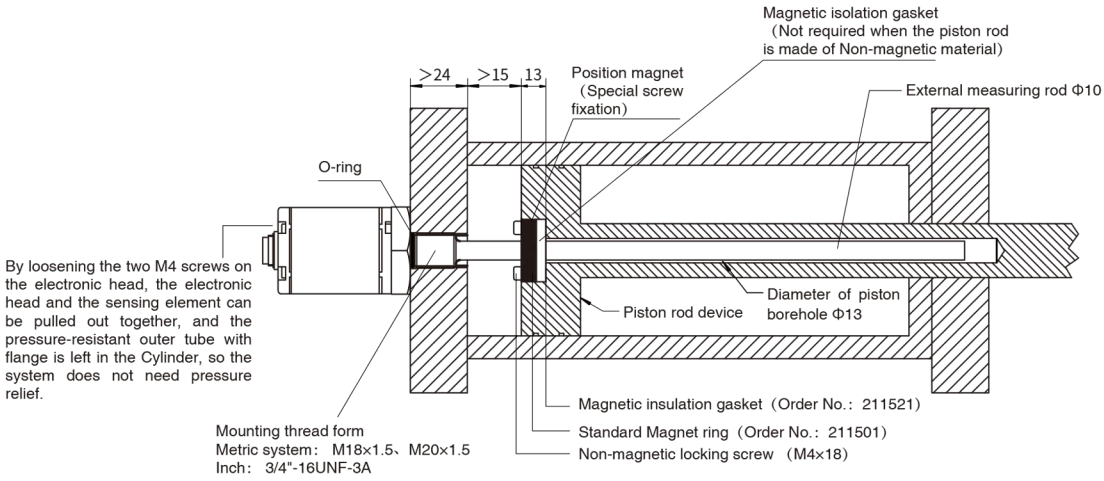
Cable color3*	Pin/wire function definition
Yellow	Clock (+)
Grey	Data (+)
Pink	Clock (-)
-	Reservation
Green	Data (-)
Blue	0 Vdc (power supply circuit)
Brown	+24Vdc power supply (-20%~+20%)
White	Reservation

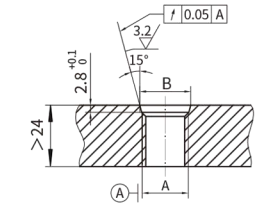
• CAN bus output

Cable color	Pin/wire function definition
Green	CAN (-)
Yellow	CAN (+)
-	Do not connect
-	Do not connect
Brown	+24Vdc power supply (-20%~+20%)
White	0 Vdc (power supply circuit)

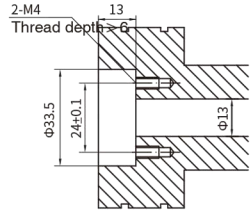
Installation Instruction

- Built-in installation instruction of RH pressure-resistant rod sensor





Machining requirements for installation sealing surface
Note: Recommended structural dimensions of mating threaded holes



Structural dimensions and central dimensions of accessories installed on piston rods

Schedule of dimensions of installation accessories

Code	A	B	O-ring
S1	M18 × 1.5	Φ19.9±0.1	15.3×2.4
S2	M20 × 1.5	Φ21.8±0.1	16×2.4
S3	3/4"-16UNF-3A	Φ20.8±0.1	17×2.4

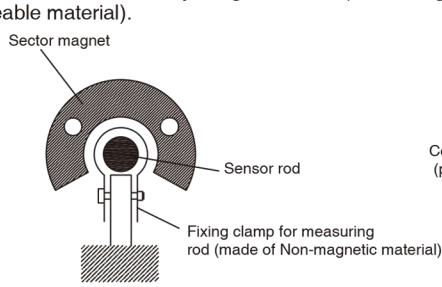
- RH Pressure resistance rod sensor installation precautions

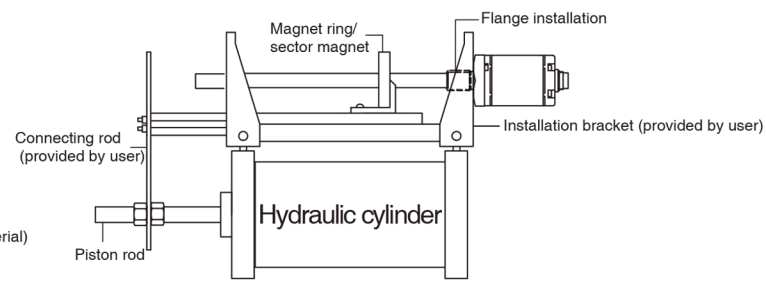
Cylinder installing — Pressure tube enclosed transducer (RH) usually has built-in cylinder installing, mounting thread form include: M18 x 1.5, M20 x 1.5, 3/4"-16UNF-3A. Before installation, make sure that the cylinder has been processed according to the correct size given in the atlas.
Mechanical installation — Sensor installation position and direction are not required, but must ensure that the installation is firm and reliable. The position magnet is installed on the moving part to be measured and keeps a proper distance from the measuring rod.
Outdoor use — when the sensor is used outdoors, it must be equipped with protective devices to prevent rainwater from immersing into the electronic compartment along cables or connectors in case of rain. The protective cover must consider the water outlet to prevent water accumulation.
Position magnet — In order to ensure the accuracy of measurement, the installing bracket of position magnet must be made of non-magnetic materials, such as screws, magnetic insulation gaskets, etc.

- Precautions: The sensor is magnetic sensitive equipment, which must keep away from the interference of external strong magnetic field. The stability and accuracy of power supply should also be considered when measuring with high precision. In use, it is also necessary to prevent the electronic bin from being impacted by foreign objects.

- External installation guide of RH pressure-resistant rod sensor

When mounted horizontally, longer sensors (measuring ranges greater than 1m) must be mechanically supported (made of Non-magnetically permeable material).

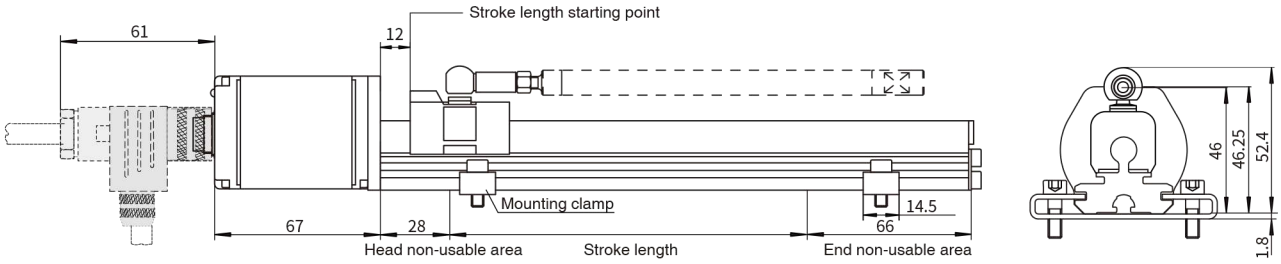


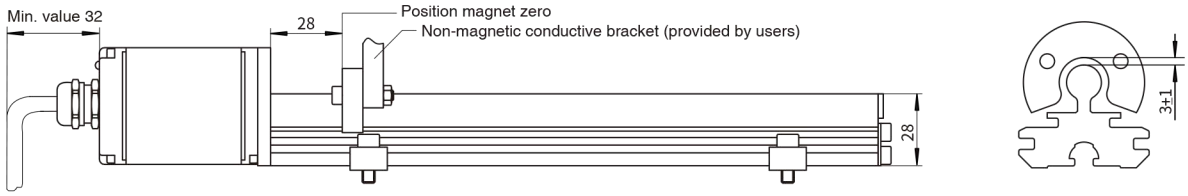


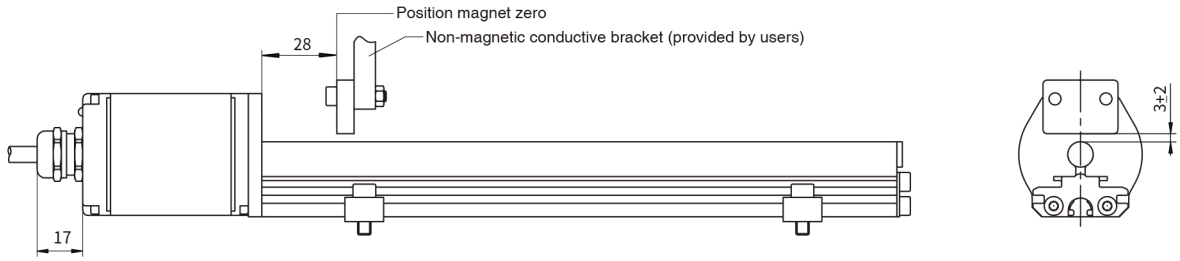
Installation Instruction

- Size and Installation Guidance of RP Aluminum profile Sensor

  RP Series Aluminum profile provides a flexible and simple installation. In general, the sensor can be installed on the machine surface with mounting clamps.







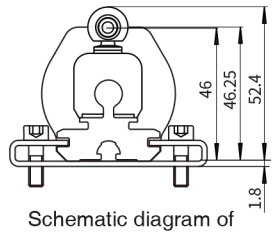
- Position measurements are achieved using two types of magnets:

  1、 The slider magnet moves along the guide rail of the aluminum profile shell, and the moving part is connected with the slider magnet through a connector bearing;

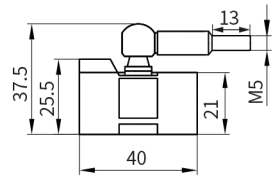
  2、The sector magnet is directly installed on the moving part and moves near the surface of the profile, with a gap of 3mm (±1mm).

  3、The square magnet is directly installed on the moving part and moves near the surface of the profile, with a gap of 3mm (±2mm).

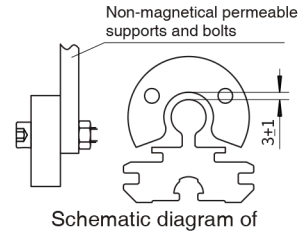
Mounting clamp installation



Schematic diagram of slider magnet installation



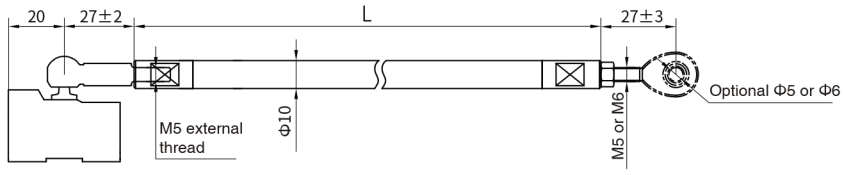
Slider magnet



Schematic diagram of installation of sector magnet

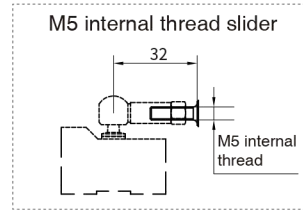
Installation Instruction

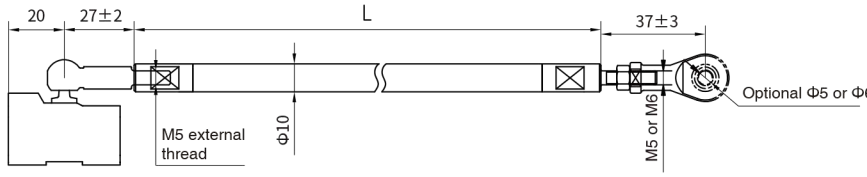
- Type selection of pull rod

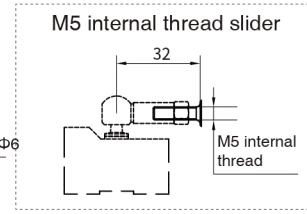


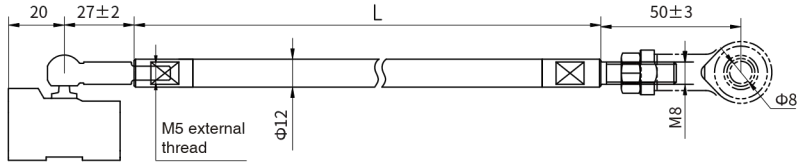
A magnet end

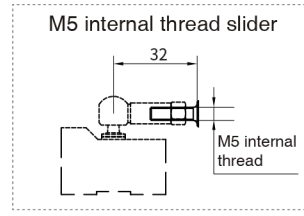
B installing end

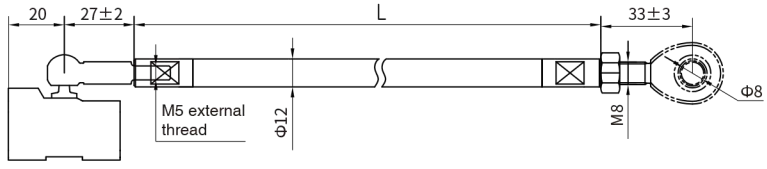


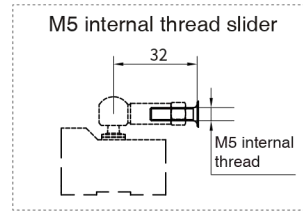












- Selection Guide

01	02	03	–	L	04	05	06	07	08	–	09	10	–	M	11	12	–	13

01	Connecting thread form: F : M 5 Internal thread/D : M 5 External thread
02 - 03	Diameter of pull rod: 10, 12
04 - 08	Length of pull rod (L): Four digits, less than four digits are preceded by zero, M means metric system, unitmm
09 - 10	Mounting thread form, two choices: C1: Internal thread/C2: External thread
11 - 12	Mounting thread specification: M 5 / M 6: Tie rod diameter 1 0 m m option; M 8: Tie rod diameter 1 2 m m option
13	Whether to equip plain bearings and their locking nuts: Y: Yes/N: No

- Selection examples:F10-L0200-C1-M5-N

Indicates: The diameter of pull rod is 10mm, the length of pull rod is 200mm, internal thread, thread specification is M5, without connector bearing.

G g Selection of Cable Accessories for Industrial Ethernet

N	E	T	–	M				–			
01	02	03		04	05	06	07		08	09	10

01 - 03	Type
N E T	Industrial Ethernet
04 - 07	**Cable length**
M * * *	Less than 3 digits are preceded by zeros, and M means metric system, unit m
08 - 10	**Cable type, outlet mode**
08	**Cable type**
D	PVC sheath, blue, 8-core, shielded, CAT-5e,-40~85℃
A	PUR sheath, green, 4-core, shielded, CAT-5e ES,-40~70℃
09 10	**Cable type**
1 1	Two-end 4-pin male connector, M12, d-code
2 2	Two-end 4-pin right angle male connector, M12, d-code
1 3	One end 4 pin male connector, M12, d-code, one end shielded RJ 45 connector
2 3	One end 4-pin right angle male connector, M12, d-code, one end shielded RJ 45 connector

● Selection examples: NET-M010-D11

Indicates: Ethernet cable, 10m long, PVC sheathed, blue, 8-core, CAT-5e standard, shielded,-40~85℃, 4-pin male connector at both ends, M12, d-code.

C c Selection of SSI cable Accessories

S	S	I	–	M				–			
01	02	03		04	05	06	07		08	09	10

01 - 03	Type
S S I	SSI interface
04 - 07	**Cable length**
M * * *	Less than 3 digits are preceded by zeros, and M means metric system, unit m
08 - 10	**Cable type, outlet mode**
H 0 1	One end of 7 pins (M16) female connector, and one end scattered
H 0 3	One end of 7 pins (M16) right angle female connector, and one end scattered
U 0 1	One end of 7 pins (M16) female connector, and one end scattered
U 0 2	One end of 8-pin (M16) female connector,and one end scattered
U 0 3	One end of 7 pins (M16) right angle female connector, and one end scattered
U 0 4	One end of 8-pin (M16) right angle female connector, and one end scattered
Note	H: Cable type, PUR sheath, orange,-20~90℃ U: Cable type, PVC sheath, orange,-20~105℃

● Selection example: SSI-M005-H01

Indicates: SSI interface cable, 5m long, PUR sheath, orange,-20~90℃, 7 pins (M16) female connector at one end, and the other end is scattered.

Dd Selection of Analog/Start-Stop Cable Accessories

A	S	T	–	M				–			
01	02	03		04	05	06	07		08	09	10

01 - 03	Type
A S T	Analog/Start-Stop interface
04 - 07	**Cable length**
M * * *	Less than 3 digits are preceded by zeros, and M means metric system, unit m
08 - 10	**Cable type, outlet mode**
H 0 1	One end of 6 pins (M16) female connector, and one end scattered
H 0 3	One end of 6-pin (M16) right angle female connector, and one end scattered
U 0 1	One end of 6 pins (M16) female connector, and one end scattered
U 0 2	One end of 8-pin (M16) female connector,and one end scattered
U 0 3	One end of 6-pin (M16) right angle female connector, and one end scattered
U 0 4	One end of 8-pin (M16) right angle female connector, and one end scattered
Note	H:Cable type, PUR sheath, orange,-20~90°C U: Cable type, PVC sheath, orange,-20~105°C

- Selection example:AST-M005-H01

  Indicates: Analog or Start-Stop interface cable, 5m long, PUR sheath, orange,-20~90°C, 6 pins (M16) female connector at one end, and the other end is scattered.

Cc Selection of CAN Bus Cable Accessories

C	A	N	–	M				–			
01	02	03		04	05	06	07		08	09	10

01 - 03	Type
C A N	CAN bus
04 - 07	**Cable length**
M * * *	Less than 3 digits are preceded by zeros, and M means metric system, unit m
08 - 10	**Cable type, outlet mode**
08	**Cable type**
C	PVC sheath, purple, 4 cores,-40~75°C
09 - 10	**Cable type**
0 1	One end of 6 pins (M16) female connector, and one end scattered
0 2	One end of 5-pin (M12) female connector, and one end scattered
0 3	One end of5-pin (M12) female connector, and one end scattered
0 4	One end of 5-pin (M12) right angle female connector, and one end scattered
0 5	One end of 6-pin (M16) right angle female connector, and one end scattered
1 1	One end of 6-pin (M16) female connector
2 3	One end of5-pin (M12) female connector; One end 5-pin (M12) male connector

- Selection example: CAN-M015-C01

  Indicates: CAN bus interface cable, 15m long, PVC sheath, purple, 4 cores,-40~75°C, 6 pins (M16) female connector at one end, and the other end is scattered.

Selection of Profibus-DP Cable Accessories

D	P	–	M				–			
01	02		03	04	05	06		07	08	09

01 - 02	Type
D P	Profibus-DP interface

03 - 06	Cable length
M * * *	Less than 3 digits are preceded by zeros, and M means metric system, unit m

07 - 09	Cable type, outlet mode
H 0 1	One end of5-pin (M12) female connector, and one end scattered
H 0 2	One end of5-pin (M12) male connector, and one end scattered
H 0 3	One end of 5-pin (M12) right angle female connector, and one end scattered
H 0 4	One end of 5-pin (M12) right angle male connector, and one end scattered
Z 0 5	One end of 6-pin (M16) male connector, and one end scattered
Z 0 6	One end of 6-pin (M16) male connector, and one end scattered
Z 0 7	One end of 6-pin (M16) right angle female connector, and one end scattered
H 1 2	One end of 5-pin (M12) male connector, One-end 5-pin (M12) female connector
H 3 4	One end of 5-pin (M12) right angle male connector; One-end 5-pin (M12) right angle female connector
Z 5 6	One end of 6-pin (M16) male connector; One end of 6-pin (M16) female connector
Note	H:Cable type, PUR sheath, purple, 2 cores,-20~80°C Z:Cable type, PUR sheath, cyan, 5-core,-20~80°C

- Selection example: DP-M020-H01

  Indicates: Profibus-DP interface cable, 20 meters long, PUR sheath, purple, 2 cores,-20~80°C, 5-pins (M12) female connector at one end, and the other end is scattered.

- Selection example:DP-M015-Z56

  Indicates: Profibus-DP interface cable, with a length of 15m, PUR sheath, cyan, 5 cores,-20~80°C, with 6 pins (M16) male connector at one end and 6 pins (M16) female connector at the other end.