

TLS Monitoring Systems

Contractors' Site Preparation Guide

Full GVR EMEA contact information contact information and product documentation is available for viewing and download by distributors from the GVR Extranet: *www.mygvr.com*

Distributors requiring GVR Extranet login details should contact *paul.deitch@gilbarco.com* to obtain an ID and password.

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Introduction

General

This document describes the procedures necessary to prepare the site, ready for the installation of the Veeder–Root TLS Series Underground Storage Tank Monitoring Systems.

This manual does *not* cover the site preparation necessary for the installation of Veeder–Root Delivery Information Systems (DIS). For information on these products please refer to the relevant manuals for DIS-500, DIS-100, DIS-50, and DIS-T systems.

Veeder–Root maintains a continuous process of product development and therefore product specifications may not be as described in this manual. Please contact the Veeder–Root office nearest you, or visit our website at www.veeder.com for information on new or updated products. Changes affecting products or procedures described in this manual will be reported in subsequent revisions. Veeder–Root has taken every care in the compilation of this manual; however it is the installers' responsibility to take every precaution to safeguard themselves and others.

Every person working with Veeder–Root equipment is expected to take every safety precaution possible and to have read this manual, particularly the sections referring to health and safety.

NOTE Deviation from the specifications contained in this manual can result in rework, delays in system installation and additional installation charges.

Contractors are advised to contact their nearest Veeder–Root office where local conditions may preclude using the specifications contained in this manual.

Installation Levels

Veeder–Root or its Approved Installers may require that certain facilities are installed by contractors, nominated by the customer, prior to attending the site for the installation of a TLS system. These facilities vary dependent on the installation contract agreed between Veeder–Root or its Approved Installers, and the customer. For the UK, two levels of site preparation exist and are described below:

LEVEL 1 INSTALLATION

The customer or his elected contractor will supply (unless stated otherwise) and install the following:

- Console power supply and earth.
- High level alarm and associated wiring to TLS position. (supplied by Veeder–Root)
- External devices power supply and cabling (e.g. High level alarm)
- Peripheral devices cabling (e.g. data cables to pump controller and point-of-sale terminal)
- Probe and sensor cable ducting
- Probe field cables
- Probe risers
- Groundwater sensor wells
- Vapour sensor wells
- The contractor will seal all ducting after system testing has been carried out.

LEVEL 2 INSTALLATION

The contractor will install the following:

- Console power supply and earth
- High level alarm and associated wiring to TLS position. (supplied by Veeder–Root)
- External devices power supply and cabling
- Probe and sensor cable ducting
- Groundwater sensor wells
- Vapour sensor wells
- The contractor will seal all ducting after system testing has been carried out.

NOTE Unless stated otherwise, instructions in this manual refer to both levels of site preparation.

Product Description

SYSTEMS

Veeder–Root offer a comprehensive range of products designed to meet the needs of both large and small forecourt retailers. From stand alone gauging and leak detection systems, to fully integrated systems that can perform a wide range of functions including: tank gauging, automatic stock reconciliation, leak detection for double-wall tanks and precision tank testing.

All Veeder–Root systems have been designed for ease of operation. System consoles have liquid crystal display screens and one-touch function keys to guide the user through all operating functions. The status of all in-tank probes and leak detection sensors is available immediately on the LCD screen, on the system's printer or, through the system's communication facilities, on the point-of-sale terminal or back office computer.

IN-TANK PROBES

Magnetostrictive Probes are capable of performing precision tank testing as described by the United States Environmental Protection Agency [0.38 litres per hour (0.1 gph) and 0.76 litres per hour (0.2 gph)] when combined with the in-tank leak testing features of a TLS Console.

For further information on the performance and specification of in-tank probes, please contact your local Veeder–Root representative.




LEAK DETECTION SENSORS

- Sump Sensors - float sensors used for detecting liquids in dispenser sumps, tank lid access chambers and similar locations.
- Discriminating Sump Sensors - comprised of a float switch and conductive elastomer sensor that detects the presence of either hydrocarbons or fluids and can differentiate between the two.
- Twin Wall Storage Tank Interstitial Sensor - a high and low level float sensor used to monitor the liquid in the interstice of double walled storage tanks. The sensor is supplied as an integral part of an interstitial fluid header tank which is located in the tank lid access chamber.
- Twin Wall Pipe Interstitial Sensor- a float sensor used for detecting liquids within the interstice of twin wall piping systems.
- Vapour Sensors - used to detect vapour in monitoring wells. The level of vapour detected is set on the system console, enabling background contamination to be accommodated. This sensor is used where the water table level is unreliable.
- Groundwater Sensors - detect liquid hydrocarbons on the water table in monitoring wells. The sensor is capable of detecting 2.5 mm of free hydrocarbon on water. The sensor also alarms if the water table drops below the level where the sensor can no longer operate.
- Interceptor Sensors - these Veeder-Root sensors are usually supplied via the interceptor manufacturer. In all cases they must be approved for use by the interceptor manufacturer to ensure correct operation. Customers should check with their local Veeder-Root representative before ordering to ensure equipment compatibility.
- Discriminating Interstitial Sensors - uses ultrasonic liquid level sensing technology to detect liquid in the interstitial space of the tank. This sensor can also differentiate between hydrocarbons and other liquids.
- MicroSensors - A small, solid-state sensor with a stiff, easy to push cable, is designed for liquid detection in any confined space, such as the interstitial space of a steel tank or in a fill riser containment.
- Mag Sump Sensors - detects the presence and amount of water and/or fuel in the containment sump or dispenser pan. Using proven magnetostrictive technology to detect the hydrocarbons and water, the station (where allowed) remains in operation when water alone is detected. An alarm is also generated if the sensor has been moved from its proper position at the bottom of the sump or pan.
- Pressurised Line Leak Detection (PLLD) - Veeder-Root's electronic Pressurised Line leak Detection System consists of a pressure transducer and Swiftcheck valve (not required for all pump types) installed in the leak detector port of a submersible turbine pump, two console plug-in modules, and patented measurement software to test the product line at full pump pressure for highly accurate 0.1 gph precision and 3.0 gph gross testing.

Health And Safety

SAFETY SYMBOLS

The following safety symbols are used throughout this manual to alert you to important safety hazards and precautions.

 <p>Explosive Fuels and their vapors are extremely explosive if ignited.</p>	 <p>Read All Related Manuals Knowledge of all related procedures before you begin work is important. Read and understand all manuals thoroughly. If you do not understand a procedure, ask someone who does.</p>
 <p>WARNING Heed the adjacent instructions to avoid equipment damage or personal injury.</p>	

GENERAL




Ensure that all local council, U.K. and E.C. laws and regulations are complied with. Also ensure that all recognised safety codes are followed.

NOTE Every person working with Veeder-Root equipment is expected to take every safety precaution possible in the installation of the TLS Systems.

Contractors must ensure that supervisory personnel on the installation site are aware of their presence and requirements, especially the provision of safe working areas and isolation from AC electrical power.

Leaking underground tanks can create serious environmental and health hazards. It is the contractor's responsibility to comply with the instructions and warnings found in this manual.

DANGER AREAS

 WARNING	
 	<p>TLS System products will be operated near the highly combustible environment of a fuel storage tank.</p> <p>Failure to install these products according to the instructions contained in this manual may result in explosion and personal injury.</p> <p>It is essential that the warnings and instructions in this manual are carefully read and followed to protect both the installer and others from serious or fatal injury.</p>

If the underground storage tank to be fitted with a TLS system either contains or at any time has contained petroleum products then the tank inspection chamber must be considered a hazardous environment as defined in IEC EN 60079-10 Classification of Hazardous Areas. Suitable working practices for this environment must be observed.

INTRINSIC SAFETY



The design of Veeder-Root products limits the power in the wiring to the in-tank probes and sensors and keeps this wiring physically separated from any other. It is the responsibility of the contractor to maintain the effectiveness of these safety features by preparing the installation site in accordance with the instructions and warnings which follow. Failure to do so could create danger to life and property. Only those products contained in the system descriptive documents are certified by Veeder-Root. The safe installation and placing of equipment into service that is not contained on the system descriptive documents is the sole responsibility of the installer, end user and local authority having jurisdiction. All installations must comply with all local, national and international codes.

Circuitry within the probe and console barrier forms an intrinsically safe, energy limited system. This system makes the probes and sensors suitable for use in hazardous locations. Probe and sensor wiring is intrinsically safe only when connected to the TLS console.



Substitution of specified components may impair intrinsic safety.

All probe and sensor wiring must be contained in dedicated ducts.


 WARNING	
	<p>Explosion could occur if other wires share ducts with intrinsically safe probe or sensor wiring. Ducting from probes and sensors must not contain any other wiring circuits.</p> <p>Failure to comply with this warning could result in explosion, death, serious personal injury, property loss or equipment damage.</p>

Special Conditions for Safe Use

All installations must be made in accordance with the accompanying Descriptive System Documentation (see Appendix A for certificate descriptions).

General Overview Of The Atex Directive

The Veeder-Root TLS (Tank Level System) Consoles are installed in an indoor, non hazardous area. The consoles have barriers that protect the linked apparatus by an **Ex [ia]** intrinsically safe mode of protection and are suitable to control apparatus installed into areas that are likely to become hazardous in the presence of concentrations of gases, vapours or mists formed by group **IIA** dangerous substances. The symbols on the nameplate have the following meaning:

	Device suitable to be installed in potentially explosive areas
II	Group II: for installations in areas other than mines and related surface equipment
(I)	Category 1: suitable to control apparatus installed into Zone 0, Zone 1 or Zone 2 hazardous areas
G	For potentially hazardous areas characterised by the presence of gases, vapours or mists

All ATEX models of **TLS Consoles** are in compliance with Directive **94/9/EC (ATEX)**.


A sample Console has been evaluated and tested by **UL International Demko A/S** P.O. Box 514 Lyskaer 8, DK-2730 Herlev, Denmark and approved by the issue of the EC type certificates:

DEMKO 06 ATEX 137481X for TLS-350 & TLS-350R Consoles

DEMKO 06 ATEX 137484X for TLS-300 Consoles

DEMKO 06 ATEX 137478X for TLS-50, TLS2, TLS-IB Consoles

The Veeder-Root MAG Probes and Sump Sensors, Solid State Sensors and Pressurized Line Leak Sensors are intrinsically safe apparatus, marked **Ex ia**, suitable for installation into areas that are likely to become hazardous in the presence of concentrations of gases, vapours or mists formed by group **IIA** dangerous substances. The temperature class of the devices is **T4** (surfaces temperatures lower than 135°C). The symbols on the nameplate have the following meaning:

	Device suitable to be installed in potentially explosive areas
II	Group II: for installations in areas other than mines and related surface equipment
I	Category 1: suitable to control apparatus installed into Zone 0, Zone 1 or Zone 2 hazardous areas
G	For potentially hazardous areas characterised by the presence of gases, vapours or mists

All ATEX models of **Probes, Vapour and Pressure Sensors** are in compliance with Directive **94/9/EC (ATEX)**.


A sample has been evaluated and tested by **UL International Demko A/S** P.O. Box 514 Lyskaer 8, DK-2730 Herlev, Denmark and approved by the issue of the EC type certificates:

DEMKO 06 ATEX 0508841X for MAG probes

DEMKO 06 ATEX 137486X for Pressure Line Leak Detection sensors

DEMKO 06 ATEX 137479X for Solid State Sensors

Symbol **X** used as suffix in all of the EC type test certificates listed above indicates the need for observing special conditions for safe use. Further information is provided in each respective EC type certificate under the paragraph, **SPECIAL CONDITIONS FOR SAFE USE**.

 1180	Equipment marking is compliant with requirements in the CE Marking Directive.
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The manufacturers Quality System has been reviewed and is notified by *Baseefa(2001) Ltd, Harpur Hill, Buxton, Derbyshire, SK17 9JN, United Kingdom* authorizing the use of its ID **1180** in conjunction with the CE mark. The manufacturer is notified via Baseefa(2001) Ltd. QAN No. BASEEFA ATEX 1968. The CE mark may indicate compliance with other relevant EC directives. Consult the manufacturers EC Declarations of Conformity for details.

Tank Lid Access Chambers

Access Chamber Installation

GENERAL

The installation of the tank access chamber is the responsibility of the customer or their local site contractor and not that of Gilbarco S.p.A. / Gilbarco UK. However, there are certain requirements which need to be met to allow the correct installation of Veeder-Root in-tank monitoring probes and other sensors. A typical installation is shown in Figure 1.

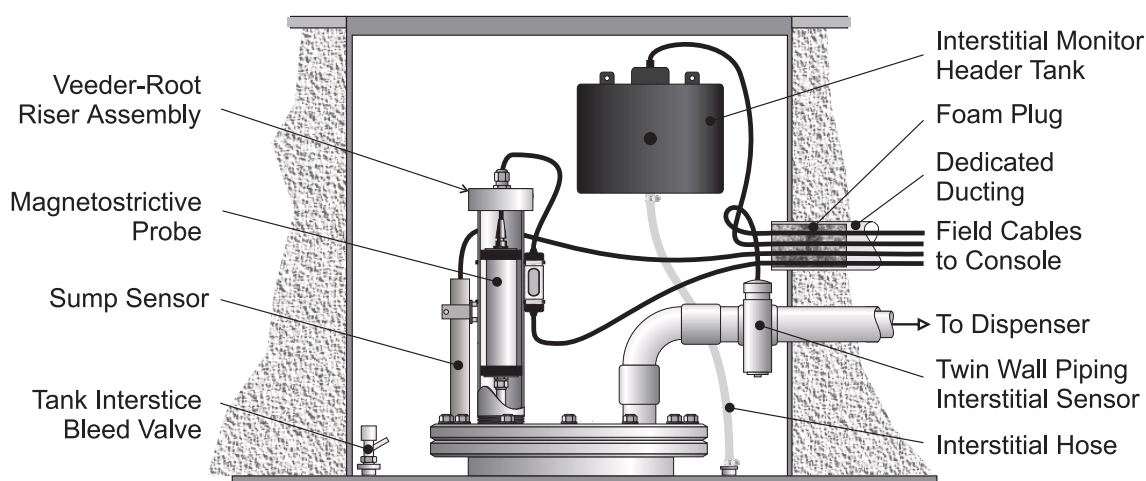


Figure 1. Typical tank lid access chamber installation

NOTE To allow adequate space for probe installation and servicing, it is recommended that the access chamber is a minimum 750mm deep and 600mm wide at the base. See Figure 2.

PROVISION FOR PROBE RISERS

A dedicated probe tapping of either 2-inch BSP (preferred), 3-inch BSP, or 4-inch BSP must be provided. For maximum height-to-volume accuracy, the probe socket must be as close as possible to the longitudinal axis of the tank.

NOTE The probe entry must not be obstructed by other pipe work. A free area above the probe socket of at least 100mm radius from its centre must be provided. See Figure 2.

For Level 2 installations probe entry plugs must be loosened and readily removable. Failure to provide sufficient access or to loosen plugs will cause delays in system installation and result in additional charges.

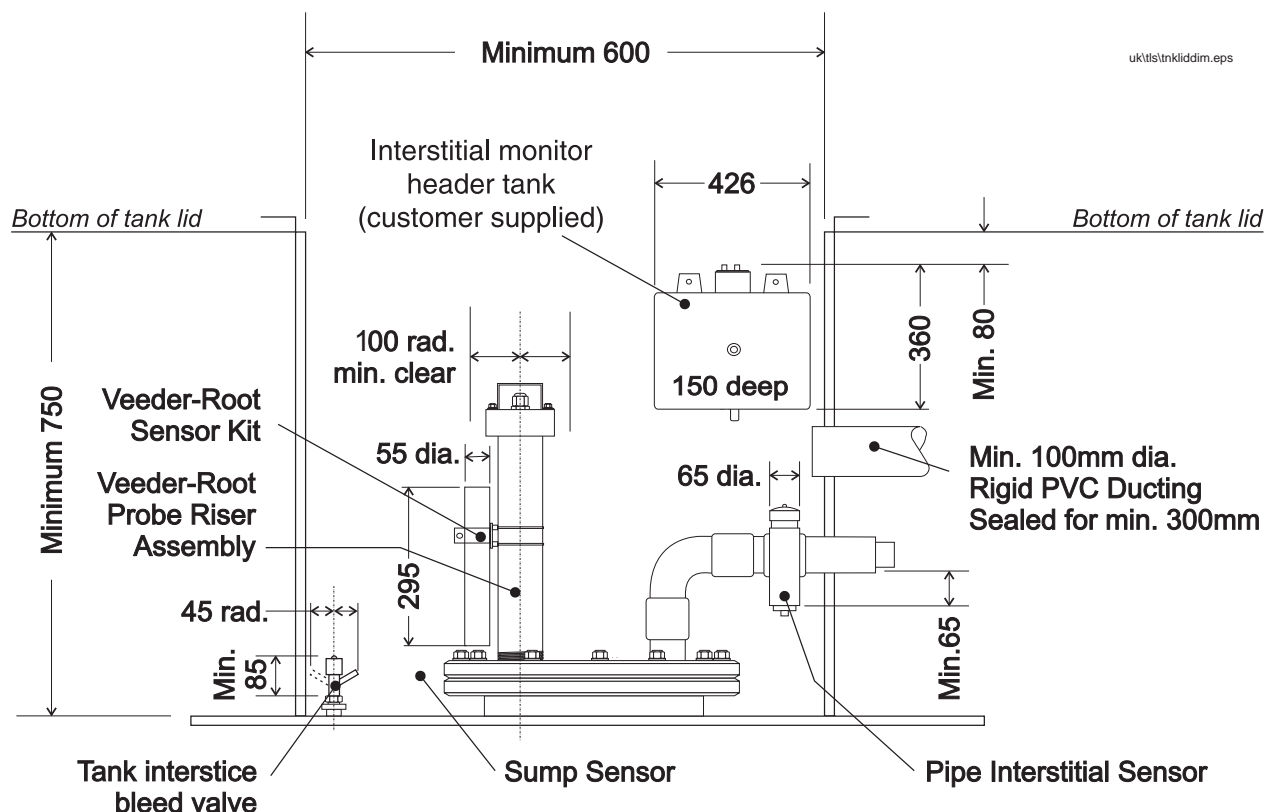


Figure 2. Tank lid access chamber – critical dimensions (in mm)

NOTE Where mechanical overfill prevention devices are installed, contractors must ensure that no part of these devices will be obstructed when the probe and riser assembly are installed.

Failure to comply with this warning may result in the overfill prevention device not operating correctly.

TANK LID ACCESS CHAMBER SUMP SENSOR

Tank lid access chambers may be fitted with sump sensors to detect fluid in the access chamber. The sump sensor must be fitted at the lowest point of the access chamber. Sump sensors are 295 mm x 55 mm diameter. Sufficient free space should be made available for siting, installation and maintenance of the sensor (Figure 2).

INTERSTITIAL MONITOR

Double wall tanks to be fitted with a Veeder–Root interstitial monitor should have two 1-inch BSPT threaded openings to the interstice. The interstice should be filled with a glycol and water mixture of 1 part glycol to 5 parts water. Care should be taken when filling the interstice to ensure that air is not trapped.

The interstitial monitor is contained in a header tank that requires mounting in the tank access chamber. The header tank measures 300 mm (h) x 420 mm (w) x 145 mm (d). An additional 80 mm is required above the header tank for installation and maintenance (Figure 2).

The interstitial monitor header tank may be mounted directly off the tank lid using an Interstitial Sensor Installation Kit (Part No. 711-000-4103). The interstitial monitor header tank may also be mounted directly to the access

chamber walls, providing that total containment is maintained by the use of special fixings or by mounting to the flange bolts of glass reinforced plastic (GRP) chambers.

Probe and Riser Installation Criteria

Mag probe installations require a 2-inch or 3-inch riser, regardless of tank entry size. Entry sizes of 1 inch, or entries larger than 3 inches must be with suitable fittings.

Where possible, the canister of the probe should be completely contained within the riser. In all cases, the probe must rest on the bottom of the tank (see Figure 3).

NOTE Incorrect readings will result if the probe is not resting on the bottom of the tank.

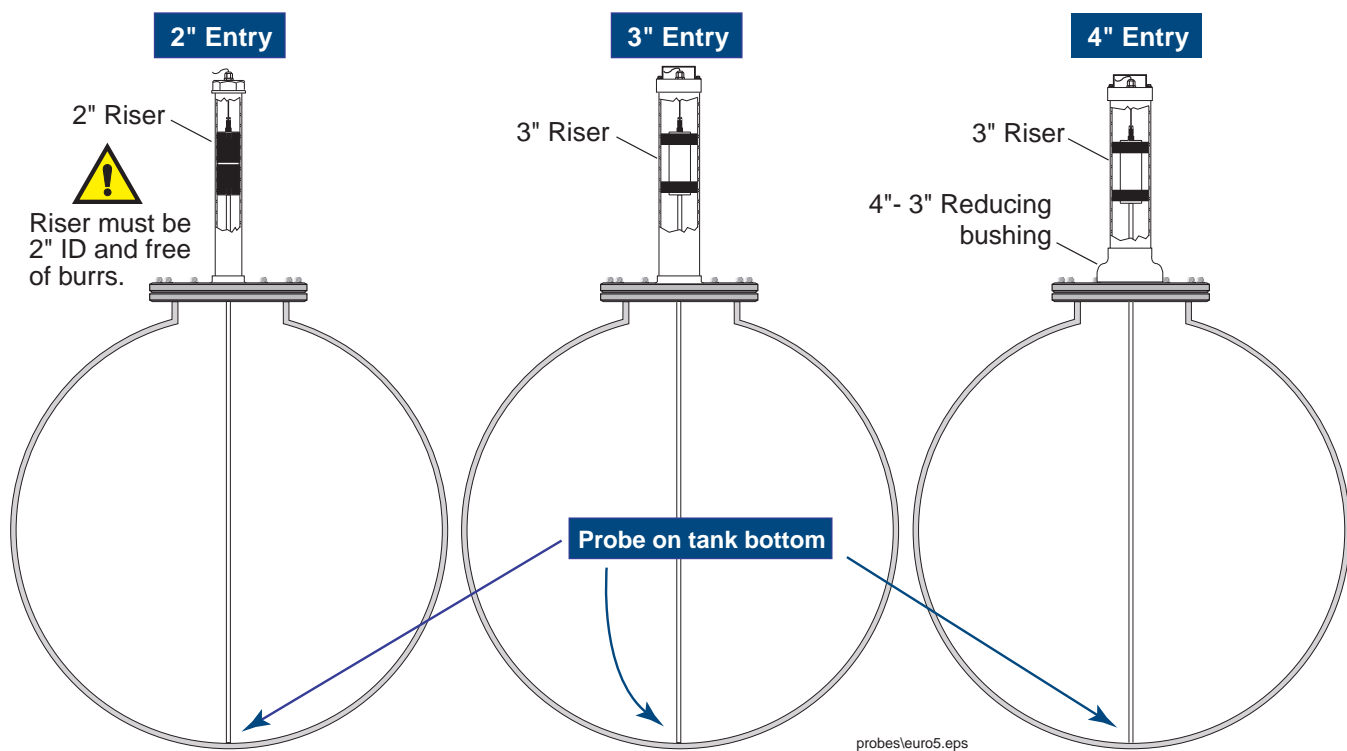


Figure 3. Typical probe installations

GENERAL NOTES

- Risers, when fitted, should be a minimum of 100 mm above the probe canister (see Figure 4).
- The Mag Plus probe canister is always be completely contained within the riser. When installing into 2-inch risers, a Probe Insulator must be fitted to the probe canister. Probe Insulators provide electrical insulation and are supplied with 2-inch Probe Installation Kits (see Figure 4).

NOTE When using Mag Plus probes with 2-inch risers, probe insulators must be used.

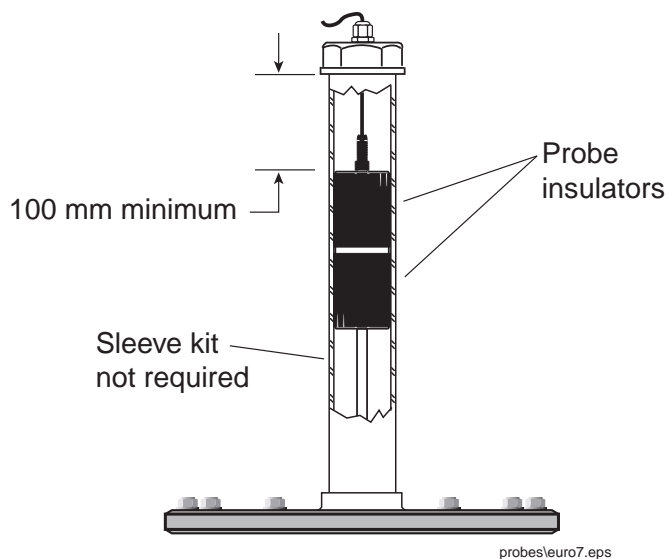


Figure 4. Probe canister - 2-inch riser installation

- Probes specified for tanks with 1-inch entries must always be long enough to rest on the tank bottom and not 'hang' in the riser adaptor (see Figure 5).

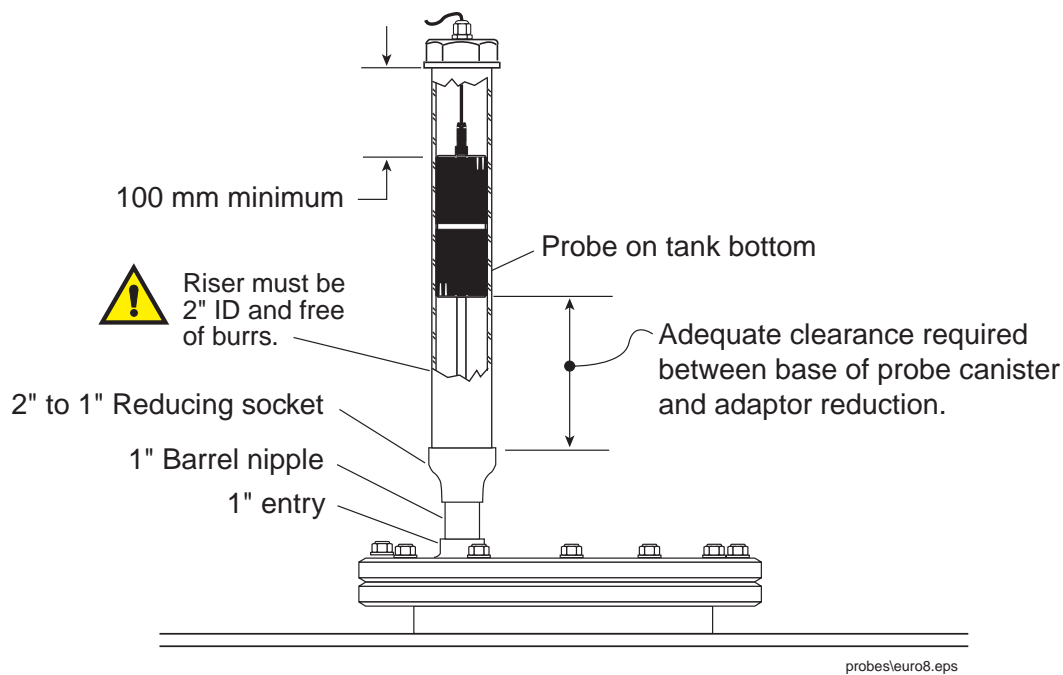


Figure 5. Canister clearance for 1-inch entries

DETERMINING THE CORRECT PROBE LENGTH

Refer to Figure 6 and carry out the following procedure.

1. Enter dimensions A, B, C, and E in Table 1.
2. Add dimensions B + C and enter this in column "F".
3. Select a standard probe length that is equal to or greater than the dimension in column "F". Enter the standard probe Length in column "G".

Dimensions

- A - Tank diameter (internal)
- B - Tank bottom to top of tank lid
- C - Height of probe entry
- D - Probe entry size
- E - Vertical clearance for riser assy, above tank lid at probe entry

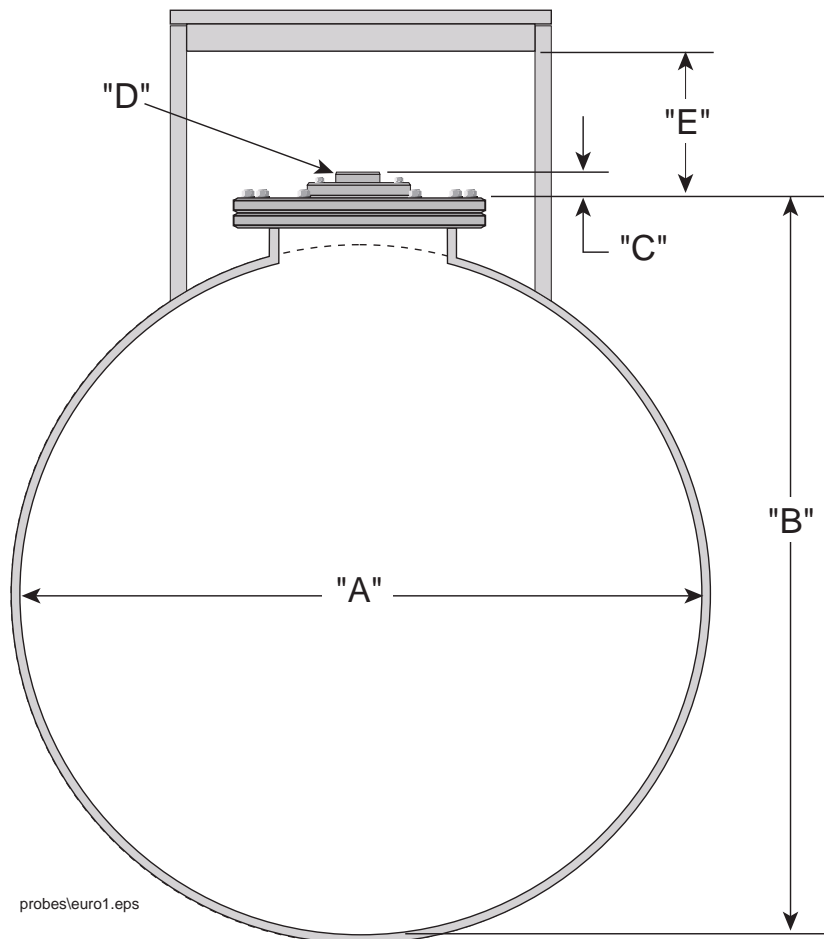


Figure 6. Dimensions needed to calculate custom probes and risers

DETERMINING THE MINIMUM ACCESS CHAMBER DEPTH

The minimum access chamber depth, is calculated as follows:

1. To the chosen standard probe Length ("G"), add 290 mm, this is the overall probe length; enter this in column "H".
2. From the overall probe Length subtract dimension "B + C" (bottom of tank to top of probe flange); the result is the minimum access chamber depth. Enter in column "I".
3. Calculate the actual access chamber depth, dimension "E" minus dimension "C" and enter in column "J"
4. Calculate the probe clearance ("J" – "I") and enter in column "K".

NOTE Column "K" must be zero or a positive number. If the result is a negative number there is insufficient clearance for the probe and riser assembly. In this case please contact Veeder-Root Technical Support or your local Representative for details on custom length Mag Probes and special skirted risers, having available the dimensions A - E shown in Figure 6.

Probe Riser Pipe Installation

A riser assembly consisting of a riser (either 2- or 3-inch nominal bore galvanised steel pipe threaded 2- or 3-inch BSPT at each end) and a 2- or 3-inch riser cap, designed specifically for the efficient installation of Veeder-Root magnetostrictive probes, should be used for Mag Probe installation. Riser caps are normally fitted at the time of probe installation by Veeder-Root authorised engineers. An optional cable shield is available for 3-inch riser caps, if required.

Non-standard or locally supplied risers may be made from 2- or 3-inch nominal bore galvanised steel pipe threaded 2- or 3-inch BSPT at each end.

Remove the plug from the tank socket. Install a 2-inch (50 mm nominal bore) or 3-inch (80 mm nominal bore) riser using an appropriate thread-sealing compound. Reducers are available for 4-inch (110 mm nominal bore) sockets. If the probes are not to be installed immediately, cap the riser (see Figure 7 for available cap assemblies).

NOTE Where locally supplied, 2-inch risers should be seamless, have a 2-inch ID, and be free of burrs.

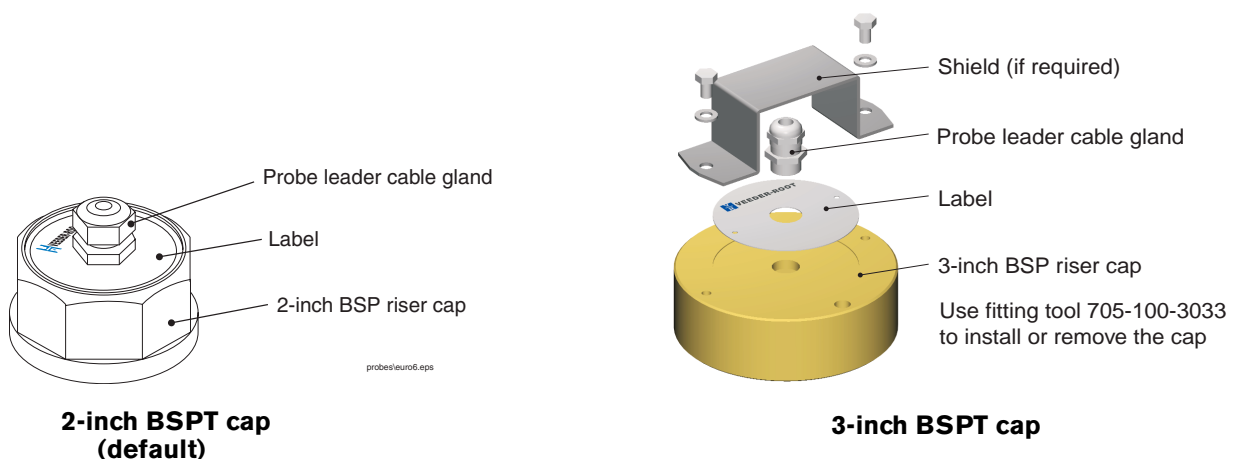


Figure 7. Veeder-Root riser cap assemblies

Table 1. Calculation sheet for determining the correct probe length

TANK No.	A	B	C	E	F Bottom of Tank to Top of Probe Entry "B"+"C"	G Standard Probe Length	H Overall Probe Length "G"+290mm	I Minimum Access Chamber Depth "H"-"F"	J Actual Access Chamber Depth "E"-"C"	K Probe Clearance "J"-"I"
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										

System Consoles

Console Location

The system console should be located on an inside wall of the forecourt building at a height of 1500 mm from the floor. Figure 8 through Figure 10 show typical console installation arrangements.

The equipment is designed to operate safely under the following range of conditions:

- Altitude up to 2000 m.
- Temperature range of 0 to 40 degrees C.
- A maximum relative humidity of 95% RH (non-condensing) at temperatures up to 40 degrees C.
- Main supply voltage fluctuations not exceeding $\pm 10\%$
- Pollution Degree Category 2, Installation Category II

NOTE Consoles are not suitable for external locations and must be installed within the interior of buildings.

Ensure that the console is located where neither the console nor its associated cabling will be damaged by doors, furniture, barrows, etc.

Consider the ease of routing wiring, ducting and probe cables to the console.

Check that the mounting surface material is strong enough to support the console.

NOTE If the unit requires cleaning, do not use any liquid materials (e.g. cleaning solvents). It is recommended that the unit be wiped with a clean dry cloth when necessary.

Overall dimensions and the weight of the various system consoles are as shown in Table 2:

Table 2. System Console Dimensions

System	Height	Width	Depth	Weight	Descriptive System Document
TLS-300	330mm	510mm	110mm	10kg	331940-002
TLS-350R / Plus	330mm	510mm	190mm	15kg	331940-001
TLS-50, TLS-IB	163 mm	188 mm	55 mm	2.3 kg	331940-003
TLS2	163 mm	188 mm	105 mm	2.3 kg	331940-003
TLS-RF Accessories	163 mm	188 mm	55 mm	2.3 kg	331940-005

To allow for maintenance ensure that the console is in an accessible area, even when the console doors are open. Ensure that all relevant subcontractors and other personnel are aware of the selected location. The system console is installed by Veeder-Root authorised engineers.

Console power must come from a dedicated circuit via a fused, switched, neon indication spur within 1 metre of the console position. The spur must be clearly marked to identify it as the means for disconnecting the console. Input power: 3-core, 240 Vac 5A switchable spur at fuse box (24-hour clean supply).

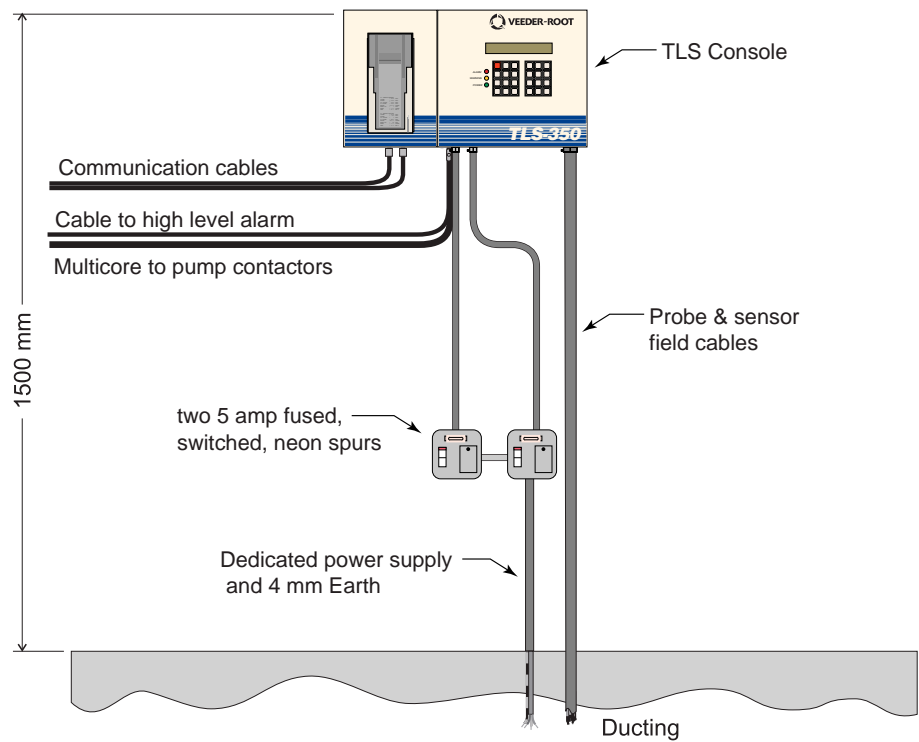


Figure 8. Example TLS-3XX console installation

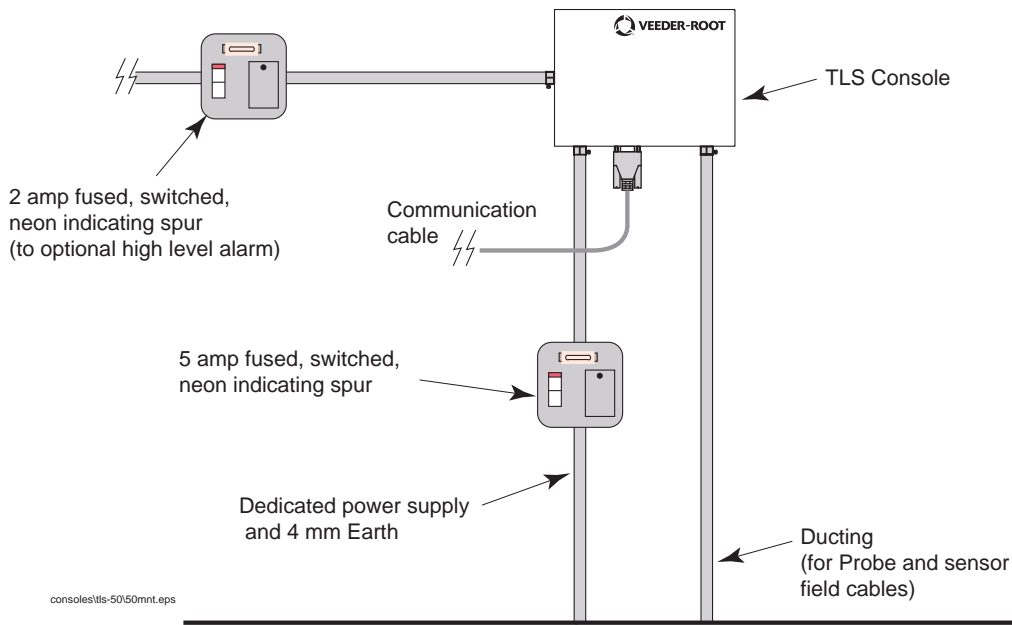


Figure 9. Example TLS2, TLS-50 and TLS-IB installation

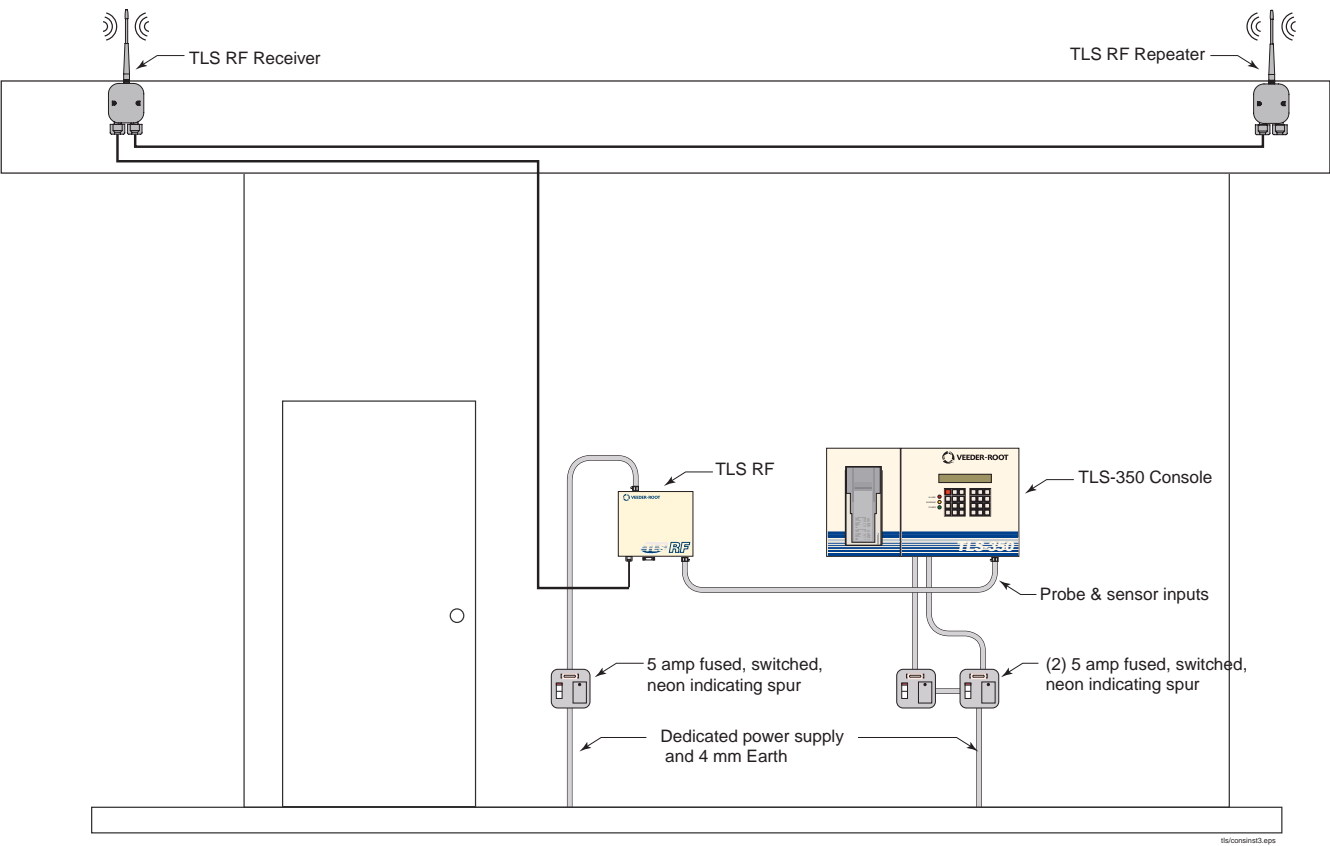


Figure 10. Example TLS RF installation

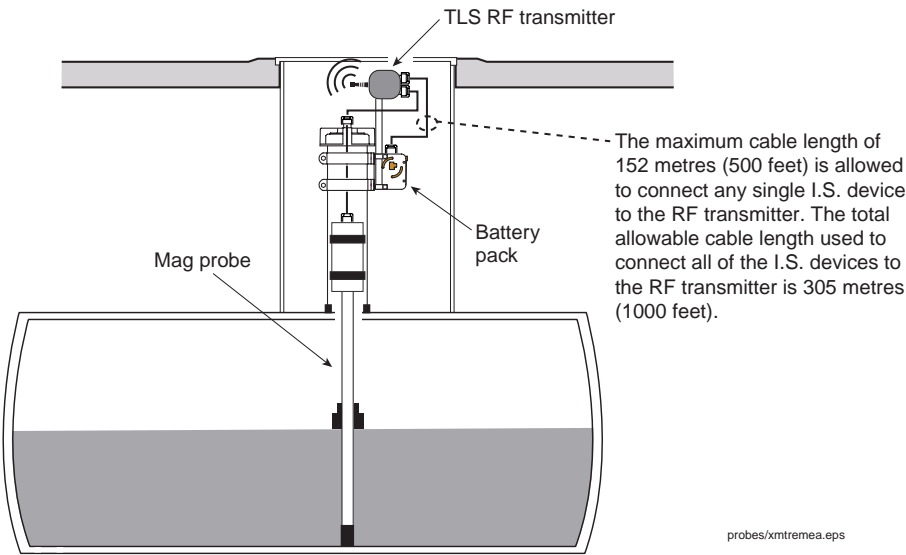


Figure 11. Example TLS RF Accessories installation

TLS Terminal Box Location, If Required

Veeder–Root recommend that the field wiring is run directly to the TLS console. However, if a terminal box is used, it should be mounted on an inside wall of the forecourt building at a practical level, adjacent to the field wiring ducting entry.

Connection to the system console is made by Veeder-Root engineers.

NOTE The cable route from the TLS terminal box location to the system console location must not exceed 15 metres.

Ideally the terminal box should be placed on the same wall and within 2 metres of the system console.

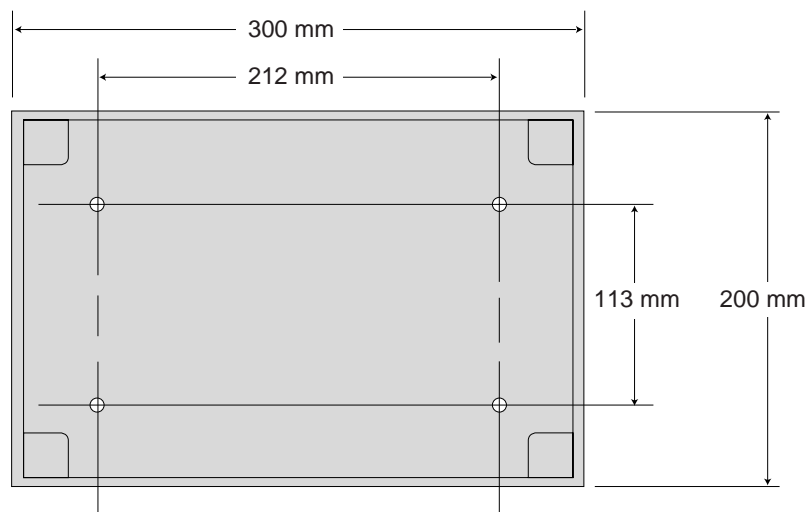
Be sure the terminal box will be protected from vibration, extremes in temperature and humidity, rain and other conditions that could cause equipment malfunction.

Ensure that the terminal box is not located where either the console or its associated cabling will be damaged by doors, furniture, barrows, etc.

Where TLS terminal boxes are to be installed by the contractor the specified units will be shipped to the site prior to the installation and commissioning of the TLS system.

Check the mounting surface material is strong enough to support the terminal box.

Overall and fixing dimensions are given in Figure 12.



Box is 115 mm deep with lid.

Figure 12. TLS terminal box – overall and fixing dimensions

Leak Detection Sensors

Mag Sump Sensor

NOTE Make sure there is no liquid present in the pan/sump before installing sensor

The sensor must rest in the lowest point of the pan or sump and completely compress the position indicator to avoid causing a 'Sensor Out' alarm (see Figure 13).

The sensor should be mounted such that you can pull the sensor straight out of the pan/sump if service is required.

Access wells are recommended for dispenser sumps and other similar situations where access to the sensor may be restricted.

NOTE Customers should note that the use of access wells reduces maintenance times and consequently site downtime. Ducting entry points to all containment sumps and monitoring wells must be sealed *after system testing* to prevent both the escape of either hydrocarbon vapour or liquid and to prevent the ingress of water.

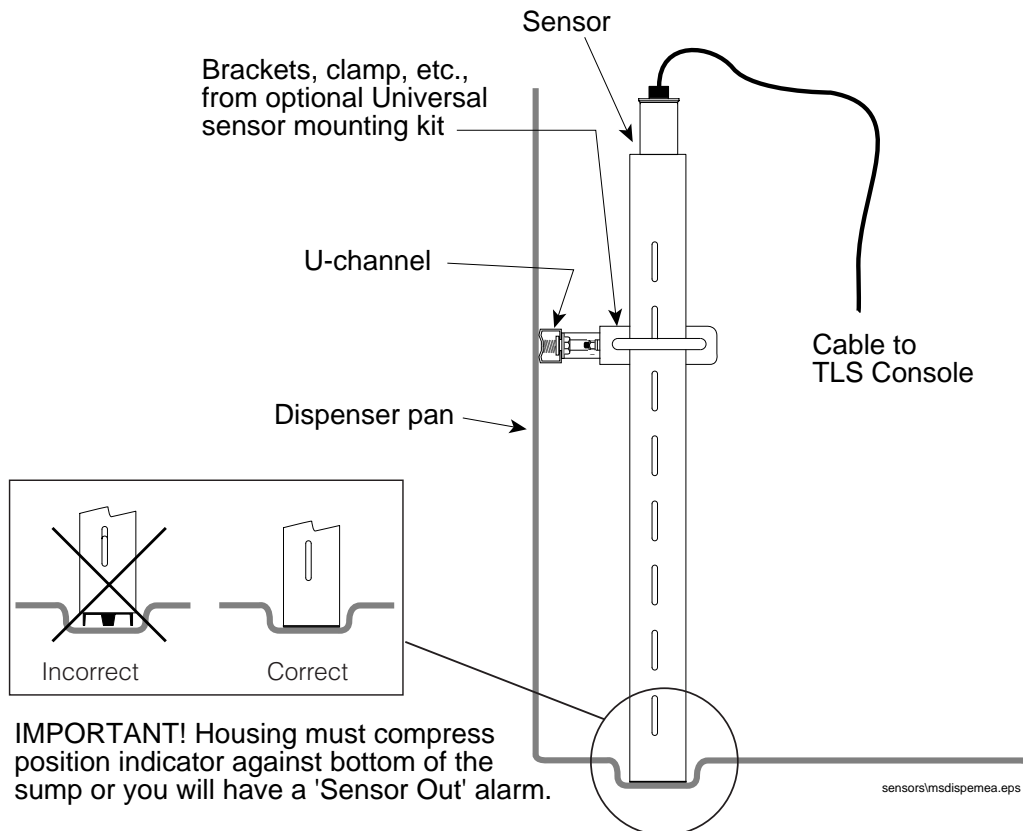


Figure 13. Example installation of Mag Sump sensor

Interceptor Sensors

The interceptor sensor is intended primarily for interceptor manufacturers to incorporate into their product during manufacture and is designed specifically for interceptors that use a coalescing filter, rather than older, multi compartment types. It should be verified with the manufacturer that the sensor is compatible with the interceptor it is required to monitor. The sensor must be mounted in a position that allows easy access to Veeder-Root approved installation and service engineers. Contact Veeder-Root Technical Support if more information is required.

Ducting entry points to all interceptor traps must be sealed *after system testing* to prevent both the escape of either hydrocarbon vapour or liquid and to prevent the ingress of water.

Twin Wall Piping Sensors

A sump of no less than 50 mm internal diameter must be provided at the lowest point of the outer pipe. The sump must be constructed so that any liquid in the pipe interstice will flow directly to the sump. Figure 14 shows an example fabricated from standard pipe fittings. The sump riser must provide an external 2-inch BSP thread for the fitting of a Veeder-Root gland cap.

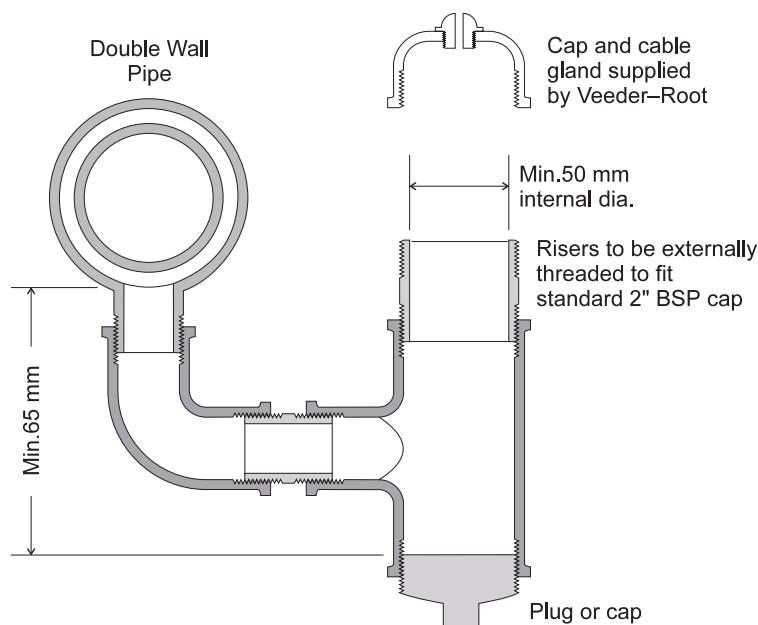


Figure 14. Example of a double wall piping sensor sump

MicroSensor

The V-R MicroSensor uses solid-state technology to detect liquids in small, hard to reach locations such as the interstice of steel tank's contained riser or in its annular space.

NOTE Make sure there is no liquid present in the interstice before installing sensor to avoid causing an alarm.

CONTAINED RISER

When used as a contained riser sensor, it fits in the 5/8-inch (16 mm) interstice space between the 4- and 6-inch (102 mm and 152 mm) riser (see Figure 15).

Install the sensor in the ducting by pushing the cable until it cannot be pushed any further - you should be able to feel the sensor contact the bottom of the riser. To function correctly, the sensor must rest as close as possible to the bottom of the riser.

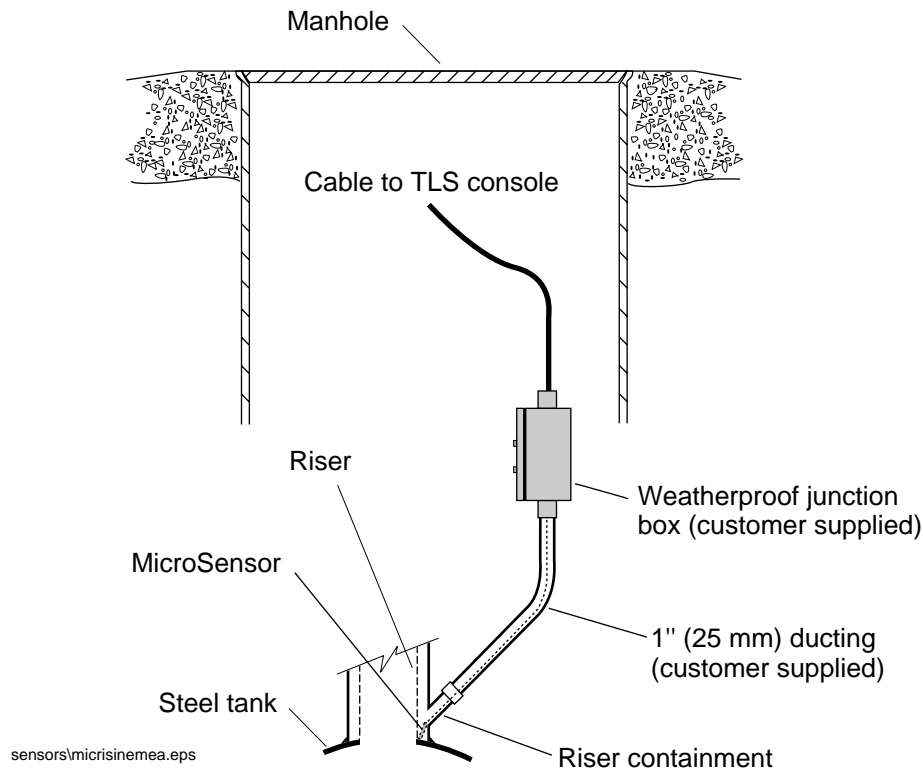


Figure 15. Example of a MicroSensor installed in contained riser of a steel tank

ANNULAR SPACE

When used as a steel tank interstitial monitor, it fits in risers as small as 1-inch (25.4 mm) diameter (see Figure 15).

To be sure the sensor will reach the bottom of the annular space, first measure and record the distance from the bottom of the tank to the top of the sensor riser pipe (see Distance A in Figure 16).

Screw the reducer tightly onto the riser and stick a piece of tape at the bottom edge of the reducer to mark the how far down the reducer goes onto the riser pipe. Remove the reducer and measure and record the distance from the top of the pipe down to the tape mark (Distance B).

Remove the reducer and screw a cord grip from the kit into the top of the reducer. Measure the distance from the top of the cord grip to the end of the reducer (Distance C).

Subtract Distance C from Distance B. Add that number to Distance A (Distance A+). Lay the MicroSensor on a flat surface and measure from the end of the sensor up the cable Distance A+ and mark this point on the cable.

Insert the sensor into the tank riser until it rests on the bottom of the tank. Loosen the cord grip in the top of the reducer and slide the reducer down over the sensor cable and tighten the reducer (down to the previously taped mark on the riser pipe). Raise/lower the sensor cable until the mark is just beneath the top of the cord grip (the sensor should now be resting on the tank bottom). Tighten the cord grip.

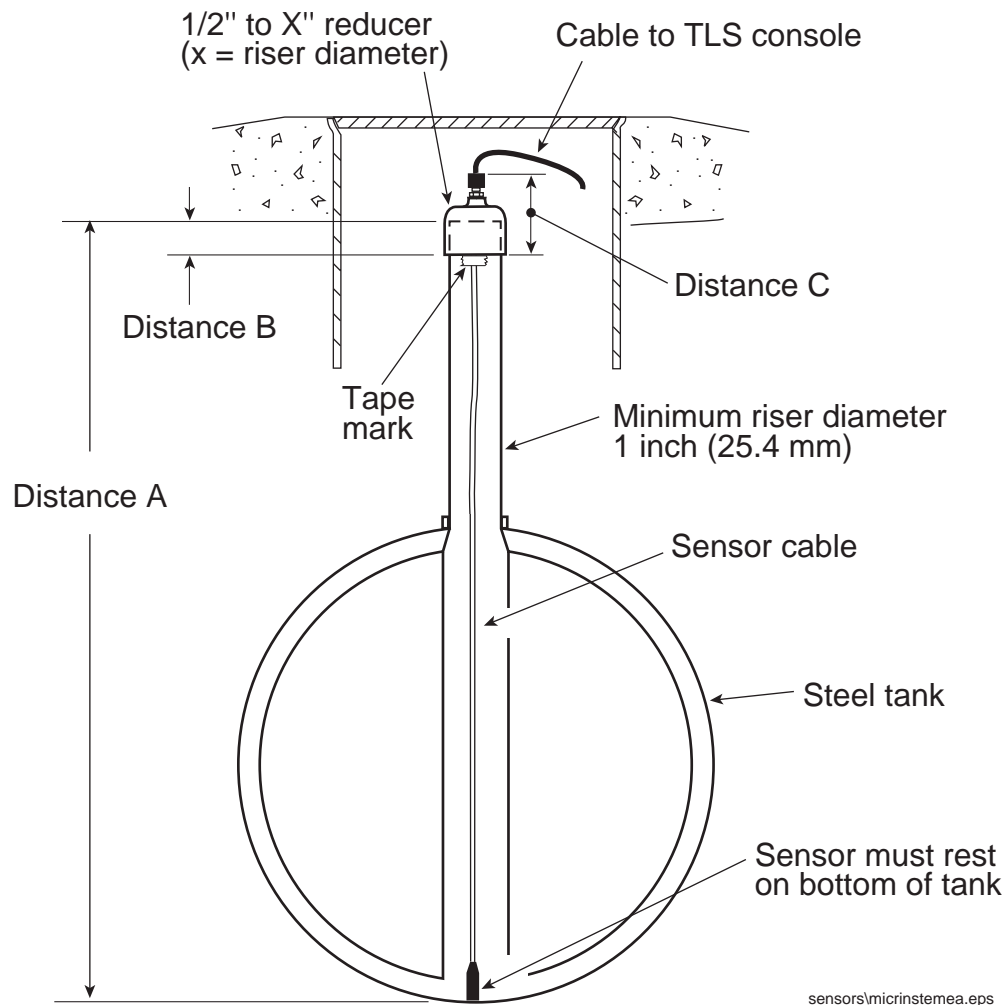


Figure 16. Example of a MicroSensor installed in a steel tank's interstitial space

Discriminating Interstitial Sensors

Do not install sensor if liquid is present in the annular space or an alarm will occur. Follow the installation manual procedure to ensure that the sensor is oriented correctly and that the sensor is positioned in the lowest point of the interstice.

Measure the length of riser pipe as shown in Figure 17.

Locate the label on the sensor cable that corresponds to the tank size. Add the riser pipe length determined above (measuring away from the sensor) to tank size mark and mark this position on the cable with a tie wrap from the kit.

Attach a pull cord to the eyelet in the sensor and after confirming correct orientation of sensor (ref. inset in Figure 17), pull the sensor through the interstitial space of the tank until the tie-wrapped mark is even with the top of the riser pipe.

Put a cord grip fitting from the kit in the top of the riser cap and pass the end of the sensor cable through the riser cap and loosened cord grip. Screw the riser cap snugly onto the riser pipe and tighten the cord grip.

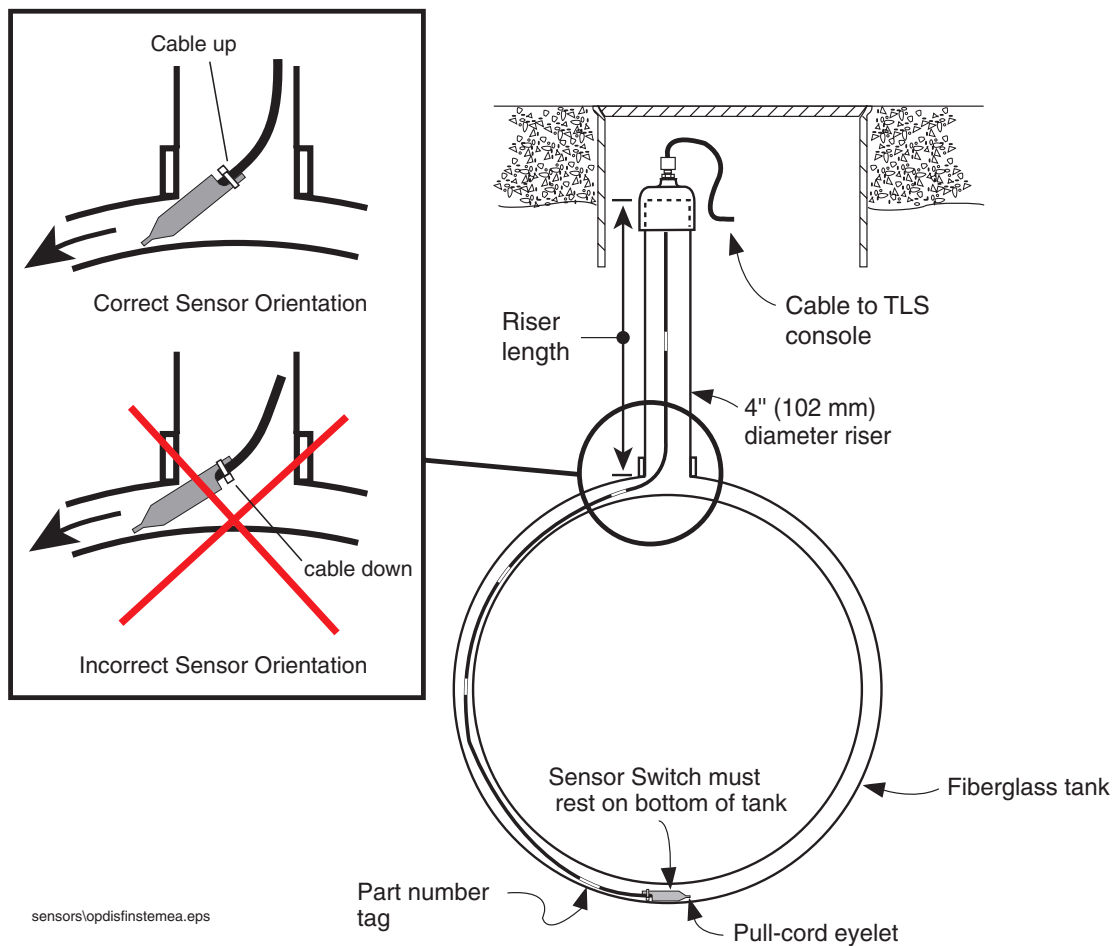


Figure 17. Example of a Discriminating Interstitial Sensor installed in a fiberglass tank

Monitoring Wells

To ensure the maximum efficiency of Veeder–Root Groundwater and Vapour Sensors Veeder–Root strongly recommend that wells for the installation of vapour or groundwater sensors are constructed in accordance with the following specifications.

All materials are proprietary items and are readily available.

NOTE These are recommendations only. Contractors should ensure that all wells conform to all regulations and codes of practice in force for the installation locality.

All monitoring wells should extend to 1000 mm below the level of the lowest tank or to pipework system (see Figure 18).

The well must be capped and protected from traffic with a suitable access chamber and cover. The top of the chamber should be raised slightly above the general forecourt surface to prevent standing water accumulating on the cover. The cover must offer limited access and should be clearly marked to avoid confusion with other openings.

All wells must be cased with factory drilled or slotted PVC, galvanised, or coated metallic pipe 100 mm internal diameter with 0.5 mm maximum width openings. The openings must extend from the bottom of the well to within 600 mm of the surface.

Blank 100 mm diameter well casing should extend to between 300 mm and 100 mm of the surface. The well casing must be capped at the bottom.

Permeable backfill material with a minimum grain size of 7 mm should be used to the top of the perforated area; above this, extending to the access chamber, an impermeable barrier must be provided to prevent the ingress of surface water.

Ducting entry points to all monitoring wells must be sealed to prevent the ingress of water and hydrocarbon vapour *after system testing*.

GROUNDWATER SENSORS

Groundwater monitoring wells should extend to at least 1.5 metres below the mean water table, to a maximum depth of 6 metres. Veeder–Root Groundwater Sensors should be installed only in wet wells where testing has determined that water in the well is not contaminated beyond acceptable limits. A Groundwater Sensor must not be installed in wells where preliminary testing indicates that a hydrocarbon film on the surface of the groundwater water exceeds 0.75 mm (0.030 inch) or where the water table may fall below the bottom of the well.

Figure 18 shows an example installation of a groundwater sensor.

VAPOUR SENSORS

Veeder–Root Vapour Sensors should be installed only in wells where testing has determined that the soil is not contaminated beyond acceptable limits as determined by local codes.

A Vapour Sensor should **not** be installed in wells at sites which have suffered from either a spill or other source of contamination, or where the sensor may become submerged in groundwater.

NOTE Veeder–Root vapour sensors should not be operated in monitoring wells where the initial vapour sensor resistance exceeds 25 kohms. Where contamination is suspected contact your Veeder–Root Account Administrator at the address on the inside front cover.

Figure 18 shows an example installation of a vapour sensor.

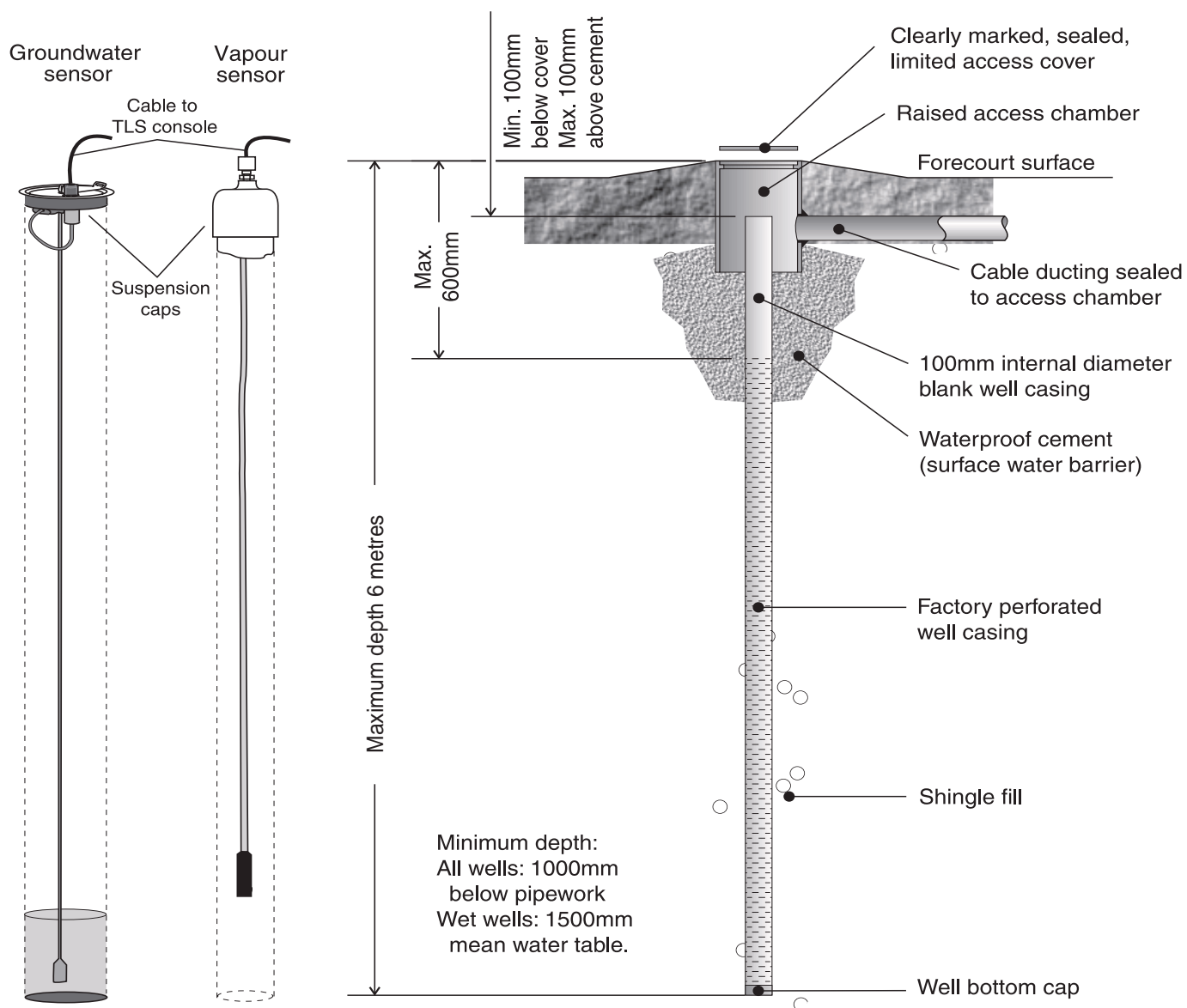


Figure 18. Cross section through a typical monitoring well with sensor installation examples

PLLD Transducers

Figure 19 shows an example Pressurized Line Leak Detector (PLLD) transducer installation in a submersible turbine pump (STP).

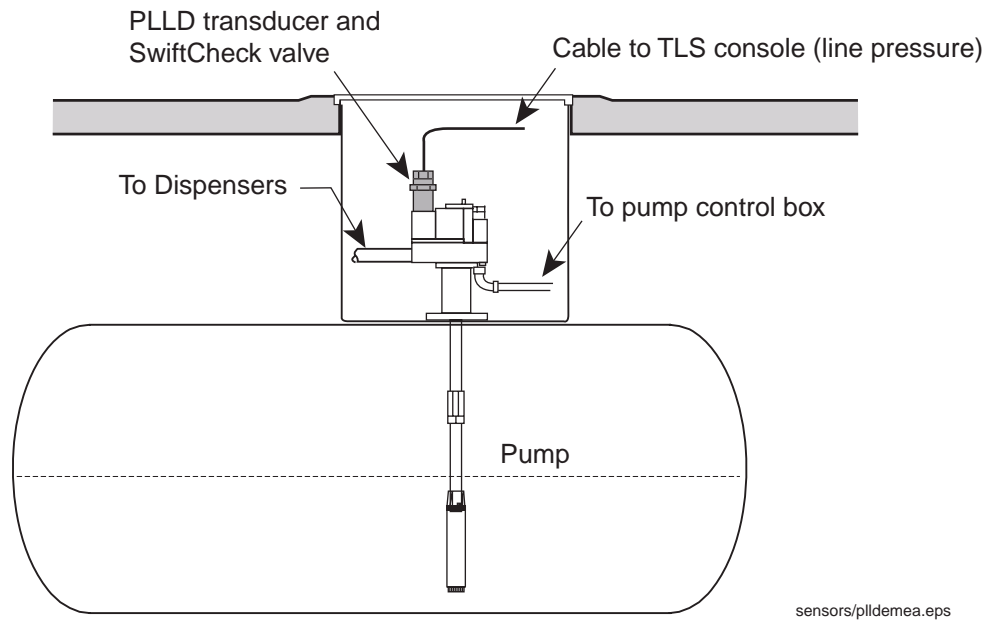


Figure 19. Example PLLD installation

Wiring

Field Cable Ducting



Explosion could occur if other wires share ducts with intrinsically safe circuits. Ducting from probes or sensors must not contain any other wiring. Failure to comply with this warning could result in explosion, death, serious personal injury, property loss or equipment damage.

NOTE Improper system operation could result in inaccurate inventory control or undetected potential environmental and health hazards if probe to console wire runs exceed 240 metres (or 100 m for type 8473 probes).

Minimum diameters for probe and sensor ducting are:

- Up to 20 cables -100 mm diameter
- Up to 50 cables -150 mm diameter

Run suitable diameter ducting from all probe and sensor locations to the console location. Ducting entry points to all containment sumps and monitoring wells must be sealed to prevent the escape of hydrocarbon vapour and liquid and to prevent the ingress of water.

Ducting plans must be designed to suit local site requirements and must conform to all local, national, EC and industry standards and regulations.

NOTE For multiple tank gauge installations, probe and sensor wiring from different tank gauges must be contained in separate ducts. Doing so is a direct violation of the intrinsically safe approval for this system and is not allowed.

Improper system operation will result if sensor and probe wiring from more than one gauge is contained in a common duct.

Unless specified otherwise, draw pits should be sited at 10 metre intervals or where acute ducting angles are unavoidable.

Ensure that all ducting is equipped with cable pull through ropes and that all visible ducting is properly fixed and finished off in a neat and tidy state.

Power Requirements

Console power should come from a dedicated circuit via a fused, switched, neon indication spur within one metre of the console position.

For each external device, such as a forecourt alarm, requiring a 240 Vac supply, a separate switched, neon indication spur fused to the correct rating must be supplied.

From an independent 24-hour supply at the distribution panel, run three 2.5 mm² (minimum) standard colour coded wires, live, neutral and earth, to the fused spur.

Run one 4 mm² wire, colour coded green/yellow, from the earth bus bar at the distribution panel direct to the Console location. Leave at least 1 metre of free cable for connection to the console

Equipment Connected to the RS-232 Port

(Level 1 Installation Only)

Any equipment such as a pump controller or point-of-sale terminal connected to the RS-232 port must meet the following criteria:

- The equipment must have an EIA standard RS-232C or RS-232D communications protocol.
- The equipment must *NOT* be installed over or in a hazardous location

The RS-232 Interface can be used for direct local attachment of terminals if the cable run is no more than 15 metres. Veeder-Root do not guarantee proper equipment operation if RS-232 cable runs exceed 15 metres.

NOTE RS-232 cable runs longer than 15 meters could result in data errors.

Run cable from the peripheral equipment location to the system console location. At least 1 metre of free cable must be left for subsequent connection at both ends.

External Inputs (TLS-3XX only w/ I/O Option)

(Level 1 Installation Only)

TLS systems can accept inputs (either normally closed or normally open) from an external non-intrinsically safe switch.



Intrinsically safe equipment must not be connected to TLS system external input modules. Failure to comply with this warning could result in explosion, death, serious personal injury, property loss or equipment damage.

Wiring from external devices to the system console input connector must be two-core, 2 mm² shielded cable. Run cable from the external device to the system console location. At least 2 metres of free cable must be left for subsequent connection.

Output Relays

Output Relay Contact, resistive load, 240 Vac, 2 A max. (or 24 Vdc, 2 A max.).



Do not connect output relays to systems or devices that draw more than 2 amperes.

NOTE Alarm relays remain activated for the duration of the alarm condition. They may be used to shutdown pumps during leak, low level or high water conditions. Alarm relays cannot actuate flow control devices.

Wiring from external alarms to the TLS console relay output connector to be standard colour coded three core 2 mm² cable.

Run cable from the external alarm to the system console location. At least 1 metre of free cable must be left for subsequent connection.

NOTE External alarms cannot be powered from a TLS console. A separate fused power supply must be provided.

TLS High Level Alarm

The TLS High Level Alarm can be supplied to site before installation of the TLS system components if required. Contact your Veeder–Root representative if you have special delivery requirement.

The TLS High Level Alarm is 240 Vac powered and requires a dedicated supply via a switched 5 A fused neon indication spur within 1 metre of the system console. (See Figure 9 on page 15.)

The TLS High Level Alarm must be located outside any hazardous area as defined by IEC EN 60079-10 Classification of Hazardous Areas. The chosen location and the attendant cable specification must comply with all EC, national and local regulations.

NOTE Customers and contractors are strongly advised to check with the local licensing authority before finalizing the alarm location and cabling.

Cable Specifications



The cable type tables listed form part of the individual system ATEX approval. Substitution of cable may impair intrinsic safety and may invalidate system approval. See accompanying descriptive system documents and/or Appendix A for cable restrictions.

All specifications are in free air at +30°C:

Table 3. Probe Cable Specification (V-R P/N 222–001–0029) - Maximum of 305 metres per probe

Number of Cores	2
Conductors	Bare copper, 24/0.20mm, diameter 1.1 mm
Insulation	PVC R2 to CEI 20-11, colour black 1/black 2, radial thickness 0.54mm, twisting 1 x 2, lay pitch 76mm
Shielding	Aluminium polyester tape, tinned copper drain wire 7/0.30mm
Sheath	PVC RZ FR hydrocarbon resistant, colour blue, radial thickness 0.80mm
Diameter	6.10mm
Conductor Resistance	25 ohm/km
Drain Wire Resistance	15 ohm/km
Capacitance	0.14 μ F/km (140 pF/m)
Inductance	0.65 mH/km (0.65 μ H/m)
LR Ratio	17 μ H/ohm
Insulation Resistance	1050 Mohm/km
Voltage Core to Core	500
Voltage Core to Screen	500
Voltage Earth to Screen	500
Voltage Test	1kV/1 minute
Standard	IEC 227-74

Table 4. Sensor Cable Specification (V-R P/N 222–001–0030) - Maximum of 305 metres per sensor

Number of Cores	3
Conductors	Bare copper, 24/0.20mm, diameter 1.1mm
Insulation	PVC R2 to CEI 20-11, colour black 1/black 2/black 3, radial thickness 0.54mm, twisting 1x 32, lay pitch 76mm
Shielding	Aluminium polyester tape, tinned copper drain wire 7/0.30mm
Sheath	PVC RZ FR hydrocarbon resistant, colour blue, radial thickness 0.80mm
Diameter	6.380mm
Conductor Resistance	25 ohm/km
Drain Wire Resistance	15 ohm/km
Capacitance	0.13 μ F/km (130 pF/m)
Inductance	0.65 mH/km (0.65 μ H/m)
LR Ratio	17 μ H/ohm
Insulation Resistance	1400 Mohm/km
Voltage Core to Core	500
Voltage Core to Screen	500
Voltage Earth to Screen	500
Voltage Test	1kV/1 minute
Standard	IEC 227-74

Table 5. Data Transmission Cable Specification (V-R P/N 4034-0147)

Cable Type	2 x twisted pair, PVC insulated, foil wrapped, common drain
Conductor Stranding	7/0.25mm
Characteristic Impedance	58 ohms
Capacitance	203 pF per metre
Attenuation	5.6 dB per 100 m
Operating Temp. Range	–30°C to +70°C
Insulation	PVC
Sheath	Polyethylene
Sheath Colour	Grey
Core Colours	Black, red, green, white
Nominal Outside Diameter	4.2 mm
Recommended UK Supplier:	RS Components Ltd., Stock number (500metre drum) 368–312

Table 6. Screened Multicore Cable - TLS Terminal Box to Console (V-R P/N 328471-003)

Cable Type	Screened Multicore
Number of cores	18
Conductor Stranding	16/0.2 mm
Current Carrying Capacity	2.5 A per core
Resistance	40 ohms/km
Max. Working Voltage	440 V r.m.s.
Screen	copper braided
Core/Screen Capacitance	200 pF/m (nominal)
Insulation	0.45 mm PVC
Sheath	PVC
Sheath Colour	Grey
Core Colours	Red, blue, green, yellow, white, black, brown, violet, orange, pink, turquoise, grey, red/blue, green/red, yellow/red, white/red, red/black, red/brown
Nominal Outside Diameter	12.0 mm
Recommended UK Supplier:	RS Components Limited, Corby, Part No. 367-785

Field Wiring

PROBE TO TLS CONSOLE

Pull appropriate cable from the each probe/sensor location to the TLS console.



Explosion could occur if other, non-intrinsically safe wires share TLS intrinsically safe wire conduits or wiring troughs. Conduits and wiring troughs from probes and sensors to the console must not contain any other wires.

NOTE At least 2 metres of free cable must be left for connection at both the TLS console and the probe locations.

Ensure that **all** cables are correctly identified. All probe field wiring **must** be legibly and permanently labelled with the tank number.

NOTE Failure to correctly mark probe field wiring may lead to re-work, delays in system installation and additional charges.

MAXIMUM CABLE LENGTHS

A maximum of 305 metres of cable length per sensor or probe must be observed. Details for total allowance per system are given in Appendix A.

DUCTING ENTRY TO SYSTEM CONSOLE LOCATION

Connection to the TLS console may only be made by a Veeder-Root authorised engineer.

The cable route from the ducting entry to the system console must be clearly defined and all necessary preliminary work undertaken. All necessary holes must be drilled through walls, counters, etc.; cable trays fitted, ducting with draw cords installed and adequate access for the installation of the cable provided.

RELAY OUTPUT WIRING

TLS console relays may be connected to external systems or devices provided that they do not draw more than 2 amperes.

NOTE Connection to the TLS console may only be made by a Veeder-Root authorised engineer.

Connection to pump contactors should be made using a multicore cable rated for 240 Vac at a maximum of 2 amperes and suitable for the intended cable route. At least 1 metre of free cable must be left for subsequent connection to the system console.

NOTE Alarm relays remain activated for the duration of the alarm condition. They may be used to shutdown pumps during leak, low level or high water conditions. Alarm Relays cannot actuate flow control devices.

Appendix A - Assessment Documents

This appendix includes assessment documents for intrinsically safe systems installed in Group IIA locations, type protection “i”.

Certification Description

SPECIAL CONDITIONS FOR SAFE USE

The devices must be installed as part of the intrinsic safety system as defined in the descriptive system documents, included with this certificate.

A risk analysis must be performed to determine if the installation location is susceptible to lightning or other electric surges. If necessary, protection against lightning and other electrical surges must be provided in accordance with EN 60079-25:2004.

Intrinsically Safe TLS Tank Gauge System

EC Type Examination Certificate Number: **DEMKO 06 ATEX 137480X**

Each Intrinsically System is comprised of a combination of Associated Apparatus and Intrinsically Safe Devices described in their respective EC Type Examination Certificates. The descriptive system documents include references to simple apparatus. Simple apparatus used with these systems must not contain any inductance or capacitance and must also comply with all requirements indicated in the system descriptive document.

Installation requirements for TLS Systems appear in the Descriptive System Documents listed below.

<u>Associated Apparatus</u>	<u>Document Number</u>
TLS-350R or TLS-350 Plus	331940-001
TLS-300	331940-002
TLS-50 or TLS2 or TLS-IB	331940-003
Tank Gauge Accessories	331940-005

Associated Apparatus - Non-Hazardous Area

CONDITIONS FOR SAFE USE THAT APPLY TO ASSOCIATED APPARATUS

Cable and wiring used to connect the Associated Apparatus to the Intrinsically Safe Devices, shall have a maximum L/R ratio of 200 $\mu\text{H}/\text{ohm}$.

The acceptable operating temperature range for the Associated Apparatus is: $0^{\circ}\text{C} \leq T_a \leq 40^{\circ}\text{C}$.

The maximum source voltage for the associated apparatus is: $U_m = 250\text{V}$.

These Apparatus comply with the electrical dielectric strength test as stated in Clause 6.4.12 of EN 50020, Electrical Apparatus for Potentially Explosive Atmospheres.

The values for C_o and L_o are the aggregate sum of all terminals when these devices are used in installations that do not follow the System Descriptive Documents specified in 06 ATEX 137480X. Based on compliance with EN 60079-25:2004 the values for C_o and L_o do not apply when these devices are installed in accordance with the System Descriptive Documents specified in 06 ATEX 137480X.

This device must be installed as part of the intrinsic safety system defined in DEMKO 06 ATEX 137480X. The descriptive system documents included with the aforementioned certificate must be followed during installation.

The maximum cable length between an associated apparatus and an intrinsically safe sensor is 305 metres. The maximum cable length between associated apparatus, e.g., a TLS RF console and any other ATG, is 25 metres.

To ensure safe operation, all covers must be secured in place in both the intrinsically safe and unspecified circuit field wiring compartments on the TLS-350, TLS-350R, TLS-300, TLS-50, TLS2, TLS-IB, and TLS RF consoles.

All Modules and/or module covers must be secured in place in both the intrinsically safe and unspecified circuit field wiring compartments to ensure safe operation of the TLS-350 and TLS-350R consoles.

Electrical Data Table for Associated Apparatus

Console Description	EC Type Examination Certificate Numbers	Data Per TLS Console			Total Per TLS System		
		U_o volts	I_o amps	P_o watts	L_o mH	C_o μF	Maximum Cable Capacitance and Length
TLS-350 Plus 8470 TLS-350R 8482	DEMKO 06 ATEX 137481X	12.6	0.196	0.62	3.70	13.5	5.0 μF 15240 Metres
TLS-300 8485	DEMKO 06 ATEX 137484X	12.6	0.194	0.62	3.70	13.5	3.2 μF 9753 Metres
TLS-50 8469 TLS2 8560 TLS-IB 8466	DEMKO 06 ATEX 137485X	12.6	0.189	0.60	3.70	13.5	0.8 μF 2438 Metres
TLS RF Console 8580	DEMKO 06 ATEX 137478X IECEx UL 06.0003X	0	0	0	3.70	13.5	0.1 μF 305 Metres

Intrinsically Safe Apparatus

CONDITIONS FOR SAFE USE THAT APPLY TO INTRINSICALLY SAFE APPARATUS

The acceptable operating temperature range for the Intrinsically Safe Devices is: $-40^{\circ}\text{C} \leq T_a \leq 60^{\circ}\text{C}$. The temperature classification for the Intrinsically Safe Devices is T4.

These Intrinsically Safe Devices comply with the electrical dielectric strength test as stated in Clause 6.4.12 of EN 50020, Electrical Apparatus for Potentially Explosive Atmospheres.

This device must be installed as part of the intrinsic safety system defined in DEMKO 06 ATEX 137480X. The descriptive system documents included with the aforementioned certificate must be followed during installation.

Input Electrical Data Table for Intrinsically Safe Devices

Product Description	EC Type Examination Certificate Numbers	Ui volts	Ii amps	Pi watts	Li mH	Ci μF	Additional Conditions
Mag Plus Probe 8462, 8463, 8563	DEMKO 06 ATEX 0508841X IECEX UL 06.0001X	12.6	0.196	0.62	2.83	1.22	2, 3
Mag Sump Sensor 8570	DEMKO 06 ATEX 0508841X IECEX UL 06.0001X	12.6	0.196	0.62	2.83	1.22	1, 2, 3
PLLD Line Leak 8484	DEMKO 06 ATEX 137486X	12.6	0.196	0.62	0	2.24	2, 3
Discriminating Sensor 794360-343	DEMKO 06 ATEX 137479X	12.6	0.196	0.62	0	2.24	
Micro-Sensor 794360-344	DEMKO 06 ATEX 137479X	12.6	0.196	0.62	0	2.24	
TLS Radio Transmitter Inputs 332235	DEMKO 06 ATEX 137478X IECEX UL 06.0003X	5.40	1.29	1.20	0.287	12076	

Output Electrical Data Table for Intrinsically Safe Devices

Product Description	EC Type Examination Certificate Numbers	Uo volts	Io amps	Po watts	Lo mH	Co μF	Additional Conditions
TLS Radio Transmitter Outputs 332235	DEMKO 06 ATEX 137478X IECEX UL 06.0003X	9.60	0.19	0.42	3.70	13.5	1, 4, 5
Battery Pack Outputs 332425	DEMKO 06 ATEX 137478X IECEX UL 06.0003X	3.70	1.29	1.20	0.287	12076	1, 4, 5

Explanation of Additional Conditions:

- Before installing or taking into a hazardous area, earth the unit in a SAFE AREA to remove any static charge. Then immediately transport the unit to the installation site; do not rub or clean the unit prior to installation. Cleaning is not required under normal service conditions; do not rub or clean the device after installation. If the unit is not fixed to a known earth point when installed, ensure that a separate earth connection is made to prevent the potential of static discharge. When fitting or removing the unit, use of anti-static footwear and clothing is required.
- This device is not intended to be installed across a boundary wall.
- Enclosure contains aluminum. Care must be taken to avoid ignition hazards due to impact or friction
- Non serviceable, fixed device. Must be carried in and out of hazardous location as an assembly.
- Maximum cable length between the radio transmitter and battery pack shall not exceed 7.62 m (25 feet).

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