

process measurement solutions

Magne-Sonic MS900GH Series Level Transmitter

Instruction Leaflet

Software Version 2.11

**Installation, operation &
maintenance instructions**



IP2045/IM
May 2003

2.2 Safety Data

Type numbers	See above	
Certificate number	SIRA 02ATEX2405X	
ATEX Coding (EU Directive 94/9/EC)	II 1 G	EEx ia IIC T4 (-40DegC≤Ta≤60DegC) EEx ia IIC T6 (-40 DegC≤Ta≤55DegC)
Safety parameters	Ui 30 V, Ii 120mA, Pi 0.82W, Li 108μH, Ci OnF	

2.3 Pressure Equipment Directive

The MS900GH transmitter does not fall within the PED definition as enclosing a pressurised fluid, so is therefore outside the scope of the Directive.

Accordingly, the Declaration of Conformity does not list the Pressure Equipment Directive.

2.3 Specifications

Materials of construction:

Transducer material	PVDF
Body & cover Material	Glass filled nylon
Cable gland	Nylon with Nitrile cable seal
Cover seal	Silicone rubber
Cover screws	316 Stainless Steel
Transducer bodyseal	EPDM

Electrical

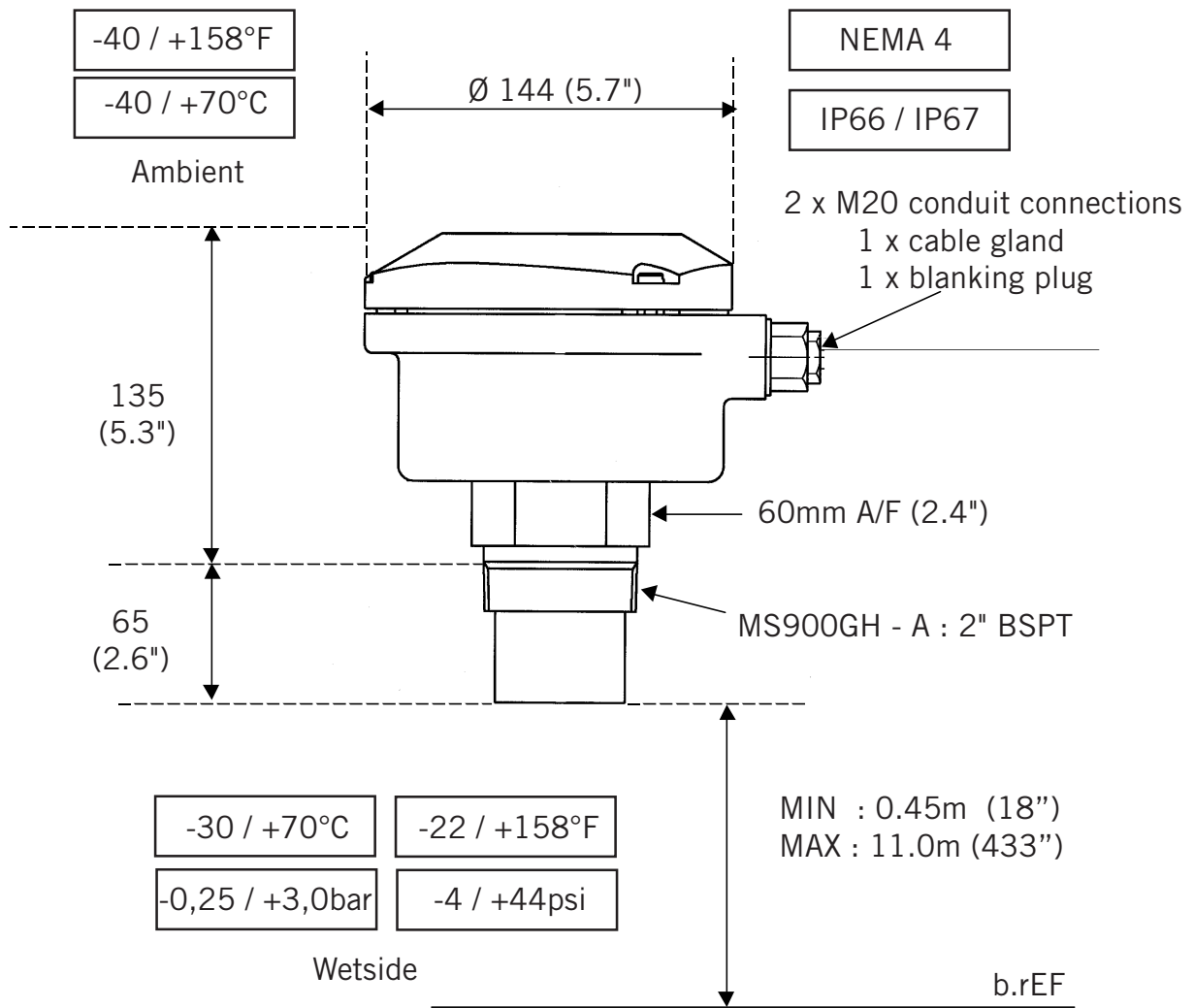
Supply voltage	Transmitter in Non Hazardous area: 12-40V dc Transmitter in Hazardous area: 12-30V dc
Output	4-20mA (3.8 - 20.5mA linear)
Communications	HART Digital communications (Rev. 5)
Earthing	None required
Recommended Cable	Two core each 0.22 mm ² min, shielded
Max. cable length	3000m
Cable resistance	0.1 Ohm per metre length max.
Cable gland	Suitable for cable sizes 4mm - 8mm diameter

Operating

Range	0.45 to 11m
Temperature	
Ambient	-40°C to +70°C
Wetside	-30°C to +70°C
Pressure	-0.25 bar to 3.0 bar
Weatherproofing	IP66/IP67

Certification

ATEX	Intrinsically Safe II 1 G EEx ia IIC T4 & T6 (See above)
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3.0 Installation

The MS900GH may be mounted in a hazardous area provided it is supplied through or from a suitably protected power supply (such as the MSC900 Series).

3.1 Location of the MS900GH transmitter

Correct location of the transmitter is essential for the reliable operation of any ultrasonic level measurement system.

Whilst the transmitter may be site tuned to deal with most application conditions, it is strongly recommended that the following guidelines should be adopted wherever relevant.

3.1.1 General considerations

- The MS900GH transmitter complies with the European Directive for Electro Magnetic Compatibility (EMC) Class B.
It is not advisable to mount the transmitter in close proximity to a source of electrical noise such as a variable speed drive or other high powered electrical device.
- The MS900 should be mounted above the liquid surface using the “2” thread provided. To facilitate mounting, a bracket kit is available. See Section 3.2.

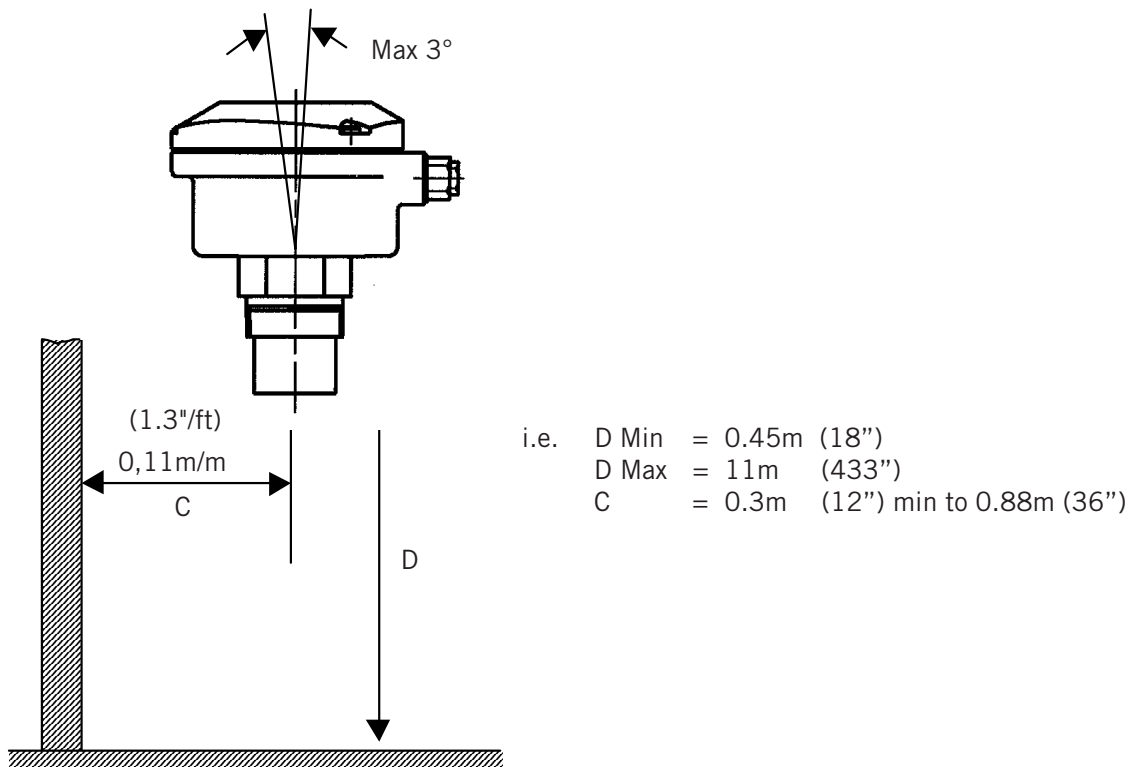
Note : The MS900 is designed to be mounted in a non-metallic fitting or flange. The use of metallic fittings or flanges is not recommended.

- The transmitter should be mounted as near vertical as possible to ensure a good echo from the liquid surface and maximum echo size received.
The beam angle (to the half power point) of the transmitter is 12 degrees inclusive.

Obstructions in the tank or well may generate echoes which can be confused with the real liquid surface echo. Obstructions within the beam angle generate strong “false-echoes”; wherever possible, the transmitter should be positioned such that false echoes are avoided.

To avoid detecting unwanted objects in the tank or well, it is advisable to maintain a distance of at least 0.11m from the centre line of the transmitter for every metre range to the obstruction.

- If the transmitter is located near the side of the tank or well, there will be no false echo generated provided the wall is smooth and free of protrusions. However, there will still be a reduction in the echo size. To avoid large echo size loss, it is recommended that the transmitter never be mounted closer than 0.3m to the wall.
Fatty, dirty or viscous liquids can cause a “scum line” to build-up on the tank or well wall. Avoid false echoes from this by enabling “scum line prevention” software in the MSC control unit.



- If the transmitter is mounted in an enclosed tank, avoid mounting the transmitter in the centre of the tank roof as this could act as a parabolic reflector and create unwanted echoes. Avoid applications where heavy condensation could form on the transducer face.
- If the transmitter is mounted in a stand-off or nozzle, it is always preferable that the transmitter face be at least 5mm proud of the stand-off such that it protrudes beyond the stand-off and into the tank. If this is not possible, see section 3.2.
- If the transmitter is used in environments where direct sunlight can cause very high surface temperatures on exposed instruments, it is recommended that the installer should construct a suitable sun-shade to protect against this.
- Remember that the minimum operating range of the transmitter is 0.45m. The transmitter will not detect any liquid surface closer than 0.45m to the transmitter face.

3.1.2 Liquid surface conditions

- Foaming liquids can reduce the size of the returned echo as foam is a poor ultrasonic reflector. It is always preferable to mount an ultrasonic transmitter over an area of clear liquid, such as near the inlet to a tank or well. In extreme conditions, or where this is not possible, the transmitter may be mounted in a vented stilling tube provided that the inside bore of the stilling tube is at least 100 mm (4") and is smooth and free from joints or protrusions. It is also preferable that the bottom of the stilling tube does not become uncovered, thus preventing the ingress of foams.
- Beware of mounting the transmitter directly over any inlet stream.
- Liquid surface turbulence is not normally a problem unless it is excessive. In most cases, the effects of turbulence are minor, with excessive turbulence being catered for by fine tuning the transmitter on site if necessary.

3.1.3 In-tank effects

- Stirrers or agitators can cause a vortex. Always try to mount the transmitter off-centre of any vortex to maximise the return echo.
As stirrer blades become uncovered they will create echoes as they pass through the ultrasonic beam. The transmitter can be tuned to ignore these false echoes on site.
- In non-linear tanks with rounded or conical bottoms, always mount the transmitter off-centre. In some cases, it may be desirable to install a perforated reflector plate on the tank bottom directly under the transmitter centre line to ensure a satisfactory return echo.
- Avoid mounting the transmitter directly above any pumps as the transmitter will detect the pump casing as the liquid falls away. If this is not possible, fine tuning on site may be required to ignore echoes from the pump casings.

3.1.4 Open Channel Flow installations.

There are normally two distinct parts to an open channel flow measurement system; the primary element (flow structure) and the secondary element (Head measurement instrumentation).

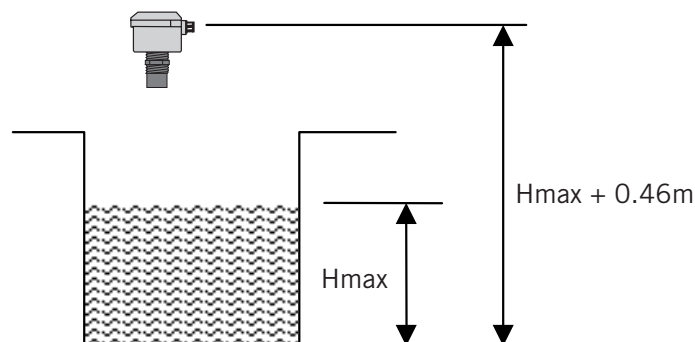
For accurate open channel flow measurement, both parts of the system must be installed accurately.

This manual explains some key aspects of the installation of the secondary element, in this case the ultrasonic transmitter.

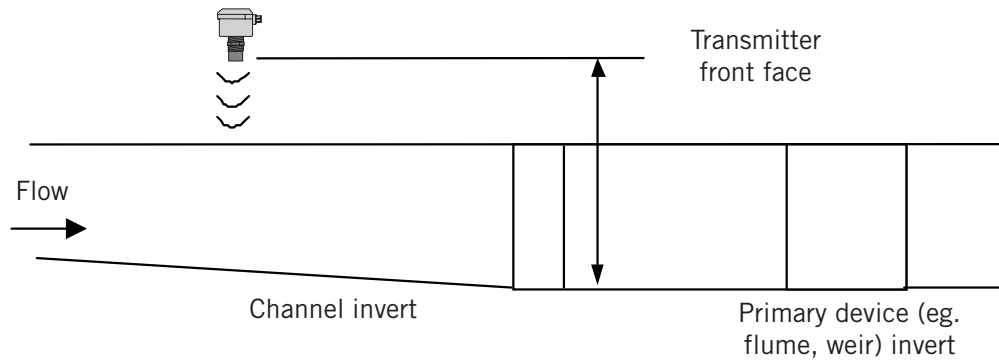
For full details of the installation of a primary element such as a flume or weir, reference should be made to the relevant British (BS3680) or International standard.

Positioning of the transmitter is critical and should be the correct distance upstream from the flow structure as stated in BS3680 e.g. a distance of 4 to 5 times H_{max} for a thin plate weir or 3 to 4 times H_{max} for a flume.

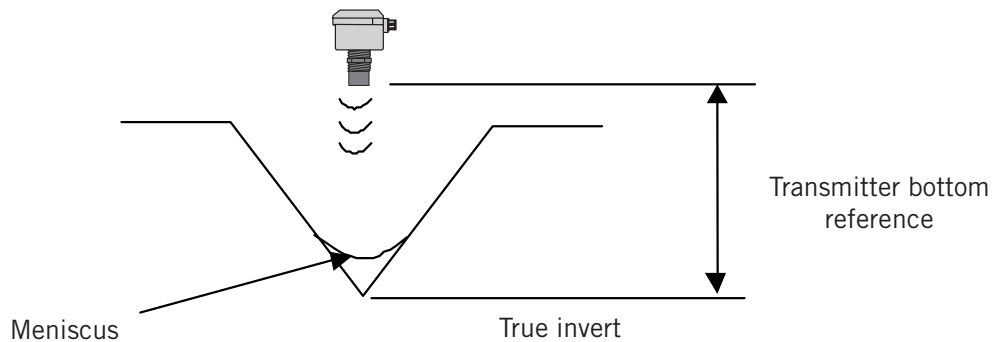
For optimum accuracy, the front face of the transmitter should be positioned at a height that is at least equal to the maximum flow depth plus the blanking distance of the transducer. A minimum distance of 0.46m is recommended.



It is important to note that the bottom reference of the transmitter should be related to the centre of the invert of the primary device, NOT the distance to the channel bottom directly below the transmitter.



In addition to the above, when setting the bottom reference on a 'V' notch weir it is important that the true invert of the weir is taken and not the meniscus liquid level, which may be 3 to 4mm (1/8") above the true invert.



- The liquid surface at the point of measurement must have a stable, smooth surface and uniform approach velocity. It must not be affected by baffles, foam, hydraulic jumps or any other object likely to cause flow disruption.
- The primary element should be free from any situation where it is likely to 'drown' (refer to relevant standard for further information)
- The MS900GH transmitter has integral temperature compensation and must be protected at all times from direct sunlight and any radiated heat.
For maximum accuracy and stability of level measurement reading the transmitter should always be shrouded to prevent the incidence of direct sunlight.
If the flow structure permits, mount the transmitter within the flow channel or chamber.
Alternatively, the MS900GH transmitter can accept an input from an external temperature sensor.
See section 3.3.1.

3.2 Mounting the transmitter above the liquid surface.

A 2" thread is provided to mount the transmitter.

The user should check the thread form, which will be either 2" BSPT or 2" NPT. The thread form is clearly marked on the hexagon of the transducer body.

Note : The MS900 is designed to be mounted in a non-metallic fitting or flange. The use of metallic fittings or flanges is not recommended.

To help installation, a bracket kit is available from Magne-Sonic. This comprises a Stainless Steel angle bracket and PVC threaded disc which may be used to mount the MS900 on a gantry or other support over the liquid level. Order part number MS-BRK2 (BSP) or MS-BRK3 (NPT). The bracket may be bolted to a suitable cross member above the liquid surface.

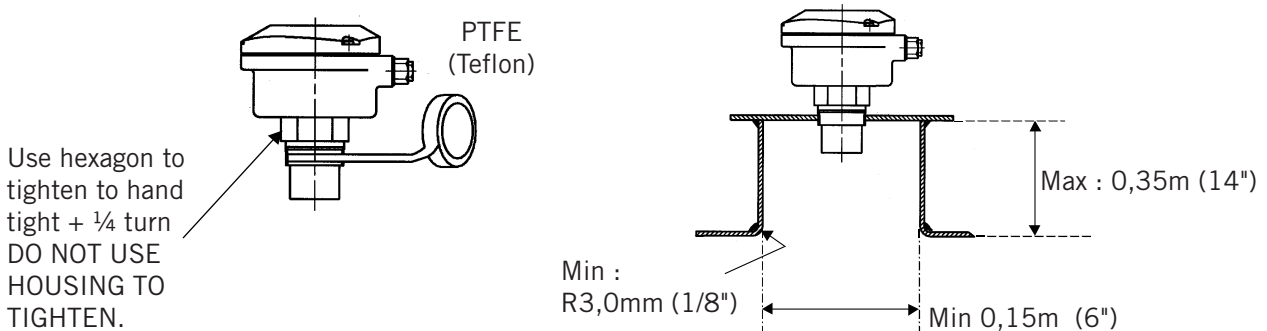
Ensure that the transmitter is perpendicular to the liquid surface to maximise the return echo size.

Check that the maximum liquid level will not encroach into the 0.45m blanking zone of the transmitter.

Note : To aid alignment, the echo size / signal strength can be displayed on the MSC900 control unit or on the MS900GH transmitter display. Refer to section 4 for details.

Use PTFE tape on the screw thread, tighten to hand tight + ¼ turn, using the Hexagon.

When installing on a vessel which has a nozzle or stand-off, and the transducer face does not protrude into the vessel, note the dimensions in the diagram below and always ensure that the nozzle/vessel weld is smooth and free from internal weld beads or other projections.

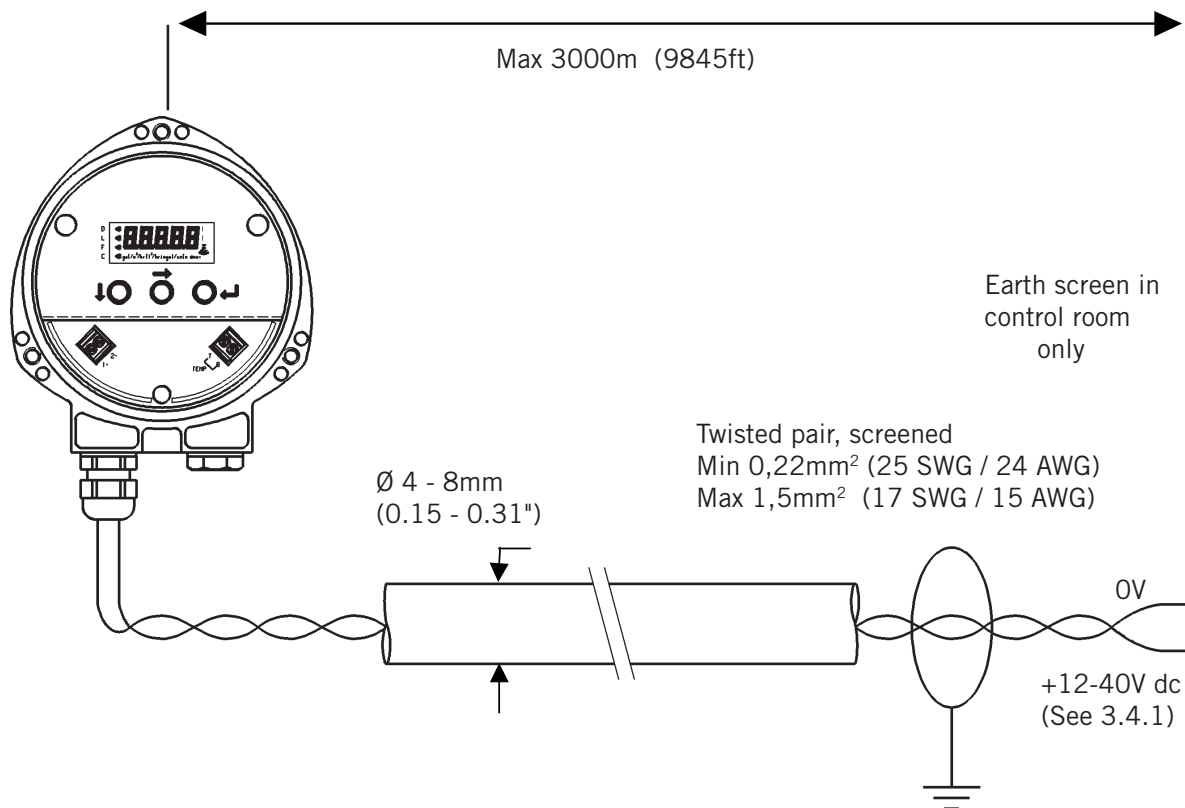


3.3 Wiring

The transmitter is supplied with cable gland suitable for cable sizes 4-8mm diameter.

Terminal	1	: +24V dc
	2	: 0v dc
	7	: MS-RTP temperature probe (if used)
	8	: MS-RTP temperature probe (if used)

Earth Screen : Connect to a standard earth in the control room.



3.3.1 External temperature sensor

The MS900GH transmitter will accept an input from a Magne-Sonics external temperature sensor.

Order part number MS-RTP.

This is a thermistor based temperature sensor specifically designed for use with the MS900GH transmitter. When connected to the MS transmitter, the MS-RTP may be installed in a hazardous area without the need for any additional protection/barriers.

Note : It is not permissible to connect any other temperature sensor to the MS transmitter.

Full installation instructions are supplied with the temperature sensor, but note that it should be mounted out of direct sunlight in a position such that it can give a representative reading of the air temperature between the liquid surface and the MS900GH transmitter.

3.3.2 After completing the wiring

Ensure all cable glands / blanking plugs and seals are in good condition after wiring to maintain the weatherproof rating of the transmitter.

Check that the cover seal is in good condition and not twisted or misaligned in the seal location groove. When replacing the cover, tighten the 3 cover screws evenly to exert uniform pressure on the cover seal.

3.4 Additional components in the two wire loop.

3.4.1 Safety barriers – installation of the transmitter in a hazardous area.

When used with the Magne-Sonics Control Unit Series MSC900, **NO** additional safety barriers are required as the output from the control unit is Intrinsically Safe (refer to manual IP2030/IM supplied with the control unit for full details)

If powering the transmitter from any other power supply, it is the responsibility of the user to ensure a suitable Intrinsically Safe barrier is fitted in the safe area.

The barrier must be chosen such that its output parameters U_o , I_o and P_o are less than U_i , I_i and P_i of the MS900GH transmitter.

For the MS900GH transmitter, $U_i = 30V$, $I_i = 120mA$, $P_i = 0.82W$, $C_i = 0$ and $L_i = 108\mu H$.

In addition, the sum of the capacitance and the inductance of the transmitter and the connecting cable fitted must not exceed the maximum specified for the barrier chosen.

Suitable barriers include the MTL products 706, 706S, 787, and 787S.

3.4.2 Lightning / surge protection and other loop devices

It is allowable to fit loop powered or separately powered devices in the two wire loop provided that the transmitter receives a minimum voltage of 12V dc at 21 mA loop current.

If the area is prone to lightning strikes or voltage surges, fitting of a suppressor device is desirable between the transmitter and the control unit.

3.5 Wiring to allow HART communication

If it is intended to use HART digital communications with the MS900GH transmitter, a 250 Ohm 0.25W load resistor must be installed in the loop.

When used with the Magne-Sonic MSC900 family of Control Units, there is no need to install an external load resistor in the loop as there is a suitable resistor built in to the Control Unit.

If the transmitter is being supplied through a safety barrier, ensure the type chosen will pass HART/SMART information.

Once installed, a HART communicator can be connected across the load resistor, or across the loop at any point downstream of the load resistor.

