

Microcor[®] High Speed ER Probes

- **Reliable Operation in All Environments**
- **Rapid Response to Process Changes**
- **Available in Offline and Online Configurations**



M4700 Flush and M4500 Cylindrical Probes

Microcor[®] Probes are an integral component of the high resolution Microcor[®] system. Special design of the probes provides advanced thermal performance and reliable operation in all environments, including sour service.

Cosasco's Microcor[®] technology measures the metal loss readings over time to compute the corrosion rate. The high resolution measurement allows process data to be determined in minutes, providing the change in corrosion rate 50-100 times faster than other metal loss methods. Multiple probe thicknesses are available. The thinner the element, the faster the response.

Two forms of probe element are available – flush and cylindrical. Several mounting configurations are available, the most common of which allows the probes to be inserted and removed under full process operating conditions without shutdown.

Flush Probes are used for best thermal performance where flush mounting with the pipe wall is desirable. A typical example is the bottom-of-line locations in oil and gas production pipelines. In these applications, water film commonly collected in the bottom of the line is the primary cause of corrosion. The flush probe ensures the whole probe element is exposed to the water film. In other pipeline applications, flush probes are essential if the line is pigged, thereby avoiding the possibility of probe damage.

Cylindrical Probes are suitable for more aggressive environments, since there is no sealing material other than the parent metal. The measurement area of the element is much greater; therefore, the design is suitable for use in a single-phase flow. In multiphase or stratified flows, care must be taken to position the whole probe element in the corrosive phase to be monitored.

M4000 Series Probes

The M4000 series probes are called retrievable probes and are designed for use in the Cosasco high pressure access fitting range. This permits probes to be removed and replaced at process conditions up to 6000 psi (400 bar), and temperatures up to 400°F (204°C) with the Cosasco Retriever and service valve. Note: All 4000 series probes must be installed with an overshoot adaptor (P/N 126292) to maintain connector cleanliness (see note on page 9 for details).

M3000 Series Probes

The M3000 series probes are called retractable probes and can be replaced under full system operating conditions, up to 1500 psi (100 bar) and 425°F (218°C). With high temperature versions, this may be extended to 1000°F (520°C) at pressures up to 1000 psi (67 bar). This series uses a sliding stuffing box seal.

M2000 Series Probes

The M2000 series probes are fixed probes and are used in high pressure, or especially hazardous process streams. However, they cannot be removed or replaced without system shutdown, unless installed in a bypass loop. The Microcor[®] Wired and Wireless Transmitters have to be closely coupled to the probe. This is achieved with a short connecting adaptor, so that the transmitter is mounted on the end of the probe. This is the recommended configuration. If conditions prevent this, then a short cable of no more than 6 ft. (2 meters) is available.

M4000 Series Retreivable Probes - Mounts in Cosasco High Pressure Access Fitting

§M4500



0.25" Length Increments (Optional Shields Available)

Note: For high velocity process conditions, it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

§M4700



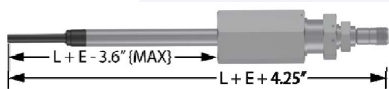
0.125" Length Increments

Note: For flush devices protruding into the line that may experience high velocity process conditions it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

§ Most popular configurations

M3000 Series Retractable Probes - Mounts in Model 60 Access Valve 1" or 1.5" Assembly, Standard Probe Lengths 18", 24", 30", & 36". Safety Clamp Assembly required for pressures over 100 psi and/or temperatures over 150°F

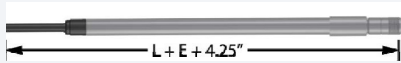
§M3500/
3500HT



Optional Shields and Safety Clamps Requires 1" full port ball valve HT = High Temperature

Note: For high velocity process conditions it is recommended that Drag Force Calculations be performed – please contact a Cosasco representative for further details.

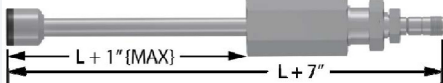
§M3501/
3501HT



Model 3500 HT replacement insert = High Temperature

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

§M3700



.25" Diameter Head Optional Safety Clamps Requires 1.5" ball or gate valve & 1" to 1.5" swaged nipple connection between valve & stuffing box.

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Drag Force Calculations be performed – please contact a Cosasco representative for further details.

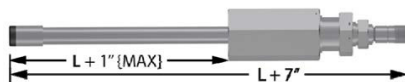
§M3701



Model 3700 replacement insert

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Drag Force Calculations be performed – please contact a Cosasco representative for further details.

§M3705



0.75" Diameter Head Optional Safety Clamps Requires 1" fullport ball valve

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Drag Force Calculations be performed – please contact a Cosasco representative for further details.

§M3706

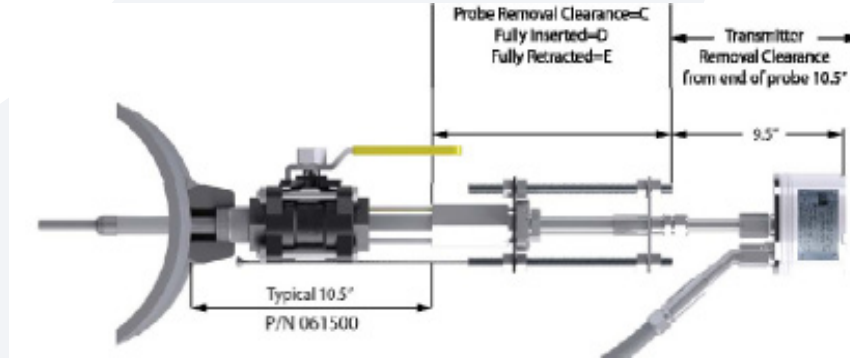


Model 3705 replacement insert

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Drag Force Calculations be performed – please contact a Cosasco representative for further details.

§ Most popular configurations

For dimensions A-E see Table (Field 4 – Order Length) under Order Information.



M2000 Series Probes - Fixed. Maximum Pressures up to 4000 psi (276 bar) and 500°F (260°C)

SM2500



0.75" Welded NPT Mounting Standard length 5", specials in 0.25" increments. Optional Shields. Max 4000 psi (276 bar)

Note: For high velocity process conditions it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

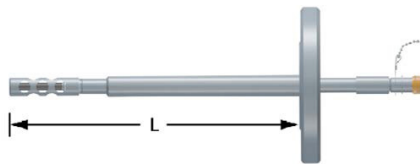
SM2510



0.75" Swagelok Adjustable Mounting Standard 5" length Optional Shields Max 500 psi (34 bar)

Note: For high velocity process conditions it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

SM2520



Flanged Mounting 1" minimum Optional Shields Max pressure - flange rating, to max 4000 psi (276 bar)

Note: For high velocity process conditions it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

SM2700



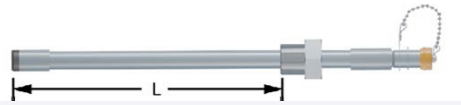
1.25" Diameter Head 1.50" Welded NPT Mounting, Standard 5" length, specials in 0.25" increments. Max 4000 psi (276 bar) Min. order length = 1.50"

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

M2000 Series Probes Continued

M2000 Series Probes - Fixed. Maximum Pressures up to 4000 psi (276 bar) and 500°F (260°C)

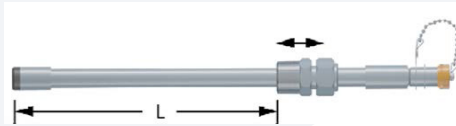
SM2705



0.75" Diameter Head 0.75" Welded NPT Mounting Max 4000 psi (276 bar) Min. order length = 1.50"

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

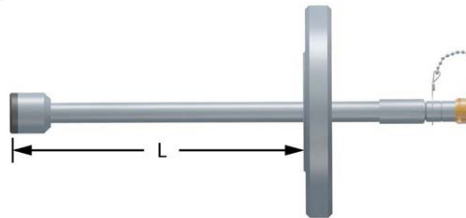
SM2715



0.75" Diameter Head, 0.75" Swagelok[®] Adjustable Mounting Max 500 psi (34 bar) Min. order length = 1.50"

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Drag Force Calculations be performed – please contact a Cosasco representative for further details.

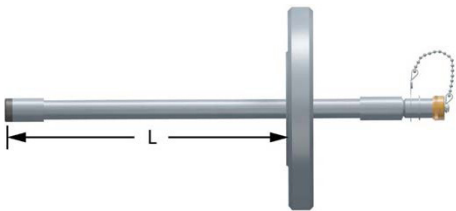
SM2720



1.25" Diameter Head Flanged Mounting 1.5" minimum Max pressure – flange rating, to max 4000 psi (276 bar)

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

SM2725



0.75" Diameter Head Flanged Mounting 1" minimum Max pressure - flange rating, to max 4000 psi (276 bar)

Note: For flush devices which are protruding into the line that may experience high velocity process conditions it is recommended that Wake Frequency Calculations be performed – please contact a Cosasco representative for further details.

Order Information

Probe Model Number Configuration										
	Field 1	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7			
Probe Model	Model #	Element Type	Element Alloy	Order Length						
M3500/3500HT	All Probes			18", 24", 30", 36" Nominal	Safety Clamp	Element Shield	Stuffing Box			
M3501/3501HT										
M3700					Safety Clamp					
M3701										
M3705					Safety Clamp					
M3706										
M4500				1/4" Increments	Element Shield					
M4700				1/8" Increments						
M2000 Series				Specify Process Side, Probe Length, Mounting Type, Shield Requirements						

Field 2 – Element Type (See Chart Below)

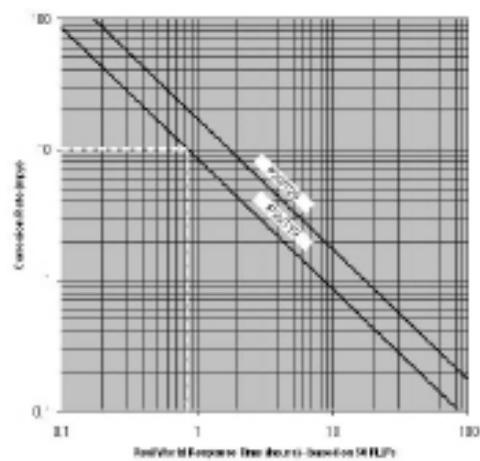
Cylindrical Element Probes (Models Mx500)	
T10	10 mils thickness (5 mils probe span)
T20	20 mils thickness (10 mils probe span)
Flush Element Probes (Models Mx700, Mx701, Mx705, Mx706)	
F10	10 mils thickness (5 mils probe span)
F20	20 mils thickness (10 mils probe span)

Field 3 – Element Alloy (UNS Number)

K03005	Carbon Steel
S31603	304/304L Stainless Steel

Note: Other alloy options are available. Contact Cosasco for price and availability.

Note: T50 Probes are no longer available.



Response time to corrosion upset conditions depends on the probe element thickness, the magnitude of the upset corrosion rate and the typical system noise. The adjacent graph shows the typical time required to detect the new corrosion rate trend over the background noise experienced in the real-world environment. This is based on 50 Probe Life Units (PLUs) change of the 262,144 PLUs that correspond to the full probe span. 1 PLU is the resolution of the Microcor[®] High Speed ER transmitter. For example (see white lines), if there is a sudden change from 0 to 10 mpy in the corrosion rate, this will be detectable in approximately 0.85 hours, or 50 minutes.

$$\text{Probe Life (Years)} = \frac{\text{Probe Span (mils)}}{\text{Average Corrosion Rate (mpy)}}$$

F10 & T10 probes are the most popular. They provide a good combination of sensitivity and probe life.

Field 4 - Order Length = L

L	Model	Probe Length				
L	M4500	2.75" (T10) or 4.5" (T20) to 18" in 0.25" increments. Consult Cosasco over 15" and 25 ft/s liquid velocity	L = P + T + 1.25" rounded down, where, P = Penetration inside pipe or vessel T = Wall Thickness of pipe or vessel			
L	M4700 / MP4700	1.25" to 18" in 0.125" increments. Consult Cosasco over 15" and 25 ft/s liquid velocity	Formula is based on standard access fitting of 5.25" and 1/16" weld gap per ANSI B31.1			
		M3500 Series	M3700/3705			
		DIM	T10	T20	DIM	T10
L =		A	L-1.35"	L+6.4"	A	L+1"
18	M3000 Series	B	L+6.5"	L+8.25"	B	L+7"
24		C	L+7.5"	L+9.25"	C	L+5"
30		D	L-10"	L-10"	D	L-12.63"
36		E	L+5"	L+5"	E	L+8"
L	M2000 Series	Probe tip to process side of mounting				

Model M3000 Series probes have probe locking ferrules on the top of the stuffing box that have been tested up to 3000 psi, twice the maximum rating of the probes. The design of the probes also provides a shoulder or a shield on the probe body that prevents the probe from passing through the stuffing box. However, for added safety above 150 psi or 150F process conditions, the additional safety clamp should

be used. The safety clamp threaded rods provide a secondary lock to hold the probe in the inserted position. The included safety wire provides a guide to full retraction of the probe through the valve at the time of probe removal. The stuffing box seal loading nut is provided with drilled holes and wire to allow locking of the nut to prevent loosening under heavy vibration conditions.

Field 5 – Safety Clamp

Model M3000 Series Only

0	None
1	Safety Clamp over 100 psi and/or 150F

Field 6 – Shields

Model Mx500 Only

0	No Shield - Liquids up to 8ft/s, Gases 25ft/s
1	Standard Shield – liquids up to 25ft/s, Gases 75ft/s
2	High Velocity Shield – Liquids up to 50ft/s, Gases 150ft/s

Field 7 – Stuffing Box Material

Model M3000 Series Only

0	M3500	Carbon Steel for cs, 316 ss, for alloys up to ss. For higher alloys use option 1 Hastelloy C-276
0	M3500HT	316 ss for alloys up to ss. For higher alloys use option 1, Hastelloy C-276
1		Hastelloy C-276 Stuffing Box

Microcor[®] probes may be subject to high flow velocities in some processes. This is not a problem for the flush element (Mx700 series) probes, since the element is recessed in its mounting so that the front face of the element is flush with the pipe or vessel wall, and not subjected to any significant bending forces due to the flow or vibration due to flow vortex shedding patterns. However, cylindrical element (Mx500 series) probes are subject to these forces and must be protected at higher velocities. If the velocity is low enough, it is preferred to run the probe without a shield as it gives full exposure of the element to the process flow. When a standard shield is used, it includes a probe tip support that provides protection from fatigue of the probe element at its base caused by flow vortex shedding. It also provides protection from the additional bending forces from the flow. For high velocity, shield has holes only on the sides of the shield. The blank side should be positioned to face into the flow and protect the element from direct impingement or erosion, while the side holes still permit circulation around the probe element.



Order Information Continued

Note: These shield recommendations are based on the exposure of the probe element. For liquid flows over 50 ft/s or gas flows over 75 ft/s, where the probe protrudes into the pipe or vessel more than 12” on model M3000 series probes, or 15” on other models contact Cosasco with details to check suitability for service. Probe body alloy matches probe element alloy, except for carbon steel in M3500HT where probe body is stainless steel

How to Order:

Order Model # Field 1 – Field 2 – Field 3 – Field 4 – Field 5 – Field 6 – Field 7

Example:

M3500 - T10 - K03005 - 18 - 1 - 1 - 0

Model # M3500 with T10-K03005 element, 18” length, with safety clamp, standard element shield, stuffing box carbon steel

Note:

Model 4000 Series Probe Connection during Installation
Microcor probe connectors must be kept clean for proper operation. To ensure this on Model 4000 series probe an Overshot Adaptor should be fitted to the hollow plug during probe installation and retrieval. This seals the area of the probe connector from the process fluid during installation and retrieval.

Overshot Adapter: P/N 126292



Overshot Adapter

Hollow Plug