

**INSTALLATION
MANUAL
for
MODEL 6290
TANK GAUGING SYSTEM**

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1 INTRODUCTION

The Model 6290 (M6290) Tank Gauging System monitors the level, temperature, and density of the cryogenic liquid in a large storage tank. It consists of two primary units, namely 1) the tank mounted mechanical drive system and its associated controller, and 2) an electronics interface assembly designed for mounting in a control room environment. Optionally, a PC based operator interface may also be installed in the control room. The field wiring connecting these units is primarily for serial communication between the units. The power sources for the different assemblies are independent and are connected according to site-specific conditions.

The first two sections of this manual correspond to the two primary assemblies to be installed, while the third section is on the field wiring that connects the assemblies. A fourth section provides information on upgrading an existing Model 6280 system to a Model 6290. The assemblies may be installed independent of each other according to conditions on site. The mechanical drive unit with its associated controller may be tested independent of the control room electronics and before field wiring is completed, provided power is available at the tank top. The control room electronics may not be fully tested until both the mechanical unit and field wiring are completely installed.

A site-specific mechanical installation drawing and a site-specific field wiring diagram may be provided with this manual. Additional standard documents are provided for clarification of details where necessary. These documents provide all information necessary to install the entire system.

Power-up, system testing, and final calibration are normally accomplished during commissioning activities at a later time and with the presence of a factory representative. A separate manual provides details of these activities.

2 INSTALLATION OF TANK TOP COMPONENTS

The drive mechanism must be installed on the exterior roof of the tank and aligned with its associated probe enclosure, pinch valve and isolation valve assembly, such that the probe assembly can move vertically in an unrestricted manner from the drive mechanism all the way to the bottom of the tank. The individual and combined weight of these assemblies, together with less than ideal working conditions and limited access space of the top of a typical liquid storage tank, necessitates that possible installation errors be eliminated before they can occur. This entails a well worked-up installation plan that assures coordination between all installation personnel at all times. To provide for maximum safety of personnel, it is strongly recommended that the work platform shown in the reference drawing be completed prior to installation of the equipment.

2.1 INTERNAL TANK REQUIREMENTS

The M6290 system may be installed in a tank without a stilling well. Obviously the probe area should be clear from other equipment and away from any pumps or filling lines that would produce high liquid flow or turbulence. Specific details on recommended distances are available from the factory. If a stilling well is used, it must be plumb to ensure that the probe does not drag on the side. If the probe drags due to a stilling well that is not vertical, unpredictable operation may occur and the additional stress placed on the drive system may cause premature failure of components.

2.2 MOUNTING MAIN ASSEMBLY & VALVE ASSEMBLY

REF: Drawing 040-271 (This drawing may be identified with a site specific number, i.e. 040-271-xx.)

The probe enclosure containing the probe (packed in foam) is already secured to the main housing base plate.

NOTE: This packing must be removed later in the procedure.

- Place a ring gasket on the tank isolation valve.
- Mount the transition piece/pinch valve assembly onto the isolation valve and secure. The size and quantity of mounting bolts will vary with the size of the valve used. Orient the valve for maximum clearance on the platform.
- Hoist the mechanical drive assembly and position above the pinch valve.
- **REMOVE THE PROBE PACKING MATERIAL NOW.**
- Lower the assembly and align the probe enclosure over the pinch valve. The buna sleeve inside the pinch valve is the gasket between the valve and the probe enclosure. There are 8 $\frac{3}{4}$ -10x3" stainless steel bolts and washers

provided to attach the pinch valve; a 1 1/8" wrench is required to tighten the bolts.

2.3 ATTACHING SUPPORT LEGS

The main weight of the unit is born by the probe enclosure assembly/pinch valve that is attached to the tank isolation valve. In addition, there are three support legs that are provided to give the mechanical unit stability and more evenly distribute the weight.

- Attach the three leg supports to the base plate of the mechanical unit using the 1/4-20 x 3/4" hardware provided. This bolt requires a 7/16" wrench.
- Slide the leg inside this support and tighten the setscrews using a 3/16" hex wrench.
- With the sliding leg extended to rest on a stable position, secure the leg by tightening the adjustable clamp.
- Using the leveling screws in the bottom of the legs, adjust the length of the legs until the base plate is level and the weight is evenly distributed.

2.4 BENCHMARK

In order to verify the level scaling during commissioning for accurate level measurement, a known benchmark must be established after the mechanical unit is installed. The method of obtaining this measurement will vary depending on site conditions.

The most common method of establishing this benchmark is to physically measure the distance from the tank floor to a marked position on the mechanical unit. The preferred point is a position midpoint on the probe enclosure window. This allows the probe to be driven to this point by observing the probe position in the window. It is convenient to mark a position that is in even numbers (such as 41.100 meters). Once this position is marked, it should be scribed on the probe enclosure in a permanent manner.

While the M6290 system is calibrated at the factory, the only way this calibration can be verified in the field is with such a benchmark. For this calibration check to be of value, the position of the benchmark must be established with as great an accuracy as possible.

3 CONTROL ROOM EQUIPMENT INSTALLATION

REF: Drawing 050-235 (This drawing may also be identified with a site specific number, i.e. 050-235-xx.)

The control room equipment consists of the Tank Gauge Interface Module and the optional PC based User Interface. These may or may not be installed in the same location, depending on site requirements. Both are intended to be installed in a standard electronics control room atmosphere. The location of the equipment depends on the individual customer requirements. The Tank Gauge Interface may be installed in a remote unattended equipment room if desired, but the PC based User Interface should be installed in the main control room for ease of access to the operators.

3.1 TANK GAUGE INTERFACE MODULE

REF: Drawing 025-093 (This drawing may also be identified with a site specific number, i.e. 025-093-xx.)

The Tank Gauge Interface Module (TGIM) is a single printed circuit card mounted in a wiring termination block. One TGIM is required for each mechanical unit installed on the site. The termination block is in turn mounted on a standard DIN rail. This configuration allows for site-specific variations according to the number of tanks and control room variations. In its simplest form, a single card block may be mounted in a wiring termination cabinet with other equipment wiring. The field wiring is then terminated at that point, and wiring to the host DCS or the optional PC based Operator Interface is also connected to this point. In this configuration, 19" panel rack space is not required. The Hand Held PC unit plugs into the front of the TGIM when it is being used for system configuration or faultfinding.

A second method of mounting the TGIM requires standard 19" panel rack space. The TGIM together with RS485 repeaters (where required) are mounted to a DIN rail inside a chassis. Since there is a power switch mounted on the front of the TGIM, a security door is provided to prevent inadvertent access by unauthorized personnel.

In both of the above configurations, easy access should be possible to the front of the TGIM. This is not only for initial system configuration, but also for routine maintenance. Other than that, the individual TGIM or the 19" rack unit may be mounted in any convenient location. The reference drawing above details the mounting configuration on a site-specific basis.

3.2 PC BASED USER INTERFACE

The user interface on many installations is the site Distributed Control System (DCS). The link between the M6290 and the DCS is an RS485 MODBUS serial data link. The programming on the DCS determines what display and control features are available to the operator. If the DCS operator interface has been designed to give the required information and control, no further operator interface is required.

Some customers require an additional operator interface either as a backup control to the DCS or to provide additional information that has not been programmed on the DCS. In addition, if there is a requirement for relay alarm outputs, they are connected to the PC.

4 SYSTEM WIRING

REF: Drawing 050-235 (This drawing may also be identified with a site specific number, i.e. 050-235-xx.)

4.1 FIELD WIRING

The field wiring connects the gauge on the top of the tank to the Tank Gauge Interface in the control room. These connections consist of communication links and power control. The site-specific wiring diagram shows all details of the connections to be made.

All unused wires and shields should be terminated to ground in the control room only. Proper grounding and shield connections must be made to minimize noise levels on the communication lines.

4.2 TANK TOP CONNECTIONS

All signal wire connections are made to a numbered connector inside the flameproof Control Unit box. Since electronic circuits inside the Control Unit box are not intrinsically safe, the box must therefore be wired in strict accordance with all specifications pertaining to flameproof enclosures. The box cover-mating surface must be coated with a silicon lubricant to provide an environmental seal to protect the enclosed electronics from adverse weather conditions.

5 RETROFIT DETAILS

The information in the previous sections of this procedure is primarily for a new installation. It is possible to upgrade an existing Model 6280 installation to the current Model 6290 LTD system. Specific information for performing this upgrade is provided in the following section. Once this upgrade is completed, the system will be identical to a new Model 6290 installation.

5.1 DOCUMENTATION

A complete Model 6290 system manual that includes a field-wiring diagram is provided for each installation. While this manual documents the current configuration of the Model 6290 system, older mechanical units may vary slightly. The original Model 6280 manual should be retained and consulted for details on the mechanical unit, while the Model 6290 manual should be used for general operation and documentation of the electronics unit.

NOTE: A complete spare parts list with a drawing showing the location of all spare parts is provided with this manual. Depending on the configuration of the original Model 6280, there may be some differences between this list and the parts related to the mechanical unit. Of particular note are the probe assembly, drive cable, and density meter. When ordering spare parts, be sure to check the original Model 6280 manual for the correct part number.

5.2 MECHANICAL

The control unit and drive assembly (if required) must first be mounted to the mechanical unit as follows.

5.2.1 Preparation

Prepare the system for installing the upgrade by following the access procedures outlined in section 6 of the Calibration and Corrective Maintenance Manual (090-251). In particular, the first sections detail safety procedures, raising the probe into the probe enclosure, and removal of the drive cover.

5.2.2 Drive Assembly

The Model 6290 requires the use of the oil-filled right angle drive assembly. If this unit is already installed, no further modifications are required. If the older mechanical gear assembly is installed, it must be replaced with the new assembly. This assembly is shipped with the upgrade and should be installed as follows:

1. Clamp the take-up reel in position to prevent it from rotating.
2. Disconnect the cable from the drive gear by removing the backup wheel that holds the drive cable against the drive gear.

3. Loosen the setscrews in the coupling just below the gear assembly.
4. Remove the gear train by removing the four (4) gear train mounting bolts and mounting legs.
 - Note: The new gear train includes a new reel feedback switch. However if there is no problem with the original switch, it may be reused and new switch kept as a spare. If the original drive couplings are in good condition they may also be reused or kept as spares.
5. Install the four (4) new mounting legs and tighten bolts. (Refer to drawing 105-111, sheet 4)
6. Install the new upper shaft and drive coupling but do not tighten at this time.
7. Install the new gear train on the mounting legs.
8. Install the long stud that holds the reel feedback switch and tighten the mounting hardware that holds the gear train to the mounting legs.
9. Adjust the reel feedback switch so that it opens and closes as each magnet passes underneath it. Use an ohmmeter to check the operation of the switch.
10. Remove the two (2) shoulder screws, backup wheel, and cable guide.
11. Reinstall the drive cable over the arc plate and into the drive gear.
12. Install the backup wheel and tighten the bolt.
 - Note: The clearance between the backup wheel and the drive cable has been set during assembly at the factory. This clearance (noted on the drive wheel as 0.003" to 0.005") should be verified at this time)
13. Adjust the location of the upper shaft inside the drive coupling and tighten.
14. This completes the installation of the new gear train assembly.

5.2.3 Control Unit

1. Open the cover of the original flameproof enclosure and disconnect all field wiring.
2. Remove the rubber boot covering the two (2) shafts and loosen the drive coupling.

3. Remove the four (4) mounting bolts from the back of the flameproof box and set it aside.
 - Note: Use caution, as the flameproof enclosure is heavy!
4. Set the new control unit onto the mounting brackets and reinstall the four (4) mounting bolts. Do not tighten at this time.
5. The upper and lower drive shafts must be aligned. Adjustment left and right is provided on the back of the flameproof box, and the front to back adjustment is provided using the eight (8) bolts that mount the brackets to the mechanical base plate. By moving the box in the required direction, the two shafts can be perfectly aligned. Alignment will be correct when the drive coupling can easily slide up and down between the shafts. After alignment is complete be sure all bolts are tight.
6. Adjust the location of the drive coupling and tighten.
7. Replace the rubber boot.
8. Inside the mechanical unit is a stainless steel hose going from the bottom of the take-up reel to a fitting on the side of the mechanical unit. This hose was used as a conduit for wiring into the junction box, but it is no longer needed. Using two wrenches remove this hose from the side connection first.
 - Note: Be careful not to disturb the fitting that goes through the side as this provides a pressure tight seal.
9. At the top of the take-up reel inside the center hub is a PC board where the sensor wiring has been terminated. Disconnect the wires on this board that are coming from the external junction box.
10. Attached to the base plate of the mechanical unit is a terminal strip where wiring for the reel feedback switch is connected. Disconnect these wires also.
11. Remove the hose from the base of the take-up reel. This hose will not be reused so it does not matter if the wiring inside is broken.
12. Included with this upgrade is a cap to seal the fitting going through the side of the unit into the junction box. Install this cap and tighten.
13. On the bottom side of the mechanical unit under the take-up reel is an aluminum plate, a stainless steel fitting, and a shaft. First remove the fitting and the shaft, and then unbolt the plate from the mechanical unit. (This plate and associated o-ring will need to be reused)

14. Install the plate just removed onto the fitting at the end of the blue conduit coming from the control unit.
15. Thread the wire from the blue conduit up the center of the take-up reel and bolt the plate (with the o-ring) back into place.
16. Connect the wiring per drawing 050-240. The wires must be cut to the proper length and terminated. Note that all wires except two (2) terminate inside the center hub at the top of the take-up reel. The other two are for the reel feedback switch and connect to the original terminal strip.

5.3 TANK GAUGE INTERFACE MODULE (TGIM)

Instructions for mounting the Tank Gauge Interface Module are given in section 3 above.

5.4 FIELD WIRING

Instructions for completing field wiring are given in Section 4 above. Normally, the original field wiring will be used. The old motor wiring can be used to provide power to the control unit. The old sensor wiring can be used to provide communications from the TGIM to the control unit.

NOTE: The junction box on the end of the mechanical unit is no longer needed. However removing it will cause problems with pressure sealing, so it is recommended that it be left in place.

Once the field wiring has been terminated, the installation is complete. Information needed to check and commission the new system are given in the Commissioning Manual (090-254).