

# RADAROVÝ HLADINOMĚR GENESIS ED1/ED2

# DESCRIPTION

The Genesis Multiphase 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 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 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*<sup>™</sup>, AMS Device Manager, and various HART<sup>®</sup> Field Communicators.

# APPLICATIONS

MEDIA: Hydrocarbons to water-based media (Dielectric Constant  $\mathbf{\hat{e}}_r$  = 1.4–100)

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

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

# Measures Multiple Phases within Interface Applications



# FEATURES

- 24 VDC multiphase detector with up to four (4) 4-20mA outputs for convenient control of top level, top of emulsion, water level, and sediment
- Concurrent 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

## TECHNOLOGY

#### PRINCIPLE OF OPERATION

The Genesis 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.

- 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

In addition to sending high frequency energy down the probe to detect upper (or total) level, the Genesis 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.)



## 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. 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 ( $\varepsilon_r \ge 1.4$ ) applications. The sensitivity of this "closed" design, however, also makes it more susceptible to measurement error in applications that can have coating and buildup.

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.

## PROBE OVERVIEW

### TWO STYLES OF GENESIS PROBES

#### ENLARGED COAXIAL

The standard coaxial offering for the Genesis is an Enlarged 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. Although this probe still yields excellent performance, its open design makes it less susceptible to buildup and bridging.

Both of the probes offered with the Genesis are unique, and 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.



**Pentarod Signal Propagation** 



**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.



# DETECTOR 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		
Туре	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 <i>ware™</i> ), EDDL	
Menu Languages LCD:	English	
HART DD:	English	
Power (at wiring board terminals)	Explosion-proof with Instrinsically Safe probe	
	24 VDC ( $\pm$ 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	

## DETECTOR 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 $\oplus$			
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 a 3 meter (10 foot) probe at +20 °C (+70 °F)			
Linearity	Application dependent			
Accuracy	Application dependent			
Response Time	Approximately 15 seconds			
Initialization Time	Less than 30 seconds			

0 Pentarod probes must be used in metallic vessel or stillwell to maintain CE noise immunity

# TEMPERATURE/PRESSURE RATING

Temperature °C (°F)	Pressure (316 SS) 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)



#### ENLARGED COAXIAL PROBE

#### PENTAROD PROBE







Description ①	PxC PxF	Enlarged Coaxial PxF: 5-Conductor		
Application		Interface		
Installation		Direct insertion (preferred) or side-mounted chamber		
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: 70 mm (2.75")		
Process Connection	Threaded Flanged	3" NPT or 3" BSP (G 3") 3" or larger; Various ASME, EN1092		
Available Probe Length		60 to 610 cm (24 to 240 inches)		
Transition Zones 3	Top Bottom	200 mm (8 inches) 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 not hermetic seal		
Maximum Viscosity PxC PxF		PxC: 2,000cP (mPa.s) PxF: 10,000cP (mPa.s)		

① 2<sup>nd</sup> digit E=English, M=Metric

② Other o-ring materials available upon request.

③ Top Transition Zone: The detector may still operate but level readings may become non-linear.

Bottom Transition Zone: Detector will not measure levels in this area.

④ Genesis probes containing o-rings can be used for vacuum (negative pressure) service but are not hermetically sealed.

## DIMENSIONS

millimeters (inches)



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.

# DETECTOR EDx-210x-xxx



## Genesis MIHQ

Explosion Proof - Flameproof with I.S. outputs

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



Genesis MINV Explosion Proof - Flameproof with I.S. outputs 5th Digit: 1 = HART 8th Digit: 3 = Explosion/Flameproof with I.S. outputs o.z. MERES, HENNLICH s.r.o. | meres@hennlich.cz | +420 416 711 203 | www.hennlich.cz/meres

## **DETECTOR** EDx-210x-xxx



Genesis MIHQ

Non Incendive - Increased Safetywith I.S. outputs

5th Digit: 1 = HART

8th Digit C = Non Incendive, Increased Safety with I.S. outputs

GENESIS <sup>®</sup>			D ZELE, BELGIUM
MODEL NO: SERIAL NO: INPUT: Um = 30Va	dc		
THREADED ENTRY: MAX PRESS: AFx/Fx ec Ta = -	-15°C to +70°C		$\bigcirc$
Ta = $-40^{\circ}$ C to $+7$ NI FM21US0011X / FM21CA0007X IS CONNECTIONS TO CL I, II, III, DIV GL I, DIV 2, GP A,B,C,D T4	70°C v 1, gp c,d,e,f,g T4	FM21ATEX0004X / FM21UKEX II 3 (1) G Ex ec [ia IIB Ga]	0073X IIC T4 Gc
CL II, III DIV 1, GP E,F,G T4 CL I, ZONE 2 AEx ec [ia IIB Ga] I Ex ec [ia IIB Ga] IIC T4 Gc	IC T4 Gc	IECEx FMG 21.0004X Ex ec [ia IIB Ga] IIC T4 Gc	

Genesis MINV Non Incendive - Increased Safetywith I.S. outputs

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

	705 ENTERPRISE ST AURORA, 603 GENESIS ®		MANUF YEAR: TYPE 4X, IP67 REFER TO INSTRUCTION MANUAL
$\bigcirc$	MODEL NO: SERIAL NO: THREADED ENTRY: 3/4 MAX PRESS: Ta = -40°C TO 70°C	NPT	$\bigcirc$
<b>IS</b> FM21 CL I, CL I, Ex id	US0011X / FM21CA0007X II, III, DIV 1 GP C.D.E.F.G T6T1 ZONE 0 AEx ia IIB T6T1 Ga IIB T6T1 Ga	FM21ATEX0004X / FM21UKEX0073X II 1 G Ex ia IIB T6T1 Ga	IECEx FMG 21.0004X Ex ia IIB T6T1 Ga

**PROBE** Pxx-xxx0-A0x-xx-xxx

Genesis MIHQ Intrinsically Safe



Genesis MINV Intrinsically Safe

#### **Specific Conditions of Use**

#### **Detector:**

- 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 detector 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	Т5
90 to 120 °C	Τ4
125 to 185 °C	Т3
185 to 285 °C	T2
285 to 435 °C	T1

## O-RING (SEAL) SELECTION CHART

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 <sup>®</sup> 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 <sup>®</sup> 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

While both versions of Genesis are robust designs capable of performing similar functions, the Model ED1 is the full-featured detector that comes standard with all (4) analog outputs; an enhanced DTM for dynamic viewing of all levels; and was the basis for developing the sophisticated algorithms that allow us to measure the most difficult levels found in the process industries.

The Model ED1 is particularly suited for the downstream Oil & Gas market (Petroleum Refining) where it outperforms traditional technologies while going head-to-head with nucleonic devices (e.g., Profilers) at a more competitive total cost of ownership.

The Model ED2 benefits from the heavy algorithms developed for the ED1 but allows two, three, or four analog output configurations that are easier to price in the upstream Oil & Gas market (E&P).

#### **1 2 3** | BASIC MODEL NUMBER



## MODEL NUMBER

#### PROBE

#### 1 | TECHNOLOGY



## MODEL NUMBER CONTINUED

#### PROBE

#### **6** | CONSTRUCTION CODES

-	
0	Industrial
Κ	ASME B31.1
L	ASME B31.3
М	ASME B31.3 & NACE MR0175/MR0103
Ν	NACE MR0175/MR0103



# QUALITY



### WARRANTY



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.

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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