cormon

GL003. 1

ER (Electrical Resistance):
General Guide and AC & GR Series Probe information

Cormon PER series probes and ER instruments are used for measuring metal loss due to corrosion/erosion in process applications. Corrosion of the exposed Sample element is measured as a change in its electrical resistance. The method is usable in almost any environment, being independent of the process properties. ER is not recommended for use in sour service if conductive (iron sulphide) scales are likely to be deposited.

As the resistivity of the Sample element will change with temperature a method of compensation must be used. A protected element of the same material, called a Reference, is placed close to the Sample and is measured at the same time. The results of measuring Reference and Sample are expressed as a ratio and as both elements are at the same temperature any change in this result must be due solely to the loss of metal from the Sample.

Any two metal loss measurements separated in time may be used to calculate an annual rate of loss. This is usually expressed as Mils-per-year (MPY) or Millimeters -per-year (MMPY).

The working life of an element is half of its total thickness and the thickness of the Sample element selected determines the life and speed of response of the probe. Dividing half of the element thickness by the estimated corrosion rate gives the approximate working life in years so a 20 thou (mil) element will last for 1 year at 10 MPY. As the theoretical resolution of an ER probe is 1/1000th of the full element, the smallest change that can be detected on a 20 thou element is 0.00002". At 10 MPY metal is lost at the rate of 0.00003" per day (0.01"/365) so the fastest that the probe will detect a 10 MPY corrosion rate is 2/3 of a day or 16 hours. In practice performance will be less than the theoretical level so a limit of one day may be better assumption. It is important to find a best match between life and performance for each application. Cormon usually assigns the code letters F to flush, T to tubular and W to wire loop probes for product code purposes. See code sheets below.

A Wire Loop probe in the AC mounting format

Probe mounting styles vary considerably according to the type of application. The Cormon series code is linked to the mounting method; for example, the AC series is the 2" high-pressure access system style. The series code is used in the Product Code string after the PER designation, as in "PER AC ...."

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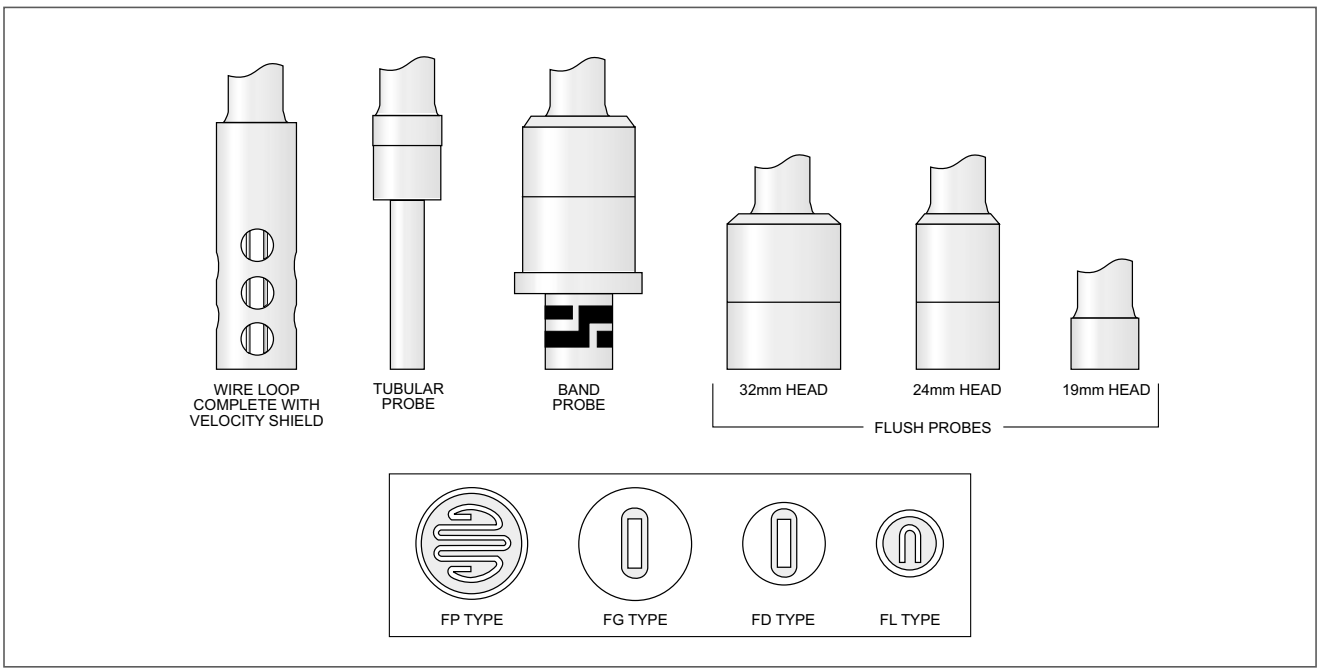
The most widely used types are:

SERIES	DESCRIPTION
AC	Body mounting suitable for 2" high pressure access fittings
RC	Retractable style 5/8" body for use with packing gland
FN & FB	Fixed length threaded bodies, NPT or BSP male threads
AN & AB	Adjustable length thread mounted bodies using swaged fittings NPT or BSP
LO	Laboratory style plain cylinder bodies
GR	Ground probes for monitoring buried structures
FL	Flange mounted probes
AR	Atmospheric sensors

ELEMENT CONFIGURATIONS

A number of element configurations have been developed for ER monitoring including Wire Loop, Tubular, Tube Loop, Flush and Band. Wire Loop and Tube Loop probes are sensitive but fragile. Tubular probes are more robust but their greater length can render them prone to vibration failure. Flush probes are ideal for bottom of line monitoring of mixed hydrocarbons, as they are most likely to contact the water phase. Band probes are most often used instead of flush types in sour service, as the product flow around the element tends to limit deposition of scale. Cormon sales provide an advisory service on probe selection by phone, fax or email. Please collate as much of the application data as possible (temperature, pressure, line diameter and wall thickness, flow velocity, process composition) to assist us to advise you correctly.



PROBE CONSTRUCTION

The pressure integrity and fitness for purpose of probes is a priority. Standard probe bodies are made from 316ss material and have glass sealed connectors with gold plated pins. Materials are all NACE MR-01-75 and EN10204 3. 1b certified. Sealing of the probe electrodes must be compatible with the process composition, pressure and temperature and Cormon cannot accept responsibility for probe problems arising from any incompatibility. Cormon sales can advise in this area. The sealing method is stated in the product code tables, for example, FG is a flush glass sealed probe.

Although there are some exceptions, epoxy resin probes are limited to 150°C (200°C to order) while glass variants are suitable for 260°C. Higher temperature applications usually require all welded tubular construction. If in doubt, contact Cormon sales for assistance. It is important to give as much process information as possible when seeking assistance with probe selection.

ADJUSTABLE FLUSH PROBES

AC series Flush probes with a variable length are useful for obtaining an exact match with pipe wall thickness or as a spare part to cover several different locations. For 5.25" access fittings two standard lengths cover all possible pipe sizes and schedules from 3" to 20". Refer to table below to select 060 or 077 length. For longer probes use the 'Flush' calculation method and order as the shortest length allowing a maximum of 35mm extension.

NOMINAL PIPE SIZE	060 (SHORT) AF	077 (LONG) AF
3" & 4"	All Schedules	
6"	Schedule 5s to 160	Schedule XXS
8"	Schedule 5s to 120	Schedule 140 up
10"	Schedule 5s to 100	Schedule 120 up
12"	Schedule 5s to 80	Schedule 100 up
14"	Schedule 5s to 80	Schedule 100 up
16"	Schedule 5s to XS	Schedule 80 up
18"	Schedule 5s to XS	Schedule 80 up
20"	Schedule 5s to 40 + Sched. XS	Schedule 60 & 80 up

AC SERIES LENGTH CALCULATIONS

PROBE STYLE>	TUBULAR CEION®, ER TUBULAR & WIRE LOOP	FLUSH CEION®, ER, & LPR	PROJECTING LPR & GALVANIC
Standard 5.25" access fitting	P + W + 32	W + 61	W + P + 61
Flanged access fitting	S + W + P - 102	S + W - 73	S + W + P - 73
For Band probes use flush method and add 23 mm to get fully wetted element	**P** = Projection of device into pipe measured from pipe ID to tip of probe.	**W** = Wall thickness of pipe in mm	**S** = Total stand off from pipe OD to top of access fitting
NOTE: Add 25.4 mm for each inch increase in height of access fitting. Example: add 50.8 mm for a 7.25" fitting instead of a 5.25"			

PRODUCT CODE GUIDE

PER

ER Probe	Mounting Style	Length	Element Type	Element Size	Element Material	Accessory
For retractable (RC) probe options see data sheet CMEP005 For fixed and adjustable threaded Probes see data sheet CMEP017	**AC** Probe for 2" access fitting 316ss body **AD** Probe for 2" access fitting Incoloy body	Insert 3 digit length in millimeters. See data sheet for calculation method	**FL** Flush epoxy seal long path 32mm **AF** Adjustable flush long path epoxy seal 32mm **FG** Flush glass seal 32mm **AG** Adjustable flush glass seal 32mm	**10** 0.010" (0.25mm) **20** 0.020" (0.5mm) **40** 0.040" (1mm)	**A07** - Carbon steel For other materials consult material code data sheet	**OO** No device fitted - not applicable
			WL Wire loop glass seal	**40** 0.040" (1mm) **80** 0.080" (2mm)	**A06** - Carbon steel 070M20 For other materials consult material code data sheet	**VS** Velocity shield as Standard **OO** No device fitted
			WT Tube loop glass seal	**04** 0.004" (0.1mm) **08** 0.008" (0.2mm)		
Flange and Hub mounted Probes: All of the element options given in this table are available as flange or hub mounted probes. Order length dimension is flange face to tip of element (with standard shield if applicable)			**TL** Tubular long glass **TS** Tubular short glass **TW** Tubular long welded **TV** Tubular short welded **TH** Tubular high temp. long **TT** Tubular high temp. short	**10** 0.010" (0.25mm) **20** 0.020" (0.5mm) **40** 0.040" (1mm) **80** 0.080" (2mm)		**OO** No device fitted **VS** Velocity shield option
Temperature & Pressure Ratings						
FL, AF, BA	150°C 300°F - 3600psi 248Bar					
FG, FD, WL, WT, TL, TS, TW, TV	260°C 500°F - 6000psi 414Bar					
TH,TT	450°C 840°F - 3600psi 248Bar					
			BA Band epoxy/glass 32mm			**OO** No device fitted - not applicable

PERGR

	Element	Bond	Cable	Element
Electrical Resistance Probes for underground service	**Flush** **F010** 0.010" **F020** 0.020" **F040** 0.040" **F100** 0.100" **Tubular** **T010** 0.010" **T020** 0.020" **T040** 0.040"	**N** No bond **P** Bond at Probe **C** Bond at connector	Specify length in meters. Range 01-99	**A06** Carbon steel 070M20 See list for options

GR Series underground probes are widely used to monitor the efficiency of cathodic protection systems. They are buried close to the structure and are usually bonded to ensure that the same degree of protection is received from the CP system.

Sand/Erosion measurements The ER method has been widely used for measuring the metal loss effects of sand erosion. This task is far better performed by the advanced metal loss technology CEION® as it has far better resolution and temperature compensation enabling much lower rates of loss to be reliably detected. CEION® is an exclusive Cormon technology. Please consult our sales team for further information.

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