MAGNETROL®

AMETEK®
SENSORS, TEST & CALIBRATION

Genesis Model ED1
High Performance Emulsion Detector

DESCRIPTION

The Genesis Model ED1 Emulsion Detector is a Time Domain Reflectometry (TDR)-based, 24 VDC level detector designed to accurately measure the various layers in interface level measurement applications. Encompassing a number of significant engineering accomplishments, this leading edge level detector is designed to provide measurement performance well beyond that of many of the more traditional technologies.

Utilizing patented "Top-Down" and "Bottom-Up" signals, along with advanced level detection algorithms, this single device can be used in a wide variety of interface applications ranging from very light hydrocarbons to water-based media.

This detector, like other Magnetrol devices, is designed to maximize ease of wiring, configuration, and viewing of the versatile graphic LCD display.

The Genesis Model ED1 supports both the Field Device Integration (FDI) and Enhanced DD (EDDL) standards, which allow viewing of valuable configuration and diagnostic information in tools such as PACT*ware*™, AMS Device Manager, and various HART® Field Communicators.

APPLICATIONS

MEDIA: Hydrocarbons to water-based media (Dielectric Constant ε_r = 1.4–100)

VESSELS: Most process, separator, or storage applications up to rated probe temperature and pressure.

CONDITIONS: All interface measurement and control applications including those with thick/dynamic emulsion layers, process conditions exhibiting, foam, surface agitation, bubbling or boiling, high fill/empty rates, and varying dielectric media or specific gravity.

Measures Multiple Levels within Interface Applications

HART REGISTERED · AMS aware · PACTware · FDT CERTIFIED

FEATURES

- 24 VDC interface detector with four (4) 4-20mA outputs for convenient control of top level, top of emulsion, water level, and sediment
- Simultaneous Top-Down and Bottom-Up signal generation
- Level measurement not affected by changing media characteristics.
- No need to move levels for calibration
- 4-button keypad and graphic LCD display allow for convenient viewing of configuration parameters and echo curves
- Proactive diagnostics advise not only what is wrong, but also offer troubleshooting tips.
- Probe designs up to +200 °C/70 bar (+400 °F/1000 psi)
- Main electronics can be remote-mounted up to 30 m (100 feet) away from the probe.
- No moving parts

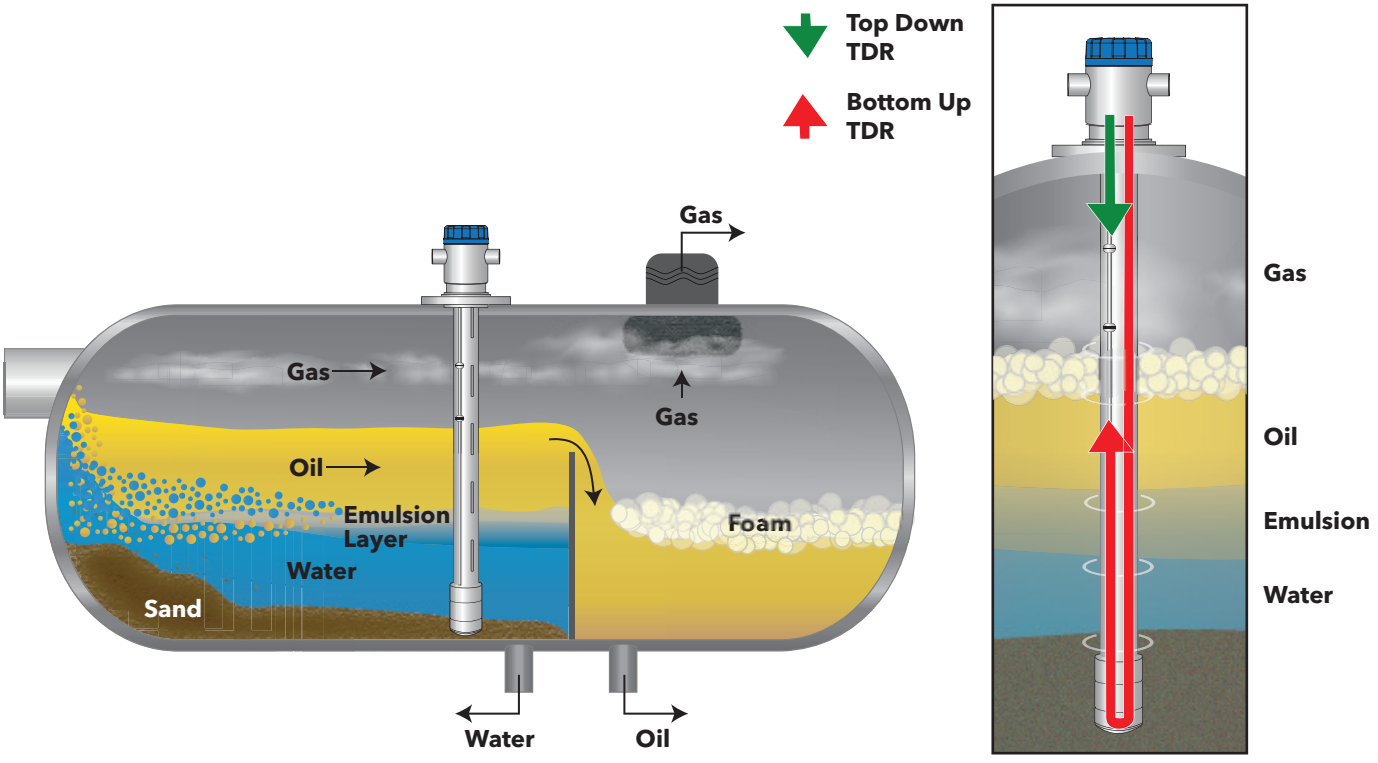
TECHNOLOGY

PRINCIPLE OF OPERATION

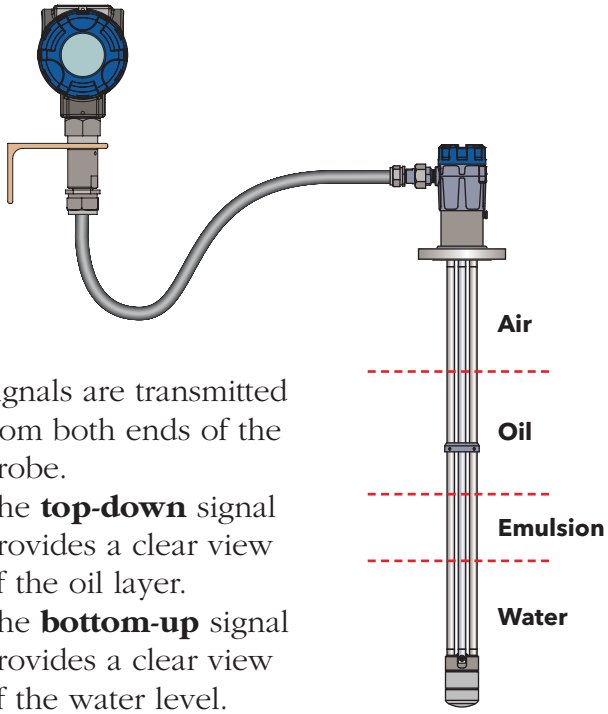
The Genesis Model ED1 is a multiphase level detector based upon the technology of Time Domain Reflectometry (TDR). The device utilizes pulses of electromagnetic energy transmitted along a physical probe. From a "Top-Down" perspective, when a pulse reaches a surface that has a higher dielectric constant than air ($\varepsilon_r = 1$), a portion of the pulse is reflected. The time of flight of the pulse is then measured via high speed timing circuitry that provides an accurate measure of the liquid level. The amplitude of the reflection depends on the dielectric constant of the product, with a higher dielectric constant yielding a larger reflection.

In addition to sending high frequency energy down the probe to detect upper (or total) level, the Genesis Model ED1 sends energy up the probe to detect various other levels that may be present; including the top of an emulsion layer, bottom of an emulsion layer (water level) and sediment.

This innovative form of TDR-based measurement, combining "Top-Down" and "Bottom-Up" signal processing utilizing sophisticated and patented algorithms, makes multiphase level detection possible.

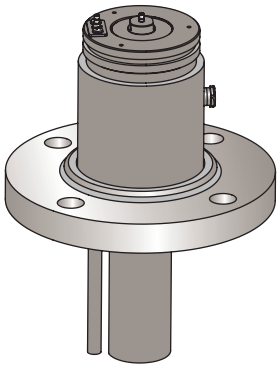


TECHNOLOGY (cont.)

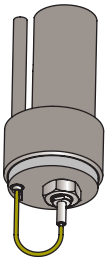


Signals are transmitted from both ends of the probe.
The **top-down** signal provides a clear view of the oil layer.
The **bottom-up** signal provides a clear view of the water level.

Two Inputs
One input for each end.



Coax
for the bottom-up measurement



GENESIS PROBE OVERVIEW

The coaxial probe is the most efficient of all TDR probe configurations and should be the first consideration in all applications. Analogous to the efficiency of coaxial cable, a coaxial probe allows almost unimpeded movement of the high frequency pulses throughout its length.

The electromagnetic field that develops between the inner rod and outer tube is completely contained and uniform down the entire length of the probe. See Figure 1. This means that the coaxial probe is immune to any proximity affects from other objects in the vessel, and therefore, in essence, it can be used anywhere that it can mechanically fit.

The efficiency and overall sensitivity of a coaxial configuration yields robust signal strength, even in extremely low dielectric ($\varepsilon_r \geq 1.4$) applications. The sensitivity of this "closed" design, however, also makes it more susceptible to measurement error in applications that can have coating and buildup.

PROBE OVERVIEW

TWO STYLES OF GENESIS PROBES

As is typical for most level measurement technologies, choosing the proper sensing element is the most important aspect in the decision-making process. The probe configuration establishes fundamental performance characteristics.

Although both of the probes offered with the Genesis Model ED1 can be considered as "coaxial", each has specific strengths and weaknesses. While there can be overlap, and both probes can certainly be used in similar applications, it is important to understand their basic differences so that one can choose the probe type that will offer optimal performance.

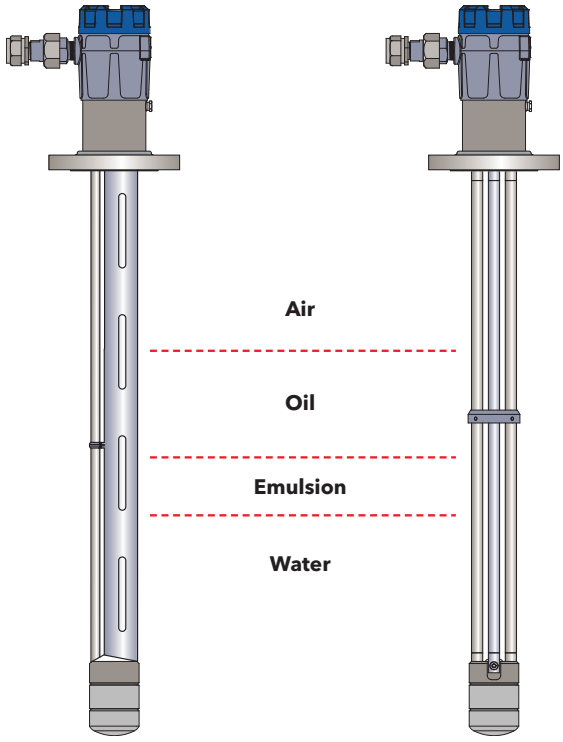
ENLARGED COAXIAL

The standard coaxial offering for the Genesis Model ED1 is an Enlarged 1.75" (45 mm) diameter probe that can be generally used for most clean applications.

5-CONDUCTOR PENTAROD

With a PFA coated active center rod surrounded by four (4) reference rods, the 5-conductor Pentarod probe is an alternative probe offering for the Genesis Model ED1. Although this probe still yields excellent performance, its open design makes it less susceptible to buildup and bridging.

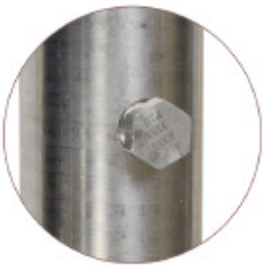
The figure at right also shows that, although most of the electromagnetic field develops between the center conductor and four reference rods, there is also some peripheral energy that expands outward, making the 5-conductor probe slightly more sensitive to proximity effects of objects located immediately around it. For that reason, it is recommended to keep the active element of the 5-Conductor probe at least 1 inch (25 mm) away from metal objects.

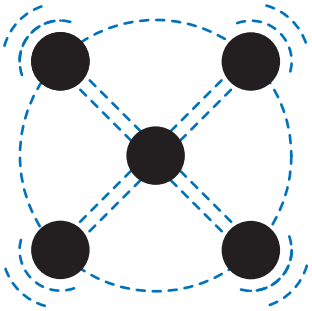


Coaxial and 5-conductor Probes

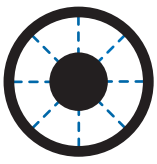
OPTIONAL FLUSHING CONNECTION

The maintenance of probes in applications containing buildup or crystallization can be significantly improved by using an optional flushing connection. This flushing connection, which is available with both probe styles, is a metal extension with a port welded above the process connection. The port allows the user to purge the inside of the probes during routine maintenance.





Pentarod Signal Propagation



Coaxial Probe Signal Propagation

TRANSMITTER SPECIFICATIONS

FUNCTIONAL/PHYSICAL

System Design		
Measurement Principle		TDR based electronics combined with patented, proprietary software algorithm
Input		
Measured Variable		Level, as determined by time of flight
Span		60 centimeters to 6 meters (2 to 20 feet)
Output		
Type		Four (4) 4–20 mA analog outputs, one (1) with HART;
		3.8–20.5 mA useable (per NAMUR NE43)
Resolution	Analog:	.003 mA
	Digital Display:	1 mm
Diagnostic Alarm		Selectable: 3.6 mA, 22 mA (meets requirements of NAMUR NE 43), or HOLD last output
Diagnostic Indication		Meets requirements of NAMUR NE107
Damping		Adjustable 0–30 seconds
User Interface		
Keypad		4-button menu-driven data entry
Display		Graphic liquid crystal display
Digital Communication/Systems		HART Version 7—with Field Communicator, AMS, or FDI
		DTM (PACT*ware*™), EDDL
Menu Languages	LCD:	English
	HART DD:	English
Power (at wiring board terminals)		Explosion-proof with Instrinsically Safe probe
		24 VDC (±10%), 10 Watt maximum, Um ≤ 30V DC (SELV)
Housing		
Main Electronics		
	Material / Net/Gross Weight:	IP67 aluminum A413 (<0.6% copper) / 2.75 kg (6 lbs.)
		Stainless Steel / 5.7 kg (12.5 lbs.)
Probe Electronics		
	Material / Net/Gross Weight:	Aluminum / 1.4 kg (3 lbs.)
		Stainless Steel / 3.2 kg (7 lbs.)
Cable Entry		¾" NPT or M20 × 1.5

TRANSMITTER SPECIFICATIONS CONTINUED

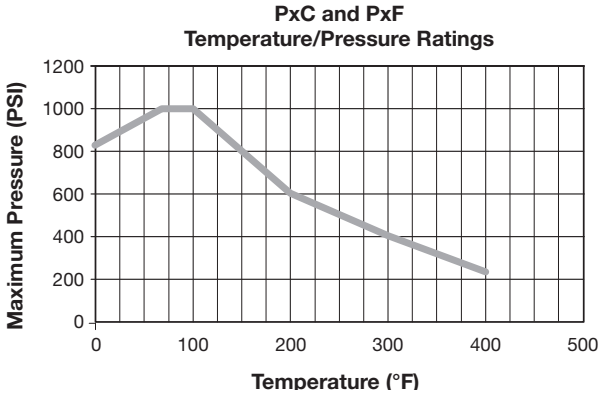
FUNCTIONAL/PHYSICAL

Environment	
Operating Temperature	-40 to +70 °C (-40 to +160 °F); LCD viewable -20 to +70 °C (-5 to +160 °F)
Storage Temperature	-45 to +85 °C (-50 to +185 °F)
Humidity	0 to 99%, non-condensing
Electromagnetic Compatibility	Meets CE requirement (EN 61326) and NAMUR NE 21 ①
Surge Protection	Meets CE EN 61326 (1000V)
Shock/Vibration	ANSI/ISA-S71.03 Class SA1 (Shock); ANSI/ISA-S71.03 Class VC2 (Vibration)
Performance	
Reference Conditions	Reflection from liquid, with dielectric constant in center of selected range, with a 3 meter (10 foot) probe at +20 °C (+70 °F)
Linearity ②	Application dependent
Accuracy	Application dependent
Resolution	Application dependent
Repeatability	Application dependent
Response Time	Approximately 15 seconds
Initialization Time	Less than 30 seconds

① Pentarod probes must be used in metallic vessel or stillwell to maintain CE noise immunity
② Linearity in top 46 cm (18 inches) of probes will be application dependent.

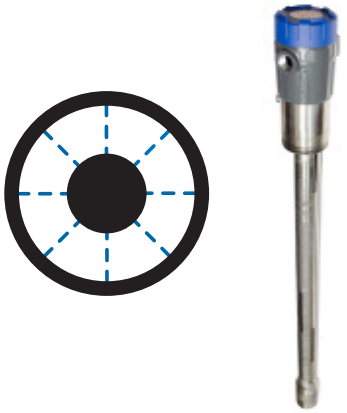
TEMPERATURE/PRESSURE RATING

Temperature °C (°F)	Pressure (All Materials) bar (psi)
-40 (-40)	52 (750)
21 (+70)	70 (1000)
38 (+100)	70 (1000)
93 (+200)	45 (650)
149 (+300)	28 (400)
204 (+400)	19 (270)

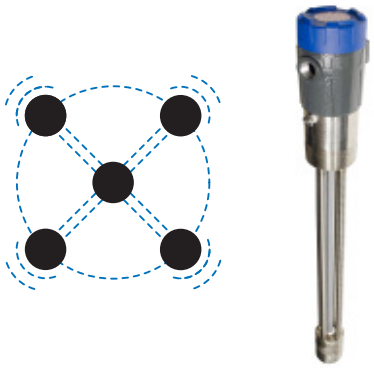


PROBE SELECTION GUIDE – PxC and PxF

ENLARGED COAXIAL PROBE



PENTAROD PROBE

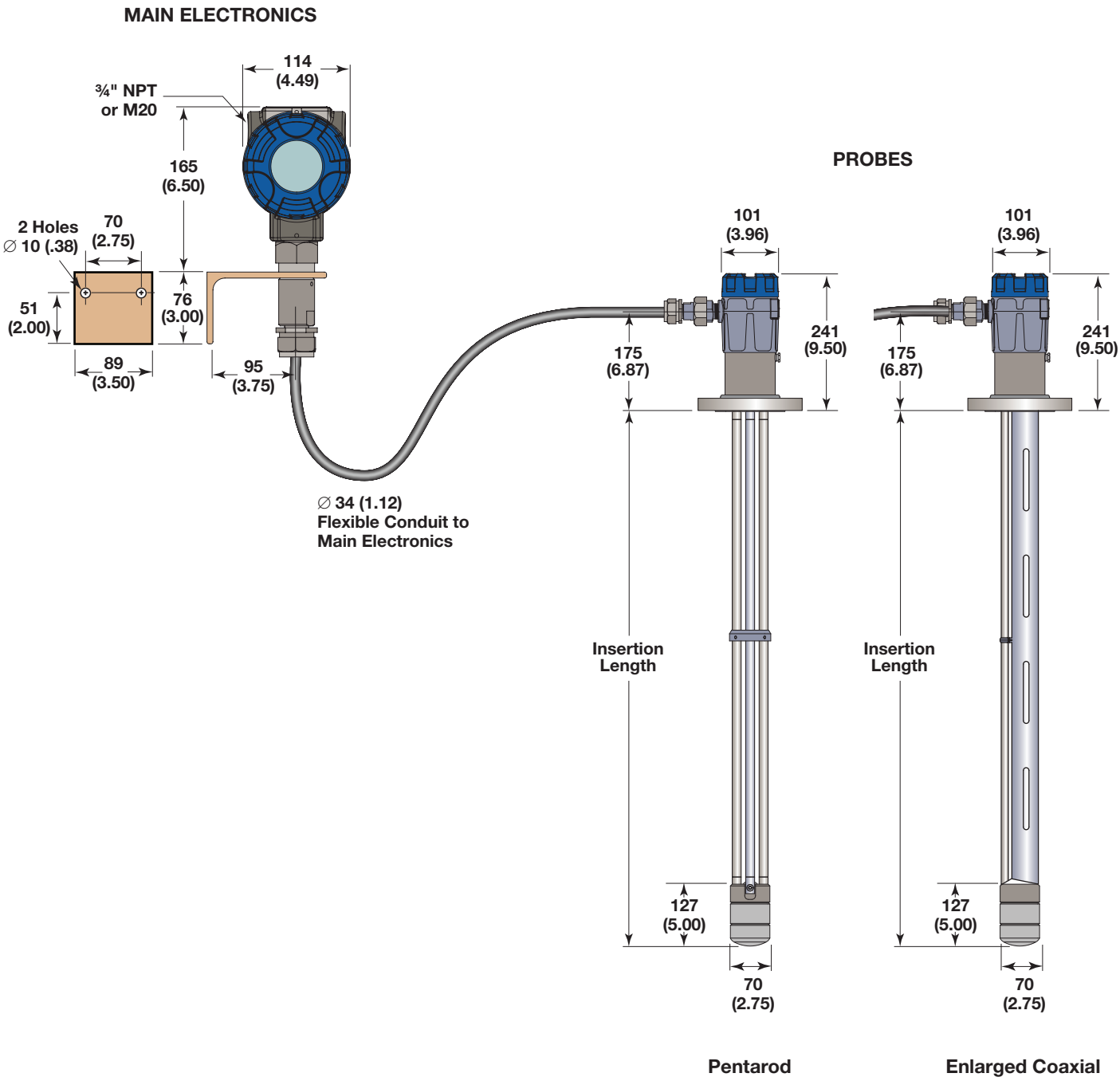


Description ①	**PxC** **PxF**	Enlarged Coaxial PxF: 5-Conductor
Application		Interface
Installation		Tank
Materials—Probe		316/316L (1.4401/1.4404) with PFA coated center rod
Process Seal		Teflon® TFE with Viton® o-rings ②
Spacers	**Coaxial** **Pentarod**	CE221 Stainless steel
Probe Outside Diameter		316 SS: 45 mm (1.75")
Process Connection		
	Threaded	3" NPT or 3" BSP (G 3")
	Flanged	3" or larger; Various ASME, EN1092
Available Probe Length		50 to 610 cm (20 to 240 inches)
Transition Zones ③		
	Top	200 mm (8 inches)
	Bottom	200 mm (8 inches)
Process Temperature		-40 to +200 °C (-40 to +400 °F)
Max. Process Pressure		70 bar @ +20 °C (1000 psi @ +70 °F)
Dielectric Range		1.4 to 100
Vacuum Service ④		Negative Pressure, but no hermetic seal
Maximum Viscosity	**PxC** **PxF**	PxC: 2,000cP (mPa.s) PxF: 10,000cP (mPa.s)

① 2nd digit E=English, M=Metric
② Other o-ring materials available upon request.
③ Transition zones (areas with reduced accuracy) are dielectric dependent. It is recommended to set the 0-100% measuring range outside of the transition zones.
④ Genesis probes containing o-rings can be used for vacuum (negative pressure) service but are not hermetically sealed.

DIMENSIONS

millimeters (inches)

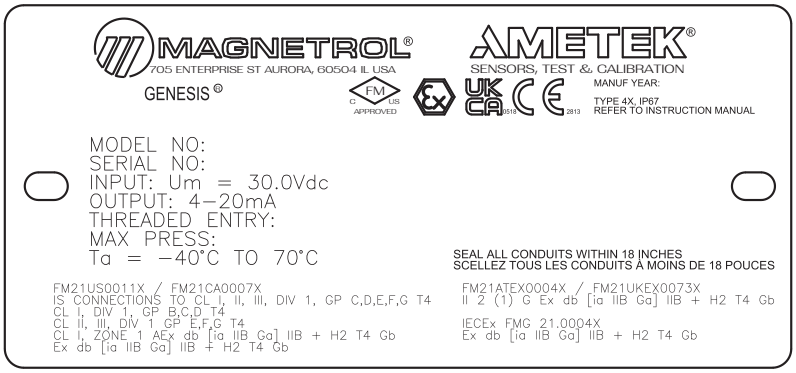


AGENCY APPROVALS

These units are in compliance with the EMC-directive 2014/30/EU, the PED-directive 2014/68/EU and the ATEX directive 2014/34/EU.

AVERTISSEMENT! Danger d'explosion éventuel. Ne brancher ou débrancher des équipements que si l'alimentation électrique a été coupée ou si la zone est réputée non dangereuse.

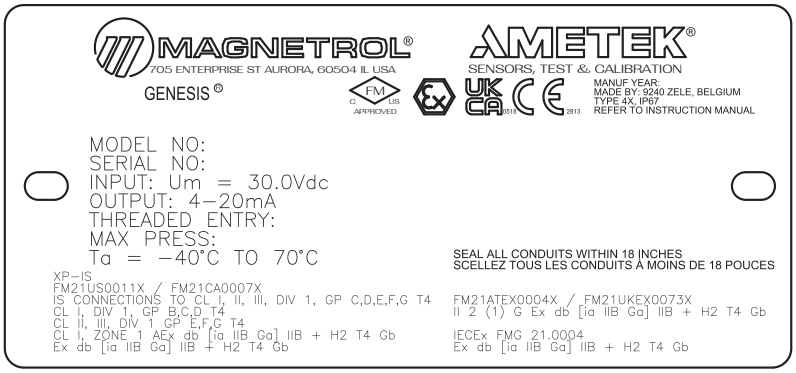
TRANSMITTER ED1-210x-xxx



005-8085-001, Genesis MIHQ

Explosion Proof - Flameproof with I.S. outputs

5th Digit: 1 = HART
8th Digit: 3 = Explosion/Flameproof with I.S. outputs

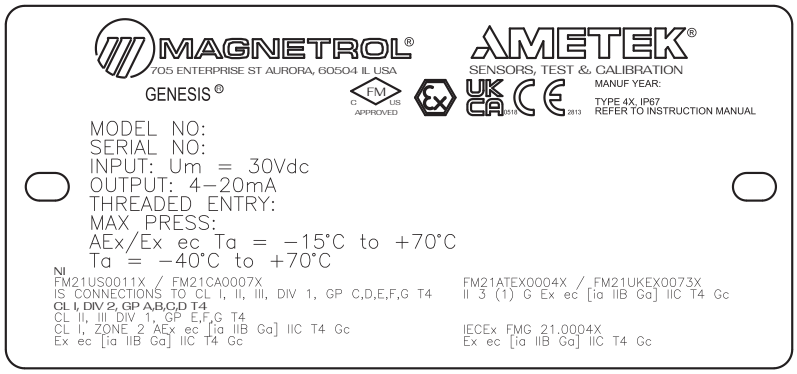


005-8085-002, Genesis MINV

Explosion Proof - Flameproof with I.S. outputs

5th Digit: 1 = HART
8th Digit: 3 = Explosion/Flameproof with I.S. outputs

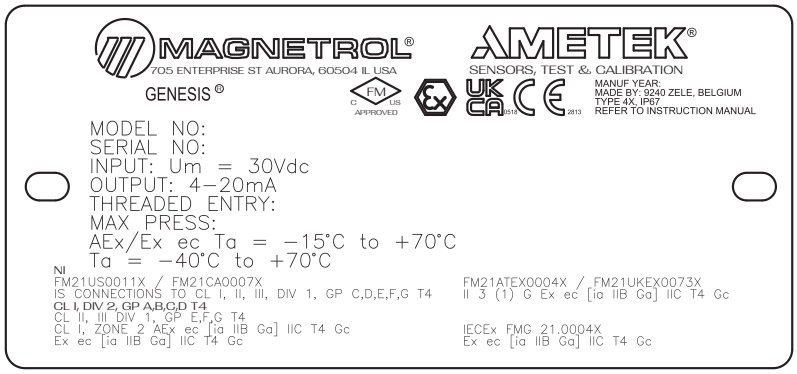
TRANSMITTER ED1-210x-xxx



005-8085-003, Genesis MIHQ

Non Incendive - Increased Safetywith I.S. outputs

5th Digit: 1 = HART
8th Digit C = Non Incendive, Increased Safety with I.S. outputs

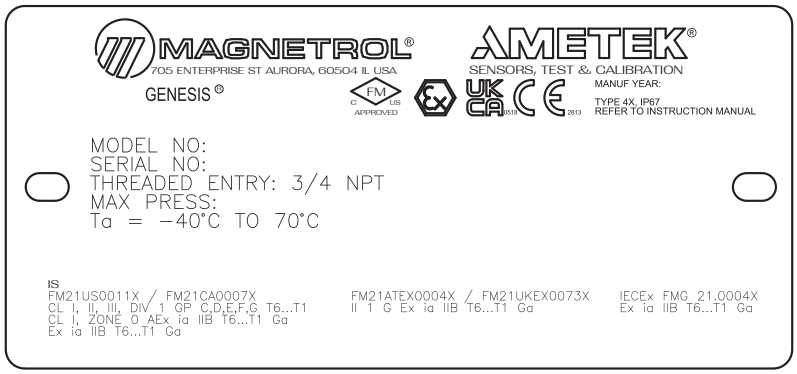


005-8085-004, Genesis MINV

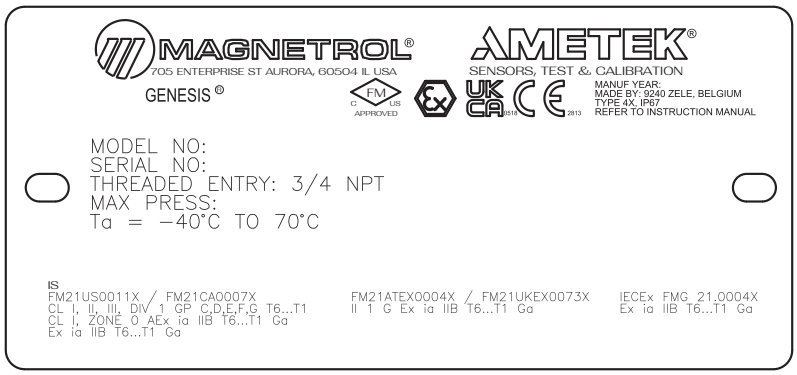
Non Incendive - Increased Safetywith I.S. outputs

5th Digit: 1 = HART
8th Digit C = Non Incendive, Increased Safety with I.S. outputs

PROBE Pxx-xxx0-A0x-xx-xxx



005-8085-005, Genesis MIHQ
Intrinsically Safe



005-8085-006, Genesis MINV
Intrinsically Safe

Specific Conditions of Use

Transmitter:

1. The flamepaths of the equipment are not intended to be repaired. Consult the manufacturer if repair of the flamepath joints is necessary.
2. Refer to the manufacturer's instructions to reduce the potential of an electrostatic charging hazard on the equipment enclosure.
3. The transmitter shall be connected to a safety extra low-voltage circuit (SELV) with Um ≤ 30V

Probe:

1. Refer to the manufacturer's instructions to reduce the potential of an electrostatic charging hazard on the equipment enclosure.

Temperature Code

For Probe: T6…T1 temperature code are defined by the following table:

Process Temperature (PT)	Temperature Code-TCG (GAS)
≤ 75 °C	T6
75 to 90 °C	T5
90 to 120 °C	T4
125 to 185 °C	T3
185 to 285 °C	T2
285 to 435 °C	T1

O-RING/SEAL SPECIFICATIONS

Code	O-Ring/Seal Material	Max. Process Temperature	Min. Process Temperature	Max. Process Pressure	Not Recommended For Applications	Recommended for Applications
0	**Viton® VX065**	400 °F @ 230 psi (200 °C @ 16 bar)	-40 °F (-40 °C)	1000 psi 70 °F (70 bar @ 20 °C)	Ketones (MEK, acetone), skydrol fluids, amines, anhydrous ammonia, low molecular weight esters and ethers, hot hydrofluoric or chlorosulfuric acids, sour HCs	General purpose, ethylene
2	**Kalrez® 4079**	400 °F @ 232 psi (200 °C @ 16 bar)	-40 °F (-40 °C)	1000 psi 70 °F (70 bar @ 20 °C)	Hot water/steam, hot aliphatic amines, ethylene oxide, propylene oxide	Inorganic and organic acids (including hydro fluids and nitric), aldehydes, ethylene, organic oils, glycols, silicone oils, vinegar, sour HCs
8	**Simriz SZ485** (formerly Aegis PF128)	400 °F @ 232 psi (200 °C @ 16 bar)	20 °F (-7 °C)	1000 psi 70 °F (70 bar @ 20 °C)	Black liquor, freon 43, freon 75, galden, KEL-F liquid, molten potassium, molten sodium	Inorganic and organic acids (including hydro fluids and nitric), aldehydes, ethylene, organic oils, glycols, silicone oils, vinegar, sour HCs, steam, amines, ethylene oxide, propylene oxide, NACE applications
A	**Kalrez® 6375**	400 °F @ 232 psi (200 °C @ 16 bar)	-40 °F (-40 °C)	1000 psi 70 °F (70 bar @ 20 °C)	Hot water/steam, hot aliphatic amines	Inorganic and organic acids (including hydro fluids and nitric), aldehydes, ethylene, organic oils, glycols, silicone oils, vinegar, sour HCs. ethylene oxide, propylene oxide

MODEL NUMBER

DETECTOR

1 2 3 | BASIC MODEL NUMBER

E D 1	Genesis High Performance Emulsion Detector

4 | POWER

2	24 VDC (SELV)

5 | SIGNAL OUTPUT

1	4–20 mA with HART

6 | OPTIONS

0	None

7 | ACCESSORIES/MOUNTING

A	3 meter (10 foot) remote
B	6 meter (20 foot) remote
C	15 meter (50 foot) remote
D	30 meter (100 foot) remote

8 | CLASSIFICATION

3	Explosion/Flame proof with I.S. outputs
C	Non-Incendive, Increased Safety with I.S. outputs

9 | HOUSING

1	Aluminum
2	316 Stainless Steel

10 | CONDUIT CONNECTION

0	¾" NPT
1	M20 × 1.5

E	D	1	—	2	1	0		—			
1	2	3		4	5	6	7		8	9	10

MODEL NUMBER

PROBE

1 | TECHNOLOGY

P	Genesis TDR Probe

2 | MEASUREMENT SYSTEM

E	English (inches)
M	Metric (centimeters)

3 | CONFIGURATION

C	Enlarged Coaxial (+200 °C/+400 °F)
F	Pentarod (+200 °C/+400 °F)

4 5 | PROCESS CONNECTION – SIZE/TYPE (consult factory for other process connections)

Threaded

5 1	3"	NPT
5 2	3"	BSP (G 3)

ASME Flanges

5 3	3"	150# ASME RF
5 4	3"	300# ASME RF
5 5	3"	600# ASME RF
5 6	3"	900# ASME RF
5 K	3"	600# ASME RTJ
5 L	3"	900# ASME RTJ

6 3	4"	150# ASME RF
6 4	4"	300# ASME RF
6 5	4"	600# ASME RF
6 6	4"	900# ASME RF
6 K	4"	600# ASME RTJ
6 L	4"	900# ASME RTJ

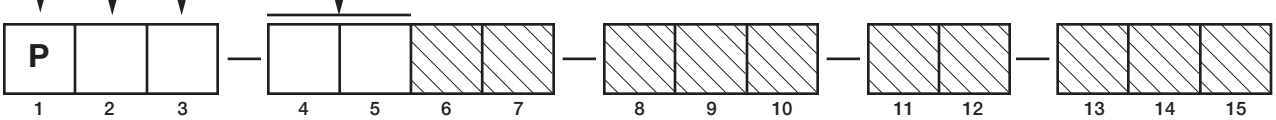
7 3	6"	150# ASME RF
7 4	6"	300# ASME RF
7 5	6"	600# ASME RF
7 K	6"	600# ASME RTJ

EN Flanges

E A	DN 80, PN 16	EN 1092-1 TYPE A
E B	DN 80, PN 25/40	EN 1092-1 TYPE A
E D	DN 80, PN 63	EN 1092-1 TYPE B2
E E	DN 80, PN 100	EN 1092-1 TYPE B2
E F	DN 80, PN 160	EN 1092-1 TYPE B2
E W	DN 80, PN 16	EN 1092-1 TYPE B1
E Z	DN 80, PN 25/40	EN 1092-1 TYPE B1
F A	DN 100, PN 16	EN 1092-1 TYPE A
F B	DN 100, PN 25/40	EN 1092-1 TYPE A
F D	DN 100, PN 63	EN 1092-1 TYPE B2

F E	DN 100, PN 100	EN 1092-1 TYPE B2
F F	DN 100, PN 160	EN 1092-1 TYPE B2
F W	DN 100, PN 16	EN 1092-1 TYPE B1
F Z	DN 100, PN 25/40	EN 1092-1 TYPE B1
G A	DN 150, PN 16	EN 1092-1 TYPE A
G B	DN 150, PN 25/40	EN 1092-1 TYPE A
G D	DN 150, PN 63	EN 1092-1 TYPE B2
G E	DN 150, PN 100	EN 1092-1 TYPE B2
G W	DN 150, PN 16	EN 1092-1 TYPE B1
G Z	DN 150, PN 25/40	EN 1092-1 TYPE B1

Confirm mounting conditions/nozzle diameter to ensure sufficient clearance.



PROBE

6 | CONSTRUCTION CODES

0	Industrial
K	ASME B31.1
L	ASME B31.3
M	ASME B31.3 & NACE MR0175/MR0103
N	NACE MR0175/MR0103

7 | FLANGE OPTIONS

0	None

8 | MATERIAL OF CONSTRUCTION - FLANGE/NUT/ROD

A	316 SS/316L SS (PFA coated center rod)

9 | OPTIONS

0	None

10 | O-RING MATERIALS/SEAL OPTIONS

0	Viton® VX065
2	Kalrez® 4079
8	Simriz SZ485 (formerly Aegis PF128)
A	Kalrez 6375

11 | OPTIONS

0	None
1	Flushing Port

12 | Remote Housing Material

1	Aluminum
2	316 Stainless Steel

13 14 15 | INSERTION LENGTH

See page 8

X X X	inches (24 – 240) cm (60 – 610)

unit of measure determined by 2nd digit of model number

P			—			0	—	A	0		—			—			
1	2	3		4	5	6	7	8	9	10		11	12		13	14	15

QUALITY

MAGNETROL
REGISTERED TO
ISO 9001
Your Assurance of
Quality and Service

The quality assurance system in place at Magnetrol guarantees the highest level of quality throughout the company. Magnetrol is committed to providing full customer satisfaction both in quality products and quality service.

The Magnetrol quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.

WARRANTY

All Magnetrol electronic level and flow controls are warranted free of defects in materials or workmanship for eighteen months from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Magnetrol shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol products.

For additional information, see Instruction Manual 63-601.
Genesis may be protected by one or more of the following U.S. Patent Nos. US9,546,895; US2,886,391; US9,360,361;
May depend on model. Other patents pending.

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