

process measurement solutions



Pegasus 2-wire FMCW level transmitter

non-contact radar transmitters

IP2028



2 year warranty



Designed to deliver

Radar level transmitters make a measurement of the distance between the antenna and the material surface by measuring the time taken for a radio signal to travel to the surface and to be reflected back.

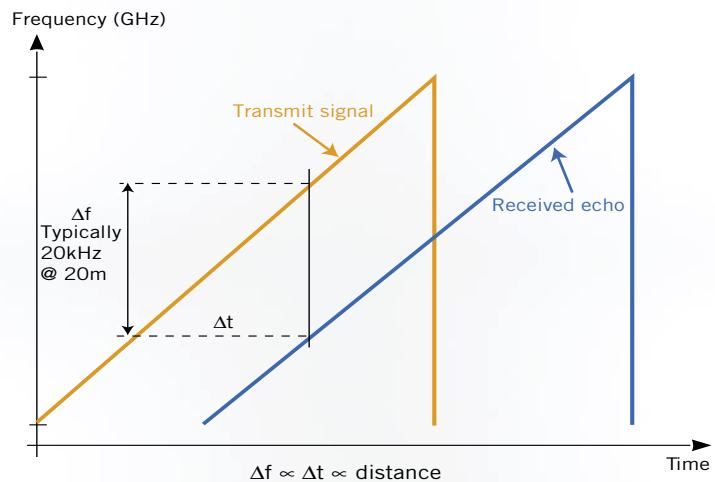
The speed of propagation in the ullage space varies very little with temperature, pressure or in the presence of vapours, so the relationship between distance and time is precisely known and the level in the vessel can be calculated.

Pulsed radar systems transmit a short burst of power and the time taken for the signal to return to the instrument is measured directly. The duration of the burst must necessarily be very short, so that the transmission will

have finished before the reflected signal returns.

However, microwaves travel at the speed of light and the distances between antenna and liquid are relatively small, making the time interval very small and difficult to measure accurately.

FMCW transmitters operate differently and deliver more microwave energy to the liquid surface, creating a bigger return echo. Rather than attempt to measure time, the electronics measures the frequency difference between transmit and echo signals which is much easier to measure accurately.



FMCW radar systems transmit a continuous signal during the measurement process.



The frequency of the signal is very precisely linearly modulated so that the received signal has a different frequency to the transmitted signal, as shown in the diagram above.

The transmitter electronics continuously monitors the difference in frequency between transmit and receive signals which is proportional to the time delay. If the material surface was moving

away from the antenna, the return echo would arrive later in time and the frequency difference would be greater, enabling the transmitter to calculate the larger distance to the material surface.

This method of using a powerful microwave signal, then calculating rather than measuring such small time differences, makes FMCW transmitters highly reliable and repeatable in most process measurement applications.

The basic physics is simple: A powerful transmit signal results in a big return echo...

- ➔ FMCW technology
- ➔ 2 wire 24V dc loop powered
- ➔ Intrinsically Safe
- ➔ Explosionproof  
- ➔ HART digital communications
- ➔ Sophisticated echo management software
- ➔ 30m/100ft operating range
- ➔ 150°C/300°F operating temperature
- ➔ Rugged industrial design
- ➔ Horn and Rod antennas



Pegasus: An immortal winged horse from Greek mythology. Synonymous with power, capability, dominance and airborne reliability.

FMCW performance on 2 wires

Radar level transmitters using FMCW technology are not new; they have been used for many years in inventory control systems where accurate and reliable level measurement is mandatory. The technology has migrated across into many process applications and over the last few years has established an enviable reputation for reliable operation in often difficult conditions.

Solartron Mobrey has moved the technology further forward with the

new Pegasus radar level transmitter, offering FMCW performance in either Intrinsically Safe or Explosionproof designs on a simple two wire twisted pair loop - giving a superior price/performance ratio to that of most other transmitters.

Applications in the process world are tough and demand rugged and robust solutions that are affordable and that can be relied upon - step forward the Pegasus.

Benefits

- **Delivers more power to target**
Reliable operation in applications with vapours or turbulence
- **4-20mA loop powered**
Fast and simple low cost installation
- **Dynamic echo tracking**
Reliable operation in vessels with stirrers and other false echo generators
- **Tough metal housing**
Designed to last in the process industries
- **Two year warranty**
Peace of mind with a product you can trust



Available with either a Rod or Horn style antenna, the Pegasus has a tough metal enclosure containing a factory sealed electronics cassette. Simply open the cover, connect two wires and turn on. A few moments using the hand-held communicator is all that is needed to configure the Pegasus to your specific application, then you can move on to the next job, leaving the Pegasus to do its job.

Choosing the right Pegasus for your application is probably the hardest thing you have to do, but even that is made easy if you follow the simple guidelines on the following pages. As a general rule, select a rod antenna for relatively calm and stable in-tank conditions and a horn antenna for the more demanding applications.

powerful signal ... big echo



Choosing the right transmitter for your application

Rod antenna



low cost mounting

Rod antennas are best suited to relatively calm and stable in-tank conditions. The standard 1.5" mounting thread allows low cost mounting. Alternatively, flanged mounting with seal welded construction is available for more critical applications.

150 (6") Horn antenna

For more demanding applications where there is agitation, light foaming or low dielectric liquids at long range, a horn antenna is preferable due to its ability to focus the microwave signal and better echo capture capability. The 150mm (6") horn antenna is the most effective solution in such demanding applications



tough applications

100 (4") Horn antenna



space saving

Where space is at a premium, the 100mm (4") horn antenna offers the minimum protrusion into the vessel, allowing filling to a higher level. When using a horn antenna, the horn should protrude into the vessel for optimum performance. Refer to the technical specification on page 7.

Min vessel size	1.5m		
Min range (m)	0.5		
Max range table (m)	Liquid dielectric		
	1.8-3.5	3.6-10	>10
Calm surface	16	18	20
Light agitation	10	12	14
Heavy agitation	6	7	8

Min vessel size	1.5m		
Min range (m)	0.5		
Max range table (m)	Liquid dielectric		
	1.8-3.5	3.6-10	>10
Calm surface	22	25	30
Light agitation	16	18	22
Heavy agitation	7	8	10

Min vessel size	1.5m		
Min range (m)	0.5		
Max range table (m)	Liquid dielectric		
	1.8-3.5	3.6-10	>10
Calm surface	14	16	18
Light agitation	8	10	12
Heavy agitation	5	5	6

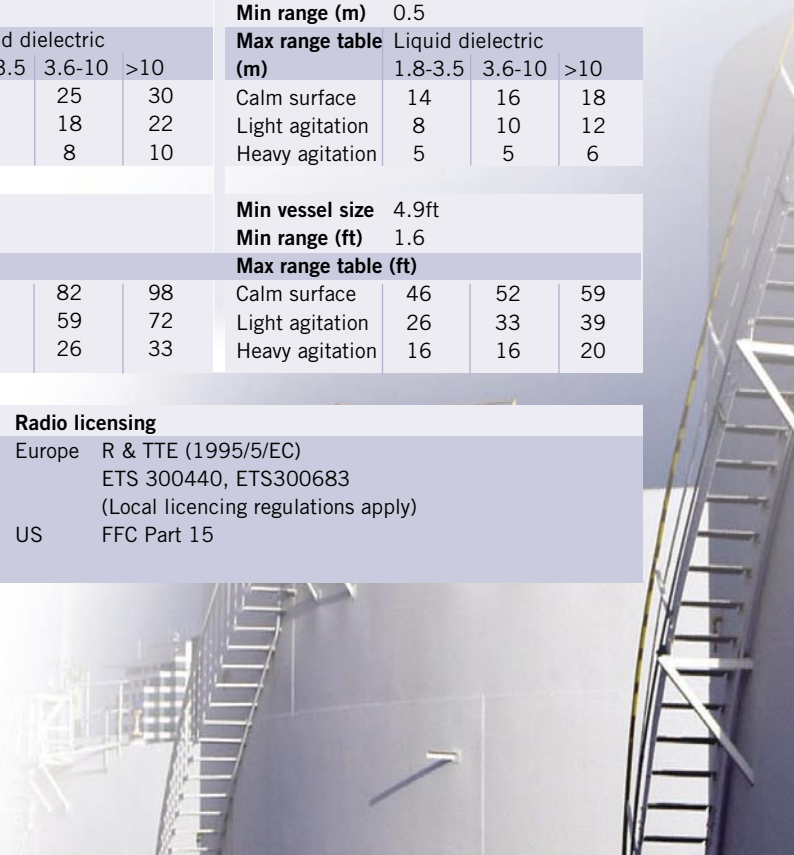
Min vessel size	4.9ft		
Min range (ft)	1.6		
Max range table (ft)	Liquid dielectric		
	1.8-3.5	3.6-10	>10
Calm surface	52	59	66
Light agitation	33	39	46
Heavy agitation	20	23	26

Min vessel size	4.9ft		
Min range (ft)	1.6		
Max range table (ft)	Liquid dielectric		
	1.8-3.5	3.6-10	>10
Calm surface	72	82	98
Light agitation	52	59	72
Heavy agitation	23	26	33

Min vessel size	4.9ft		
Min range (ft)	1.6		
Max range table (ft)	Liquid dielectric		
	1.8-3.5	3.6-10	>10
Calm surface	46	52	59
Light agitation	26	33	39
Heavy agitation	16	16	20

Certification	
ATEX: Intrinsically safe	II 1G, II 1/2 G EEx ia IIC T6...T1 II 1 D T60°C, II 1/2 D T60°C / T150°C
FM: Explosionproof	XP-IS/I/1/ABCD/T6 Ta = 60°C DIP-IS/II, III/1/EFG/T6 Ta = 60°C
Enclosure protection	IP66, NEMA 4X

Radio licensing	
Europe	R & TTE (1995/5/EC) ETS 300440, ETS300683 (Local licencing regulations apply)
US	FFC Part 15



Programming and commissioning made easy...

The Hand Held Communicator (MRL-HHC) is used for local programming of any number of Pegasus transmitters. It is connected by flying lead to the programming socket on the Pegasus and gives access to the full programming menu. A simple menu structure is used to navigate through the menu and set-up is normally accomplished in just a few minutes. Should some tuning for a particularly difficult application be required then access to a suite of engineering parameters is provided.

Programming using a PC or HART compatible communicator

The Pegasus is HART compatible and may be accessed from anywhere on the two wire loop. Using the Solartron Mobrey Windows based PC programming tool Mobrey H-Conf401, the user can access all set-up and diagnostic parameters for interrogation or change.

Mobrey H-Conf401 comprises a CD with software and manuals, plus a HART modem and software enabling hardkey. Modems and hardkeys are available in either USB or serial/parallel formats.

Details in datasheet IP2037

Being HART compatible, the Pegasus has a Device Description (DD) registered with the HART Foundation. Any HART programming device which is DD driven may be loaded with the DD of the Pegasus then used to gain access to the Pegasus parameters. Even if the DD is not loaded, any universal HART communicator can access and change the Universal and Common Practice command set of the Pegasus.

Alternatively, a Palm PDA programming tool is available. Mobrey HPC-301 comprises software and a HART cradle for the Palm PDA, allowing access to all set-up and diagnostic parameters for interrogation or change.

Solartron Mobrey universal control units: Ideal for programming & control

The MCU900 series of wall and panel mounting control units provide comprehensive control functionality for the Pegasus radar level transmitter. A back-lit display gives clear visual indication of the measured value and status of all inputs and outputs.

The mains or 24V dc powered MCU900 provides a protected 24V dc power supply to the Pegasus transmitter.

5 relays are provided and are fully field programmable to perform a wide variety of control, fault indication or alarm duties.

Control unit features and application

- ▶ Tough weatherproof wall mount enclosure for internal or external mounting
- ▶ Supports two voltage free contact closure inputs, allowing override of control functions on external triggers
- ▶ Pre-programmed tank shapes and programming wizards simplify configuration
- ▶ Mains and 24V dc versions available
- ▶ 5 voltage free SPDT relays for alarm and control duties
- ▶ 4-20mA 12 bit isolated current output proportional to calculated value
- ▶ Allows remote programming of the Pegasus through the on-board keypad using HART digital communications (check with Solartron Mobrey for availability) Full details in datasheet IP2031



Using the MRL-HHC



Mobrey H-Conf401



Palm PDA programming tool



Solartron Mobrey MCU control unit

Application considerations

General

The Pegasus is designed for the measurement of level in closed tanks of depth greater than 1.5m (4.9ft). Users may experiment and find successful application on slurries and some dry products. The total power output of the Pegasus FMCW radar is just 5mW.

Mounting

It is always preferable to mount through air transmitters off tank-centre to avoid the tank roof acting as a resonator.

Most transmitters will be mounted on a nozzle or stand-off. It is essential that the stainless steel waveguide or horn rim protrudes into the tank space by at least 5mm (0.2") to avoid the nozzle acting as an echo chamber (See dimensional drawings).

In-tank conditions

Sophisticated echo management software ensures reliable performance in tanks with agitators, and tank learning routines eliminate problems with false reflections.

Applications with low dielectric liquids at low level are catered for by switching to "bottom tracking" mode, eliminating problems caused when echoes from the tank bottom become confused with the true liquid surface echo.

Very demanding applications

The Solartron Mobrey MRL700 four wire FMCW radar level transmitter is available for more demanding applications.

A higher energy microwave signal and more powerful signal processing combine to provide a transmitter capable of reliable operation in the toughest of applications.

Further technical information

Detailed technical specifications and installation guidance are given in IP2028/IM. Programming details are given in IP2028/QS

Technical specification

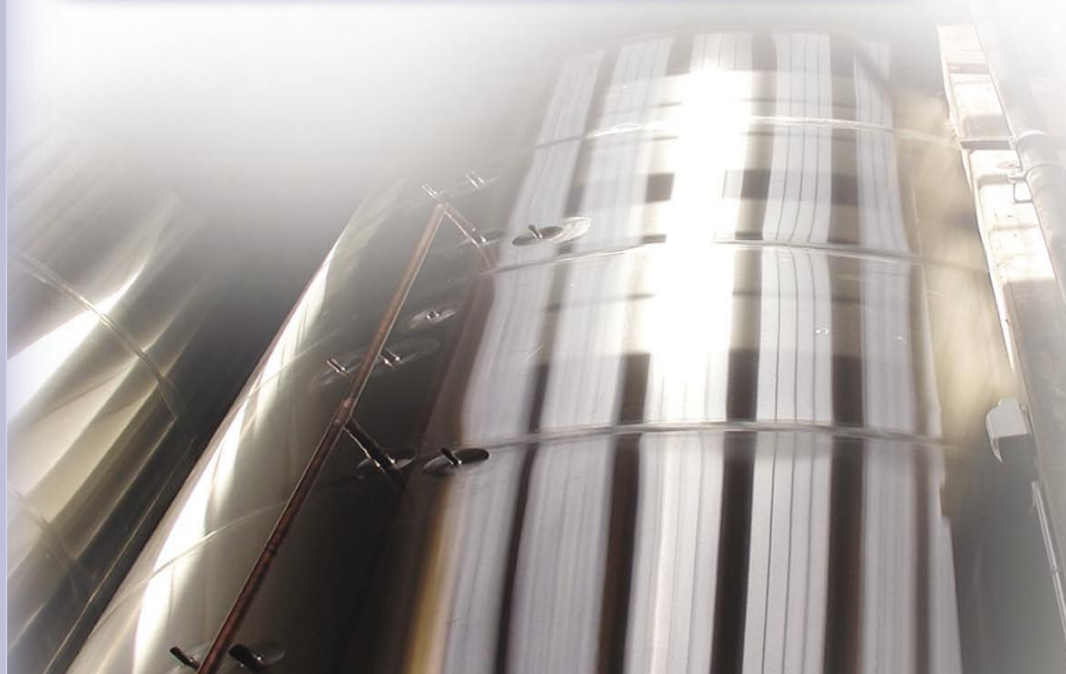
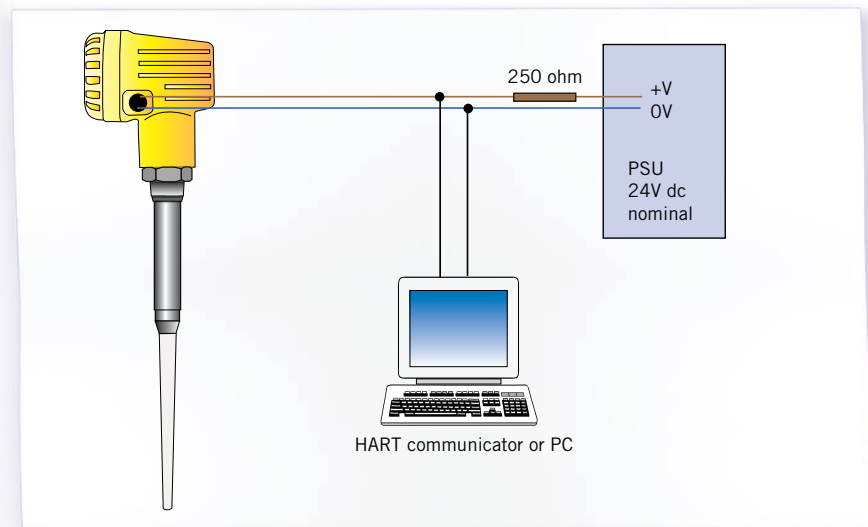
Power supply (at terminals)	2 wire 18 - 30V dc loop powered
Power consumption	< 750mW
Cable connection	1 x M20 x 1.5 (¾" NPT on FM certified models)
Output	4 -20mA isolated, 17 bit (NAMUR NE43)
Digital communications	HART Rev. 5
Wetside materials	PTFE & 316L stainless steel with Viton seals
Operating pressure	Full vac to 16bar / 232psi
Operating temperature	-20°C to +150°C / -4°F to +300°F at mounting point
Ambient temperature	-20°C to +60°C / -4°F to +140°F
Performance	
Repeatability	≤ +/- 5mm / 0.2"
Resolution	≤ 5mm / 0.2"
Reference accuracy:	≤ +/- 10mm / 0.4" or +/- 0.2% of measured distance, whichever is greater

Accuracy figures quoted are for the 150mm (6") horn antenna over a range of 1-30m (98') under reference conditions.

Two year warranty subject to correct installation as per manual IP2028/IM.

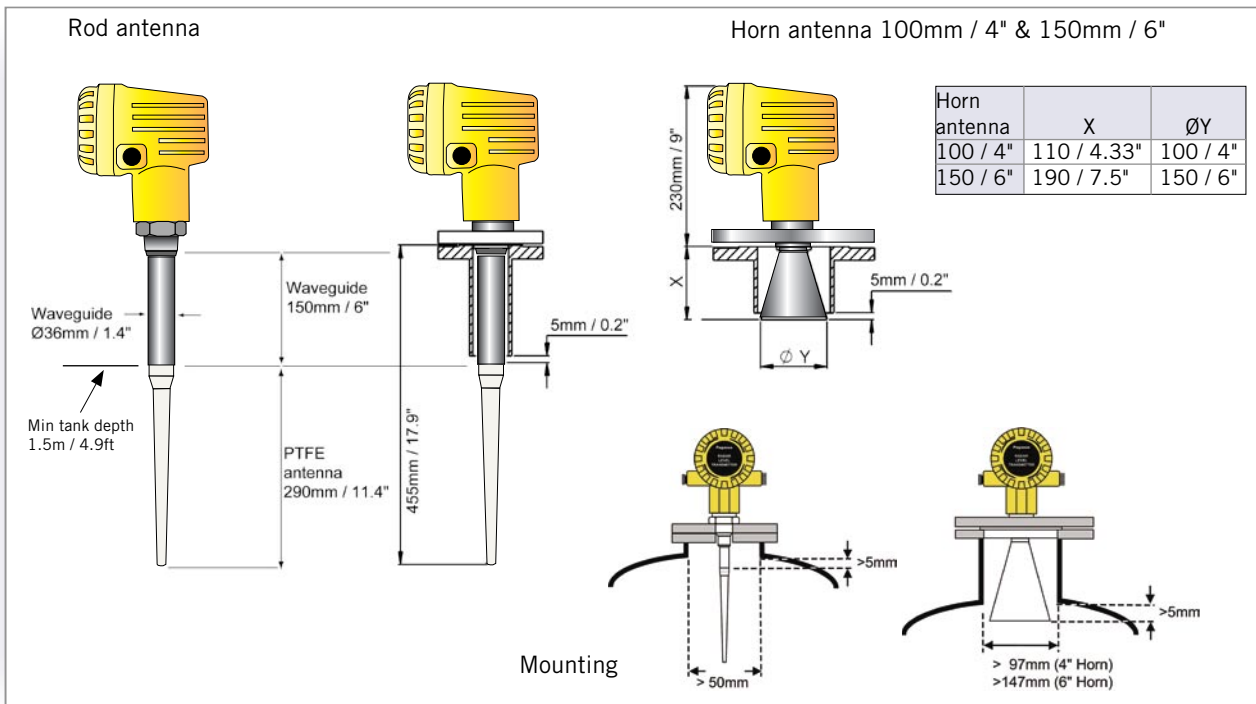
Hand held communicator MRL-HHC

Power supply	2 off size AA batteries
Cable	1m (3') Flying lead with 9 pin DIN socket
Size	180mm x 75mm x 20mm 7" x 3" x 0.8"



Technical specification

Dimensions



Ordering information

Code	Model
F	Pegasus Through-air Radar level transmitter
Code	Wetside material
S	316 Stainless steel & PTFE with Viton seals
Code	Mounting / suitable antenna
A	1.5" thread - Rod only
B	DN50 flange - Rod only
C	DN80 flange - Rod only
D	DN100 flange - Rod or 100mm (4") horn
E	DN150 flange - Rod, 100mm (4") or 150mm (6") horn
H	2" ANSI - Rod only
J	3" ANSI - Rod only
K	4" ANSI - Rod or 100mm (4") horn
L	6" ANSI - Rod, 100mm (4") or 150mm (6") horn
Code	Mounting connection rating
1	NPT
2	BSPT
3	PN16
4	PN40 (DN150 size to special order)
5	#150
6	#300 (6" size to special order)
Code	Antenna type
R1	Rod with 155mm (6") waveguide
H1	Horn (4") 100mm
H2	Horn (6" nom) 150mm
Code	Certification
A	ATEX II 1 GD Intrinsically safe
U	FM certified CLI, CLII, CLIII Explosionproof
Code	Output
0	4 - 20mA / HART Digital communications
F S A 2 R1 A 0	Typical ordering information

MRL-HHC	Hand Held Communicator English/French/German
MRL-HHC1	Hand Held Communicator English/Swedish/Polish
MRL-HHC2	Hand Held Communicator English/Spanish/Portuguese

MRL700 4 Wire FMCW radar level transmitter

Some applications require the power of a 4 wire FMCW transmitter, particularly where excessive turbulence or very low dielectric liquids at long range are involved. The MRL700 benefits from being separately powered and is proven to deliver exceptional performance in very difficult applications.

Outline specification

Measuring range	0-35m / 115ft
Material dielectric	>1.4
Resolution	+/- 3mm
Reference accuracy	+/- 3mm
Power	4 Wire 18 to 30V dc

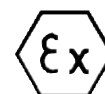
Models available

- Rod antenna:** Suitable for the majority of applications.
- Horn antenna:** Use for low dielectric liquids at long ranges. May also be used on some dry product materials.
- Process seal antenna:** Unique seal prevents vapours reaching the horn antenna and allows removal of the radar gauge without breaking the process seal of the vessel.



Process seal antenna

Rod antenna



Operating conditions

	Rod antenna	Horn antenna	Process seal antenna
Operating temp	-40°C to +150°C	-40°C to +200°C	40°C to +232°C
	-40°F to +300°F	-40°F to +392°F	40°F to + 450°F
High temp version	n/a	-40°C to +400°C	n/a
	n/a	-40°F to +750°F	n/a
Operating pressure	Full Vac to 40 bar	Full Vac to 40 bar	Full Vac to 23 bar
	Full Vac to 600 psi	Full Vac to 600 psi	Full Vac to 335 psi

Full details in datasheet IP293



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