

MOBREY

MSP900SH Series level transmitter

Software version 2.1



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Footnote :-

In this manual the following terms are used which refer to trademarks from other manufacturers:

HART: is the protocol adopted for the MSP900 SMART Communications.

HART is a registered trademark of the HART Communications Foundation and is a mnemonic for Highway Addressable Remote Transducer.

1.0 Introduction

The MSP900 ultrasonic level transmitter is designed to be mounted above a liquid and will measure the distance to the liquid surface.

When programmed with details of the vessel, sump or open channel, the MSP900 will compute level, contents or flow and give a 4-20mA signal proportional to the chosen variable. Full programming details are given in the Operating Manual IP2040/OM.

MSP900 is a two wire 24V dc loop powered transmitter and may be connected to any suitable dc power source using the factory fitted cable. The Mobrey Measurement MCU900 range of Control Units is designed to be used with the MSP900 Transmitter in this way.

The MSP900 transmitter may be mounted in a hazardous area provided that it is supplied from a protected power supply. When using the MSP900 transmitter with an MCU900 Control Unit, no external Intrinsically Safe Barriers are required as all protection is built-in to the MCU900 Control Unit.

When using any other power supply, it is the responsibility of the user to ensure suitable Intrinsically Safe Barriers are installed. Full details are given in section 3.4.1

2.0 The MSP900SH ultrasonic level transmitter.

The transmitter is a factory sealed unit with an operating range of 0.3m to 12m. When powered up the transmitter will give a 4-20mA signal on the two wire power cable over the factory default range : 4mA at 12m; 20mA at 0.3m. This range may be adjusted using a HART programmer. See section 5.0

(Note: full programming instructions are given in the Operating Manual IP2040/OM)

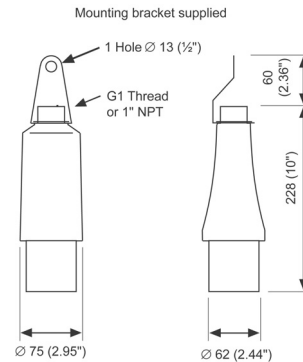


Fig (i)

A Stainless Steel mounting bracket and 1" thread type – G1" (1" BSPP) (-A); 1" NPT (-U) Nylon locknut are supplied with the transmitter to facilitate mounting.

2.1 Type numbering system

MSP Mobrey Ultrasonic level transmitter

900 UPVC construction, 12m operating range

SH Factory sealed transmitter, HART communications

-A ATEX & CSA certified intrinsically safe for Zone 0

-U FM & CSA certified intrinsically safe for Zone 0 and FM for DIV 1

/3 Fitted with 3m two core shielded cable

/20 Fitted with 20m two core shielded cable

/50 Fitted with 50m two core shielded cable

2.2 Safety Data

Type numbers	MSP900SH-A/**	MSP900SH-U/**
Certificate numbers	ATEX CSA	FM 3021193 CSA 1352094X
ATEX Coding (EU Directive 94/9/EC)	II I G	
Cenelec Coding	EEx ia IIC T4 (-40°C≤Ta≤60°C) EEx ia IIC T6 (-40°C≤Ta≤55°C)	
CSA Coding	Ex ia IIC T4 (-40°C≤Ta≤60°C) Ex ia IIC T6 (-40°C≤Ta≤55°C)	Ex ia IIC T4 (-40°C<Ta<60°C) Ex ia IIC T6 (-40°C<Ta<55°C)
FM Coding		IS/II/1/ABCD T6 Ta = 55°C T4 Ta = 60°C IS/II/0/AEx ia IIC T6 Ta = 55°C T4 Ta = 60°C
Safety parameters	<i>U_i</i> 30 V <i>I_i</i> 120mA <i>P_i</i> 0.82W <i>L_i</i> 27mH <i>C_i</i> 5nF	<i>U_i</i> (Vmax) 30 V <i>I_i</i> (Imax) 120mA <i>P_i</i> 0.82W <i>L_i</i> 27mH <i>C_i</i> 5nF

2.3 Pressure Equipment Directive

The MSP900SH transmitter does not enclose a pressurised volume and therefore is a component and outside the scope of the Pressure Equipment Directive 97/ 23/EC.

Accordingly, the Declaration of Conformity for the MSP900SH does not list the Pressure Equipment Directive.

2.4 Specifications

Materials of construction:

Body Material	UPVC (stabilised)
Cable sealant	Epoxy adhesive
Locknut	Nylon
Bracket	316 Stainless Steel
Cable	PVC sheathed two core shielded cable

Electrical

Supply voltage	Transmitter in Non Hazardous area: 12-40V dc Transmitter in Hazardous area: 12-30V dc
Output	4-20mA
Communications	HART Digital communications (Rev. 5)
Earthing	None required
Cable size	Overall diameter 4mm, two cores each 0.22 mm ²
Cable length	3m, 20m or 50m.
Cable resistance	0.1 Ohm per metre length.

Operating

Range	0.3 to 12m
Temperature	
Ambient	-40°C to +60°C
Wetside	-40°C to +60°C
Pressure	0 bar to 3.0 bar (restricted to 0 - 1.0 bar for use in Canada)

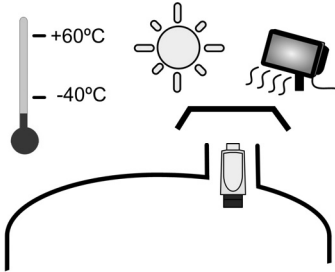
3.0 Installation



The MSP900SH may be mounted in a hazardous area provided it is supplied through or from a suitably protected power supply (such as the Mobrey Measurement MCU900 Series).

Refer to the safety parameters given in section 2.2 and safety instruction leaflet IP2040/SI (-A), 71097/1131 (-U).

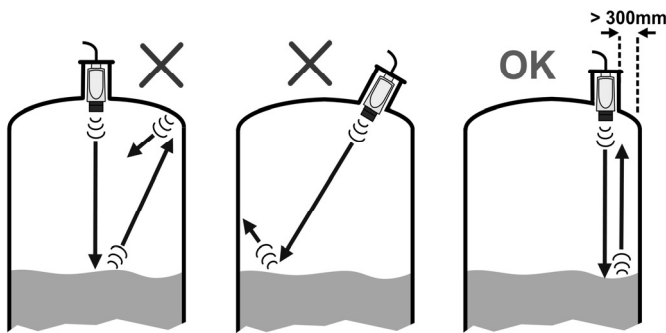
3.1 Location of the MSP900SH transmitter



The transmitter must be installed in a location where it is protected from ultraviolet radiation, in order to prevent long term degradation of the plastics used in its construction e.g. shrouded from direct sunlight.

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.

For maximum accuracy and stability of the level measurement reading the transmitter should always be shrouded from direct sunlight and any radiated heat.



The transmitter should be mounted as near vertical as possible to ensure a good echo from the liquid surface and maximum echo size received.

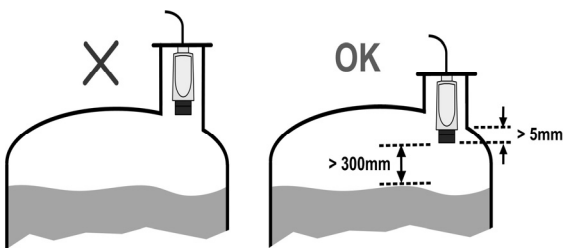
The beam angle (to the half power point) of the transmitter is 12 degrees inclusive.

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 300mm to the wall.

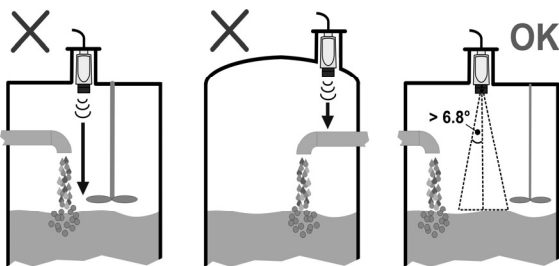
Fatty, dirty or viscous liquids can cause a "scum line" to build-up on the tank or well wall. Avoid false echoes from this by enabling "scum line prevention" software in the MCU control unit.

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.



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.

Remember that the minimum operating range of the transmitter is 300mm. The transmitter will not detect any liquid surface closer than 300mm to the transmitter face.



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.

3.1.1 General considerations

- The MSP900SH 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.

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 inside bore of the stilling tube is at least 100 mm 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 / well 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
- 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 in the well 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.
- If the well is subject to flooding, it is advisable to fit the transmitter with a submersion shield. Whilst the transmitter will of course stop working whilst covered with liquid, the transmit face will be protected from contamination by an air lock inside the shield.

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).

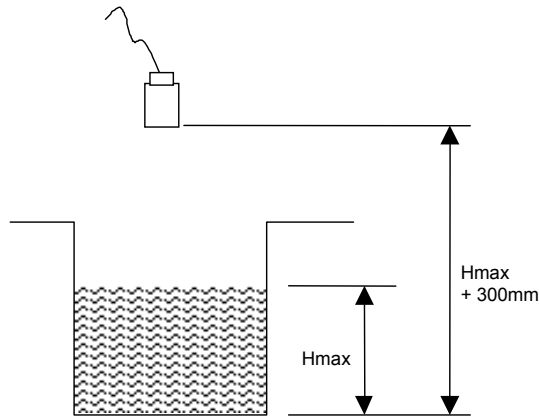
For accurate open channel flow measurement, both parts of the system must be installed accurately.

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

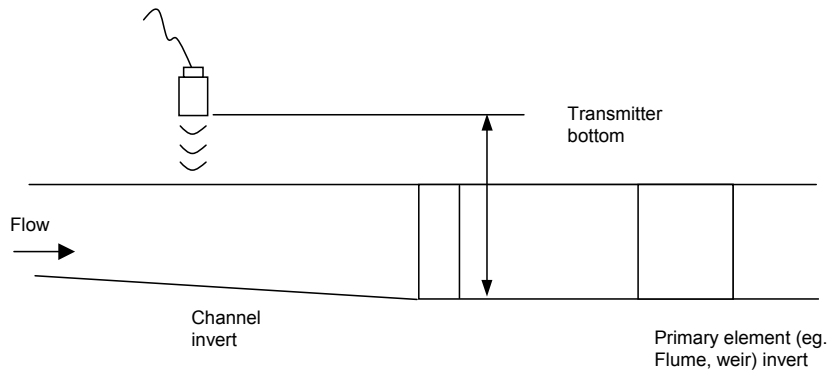
For full details of the installation of a primary element such as a flume or weir, reference should be made to the relevant British (BS3680) or International standard.

In the United Kingdom, Mobrey Measurement offers a complete installation and commissioning service for open channel flow measurement systems. For further information contact the sales office and/or refer to Mobrey Measurement's 'The Guide'.

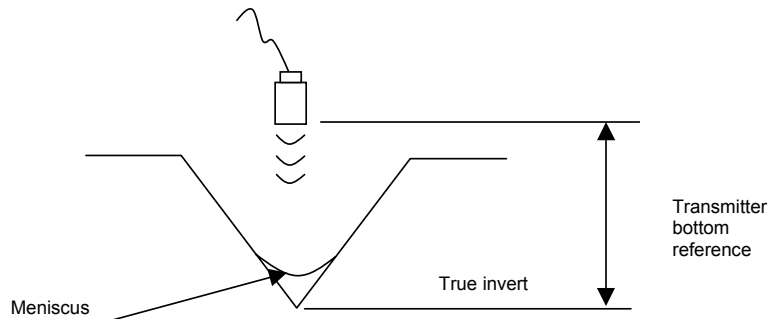
* Positioning of the transmitter is critical and should be the correct distance upstream from the flow structure as stated in BS3680 e.g. a distance of 4 to 5 times h_{max} for a thin plate weir or 3 to 4 times h_{max} for a flume.
For optimum accuracy, the front face of the sensor should be positioned at a height that is at least equal to the maximum flow depth plus the blanking distance of the transducer. A minimum distance of 310mm 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 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 MSP900SH 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.
- In many installations, the use of a calibration device is mandatory. Mobrey Measurement offer the MSP-HVD for In order to minimise measurement uncertainties when a calibration device is installed, it is recommended that the calibrated range should be kept to a realistic minimum. i.e. max flow plus 10mm. Ensure that the target plate of the calibration device does not fall within the 300mm blanking distance of the transmitter.

All calibrations should be derived to suit as installed conditions.

If you are in doubt about any aspect of transmitter installation, contact Mobrey Measurement (Service Division) who will be pleased to advise.

3.2 Mounting the transmitter above the liquid surface

The transmitter is supplied with a purpose made 316 Stainless Steel mounting bracket which should be used to mount the transmitter over the liquid surface.

The bracket is designed to fit over the 1" threaded neck of the transmitter and is retained by a locknut.

IMPORTANT : Never suspend the transmitter by the cable.

Use a chain or wire through the hole provided in the bracket, which is shaped to ensure that the transmitter will hang perpendicular to the liquid surface.

Check that the material of the chain or wire is corrosion resistant to the liquids and any vapours present.

Alternatively, 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 0.3m blanking zone of the transmitter.

Note: To aid alignment, the echo size / signal strength can be displayed on the MCU900 control unit or on a suitable HART compliant handheld. Refer to IP2030/OM for full details.

3.3 Wiring

The transmitter is supplied with a factory fitted length of PVC sheathed two core shielded cable which should be neatly run back to the control unit or a suitable local IP65 junction box.

The transmitter cable cores are identified as follows :-

Red	24V dc
Black	0V dc
Screen	Earth : must be connected to an Intrinsically Safe Earth in the non-hazardous area if the transmitter is Connect to a standard earth if the transmitter is not in a hazardous area.

The cable may be cut to length on site or may be extended using an IP65 junction box and suitable extension cable up to a total length of 3000 m.

Where the transmitter is installed in a hazardous area, it is the responsibility of the user to ensure that the cable parameters of the total length of cable used together with the parameters of the MSP900SH are less than the safety parameters of the safety barrier (or MCU900 Control Unit if used instead) . See section 3.4 below.
Multicore cable may be used provided that each pair within the multicore has a separate shield.

As good instrumentation practice, avoid tracking the cable with other cables which carry high voltages if possible.

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 Mobrey Measurement Control Unit Series MCU900, **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 it's output parameters U_o , I_o and P_o are less than U_i , I_i and P_i of the MSP900SH transmitter.

For the MSP900SH transmitter, $U_i = 30V$, $I_i = 120mA$ and $P_i = 0.82W$.

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

For the MSP900SH transmitter with 50m of factory fitted cable, $C_i = 5nF$ and $L_i = 27mH$

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.

It is the responsibility of the user to ensure any loop devices, if mounted in the hazardous area, carry the requisite hazardous area certification and do not cause the system parameters to exceed those of the safety barrier (or MCU900).

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

When used with the Mobrey Measurement MCU900 Control Unit, 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 it is intended to use HART digital communications with the MSP900SH transmitter, a 250Ohm 0.25W load resistor must be installed in the loop.

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.

It is the responsibility of the user to ensure that any HART communicator used in the hazardous area is suitably certified for that area.

3.6 Using the MSP900SH transmitter with an MSP90 Series controller

Although the MSP900SH transmitter is designed for use with the new MCU900 Series control units, there are many thousands of MSP90 Series control units in the field with which it may be used.

It is important to note that the MSP90 Controller was normally used with an MSP90 style ultrasonic transducer, with the controller supplying a voltage pulse to the transmitter and then interpreting and processing the return echo. The MSP900 transmitter works in a different way, as it performs all processing in the transmitter itself, requiring only a loop power connection to the control unit.

3.6.1 Wiring

When connecting the MSP900SH transmitter to an MSP90 Series control unit, different terminals are used in the control unit.

If connected, disconnect the existing MSP90 type transducer. These terminals are not used with the new MSP900SH type transmitters.

Connect the MSP900SH screened and twisted pair cable to the current input terminals of the MSP90 Controller as follows:

MSP900SH wire	Wall mount controller type MSP90 - 11- C	Panel mount controller type MSP90 - 61* - C
Red	Terminal 18 : I in Loop Power+	Terminal 18 : I in Loop Power+
Black	Terminal 14 : 4-20mA I in+	Terminal 8 : Current in+

Important note when the transmitter is located in a hazardous area:

If the MSP900SH transmitter is located in a hazardous area, it is the responsibility of the user to ensure that 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 MSP900SH transmitter.

For the MSP900SH transmitter, $U_i = 30V$, $I_i = 120mA$ and $P_i = 0.82W$.

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

For the MSP900SH transmitter with 50m of factory fitted cable, $C_i = 5nF$ and $L_i = 27\mu H$

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

3.6.2 Programming the MSP90 Series control unit to operate with the MSP900SH transmitter

The MSP900SH is a transmitter and will need to be programmed to give a 4-20mA signal proportional to the level in the tank. (See Section 5 of this manual)

On the MSP90 control unit :

Set P39 to 7. This sets the MSP90 control unit to current input mode.

Set P03 to the value, in metres, corresponding to the range of the 4-20mA output of the MSP900SH transmitter. In a tank or sump of depth 8.5m, you will most likely have programmed the MSP900SH to give 4-20mA over the range 0.3m to 8.5m. P03 in the MSP90 control unit will therefore need to be set to 8.2.

P21 is a parameter which is used to convert level measurement to contents measurement. Where the vessel is a simple tank or sump and the readout is required to be level, leave P21 set to 0.

If it is required to give a readout in contents, P21 should be set dependant upon vessel shape - refer to the MSP90 controller manual.

A typical example is given in Appendix 2 of this manual.

Refer to the manual supplied with the MSP90 Control unit for full programming details of the MSP90 control unit if in any doubt.

4.0. Maintenance

There is no routine maintenance required for the MSP900SH other than an occasional check to ensure that the front face of the transmitter is clean and that the wiring is in good condition.

5.0 Commissioning / Programming

5.1. Current Output

This section gives a very brief overview to allow checking of the installation. For full programming details, refer to the Operating Manual IP2040/OM.

When power is applied to the transmitter it will give a 4-20mA signal proportional to "level" based on some factory set default values for a typical tank :-

Bottom reference (depth of tank)	12m from transducer face
4mA level	0m
20mA level	11.7m

Hence, for a liquid surface (or other flat target) that is 5m away, the current on the loop will represent a liquid level of $(12m - 5m) = 7m$ with a value of 13.57mA.

The user may programme the MSP900SH transmitter with the specific installation details to re-range the 4-20mA signal.

The MSP900SH transmitter is usually connected to a Mobrey Measurement MCU900 control unit which allows access to and changing of the transmitter operating parameters.

5.2. HART programming of the MSP900SH transmitter

If being used without the MCU900 Control Unit a HART compatible programming device will be necessary (see IP2040/OM) and the loop must have a load resistor installed.

The Mobrey Measurement PC software "Mobrey H-Conf401" is also available, allowing a computer fitted with a HART modem to communicate with and re-programme the MSP900SH transmitter. Note : A HART modem is supplied with the Mobrey H-Conf401 software.

To further assist the user who has access to a HART programming tool, Appendix 1 gives a list of the operating Parameters of the MSP900SH transmitter.

HART transmitters are able to provide up to 4 Variables in digital format. These are known as the Primary (PV), secondary (SV), Tertiary (TV) and Quaternary (QV) Variables, and are factory set by the manufacturer of the HART transmitter.

HART compatible programming or control devices are able to read these variables and display them on demand.

The MSP900SH variables are factory set as follows:

Primary Variable (PV)	The primary reading from the transmitter, normally level, but which the user may change by programming of the MSP900SH, for example to Contents or Flow.
Secondary Variable (SV)	Factory fixed to read the level calculated by the MSP900SH
Tertiary Variable (TV)	Factory fixed to read distance (range) to target.
Quaternary Variable (QV)	Factory fixed to read the temperature recorded by the MSP900SH.

When being used with an MCU Series control unit, these variables are available to view as parameters:

PV	D900
SV	D901
TV	D902
QV	D903

6.0 Accessories

6.1. Submersion shield

The MSP-SUB2 is a tubular shield which slips over the black transmitter front housing. This is usually fitted in wet well installations where the liquid level could rise faster than the pumps can pump out. As the liquid covers the transmitter, an air-lock is created in the shield and the transmitter face remains free from contamination.

6.2 Head Verification Device

The MSP-HVD is a combined mounting bracket and verification device for use with the MSP900SH transmitter, normally used in Open Channel Flow applications.

The HVD is mounted on an arm over the channel and supports the MSP900SH on an integral bracket. A target plate at a fixed distance from the transmitter face may be swung under the transmitter. The level and flow readings calculated by the transmitter in this situation may then be compared to a local calibration plate to ensure that the system is functioning correctly.

Refer to data sheet IP267 for further details.

Appendix I : MSP900SH programming parameters

					USER DEFAULTS						
					MSP900SH						
					base units	m	ft	in			
SETUP	DUTY		P010	Bottom Reference	as base units	12.0	40.0	480.0			
			P011	Tank Shape	-	Linear	Linear	Linear			
			P013	PV Scale Factor	-	1.0	1.0	1.0			
			P014	Profile Height	as base units	1.0	1.0	1.0			
			NLP CURVE	P030	Profile Point 1	%	10	10	10		
				P031	Profile Point 2	%	20	20	20		
				P032	Profile Point 3	%	30	30	30		
				P033	Profile Point 4	%	40	40	40		
				P034	Profile Point 5	%	50	50	50		
				P035	Profile Point 6	%	60	60	60		
				P036	Profile Point 7	%	70	70	70		
				P037	Profile Point 8	%	80	80	80		
				P038	Profile Point 9	%	90	90	90		
				P039	Profile Point 10	%	100	100	100		
	>	P000	Message	-	MESSAGE						
	>	P001	Tag	-	MSP900						
	>	P002	Description	-	MSP900 XMTR						
	PV CALC		P012	Primary Variable Units (PV Units)	-	m	ft	in			
	OUTPUT	CURRENT	P015	Upper range value	L000	11.7	38.4	460.6			
			P016	Lower range value	L000	0.0	0.0	0.0			
			P020	Damping	sec	3.0	3.0	3.0			
	ENGINEERING		L000	Range Value Units	-						
			P021	LE Delay	sec	900	900	900			
			P022	LE Action	-	Hold	Hold	Hold			
			P023	Blanking	base units	0.3	1.0	12.0			
			P024	Speed of Sound	base units/s	331.8	1088.6	13063			
			P025	Temperature	C or F	Auto	Auto	Auto			
			P026	Threshold	%	Auto	Auto	Auto			
			ADVANCED	P041	Pulse Repetition	sec	1.0	1.0	1.0		
				P042	Echoes Needed	-	4	4	4		
				P043	Threshold 1 Time	ms	2.0	2.0	2.0		
				P044	Target Pulses	-	Auto	Auto	Auto		
				P045	Target Frequency	kHz	Auto	Auto	Auto		
P049				Spike Rejection	-	0	0	0			
	AUTO CYCLE	-		-	-	-					
SYSTEM			LOAD DEFAULTS	-	-	-	-				
			L200	Base Units	-						
		FIXED	P004	Final Assembly Number	-	as applicable					
			P005	Serial Number	-	as applicable					
			P970	Front face material	-	PVC	PVC	PVC			
		HART	D949	Model Code	-	51	51	51			
			D950	HART Device Code	-	46	46	46			
			D951	Comms Address	-	Unchanged (ex-factory = 0)					
			D952	Hardware Revision	-	as applicable					
			D953	Software Version	-	as applicable					
			D960	Manufacturer's Code	-	Mcbray					
			D961	Unique ID	-	as applicable					
			D962	Universal Cmd Rev	-	5	5	5			
			D963	Transmitter Spec. Cmd Rev	-	as applicable					
			D964	Response Preamble	-	5	5	5			
			D965	Transmitter Flags	-						
			MONITOR	READINGS	VARIABLES	D900	Primary Variable	base units			
						D901	Level (SV)	base units			
		D902				Range (TV)	base units				
D903	Transducer Temperature	C or F									
CURRENT	D906	Current output				mA					
	D905	% Current Output			%						
	D908	Relay Status			-						
DIAGNOSTICS		D910			Target Range / Distance to Target	base units					
		D911			Echo Size	%					
		D912			Echo Success Rate	%					
		D913		Target Echoes	-						
		D914		Speed of Sound	base units/s						
		D915		Transducer Temperature	C or F						
		D916		Transducer Frequency	kHz						
		HISTORY		P003	Date of Change	dmy	01/01/2002	01/01/2002	01/01/2002		
				P046	Maximum Temperature	°C	50	50	50		
				P047	Minimum Temperature	°C	-10	-10	-10		

Appendix 2 - Use with Mobrey Measurement MSP90 Series controllers – example

Programming example when using the new MSP900SH transmitter with an old style MSP90 Series controller.

A2.1 Vertical rectangular or cylindrical sump, originally displaying level in metres, 4.2m from transducer face to bottom of sump.

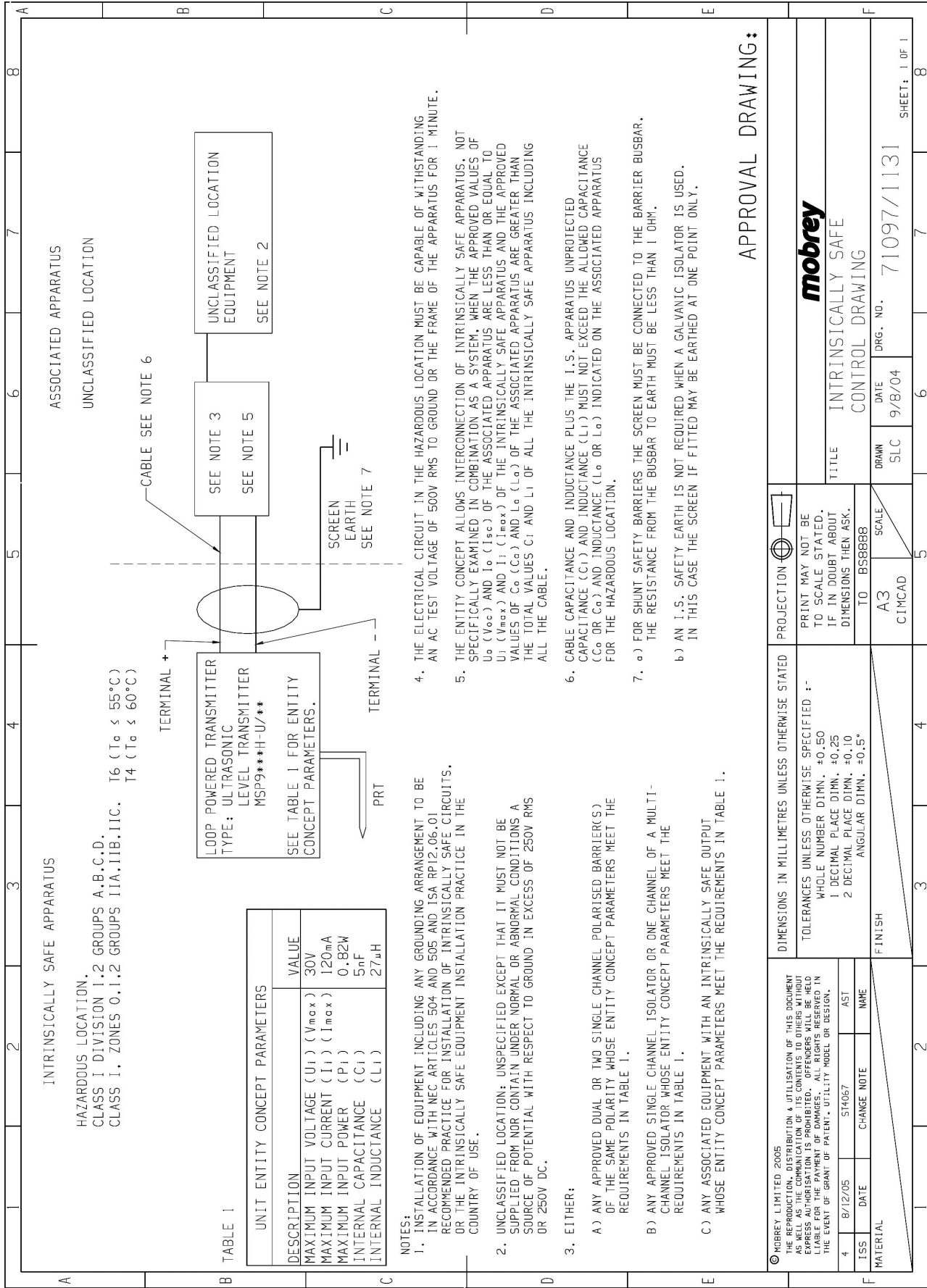
- The new MSP900SH should be mounted in the same position as the old transducer such that the distance to the bottom of sump is 4.2m. If this is not possible, re-measure the distance to the bottom of the sump once the MSP900SH transmitter is mounted.
- The MSP900SH transmitter should be configured with a bottom reference of 4.2m (or whatever the new distance is) and the 4-20mA output ranged from 0m level to 3.9m level (4.2 - 0.3m dead zone = 3.9m).
If there is no HART device available to configure the MSP900SH in this way, refer to the note below.
- On the MSP90 control unit :
Set P39 = 7 (Current input)
Set P3 = 3.9 (Range of 4-20mA signal)
Set or check P21 = 0 (linear vessel)

Note : If it is not possible to re-range the MSP900SH transmitter on site, it may be used with factory default settings. The 4-20mA from the MSP900SH transmitter is set for 4mA at 0m and 20mA at 11.7m.

In this case, P3 must be set to 11.7 as this is the full range of the transmitter signal.

If in doubt, do not hesitate to contact Mobrey Measurement Customer Support for further advice.

Appendix 3 - Intrinsically safe control drawing



APPROVAL DRAWING:

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	MATERIAL	CHANGE NOTE			
DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED		PROJECTION		PRINT MAY NOT BE TO SCALE STATED. IF IN DOUBT ABOUT DIMENSIONS THEN ASK. TO BS8888	
TOLERANCES UNLESS OTHERWISE SPECIFIED :- 1 DECIMAL PLACE DIMN. ±0.25 2 DECIMAL PLACE DIMN. ±0.10 ANGULAR DIMN. ±0.5°		SCALE		A3 CIMCAD	
FINISH		TO BS8888		DRAWN SLC	
				DATE 9/8/04	
				DRG. NO. 71097/1131	
				SHEET: 1 OF 1	



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