

# MTG

## Multi-Function Tank Gauge

### **Installation, Operation & Maintenance Manual**

Gauging Systems Inc.

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# **Chapter 1 Introduction**

## **General Information**

### **About the Manual**

This manual is your guide to the installation of the **MTG Probe**.

The manual is divided into three parts as follows:

**Part I** Comprised of the introduction, as well as **essential checklists that must be read and checked carefully before proceeding to the next section.**

**Part II** Comprised of three installation chapters - Mechanical, Electrical and Software.

**Part III** Comprised of the Appendices.

### **Where you are in the Manual**

The name of the current chapter is printed at the bottom of each page. To the right of it, the first figure indicates the chapter number and the next one is the page number. As an example, if you look down to the bottom of this page, you will see that you are currently in the Introduction, which is Chapter 1 and you are currently on page 1.

### **IMPORTANT NOTICE**




**The purpose of this document is to provide guidance with respect to technical aspects concerning the installation and use of the MTG Probe.**

**All sales of the MTG Probe will be pursuant and subject to a sales agreement or purchase order which will include the terms of sale including, among other things, restrictions and limitations of the Company's liability and warranties.**

**Document Conventions**

All **Installation** and **System** parts are printed in **bold text** when referred to in the installation procedures. Key elements that appear on your screen, as well as any other important information, are also presented in **bold text**.

The following conventions are used in this manual:

Convention	Description
	This information is important and should be noted.
	This information refers to the only safe method of installation and <i>must be adhered to</i> .
	Access to the current software task is restricted to the specified personnel.


## General Installation Guidelines

The following checklist should be read very carefully.

**You should not proceed with the installation if any part is missing.**

## Installation Parts Checklist


<b>Installation Kit Parts Checklist</b>			
<b>Part Number</b>	<b>Description</b>	<b>Qty</b>	<b>Check</b> 
IK3000-01	IK Base Plate	1	
IK3000-02	Set of 4 Mounting Bolts and Nuts for IK Base Plate	1	
IK3000-03	IK Bottom Static Plate	1	
IK3000-04	Set of 4 Mounting Nuts & Bolts for IK Bottom Static Plate	1	
IK3000-05	Pipe Stand	2	
IK3000-06	Set of 8 Mounting Nuts & Bolts for Pipe Stand	1	
IK3000-07	Set of 8 Mounting Nuts & Bolts for Screw Assembly	1	
IK3000-08	Screw Assembly with Moving Support attached	2	
IK3000-09	Moving Plate	1	
IK3000-10	Set of 4 Support Bolts Moving Plate - secures Moving Plate Support to Moving Plate	1	
IK3000-11	IK Top Static Plate	1	
IK3000-12	Set of 8 Mounting Nuts & Bolts for IK Top Static Plate	1	
IK3000-13	Top Bearing Assembly	2	
IK3000-14	Set of 8 Mounting Nuts & Bolts for Top Bearing Assembly	1	
IK3000-15	Clamp to secure Section Assembly	2	
IK3000-16	Handle for Screw Assembly Drive	2	
IK3000-17	Spacing Sleeve for <b>Optional</b> Chain Drive	2	
IK3000-18	Sprocket for <b>Optional</b> Chain Drive	2	
IK3000-19	Spacer for <b>Optional</b> Chain Drive	2	

<b>Installation Kit Parts Checklist</b>			
<b>Part Number</b>	<b>Description</b>	<b>Qty</b>	<b>Check</b> 
IK3000-20	Fixing Nut for <b>Optional</b> Chain Drive	2	
IK3000-21	Tensioning Device Base for <b>Optional</b> Chain Drive	1	
IK3000-22	Set of Two (2) Mounting Nuts & Bolts for Tensioning Device Base in <b>Optional</b> Chain Drive	1	
IK3000-23	Driving Chain for <b>Optional</b> Chain Drive	2	
IK3000-24	Double Sprocket for <b>Optional</b> Chain Drive	1	
IK3000-25	Set of 2 Mounting Nuts & Bolts for Double sprocket of <b>Optional</b> Chain Drive	1	
IK3000-26	<b>Optional</b> Split Collar for retaining Last Section prior to sealing the tank	1	


### **Tools & Accessories Checklist**

The following checklist should be read very carefully.


**You should not proceed with the installation if any tool or accessory is missing.**

<b>Recommended Installation Tools Checklist for IK 3000 to be supplied by customer.</b>		
<b>Description</b>	<b>Qty</b>	<b>Check</b> 
Spirit Level	1	
Optional Rope (the length of which should be three times that of the height of the tank).	1	
Optional Air Mask - per person on the site - <b><i>for working in dangerous area where fumes may be present.</i></b>	1	
Hard Hat - per person on the site	1	



Pipe Wrench	1	
Set of Standard Wrenches	1	
<sup>15</sup> / <sub>16</sub> " Wrench or Wrench # 24 ISO Metric for 4" Installation Flange	2	
1 <sup>1</sup> / <sub>8</sub> " Wrench or Wrench # 30 ISO Metric for 6" Installation Flange	2	
Screwdriver with Slotted Head. <b>You may NOT use a power driven screwdriver when working in a classified area.</b>	1	
Screwdriver with Philips Head. <b>You may NOT use a power driven screwdriver when working in a classified area.</b>	1	

<b>Accessories Kit Checklist for IK 3000</b>			
<b>Part Number</b>	<b>Description</b>	<b>Qty</b>	<b>Check</b> 
MTG3000-0101	Loctite Sealing Paste	1	
MTG3000-0102	Alcohol Cleaner or Thinners	1	
MTG3000-0103	Multi Purpose Lithium Grease	1	
MTG3000-0104	Cleaning Cloth	1	

**MTG 3000 Mechanical Parts List**

<b>MTG 3000 Mechanical Parts List</b>			
<b>Part Number</b>	<b>Description</b>	<b>Qty</b>	<b>Check</b> 
MTG3000-01	Set of 8 Mounting Nuts and Bolts for Base Flange	1	
MTG3000-02	Flat Sealing Ring	1	
MTG3000-03	Base Flange	1	
MTG3000-04	Optional Zero-Section Spacer for First Section Assembly. This item may be supplied attached to the First Section Assembly.	1	
MTG3000-05	First Section Assembly marked '1' - complete with Sensor Unit and Cables bound together.	1	
MTG3000-06	'O' Ring for each section	No of Sections	




<b>MTG 3000 Mechanical Parts List</b>			
<b>Part Number</b>	<b>Description</b>	<b>Qty</b>	<b>Check</b> 
 <b>Note: Your MTG 3000 might be supplied 'O' Rings already installed on each section.</b>			
MTG3000-07	Additional Section Assembly - supplied with or without Sensor Unit	See ID	
MTG3000-08	Last Section Assembly with externally threaded top end	1	
MTG3000-09	Tank Sealing Cover with 1 or 2 pre-inserted 'O' Ring seals. Seals must be greased prior to insertion.	1	
MTG3000-10	Bolts for securing Tank Sealing Flange	6	
MTG3000-11	Bolts for fixing the Tank Sealing Flange to the Base Flange	6	
MTG3000-12	Optional Flat Sealing Ring for inserting between the Tank Sealing Cover and Base Flange.	1	
MTG3000-13	MTG Transmitter Base with attached J-condulet	1	
MTG3000-14	MTG Transmitter Dome Cover	1	

## Electrical Parts Checklist

The following checklist should be read very carefully.

**You should not proceed with the installation if any part is missing.**

<b>Electrical Parts Checklist</b>			
<b>Part Number</b>	<b>Description</b>	<b>Qty</b>	<b>Check</b> 
MTG-DT3	MTG Digital Transmitter Dual Microprocessor board	1	
MTG-JB3	MTG Transmitter Junction Board With Preinstalled Male Connectors	1	

### IMPORTANT NOTE



**Note: EACH MTG GAUGE IS SPECIALLY CONFIGURED TO MEET THE PHYSICAL TANK STRUCTURE AND THE PRODUCT APPLICATION PER YOUR ORDER.**

**PLEASE REFER TO THE ID DOCUMENT.**

**FROM THE DRAWING, YOU WILL SEE EXACTLY HOW MANY GAUGE SECTIONS YOU SHOULD HAVE.**

**YOU SHOULD REFER TO THE ID DOCUMENT DURING INSTALLATION IN ORDER TO ENSURE THAT THE VARIOUS SECTIONS ARE INSTALLED IN THE CORRECT ORDER.**

## **Chapter 2 Mechanical Installation Procedures**

### **Before You Start**

Before you start this installation, we recommend you to watch the Video Installation Guide if provided, also read this manual carefully so as to familiarize yourself with the general procedures and the order in which the installation should be carried out.

### **Manpower and Time Requirements**

Two to three men are required to safely carry the installation parts as well as the MTG Model 3000 parts, to the top of the tank. The same number is required for mounting the Installation Kit and installing the System.

The following are the approximate time requirements for a 12m (40ft) tank:

<b>Operation</b>	<b>Approximate Time Requirement</b>
Hauling Installation Kit, System & Tools to the top of the tank.	30 - 40 minutes
Mounting the Installation Kit on the Installation Flange.	30 - 40 minutes
Installing the System on an average 12-meter (40 Foot) tank.	2.5 hours
Wiring the connections on the roof of the tank	30 minutes

### **Installation Tools Requirements**

The Installation Tools Checklist in Chapter 1 should be carefully completed. Check to make sure that only non-ferrous tools are used and only then should the tools be hauled to the top of the tank.

### **Unpacking and preparing the Installation Kit**

The Installation Kit Checklist in Chapter 1 should be carefully completed, and only then should the Kit be carried to the top of the tank.

An installation kit and the MTG sections can be carried to the top of the tank or it can be lifted by rope. If manually lifted, two people should pull the load from the top of the tank and the third should guide it from the ground. It should be securely fastened and lifted a section at a time.

## **Unpacking & preparing the MTG Model 3000 for Installation**

### **Unpacking the MTG Model 3000**

The crate containing the MTG Model 3000 is clearly marked with the tank tag number onto which it is to be installed.

Carefully open the relative crate on the ground near the appropriate tank.

Each section of the MTG Model 3000 is clearly marked with the tank tag number as well as the sequential number. These sequential numbers are important, as they must be followed during the installation procedure.

*The Section sequential numbers also appear in your ID Document for easy reference.*

Do not unwrap the plastic covers at the ends of the Sections. They should be kept in place for protection until after they are hauled onto the top of the tank.

It is recommended that the cables (which are connected to the Sections with the Sensor Units) are not unwound until you are ready to insert them into the Sections.

### **Preparing the Installation Flange**

Before the installation is commenced, the Installation Flange should already be in place and its surface thoroughly cleaned.

The Installation Flange should be checked to ensure that it is perfectly level.

## STAGE 1: Mounting the Base Flange onto the Existing Installation Flange

To mount the Base Flange onto the existing Installation Flange:

1. Place the **Flat Sealing Ring** on the raised face of the **Installation Flange** (See Figure 1).
2. Place the circular **Base Flange** over the **Flat Sealing Ring**, ensuring that the eight holes are aligned with those of the **Installation Flange**.
3. Insert the four mounting bolts through four holes set at 90° and secure them with nuts underneath the flange.
4. Tighten the nuts.

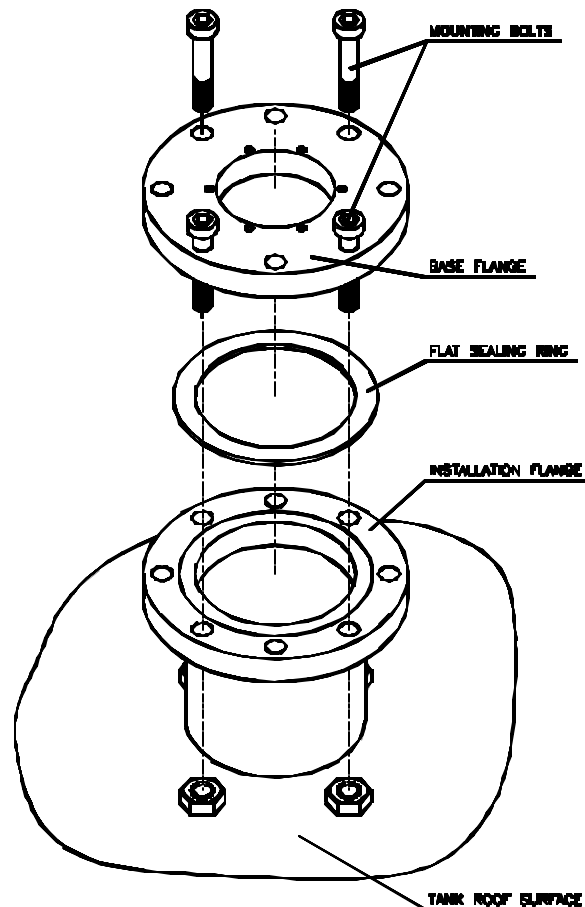
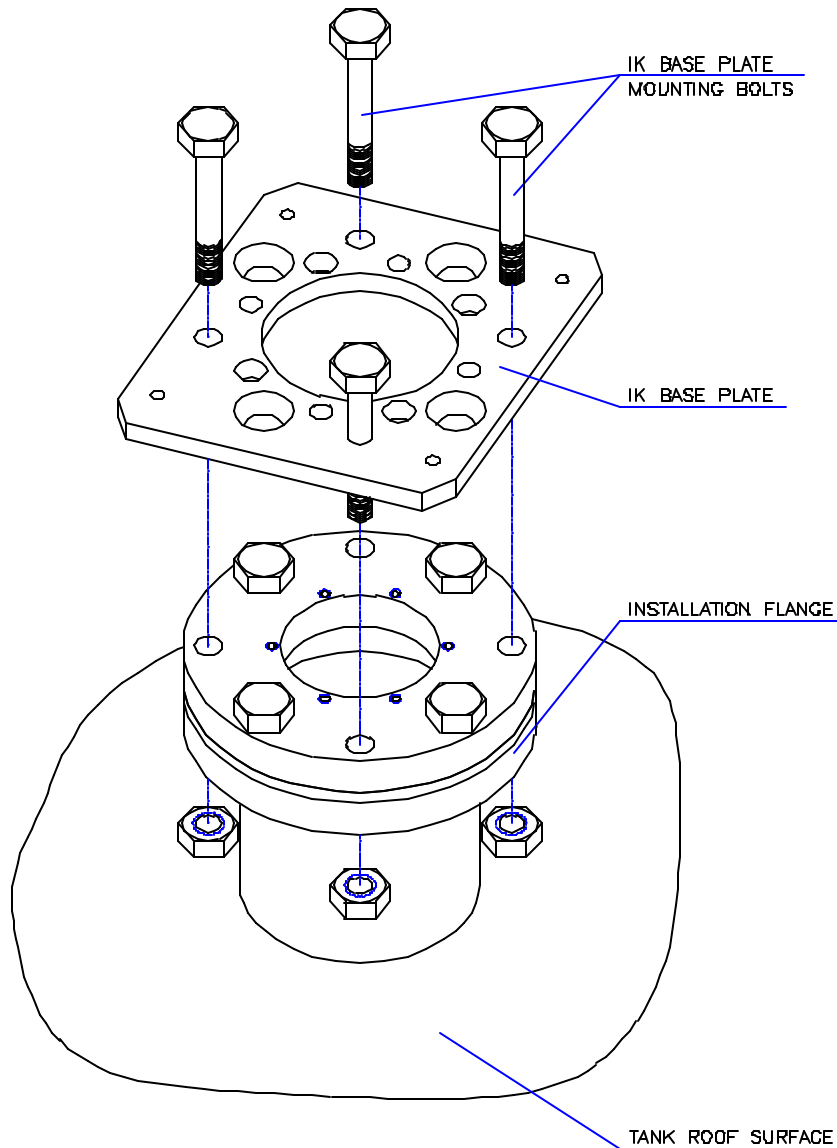


Figure 1

## STAGE 2: Mounting the IK Base Plate onto the Base Flange



*Figure 2*

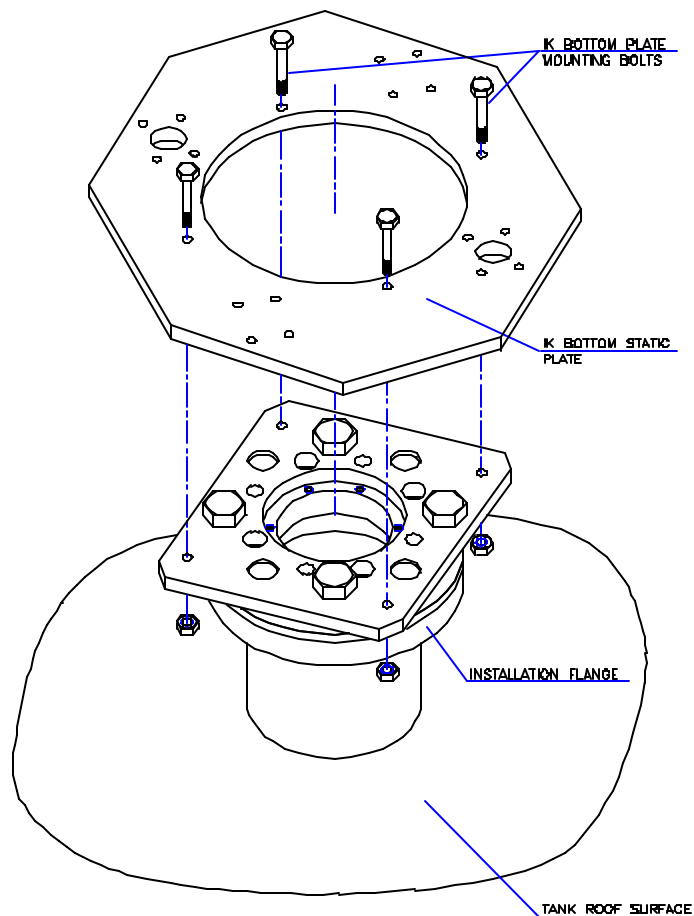
### *✍* To mount the Installation Kit (IK) Base Plate onto the Base Flange:

1. Lower the square **IK Base Plate** onto the **Base Flange** and ensure that the bolt heads protruding from the **Base Flange**, fit into the holes in the **IK Base Plate** (See *Figure 22*).
2. Insert the four mounting bolts through the holes in the **IK Base Plate** and the **IK Base Flange** and secure them with the four nuts, underneath the **IK Base Flange**.
3. Tighten the nuts.

## **STAGE 3: Mounting the IK Bottom Static Plate onto the IK Base Plate**

### ***✍* To Mount the IK Bottom Static Plate onto the IK Base Plate:**

1. Place the eight-sided **IK Bottom Static Plate** on the **IK Base Plate** and align the four holes situated near the large central hole, with the four holes at the four corners of the **IK Base Plate** (See *Figure 3*).
2. Insert the four mounting bolts through these holes and secure them with the nuts, from underneath the **IK Base Plate**.
3. Tighten the nuts.



*Figure 3*

## STAGE 4: Attaching the two Pipe stands to the IK Base Plate

### To attach the two Pipes stands to the IK Bottom Static Plate:

1. Place the end of the first **Pipe Stand** over one of the group of four holes, WITHOUT the larger central hole in the **IK Bottom Static Plate** (see *Figure 4*).
2. Align all four holes.
3. Insert the four mounting bolts through the holes and secure them with nuts, underneath the **IK Bottom Static Plate**.
4. Tighten the nuts.
5. With the second **Pipe Stand**, repeat Steps 1,2, 3 & 4 over the second group of four holes WITHOUT the larger central hole and located opposite those mentioned in Step 1.

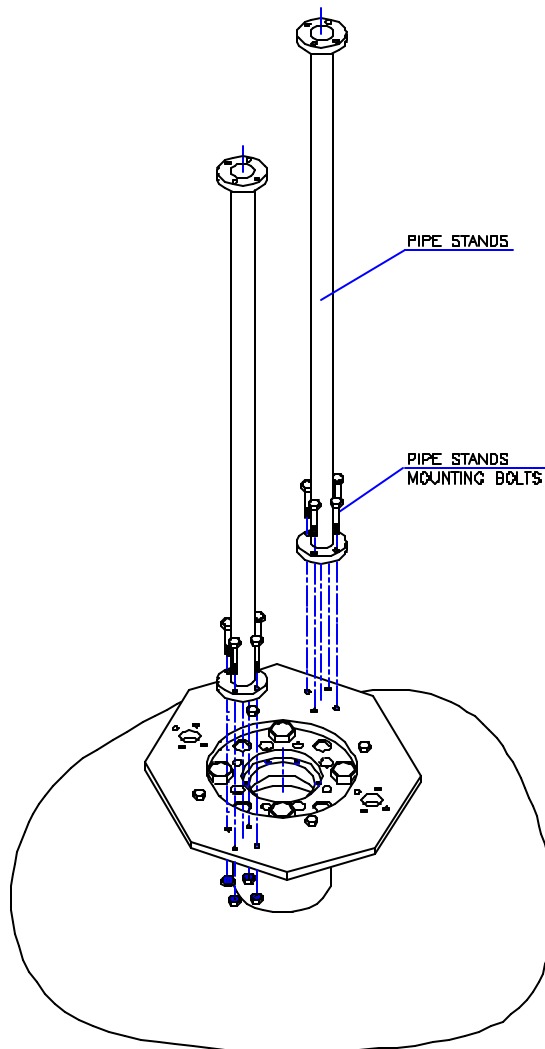


Figure 4



## **STAGE 5: Attaching the Two Screw Assemblies to the Bottom Static Plate**

### **To attach the two Screw Assemblies to the IK Bottom Static Plate:**

1. Place the end of the first **Screw Assembly** over one of the group of holes WITH the central hole (*see Figure 5*).
2. Align the four holes of the end of the **Screw Assembly** with those of **the IK Bottom Static Plate**.
3. Insert the four mounting bolts with hexagonal heads through the four holes and secure them with the four nuts, underneath the **IK Bottom Static Plate**.
4. Tighten the nuts.
5. With the second **Screw Assembly**, repeat Steps 1,2,3 & 4 over the second group of four holes, diametrically opposite.

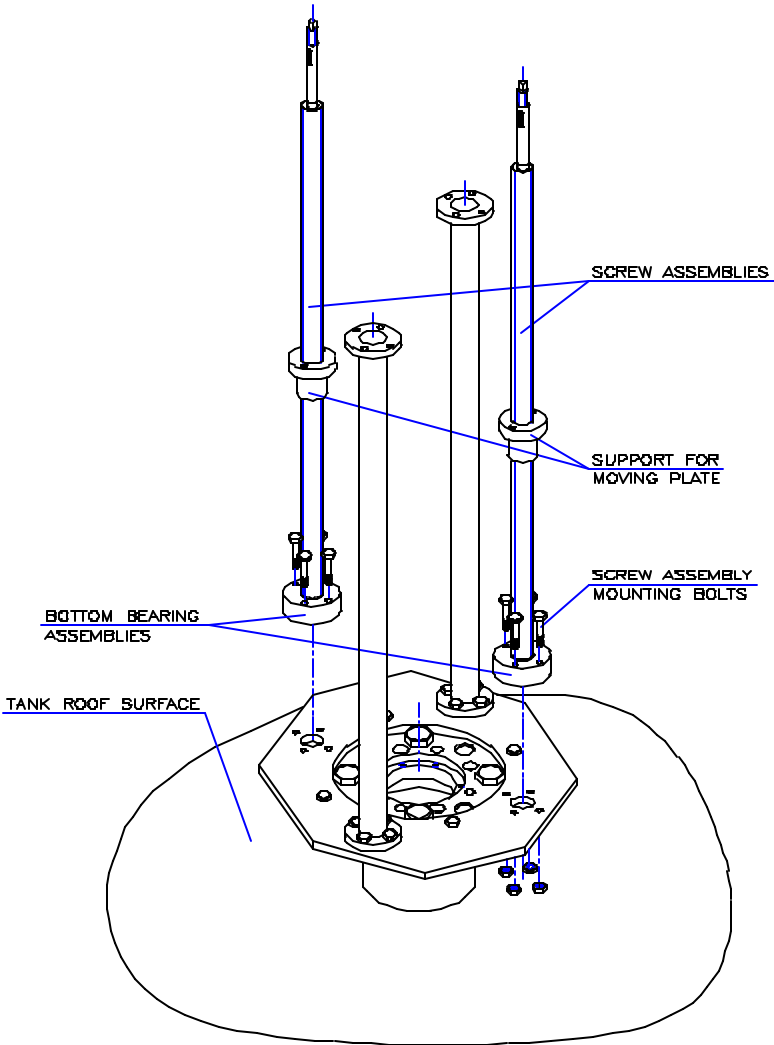


Figure 5

## STAGE 6: Attaching the Moving Plate to the Screw Assemblies

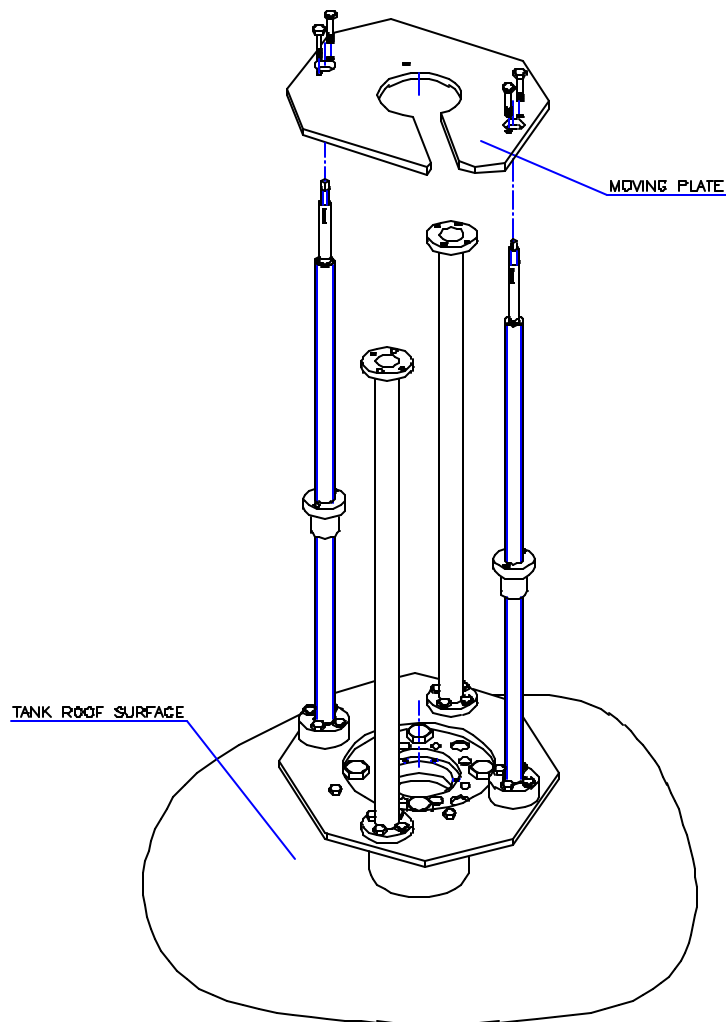


Figure 6

### To Attach the Moving Plate to the Screw Assemblies:

1. Ensure that each of the pre-installed **Moving Plate Supports** on each of the **Screw Assemblies** is located approximately half way along the assembly (see *Figure 6*) and that they are level with each other.
2. Align the two large holes of the **Moving Plate** over the tops of the **Screw Assemblies** and lower it until it comes to rest on the **Moving Plate Supports**, with the **Screw Assemblies** protruding through the plate.
3. Align each of the sets of two holes of the **Supports** with those of the **Moving Plate**.

4. Insert two of the mounting bolts through one set of the two threaded holes of the **Moving Plate Support** and only slightly hand-tighten them, leaving 2-3 mm space between the bolt heads and the plate, thus allowing for play for the **Moving Plate**.
5. Repeat Step 5 & 6 with the other two holes in the **Moving Plate**.

## STAGE 7: Attaching the IK Top Static Plate to the Pipe Stands

### To attach the IK Top Static Plate to the Pipe Stands

1. Align the **IK Top Static Plate** over the **Pipe Stands** and **Screw Assemblies** and lower it so that the tops of the **Screw Assemblies** protrude through the plate (*see Figure 7*).
2. Rest the plate on the two **Pipe Stands** and insert four of the mounting bolts through a set of four holes and through the top of the **Pipe Stand**.
3. Secure the bolts with the nuts and tighten them.
4. Insert the four remaining mounting bolts through the other set of four holes and through the top of the **Pipe Stand**.
5. Secure the bolts with the nuts and tighten them.

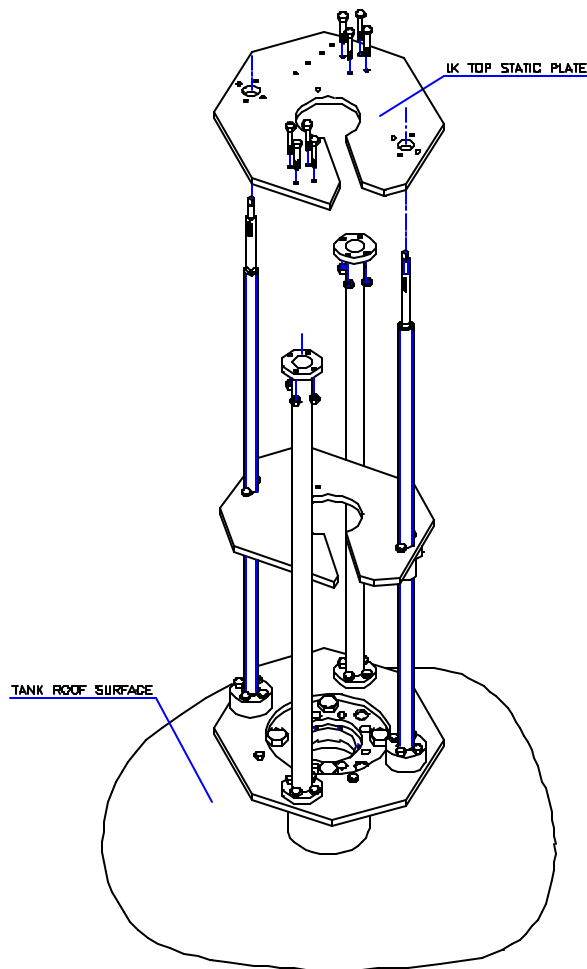


Figure 7

## STAGE 8: Attaching the Top Bearing Assemblies to the IK Top Static Plate

### ✍ To attach the Top Bearing Assemblies to the IK Top Static Plate:

1. Lower one of the **Top Bearing Assemblies** over the top of one of the **Screw Assemblies** until it rests on the **IK Top Static Plate** (see *Figure 8*).
2. Align the four holes of the bearing with those of the plate.
3. Insert four mounting bolts through the holes secure with the nuts, beneath the **IK Top Static Plate**, and tighten them.
4. Repeat Steps 1,2,3 & 4 with the second **Top Bearing Assembly**.

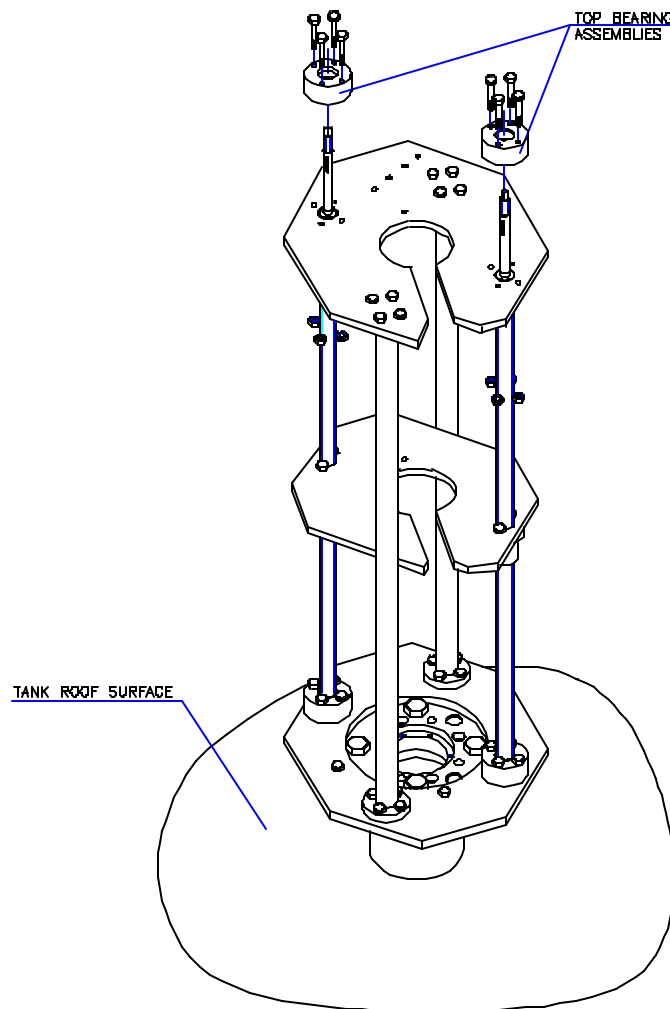


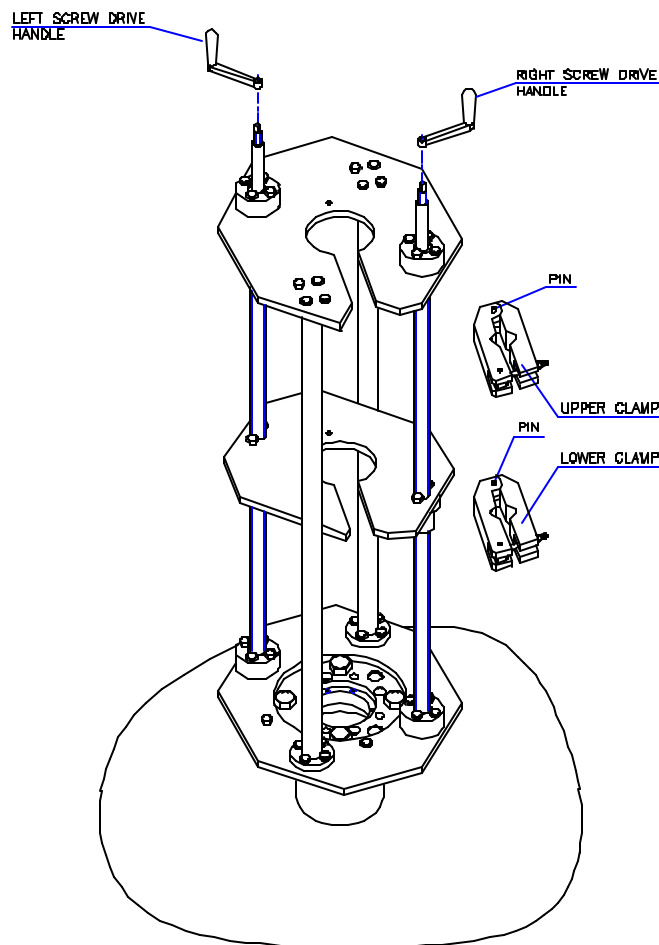
Figure 8

**IF YOUR INSTALLATION KIT IS SUPPLIED WITH A CHAIN DRIVE ASSEMBLY,  
CONTINUE WITH STAGE 9A.**

## **STAGE 9: Attaching the Handles and the Clamps**

### **✎ To attach the Handles and the Clamps**

1. Firmly press a **Handle** onto the top of each **Screw Assembly** (see *Figure 9*).
2. Place a **Clamp** with the protruding pin downwards, on top of the **Moving Plate** and locate the pin in the hole on the plate, which is near the large center opening.
3. Open the **Clamp** by loosening the nut on the threaded bar, and moving the bar out from between the jaws of the **Clamp**.
4. Repeat Step 2 and 3 with the other **Clamp** on top of the **IK Top Static Plate**.
5. **PLEASE CONTINUE FROM STAGE 10.**



*Figure 9*

**IF YOUR INSTALLATION KIT IS SUPPLIED WITH A CHAIN DRIVE ASSEMBLY, THE FOLLOWING PROCEDURES MUST BE CARRIED OUT:**

## **STAGE 9A: Attaching the Optional Chain Drive to the Installation Kit**

**✍ To prepare the attachment of the Chain Drive to the Two Screw Assemblies:**

1. Lower a **Spacing Sleeve** over the top of one of the **Screw Assemblies** and let it down to rest on the **Top Bearing Assembly**, (*see Figure 10*).
2. Lower a **Single Chain Drive Sprocket** *with its teeth to the bottom*, over the top of the **Screw Assembly** and let it down to rest on the **Spacing Sleeve**.
3. Place a **Spacer** over the top of the **Screw Assembly** and let it down to rest on the **Single Chain Drive Sprocket**.
4. Finally, secure these components with the nuts.
5. Tighten the nuts.
6. Repeat Steps 1,2,3,4, & 5 with the other **Screw Assembly** *in the inverted position - with its teeth to the top*.
7. Align the **Tensioning Device Base** over the four holes drilled in a straight line.
8. Insert a mounting bolt through the two holes with the wider diameter.
9. Secure the bolts with nuts, underneath the **IK Top Static Plate**, ensuring that the heads of the mounting bolts are sunk into the holes in the **Tensioning Device Base**.



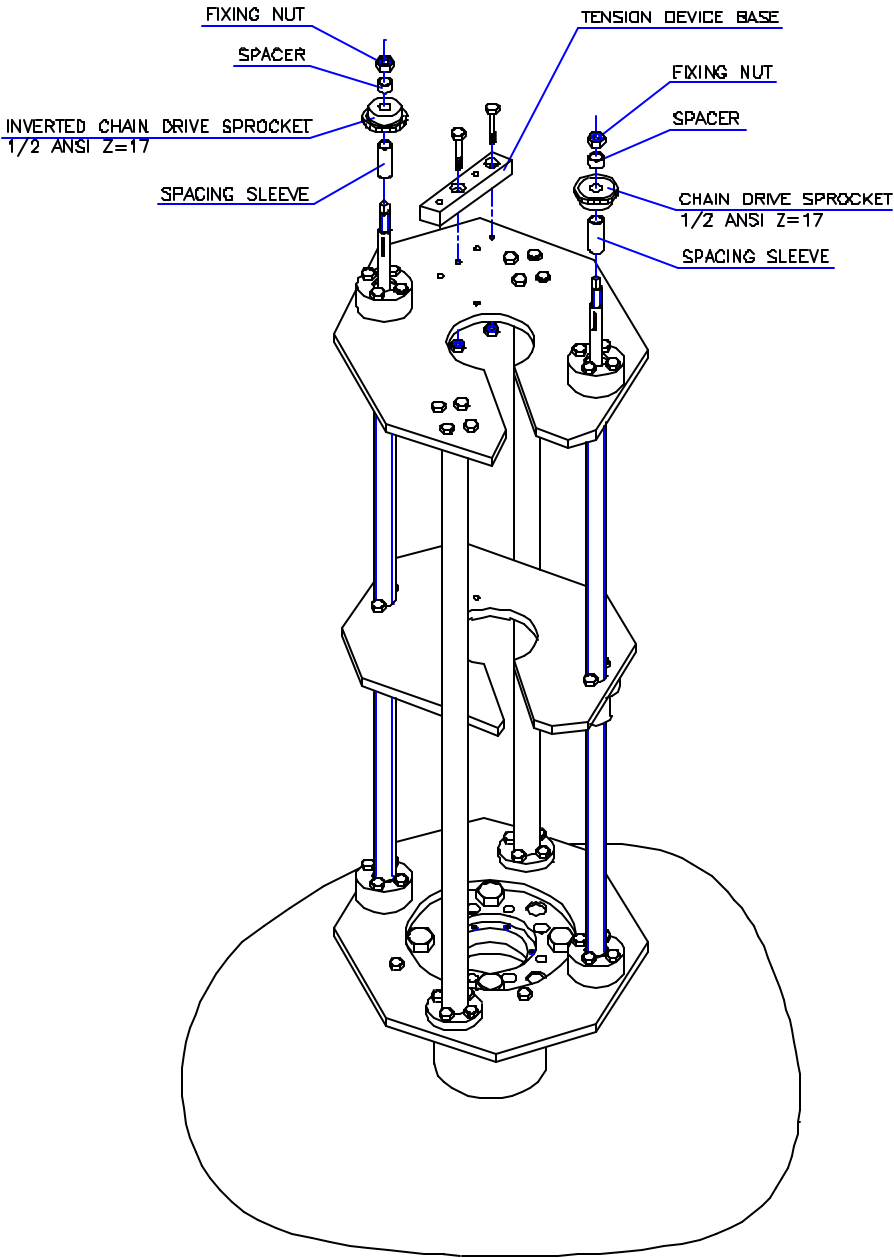


Figure 10

### **To attach the Chain drive to the two Screw Assemblies:**

1. Place the **Tensioning Device** with the **Double Sprocket** attached, on the **Tensioning Device Base** and align the extended holes with the holes of the base (*see Figure 11*).
2. *From underneath* the **IK Top Static Plate**, insert a mounting bolt through the hole *and from the top*, place a spring washer and then a nut, over it.
3. Tighten the nut only slightly.
4. *From underneath* the **IK Top Static Plate**, insert the other mounting bolt through the hole and *from the top*, place a split washer and then a nut over it.
5. Tighten the nut only slightly
6. Place a **Driving Chain** around one of the **Single Sprockets** and loop it around the lower wheel of the **Double Sprocket**.
7. Place the other Driving Chain around the other **Single Sprocket** and loop it around the upper wheel of the **Double Sprocket**.
8. Pull the **Tensioning Device** away from the center of the **IK Top Static Plate**, in order to make both the **Driving Chains** taut.
9. Once the **Driving Chains** are equally taut, fully tighten the mounting bolts that were inserted from below the **IK Top Static Plate**.
10. Firmly press a **Handle** onto one of the tops of the **Screw Assemblies**.
11. Place a **Clamp** with the protruding pin downwards, on top of the **Moving Plate** and locate the pin in the hole on the plate, which is near the large center opening.
12. Open the **Clamp** by loosening the nut on the threaded bar, and moving the bar out from between the jaws of the **Clamp**.
13. Repeat Steps 11 and 12 with the other clamp on top of the **IK Static Plate**.

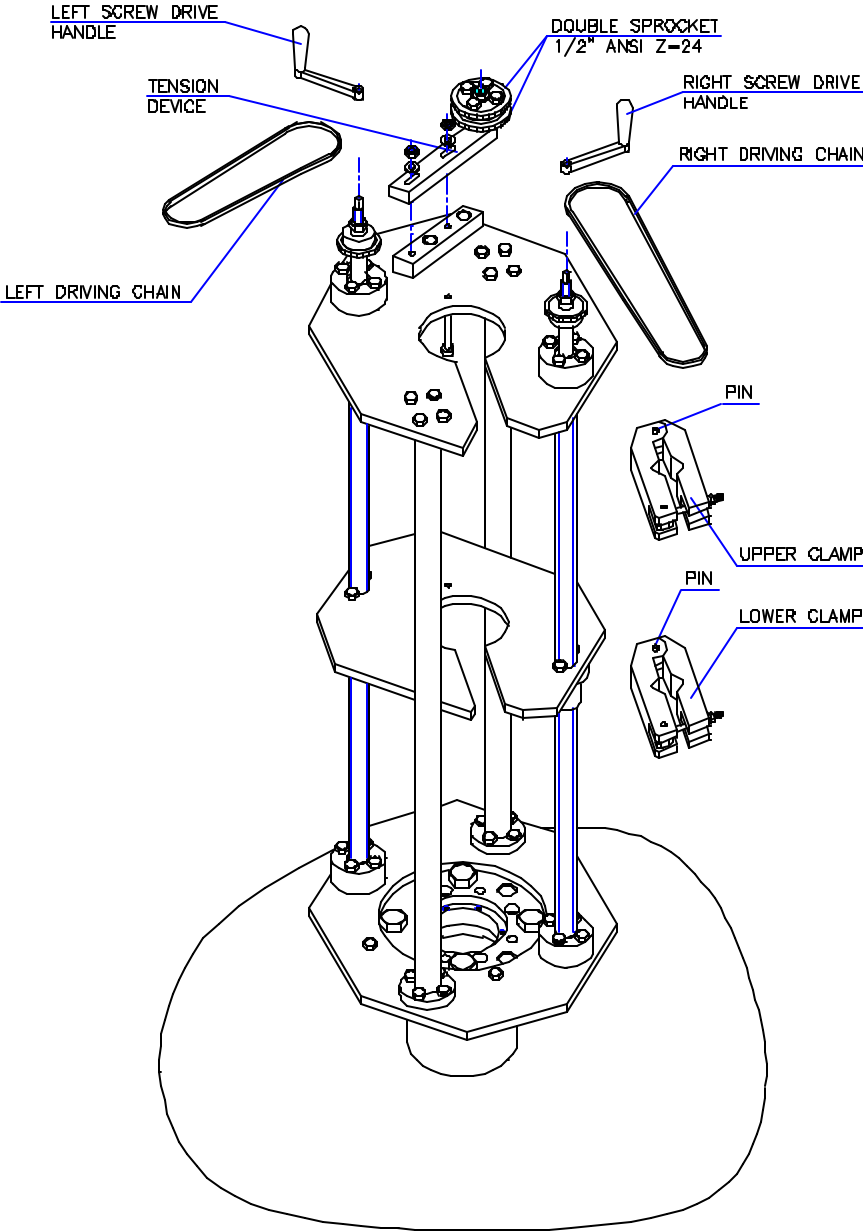
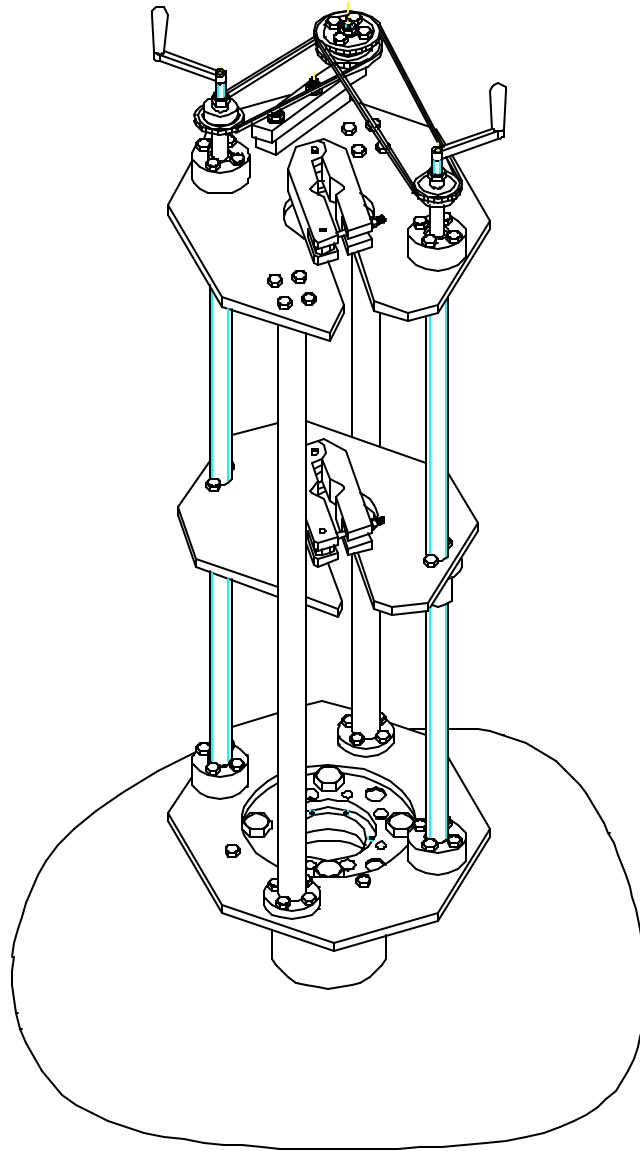


Figure 11

*Figure 12* illustrates how the **Installation Kit** with the **Chain Drive Assembly** and (closed) **Clamps**, should appear on the site.



*Figure 12*



**Note:** Depending on the particular configuration you ordered, your MTG 3000 System comprises a number of Sections with Sensor Units, Intermediate Sections and the Last Section.

## STAGE 10: Preparing and inserting the First Section Assembly with a Sensor Unit into the Tank

If the **Zero-Section Spacer** (Foot Section) is already attached and/or included in the assembly, omit the next step.

### ✂ To attach the Zero-Section Spacer to the first Section Assembly:

1. Screw the **Zero-Section Spacer** onto the bottom thread of the first **Sensor Unit**, which is attached to the first Section Assembly (see *Figure 13*).
2. Remove the protection label from the sensor housing.

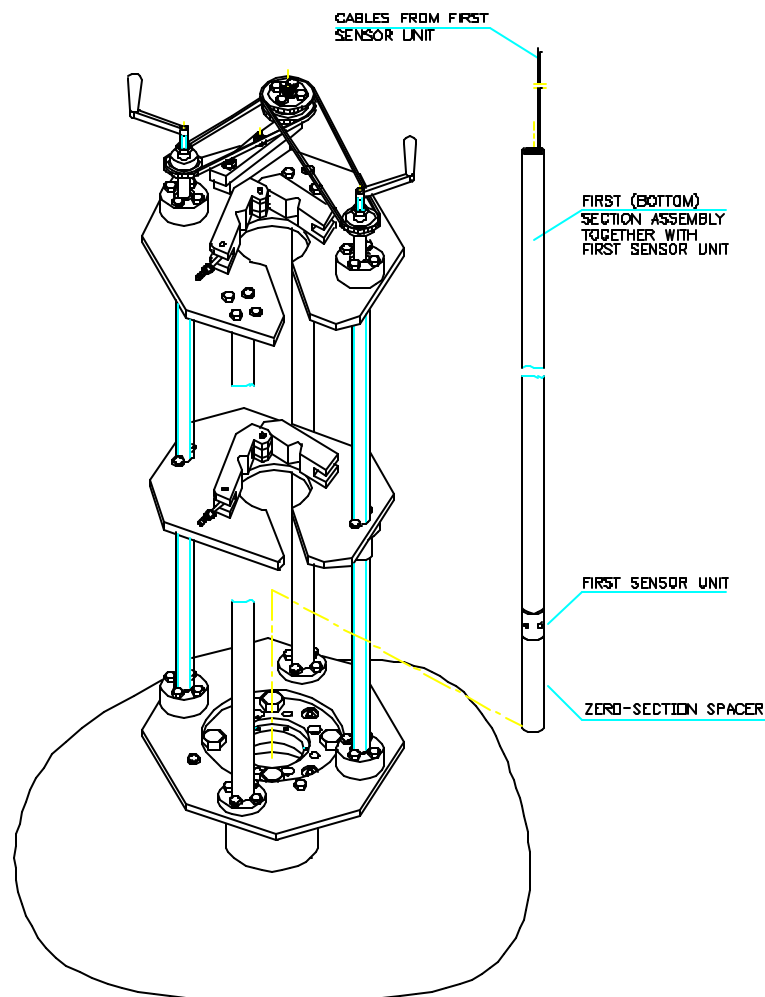
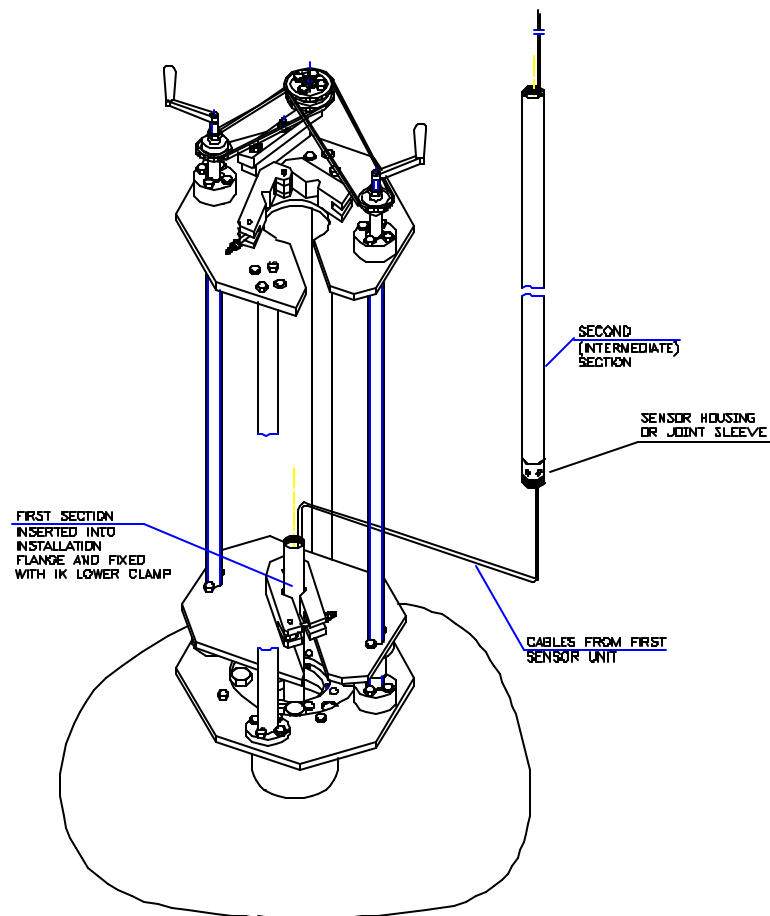


Figure 13

**✎ To insert the First Section with a Sensor Unit into the tank:**

1. Lower the **Moving Plate** to a position approximately 20 cms above the **IK Bottom Static Plate**.
2. With the **Lower Clamp** fully open and with the **Zero-Section Spacer** first, the first person should gently insert the **First Section** with the **Sensor Unit**, into the hole in the middle of the **Base Flange**.
3. The first person should hold the **Section** in place and the second person should close the **Lower Clamp** and hand-tighten it, so that the **Section** can slide freely.
4. Lower the **Section** so that its top is located approximately 10 - 20 cms above the **Moving Plate**.
5. Tighten the nut on the **Lower Clamp** with a wrench, ensuring that it is gripping the section.  
(See Figure 14)



*Figure 14*

## STAGE 11: Positioning the Intermediate Section above the First Section

### To position the Second (Intermediate) Section above the First Section:

1. Take the **Second Section** marked '2', hold it at an angle of  $90^0$  to the **First Section** and thread the **Cables** from the **First Section** through the **Second Section**.
2. Bring the **Second Section** to the vertical position and with the **Cables** protruding from its top, gently bring it down to a distance of approximately 10 cms above the **First Section**. Ensure that the top of the **Second Section** is placed through the open slot of the **IK Top Static Plate** and is protruding through the center hole of this plate.
3. Close the **Upper Clamp** around the shaft of the **Second Section**.
4. Slightly tighten the nut on the **Clamp** with a wrench, ensuring that it is gripping the section, as shown in *Figure 15* below.

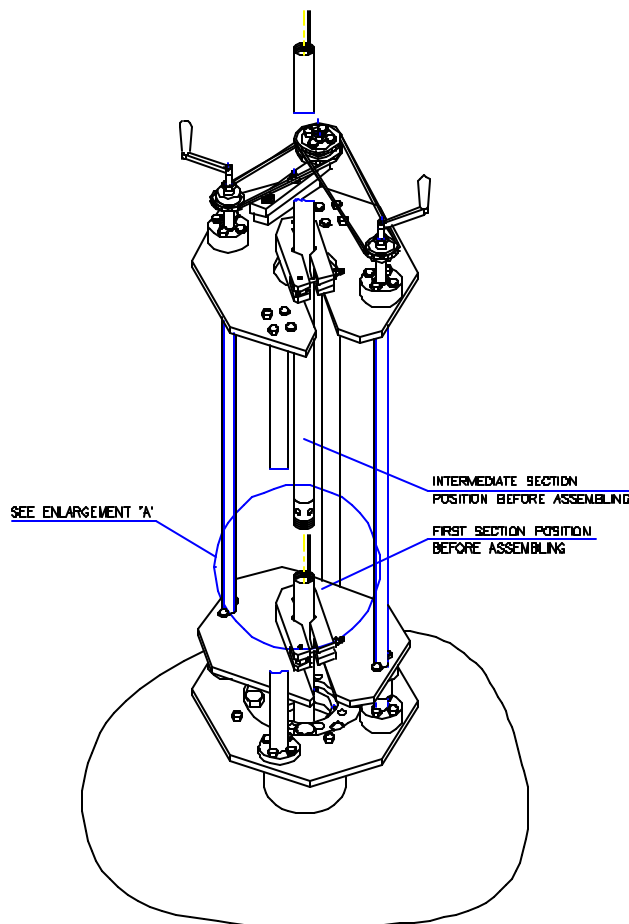


Figure 15



## **STAGE 12: Attaching the Intermediate Section to the First Section**

### **✍ To attach the Second (Intermediate) Section to the First Section:**

1. Apply **Loctite** over the whole surface area of the **Second Section Thread** outside the **O-Ring**
2. Loosen the **Upper Clamp** just slightly and slowly hand-guide the **Second Section** down until it comes in contact with the **First Section**, if necessary, pushing the cables up into the **Second Section**.
3. Ensure that threads are aligned with each other.
4. Loosen the **Upper Clamp slightly** more if necessary and use the special wrench to tighten screw sections together.
5. Remove the protective label from the sensor housing.
6. Tighten the closure on the **Upper Clamp**.
7. Loosen the nut on the **Lower Clamp** and open it.
8. For the Installation Kit *without* the **Chain Drive Assembly**, slowly turn both **Handles** simultaneously in a clockwise direction.  
- Or -  
For the Installation Kit *with* the **Chain Drive Assembly**, slowly turn one **Handle** in a clockwise direction. The **Moving Plate** rises. (*See Figure 17 on next page*)

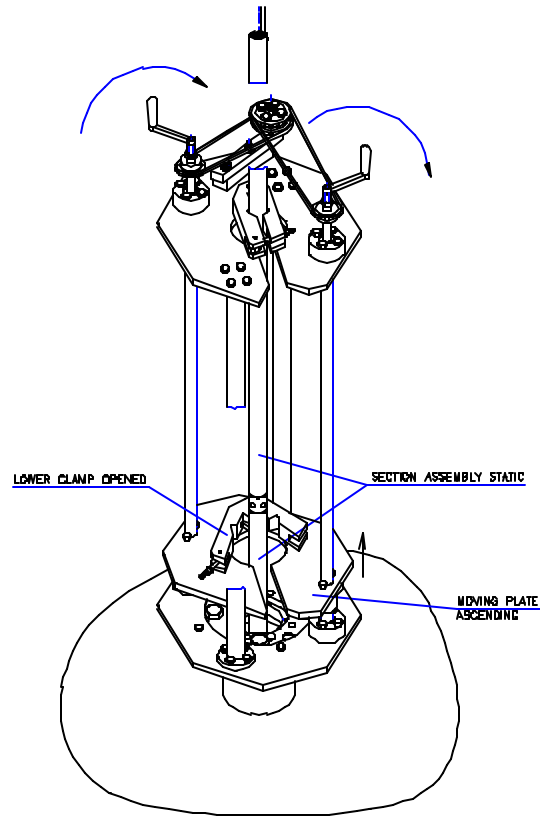


Figure 17



**If you have a Hand Assembly, you must ensure that both Handles are turned simultaneously.**

9. Continue turning either one or both **Handles** until the **Moving Plate** is approximately 10-15 cms below the **IK Top Static Plate**.
10. Close the **Lower Clamp** and tighten the nut with a wrench.
11. Slowly turn either one or both the **Handles** in an anti-clockwise direction. The **Moving Plate** descends and the assembled **Sections** are lowered into the tank (*See Figure 18 on next page*).

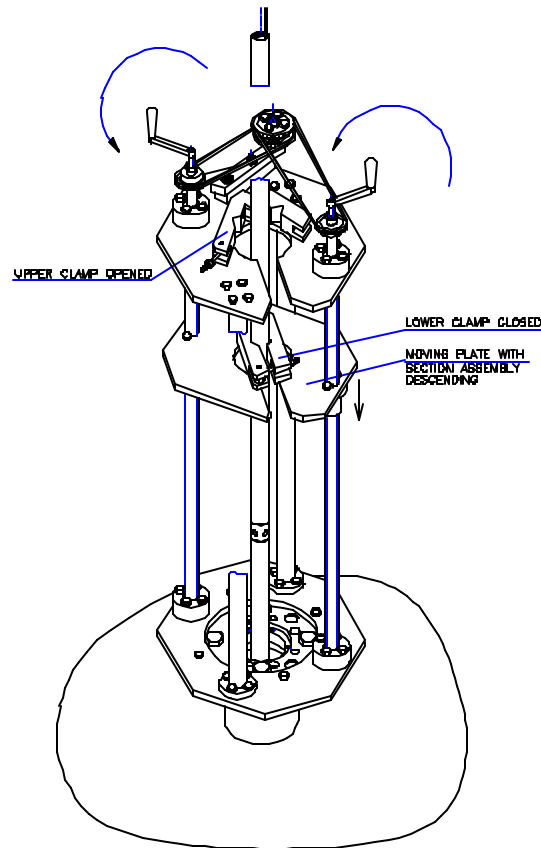


Figure 18

12. Continue turning the **Handles** until the **Moving Plate** is approximately 15-20 cms above the **IK Bottom Static Plate**.
13. Tighten the nut on the **Upper Clamp**.
14. Open the **Lower Clamp** and with the use of the **Handle(s)**, raise the **Moving Plate** to a position approximately 10-15 cms below the **Top Static Plate**.
15. Close the **Lower Clamp** and *only after it is closed*, open the **Upper Clamp**.
16. Repeat Steps 13-17, until the top of the **Second Section** is approximately 10-30 cms above the **Moving Plate**, which should be in the completely lowered position (*see Figure 19 on next page*).

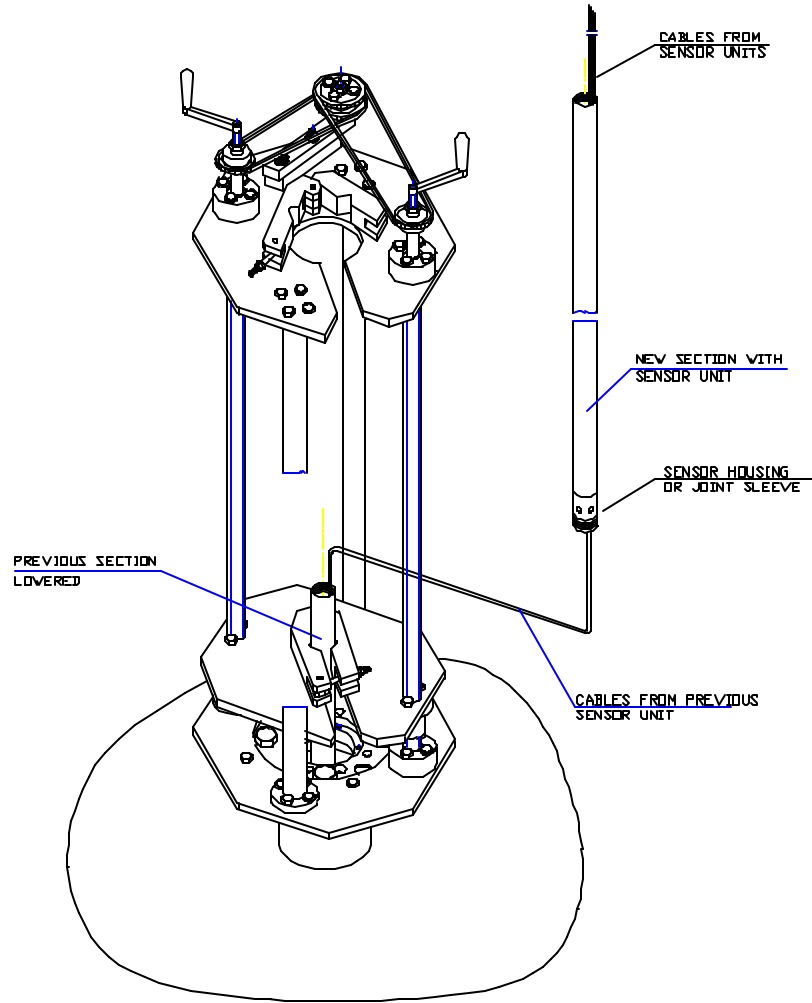


Figure 19

### STAGE 13: Installing other subsequent sections

The installation of other subsequent sections exactly repeats the above-described procedure of the installation of the intermediate section onto the first section. Each next section has a joint sleeve or a sensor unit attached to it with a male thread to be screwed to the female threaded top of the previous section.

### STAGE 14: Installing the Last Section

The last **Section** of the System is marked with the last (and highest) number as well as the letter 'L'.

**To Install the Last Section:**

1. By slowly turning the **Handles** in an anti-clockwise direction, lower the **Last Section** until you feel that the lower end of the System is touching the bottom of the tank.
2. As soon as you feel the System resting on the bottom of the tank, *stop turning the Handle(s)*.



**DO NOT** continue turning the Handle(s) once you feel the System resting on the bottom of the tank.

3. Insert the two halves of the **Optional Split Collar** inside the **IK Base Plate**, so that they rest on the **Base Flange**. This helps to hold the System in a static position while you carry out the final stages of the installation (*see Figure 20*).

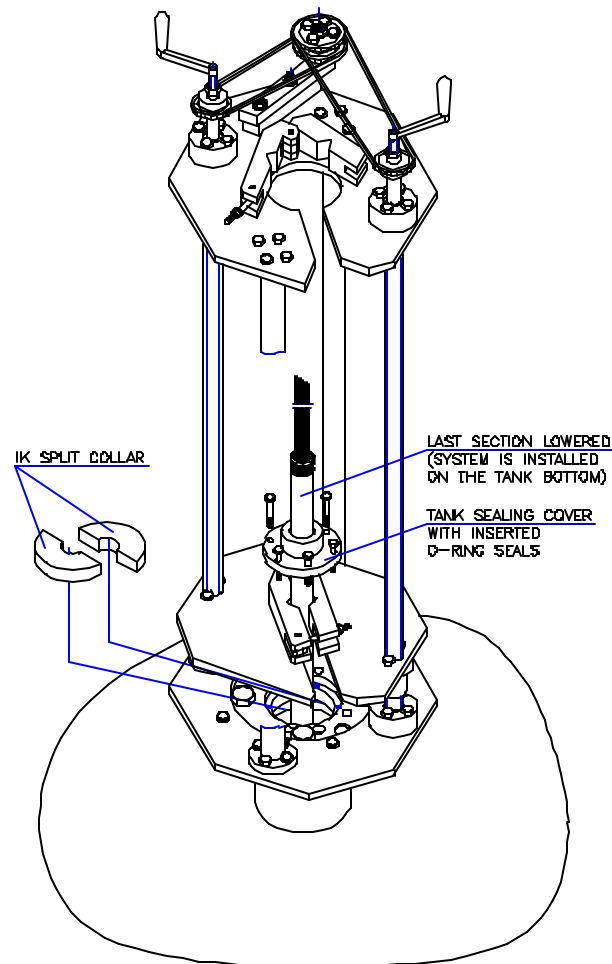


Figure 20

4. Raise the System by turning the **Handle(s)** two complete revolutions in a clockwise direction.

- Slide the **Tank Sealing Cover** down, over the top of the **Last Section** - remembering to pass the **Cables** through it, to just above the **Lower Clamp**. The **Tank Sealing Cover** has up to three 'O' Ring seals pre-inserted into the three greased grooves.
- Slowly turn the **Handle(s)** in an anti-clockwise direction until you feel that the bottom of the System has reached the bottom of the tank.



**DO NOT** continue turning the **Handle(s)** once you feel the **System** resting on the bottom of the tank.

- Open the **Lower Clamp**.
- Raise the **Moving Plate** by turning the **Handle(s)** in a clockwise direction, until it reaches a position just below the threaded part of the **Last Section**.
- Close the **Lower Clamp**.
- Turn the **Handle(s)** in an anti-clockwise direction, through two complete revolutions. The **System** rises.
- Remove the **Optional Split Collar** (see Figure 21)

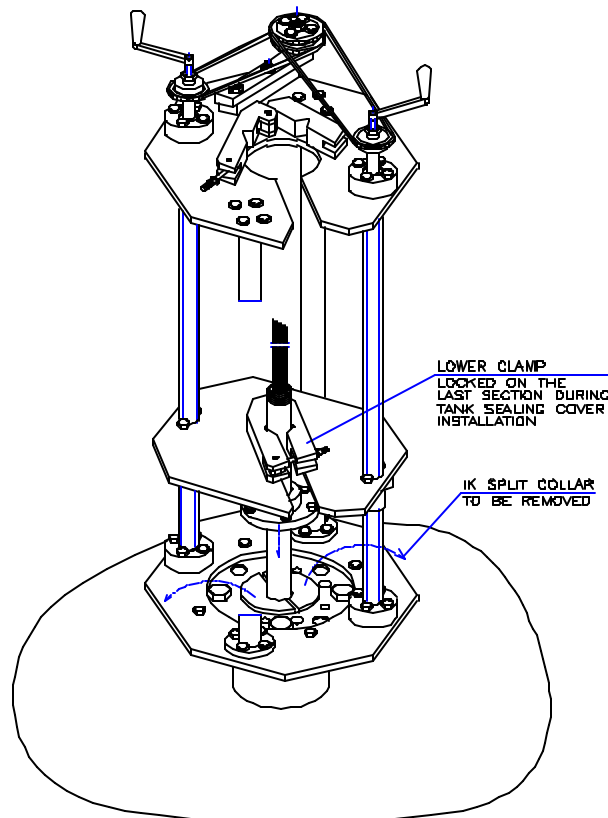


Figure 21

- Slide the **Tank Sealing Cover** all the way down the **Last Section** so that it comes to rest on top of the **Base Flange**. Pass six Bolts through the holes in the **Top System Flange** and tighten them (See *Figure 22* and *Figure 23*).

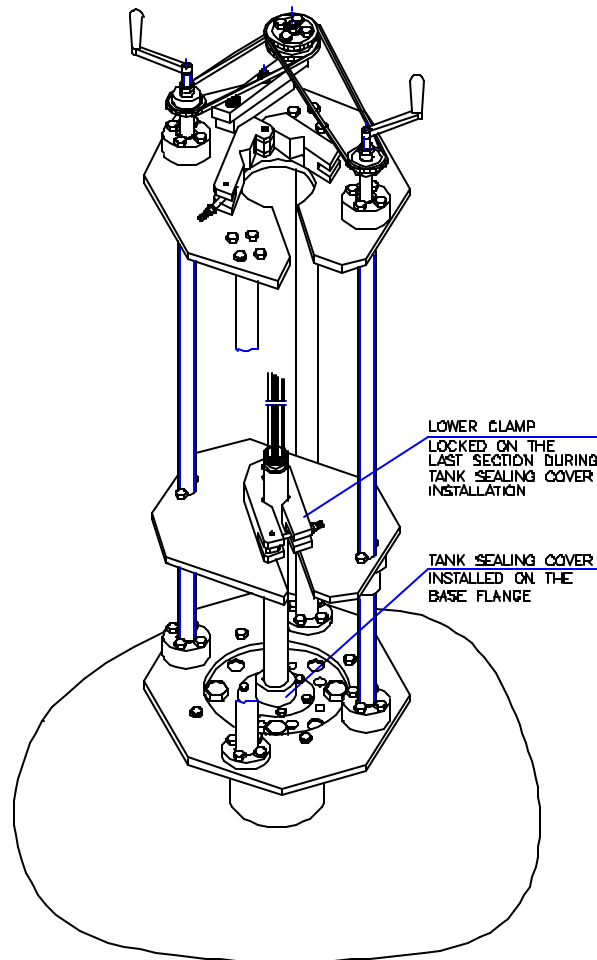


Figure 22



**The Base Flange and the Tank Sealing Cover must be very firmly attached to each other.**

- Open the **Lower Clamp**.
- With your hands, gently push the **System** down until you feel that the bottom of the System has reached the bottom of the tank.

## STAGE 15: Removing/Dismantling the Installation Kit

### To remove/dismantle the Installation Kit:

There are two methods of removing the **Installation Kit**.

#### Removing:

1. Remove the four **Bolts** that hold the **Installation Kit** joined to the **Base Flange** and carefully remove the complete kit from the top of the tank.
2. Put the four **Bolts** into the holes of the **Base Flange** and tighten them (*see Figure 23*).

-Or-

#### Dismantling:

1. Starting from the top of the **Installation Kit**, dismantle it in an orderly fashion, by undoing all the nuts and bolts that hold it together and removing the parts one-by-one.
2. Put the four **Bolts** into the holes of the **Base Flange** and tighten them (*see Figure 23*)

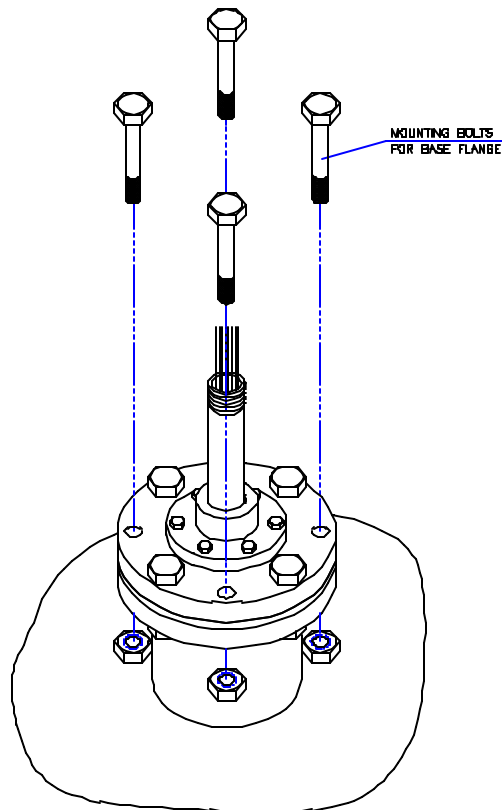


Figure 23



## STAGE 16: Installing the Transmitter Head Base

 To install the transmitter Head Base Plate



Certain components may be supplied pre-assembled. If this is the case, you should omit the relative steps.

1. Carefully unwrap the **Transmitter Head** and remove the **MTG Transmitter Boards** held in place by four screws to the mounting standoffs and electronically connected by a flat ribbon cable with a polarized connector.
2. Thread the **Cables** through the center threaded hole of the **Transmitter Head Base**.
3. Put thin layer of the Loctite Thread Sealant onto the external NPT Thread of the **Top Section** of the MTG Probe.
4. Screw the **Transmitter Head Base** with normally attached **J-Condulet** onto the external NPT thread of the **Top Section** of the MTG Probe. See *Figure 24* below.

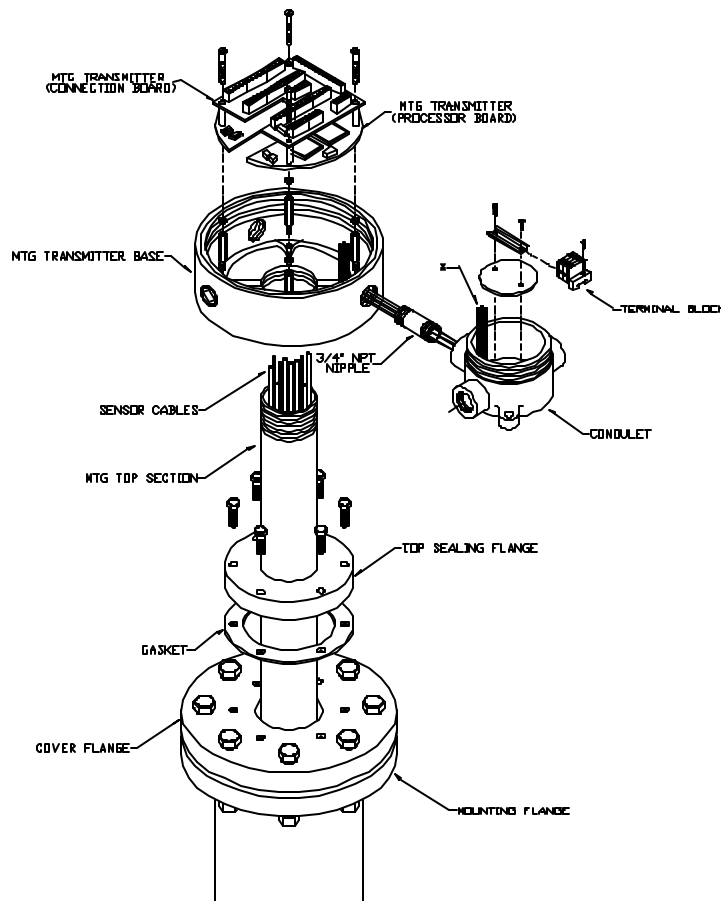
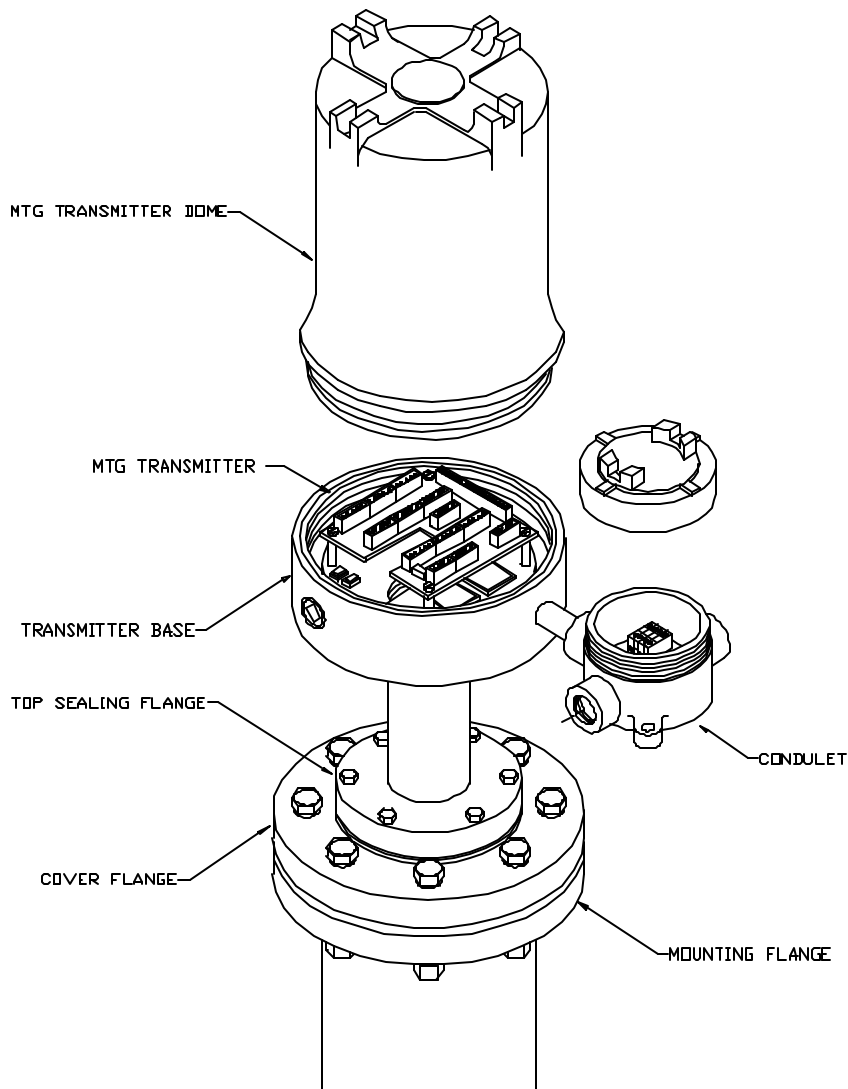


Figure 24

## STAGE 17: Installing MTG Transmitter Boards.

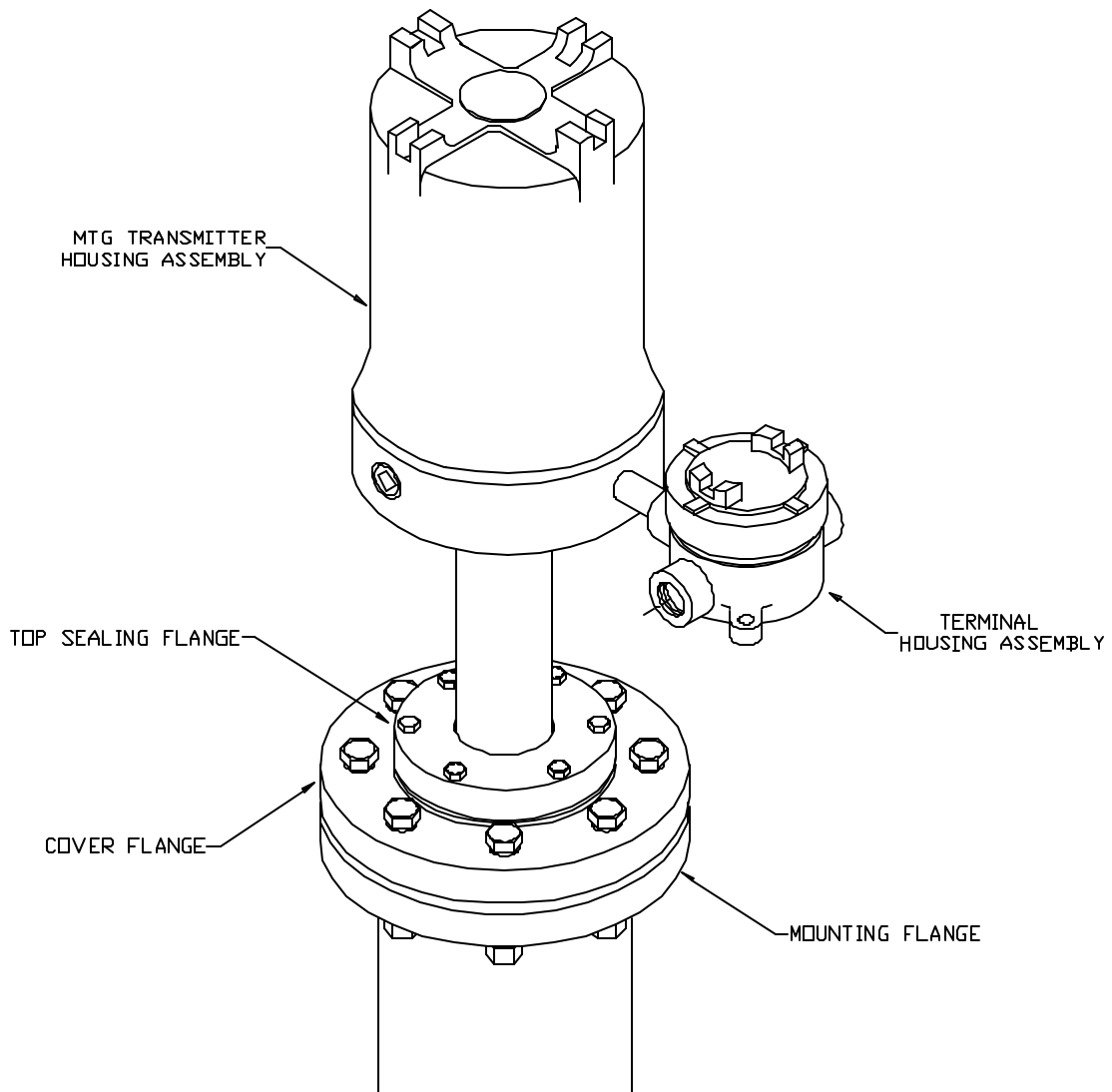
### *✍* To install the Transmitter Boards:

1. Place the **MTG-DT3/MTG-JB3** Boards assembly onto the standoffs of the **MTG Transmitter Head Base**.
2. Attach the assembly with 4 screws.
3. Complete the internal wiring as described in next Chapter.
4. Cover **Transmitter Base** with the corresponding **Dome** cover and carefully screw it on.
5. Cover **J-Condulet** with the corresponding **Dome** cover and carefully screw it on. See *Figure 25*.



*Figure 25*

6. Place DB- and DB+ wires coming from **J-Condulet** into the male 3-pin WAGO RS-485 connector as per marking on **MTG-JB3 Board**. (See figure 28 page 3-5).
7. Make sure that the power is off and Place Power Positive wire into the V1 pin of the 4-pin male Power Input Connector. Place the Power Negative wire into the Ground pin of this connector. Watch the corresponding marking on the **MTG-JB3 Board**. Set the ID of the device and check baud rate settings. (See figure 28 page 3-6)
8. See fully assembled MTG Transmitter head in *Figure 26* below.



*Figure 26*

## Chapter 3 Electrical Installation Procedures

### Electrical Tool Requirements

Recommended Tool Checklist for MTG Transmitter Installation	
Description	Qty
Small insulated wire cutter	1
Insulated wire stripper	1
Insulated Phillips screwdriver	1
Small insulated Phillips screwdriver	1
Small insulated slotted screwdriver	1
Plastic wire insertion tool	1
Dikes or Cutting knife	1
A supply of plastic straps (for holding cables together)	

Note: Use only non-ferrous tools when working within a classified area

### General Wiring Advice

#### Cable Routing

The cable routing should be planned to minimize the total length of the cables.

Always route cables to avoid sources of electrical interference.

Typical electrical noise sources to avoid include:

- Electric motors
- Electric welders
- Switched inductive loads
- Switched AC mains
- Other sources that generate large amounts of electrical interference.

Always route signal or network cables in cable trays separate from cables that control the above mentioned types of noise sources.

In general, I.S. wiring is always routed separate from non-I.S. wiring.

### Cable Splices

All cable splices for the network wiring should be protected by seals and/or terminal boxes.

Any connectors or terminal hardware should be of a non-corrosive type and attached to the wires using crimp or preferably, crimp and solder techniques.

All exposed connections must be insulated from other wires, junction boxes, ground, etc.

### Cable Polarity

Both the power supply circuit and the communication circuit have polarities associated with them.

Use color-coded wiring procedures to clearly define this information to both installation and maintenance personnel.



The **Current Transmitter** module is fault-protected in the event of short-term polarity reversal. However a long-term fault may damage the unit.

### Documentation

You must document all aspects of the network installation.

Include items such as:

- Cable routing maps,
- The number of systems on a given network
- System communication addresses
- Location of cable splices and junction boxes
- Cable types
- Cable color codes

This information will greatly reduce the time and effort needed to analyze and correct possible problems during system start-up, or problems that arise after the system has been in operation.

## **About the Main Structural Electrical Components**

The MTG 3000 System normally comprises the following main components:

The **MTG 3000 Probe** which is located on top of the tank.

Optional ISB-3000 Box located on near the tank. One ISB box can be used with up to 4 MTG probes. It contains a Set of Intrinsically Safe Barriers and an Opto-isolating RS-485 Line Booster, as well as the Power Converter Board for Power conversion from incoming 24 VDC to the Power required by MTG Probes (8 to 16 VDC). The ISB enclosure is EX-Proof.

Optional E/TGI Unit. This unit provides all the functionality of ISB plus local indication for up to 4 MTG Probes. E/TGI enclosure is EX-Proof

A Generic Intrinsically Safe Barrier Box can be used in case of special applications such as climate extremes and customer's special requirements

Host Computer or PLC Communicating with MTG).



**You must use ONLY the IS Barriers supplied within the ISB “Intrinsic Safety Box” or E/TGI “Tank Gauge Interface”, or approved by GSI / IMMI in writing.**

**In any case the barriers must comply with the MTG Control Drawing given below**

**The number of Probes per one set of IS Barriers may vary due to particular tank farm configuration and cable properties but shall not contradict the MTG Control Drawing.**

**Additional Surge Protection devices as well as RS485/RS232 Converters may be supplied upon request**

**Please consult GSI / IMMI on your case of system configuration**

## **Connecting the Electrical Components**

There are three stages in the connection procedure and we recommend you to complete them in the following order:

1. Connecting the Communication, Power and **Sensors'** wires inside the **Transmitter Head**.
2. Connecting the **MTG Probe**, to ISB-3000 when necessary.
3. Connecting to the central computer or a higher-level control system.

An MTG Probe in its Standard Configuration may include from 4 to 6 Sensor Units.

There is 1 cable that come from each **Sensor Unit**. They are color coded and numbered as follows:

<b>Cable Number and Color</b>	<b>Cable Origin</b>
#1 - Red	First (gas) Sensor Unit
#2 - Yellow	Second (top) Sensor Unit
#3 - Green	Third (Middle) Sensor Unit
#4 - Blue	Fourth (Middle or Bottom) Sensor Unit
#5 - White	Fifth (Middle or Bottom) Sensor Unit
#6 – White/Red	Sixth (Bottom) Sensor Unit

## **Wiring the MTG Transmitter Head**

After completion of the mechanical installation procedure, the wires coming from the sensor units must be connected to the **MTG-JB3 Board**

Cables coming from the **Sensor Units** are color marked as per the table above.

There is a cable coming from each **Sensor Unit**. This cable contains wires related to Pressure Sensor and to the **RTD (Temperature Sensor)**. All wires are color-coded.

See *Figure 27* on the following page for board illustrations and color codes.

## **MTG transmitter board.**

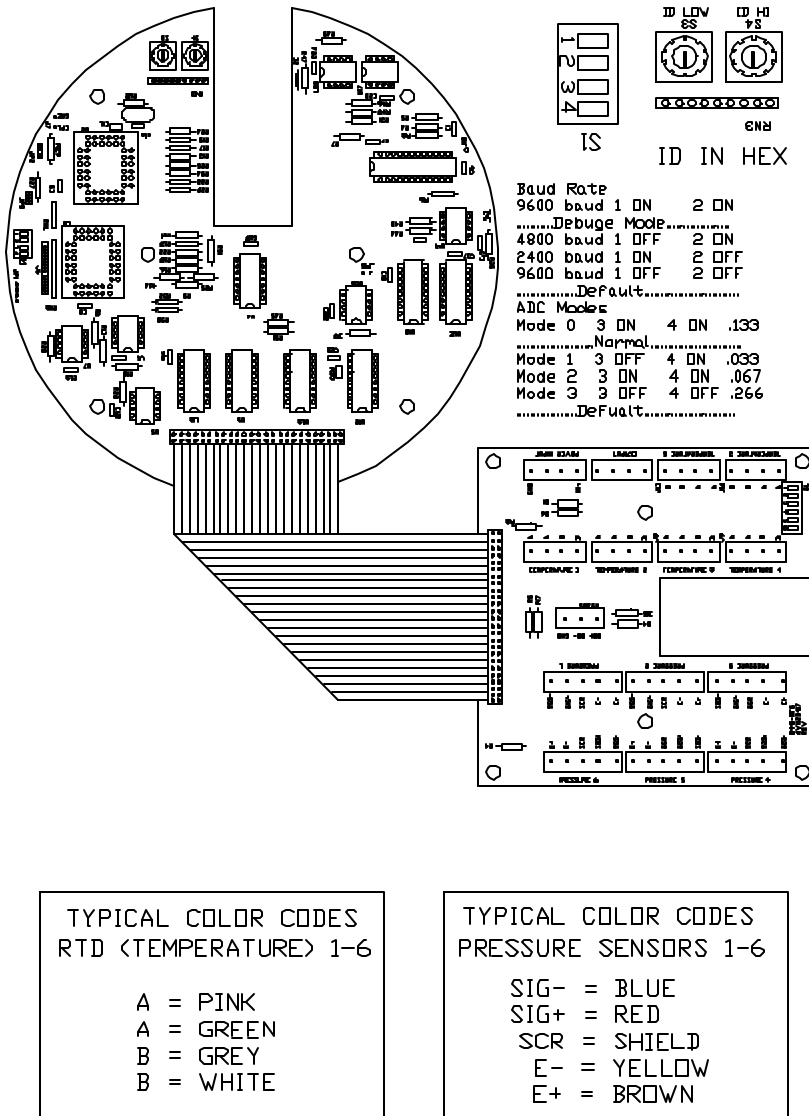


Figure 27

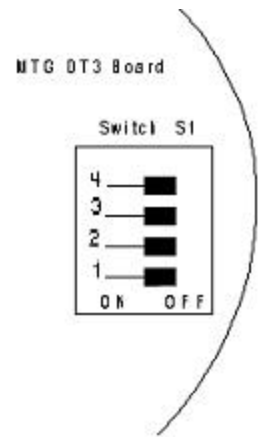
Cable Number and Color	Cable Origin
#1 - Red	First (gas) Sensor Unit
#2 - Yellow	Second (top) Sensor Unit
#3 - Green	Third (Middle) Sensor Unit
#4 - Blue	Fourth (Middle or Bottom) Sensor Unit
#5 - White	Fifth (Middle or Bottom) Sensor Unit



#6 – White/Red	Sixth (Bottom) Sensor Unit
----------------	----------------------------

**MTG-DT3 A to D and Baud-rate Switch.**

<u>POWER SOURCE</u>	<u>ADC CONFIG.</u>	<u>HEX</u>	<u>DEC</u>	<u>FILTER FIRST NOTCH</u>
<u>FREQ-CY</u> [Hz]				Hz
60	0	208	520	7.51
60	1	82	130	30.05
60	2	104	260	15.02
60	3	411	1041	3.75
50	4	271	625	6.25
50	5	9c	156	25.04
50	6	138	312	12.52
50	7	4e2	1250	3.13



Notes:

- 1) Switches S1.1 and S1.2 define ADC CONFIGURATION code.
- 2) MTG application POWER SOURCE FREQUENCY 50 or 60 Hz is defined by burned U1 software code.
- 3) Dip-switch S1 logical table:

<u>ADC CONFIG.</u>	S1.1	S1.2	
0	ON	ON	
1	OFF	ON	
2	ON	OFF	
<b>3</b>	<b>OFF</b>	<b>OFF</b>	<b>&lt;---Default Position</b>

<u>Baud Rate</u>	S1.3	S1.4	
9600	ON	ON	Debug.mode
4800	OFF	ON	
2400	ON	OFF	
<b>9600</b>	<b>OFF</b>	<b>OFF</b>	<b>&lt;---Default Position</b>

## **MTG-JB3 terminations.**

Each sensor must be connected to a matching WAGO connector number on the **MTG-JB3**.

The following steps are to be observed:

1. Place the wires of each **Pressure** sensor cable into corresponding pins of the 5-Pin WAGO connector on the MTG-JB3 Board. Please match the sensor cable color code to the connector number and the pin color to the pin name as per the tables above.
2. Place the wires of each **Temperature** sensor cable into corresponding pins of the 4-Pin WAGO connector on the MTG-JB3 Board. Please match the sensor cable color code to the connector number. Please note that wires of the corresponding colors shall be inserted into the connector slots with the same letters marking. You should put both Pink and Green wires to pins denoted as A, while Grey and White wires to pins denoted as B or vice versa.
3. Place DB- and DB+ wires coming from **J-Condulet** into the 3-pin WAGO RS-485 connector as per marking on **MTG-JB3 Board**. See *Figure 28* on next page.
4. Make sure that the power is off and Place Power Positive wire into the V1 pin of the 4-pin Power Input Connector. Place the Power Negative wire into the Ground pin of this connector. Watch the corresponding marking on the **MTG-JB3 Board**.
5. Check that the flat cable between the two boards is properly fit.

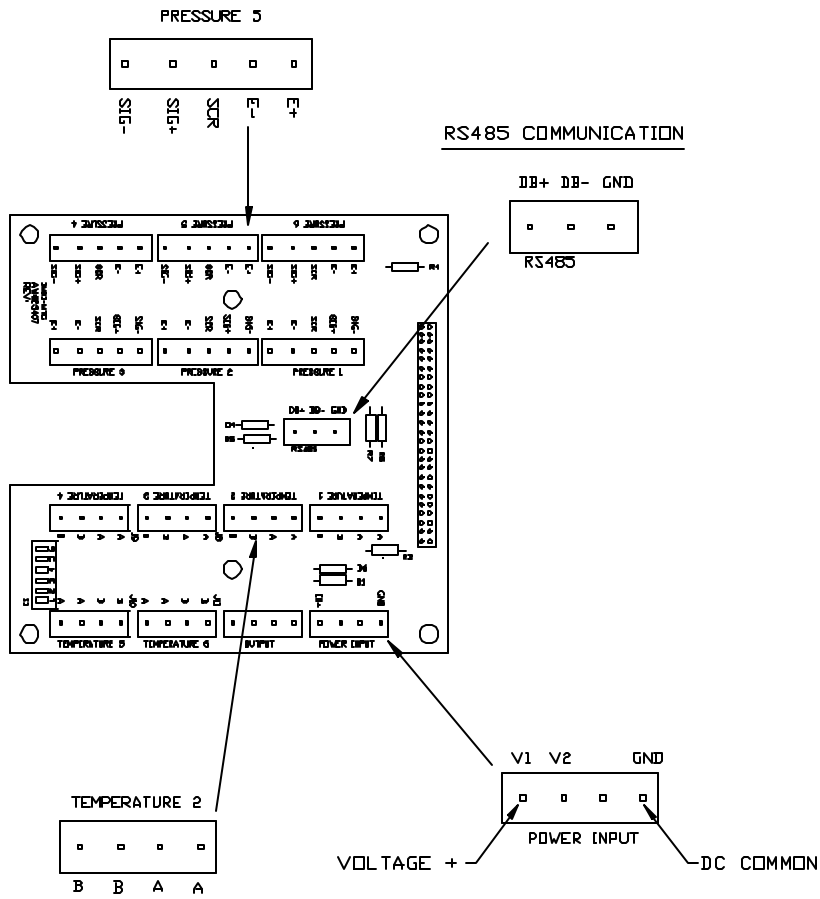
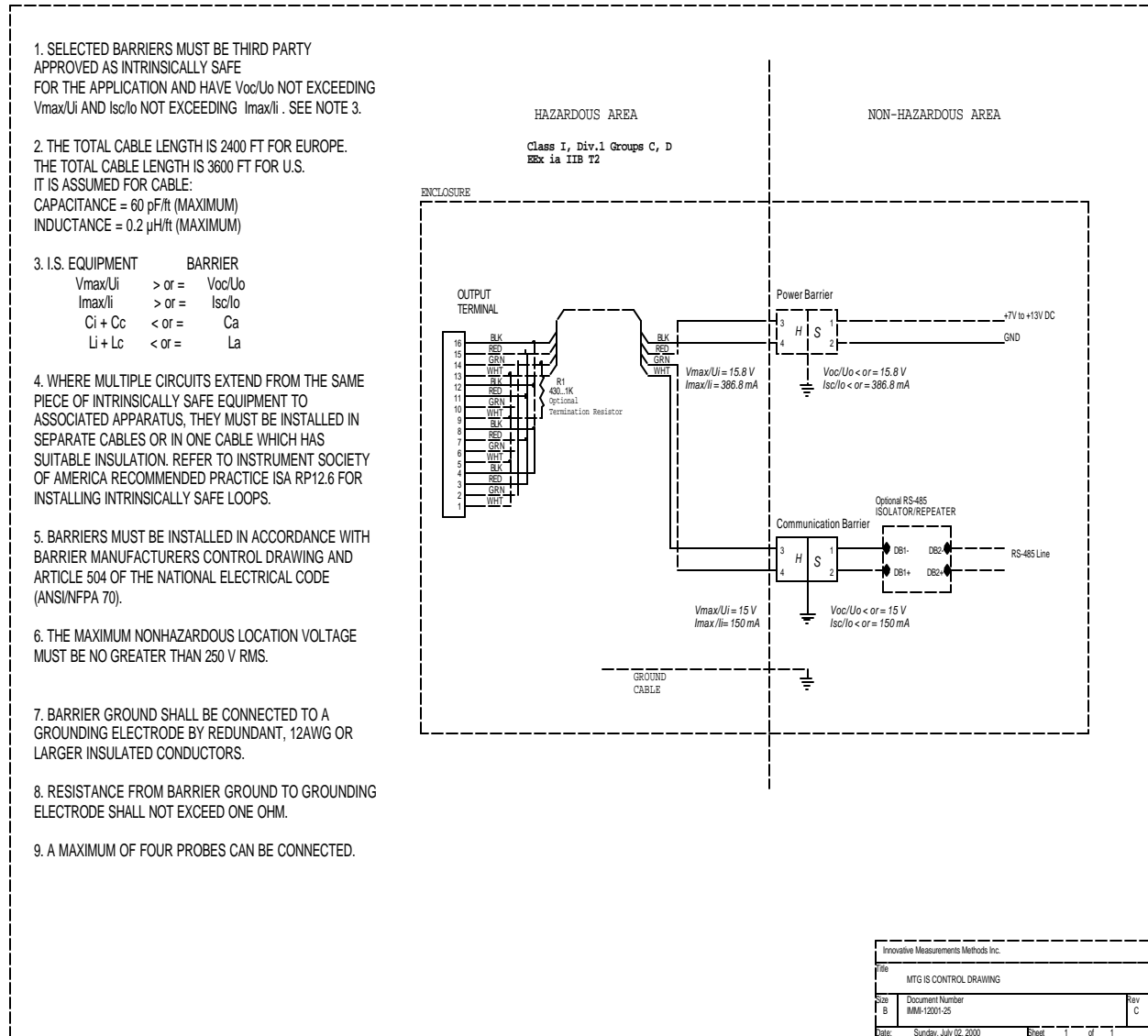


Fig 28

# MTG Probe Intrinsically Safe Installation

The following is an approved MTG Control drawing:



The actual number of MTG Probes and/or Cable type and length calculation may be provided depending on the type of IS Barriers used with the system.

In some cases the voltage drop could limit cable length. Please consult factory for details or for obtaining the Cable length and configuration calculation spreadsheets

You must not ground the shield of the wire at the MTG Transmitter  
The shield of the wire may only be connected to the **IS Barrier** ground bus.

## Chapter 4 Register map, Alarms and Software

### Address Map For MTG Driver DT3 Version 3.62

MTGdigitala.txt

Addr Hi	Addr Lo	Description	Unit	Set ability	Type	Format	Size	Comments
<b>User Register set</b>								
1	0	Coil Counter		None	Int	Dec	2	Diagn.
1	1	Alarm Register		None	WORD	HEX	2	Diagn.
1	2	Process Control Register		None	WORD	HEX	2	Diagn.
1	3	Process Control Register		None	WORD	HEX	2	Diagn.
1	4	Level as integer		None	Int	Dec	2	Diagn.
1	5	Level	mm	None	Int	Dec	2	Data
1	6	RW-Level	mm	None	Int	Dec	2	Data
1	7	Aver_Temperature	Deg C * 100	None	Int	Dec	2	Data
1	8	Product Density	kg/cub.m*10	None	Int	Dec	2	Data
1	9	Temp. 0 or as defined	Deg C * 100	None	Int	Dec	2	Data
1	10	Temp. 1 or as defined	Deg C * 100	None	Int	Dec	2	Data
1	11	Temp. 2 or as defined	Deg C * 100	None	Int	Dec	2	Data
1	12	Temp. 3 or as defined	Deg C * 100	None	Int	Dec	2	Data
1	13	Temp. 4 or as defined	Deg C * 100	None	Int	Dec	2	Data
1	14	Temp. 5 or as defined	Deg C * 100	None	Int	Dec	2	Data
1	15	Density12 or as defined	kg/cub.m*10	None	Int	Dec	2	Data
1	16	Density23 or as defined	kg/cub.m*10	None	Int	Dec	2	Data
1	17	Density34 or as defined	kg/cub.m*10	None	Int	Dec	2	Data
1	18	Density45 or as defined	kg/cub.m*10	None	Int	Dec	2	Data
1	19	Alg. Density or as defined	kg/cub.m*10	None	Int	Dec	2	Data
1	20	% Water above 3rd or as defined	% * 100	None	Int	Dec	2	Data
1	21	% Water above 4th or as defined	% * 100	None	Int	Dec	2	Data
1	22	% Water above 5th or as defined	% * 100	None	Int	Dec	2	Data

1	23	Gross Mass or as defined	Kg	None	Float	Dec	4	Data
1	25	Gross Volume or as defined	Cub. Meter	None	Float	Dec	4	Data
1	27	Pressure 0 or as defined	Pa	None	Float	Dec	4	Data
1	29	Pressure 1 or as defined	Pa	None	Float	Dec	4	Data
1	31	Pressure 2 or as defined	Pa	None	Float	Dec	4	Data
1	33	Pressure 3 or as defined	Pa	None	Float	Dec	4	Data
1	35	Pressure 4 or as defined	Pa	None	Float	Dec	4	Data
1	37	Pressure 5 or as defined	Pa	None	Float	Dec	4	Data

User registers 1-5 through 1-37 are configurable and may be different for some tanks.

Addr Hi	Addr Lo	Description	Unit	Set ability	Type	Format	Size	Comments
<b>Configuration Register Set</b>								
2	0	Work Counter Hi		Set	Int	Dec	2	System modified
		Through						
17	254	Tank Table Coef #7		Set	Float	Dec	4	Constant

## Alarm Codes

Bit	ID	Description
15 MSB	Reference Error	Error in Reference Measurements
14	ADC Error	ADC can not be initialized or Invalid Reading
13	Temp. Jump	Unexpected Change in Temperature
12	T. not Updated	Temp. Readings have not been updated during MS
11	DmaxOver	Calculated Density Over Max Value
10	DminOver	Calculated Density Less than MIN Value
9	Alpha	Error in Alpha Calculations
8	Pover	Calculated Pressure over sensor range
7 LSB	SPI Error	Error during SPI transitions
6	Termo	Alarms During sensor measurements
5	S5	
4	S4	
3	S3	
2	S2	
1	S1	
0	S0	

## Software tools

Recommended software to calibrate, configure and read an MTG gauge.

MTGDriverD2

GSITEST

WINTG PRO

## **Appendix A: MTG Specification**

### Performance

Measurement Parameters:	Mass, Level, Volume, Density, Interface Level, Multi-point Temperature & Pressure, Percentage of water
Full Measurement Range *:	Tanks up to 30 meters high
Mass Measurement Accuracy:	±0.05% F.S.
Density Measurement Accuracy:	±0.0015 g/cc
Level Measurement Accuracy:	±0.15% between sensor distance
Temperature Resolution:	0.1°C
Communications:	RS 485 MODBUS RTU
MTG Transmitter Input Power	7... 16 VDC

### Environmental

Ambient operating Temperature Range (Please consult factory for extended temperatures)	-40 to +80 C (-40 to +176 F)
Maximum Temperature of Liquid (Please consult factory for extended temperatures)	+100 C (+212 F)
Humidity:	0 - 100% R.H.
MTG Wetted Parts Materials:	Standard: SS 303, 304 & Options: Customer specified
MTG Non-wetted Parts Materials:	Standard: SST 303 & 304, Aluminum Alloys Options: Customer specified
Vessel Pressure:	Consult Factory for applications with Tanks Pressurized above 5 PSI
Minimum Life expectancy:	10 years

### Field Installation Requirements

(NB Our standard questionnaire must be completed)

Mounting:*	3" or greater ASA or DN flange Custom flanges are acceptable
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?? **Consult factory for installations in tanks taller than 60 feet (18 meters)**

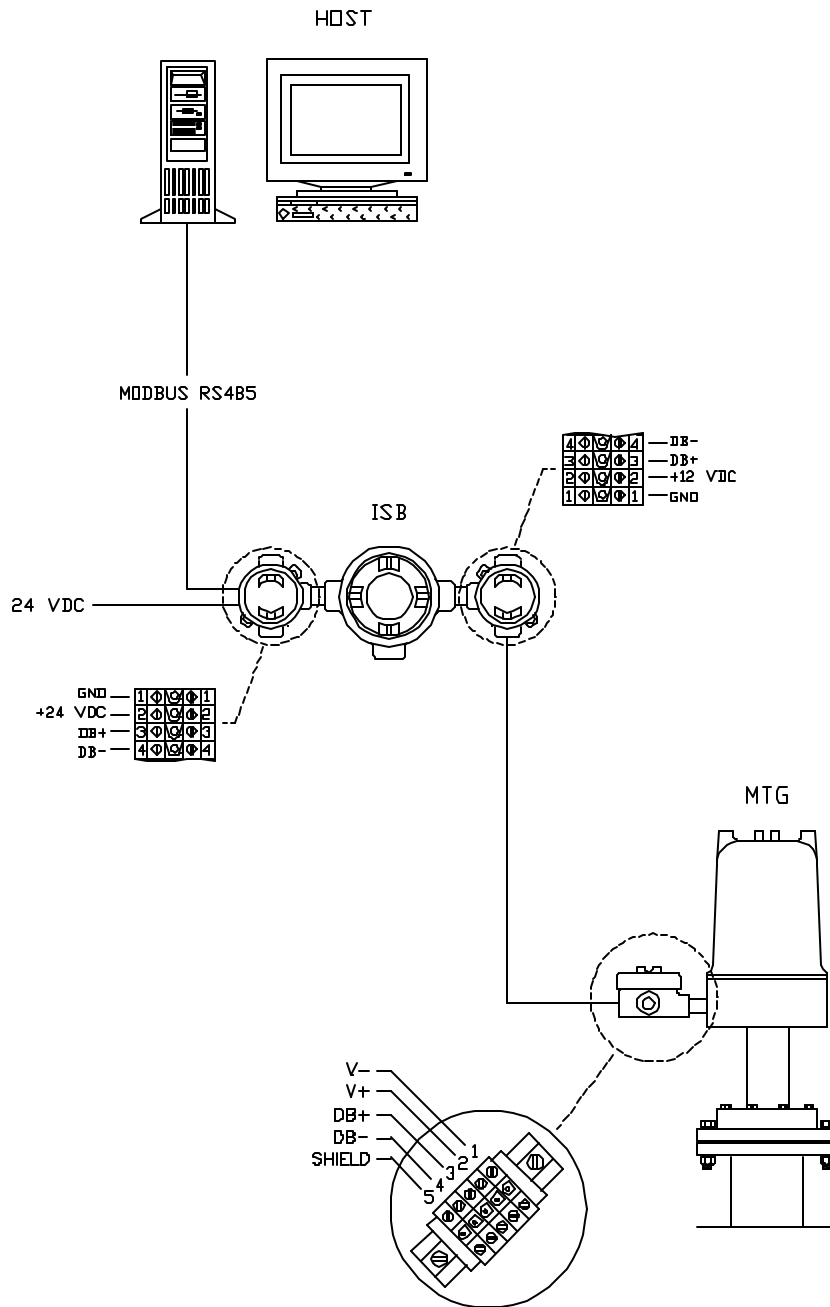
?? **\*\* Consult factory for accuracy specifications. The accuracy figures given above are for non-pressurized or low-pressure tanks.**

**NOTE: All specifications are subject to change without prior notice.**



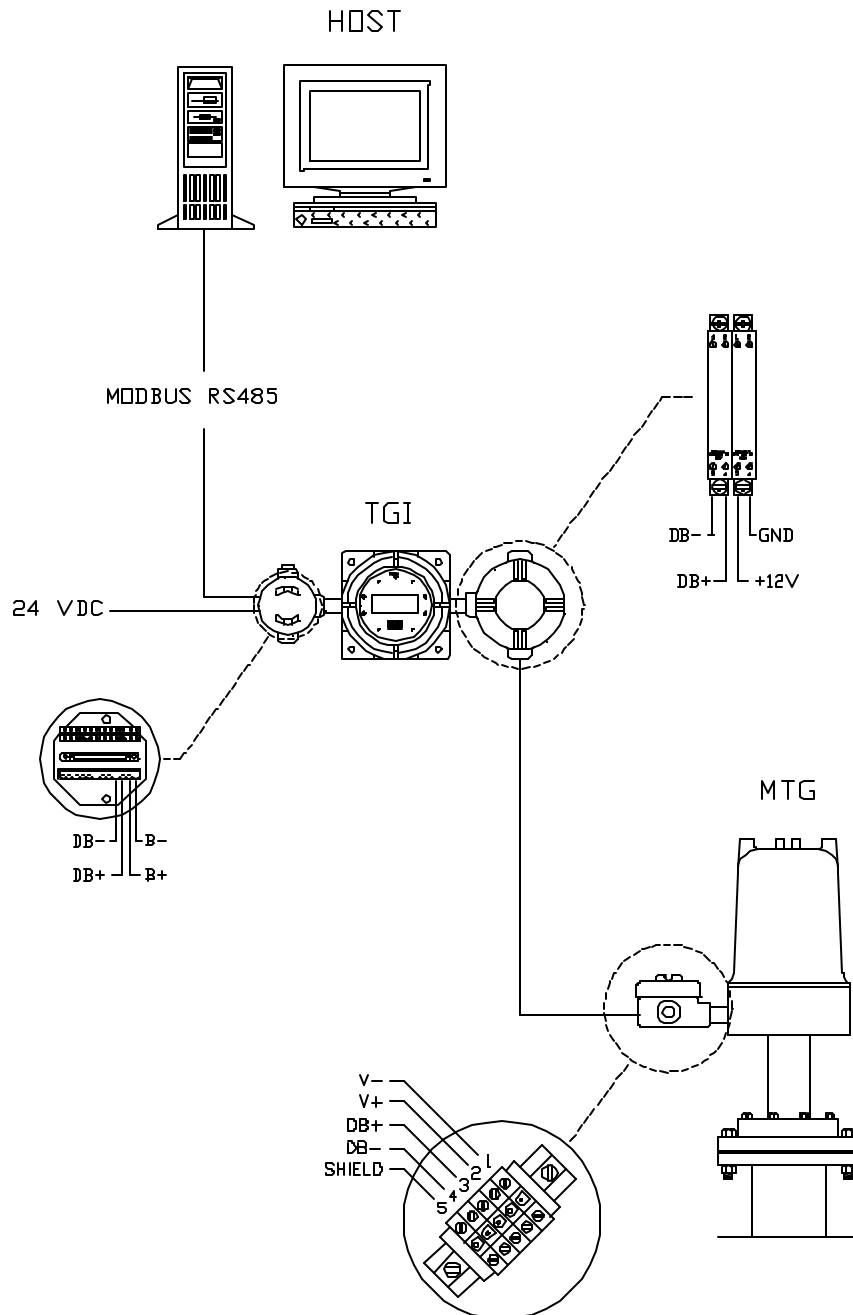
## Appendix B: MTG Network using ISB “Intrinsic Safety Box”

The following drawings and diagrams show the MTG Probe connection options and network using the ISB.



## Appendix C: MTG Network using E/TGI “Tank Gauge Interface”

The following drawings and diagrams show the MTG Probe connection options and network using the E/TGI NEMA 7– Tank Gauge Interface Unit



## Appendix D: MTG Network using E/TGI “Enhanced Tank Gauge Interface”

The following drawings and diagrams show the MTG Probe connection options and network using the E/TGI NEMA 4x- Enhanced Tank Gauge Interface Unit

