

WARNING: Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion and/or fire causing property damage or personal injury or death. Marshall Excelsior Company equipment must be installed, operated and maintained in accordance with all federal, state and local codes and Marshall Excelsior instructions. The installation in most states must also comply with NFPA standards 58 and 59, and ANSI K61.1

Only personnel trained in the proper procedures, codes, standards and regulations of the LP-Gas and NH₃ industries should install, maintain, and service this equipment.

Be sure all instructions are read and understood before installation, operation and maintenance. These instructions must be passed along to the end user of the product.

Release all system pressure prior to installation. Failure to do so could result in personal injury. Use proper safety equipment at all times. Completely purge the system of all LP-Gas or NH₃.

CAUTION: Contact or inhalation of liquid propane, ammonia and their vapors can cause serious injury or death! NH₃ and LP-Gas must be released outdoors in air currents that will insure dispersion to prevent exposure to people and livestock. LP-Gas must be kept far enough from any open flame or other source of ignition to prevent fire or explosion! LP-Gas is heavier than air and will not disperse or evaporate rapidly if released in still air.

NOTE: Before installing, inspect float gauge assembly for shipping damage that may affect performance



WARNING: These products contain a chemical known to the state of California to cause cancer and birth defects or reproductive harm

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— MEC —
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Accu - Max Liquid Level Gauges

ME930 / ME940 Series Installation Guide



CAUTION

Read completely before attempting installation. These instructions are prepared to assist qualified individuals and others generally familiar with liquid storage tank equipment. Most consumers are not qualified to perform the installation described. If you have any questions about installation or operation of Accu-Max float gauges, contact the Marshall Excelsior Co., or an authorized distributor for assistance.

*Specifications are subject to change without notice. Pressure ratings subject to change due to temperature and other environmental considerations.

Construction & Operation

Accu-Max liquid level gauges are designed for centerline mounting on bulk-storage tanks and bobtails or transports.

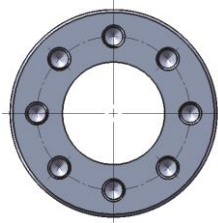
The materials used in construction are carefully selected for compatibility with the liquid to be gauged, so, you can expect the unit to provide many years of trouble-free service.

Accu-Max gauges are operated by liquid displacement of a float bulb attached to a counter-balanced float arm. The counterbalance has been adjusted so that the float will be half-submerged in the tank's liquid.

The main gear at the pivot point drives a pinion gear attached to a center shaft. The 2.2:1 gear ratio converts the 140° float arc to 308° of center shaft rotation. A drive magnet, attached to the end of the center shaft under the gauge head, couples with a dial pointer magnet through the solid, non-magnetic head to move a pointer around a dial, graduated in percent of tank volume. The limits of measurement are 5% - 95% for bobtails or transports and 3% - 97% of tank volume for bulk-storage tanks.

Attachment To Tank

Different adapters can be welded or screwed into tanks to attach the gauge. The mounting bolt holes for all Accu-Max float gauges are on the vertical centerline.



Centerline Mount

The Accu-Max float gauge must be mounted to one of the following MEC adapters, P/N ME931, which has a 2.5" Male NPT thread which screws into a 2.5" Female NPT coupling welded into the tank or P/N ME932, which is designed to be welded directly to the tank. The sealing gasket, four seal locators and eight mounting studs and nuts are included with the Accu-Max float gauge.

Part #	Description
ME930-239	Glass for 4" dial
ME930-240	Glass seal for 4" dial
ME940-210	Glass for 8" dial
ME940-211	Glass seal for 8" dial
ME930-212	Mounting flange gasket - Spiral wound stainless steel, PTFE - filled
ME930-255	Plastic seal locators, .75"OD x .49"ID - Poly
ME930-244	Stainless steel dial screw - #10-32 UNF-2A
ME930-243	Stainless steel Dial nut - #10-32 UNF-2B
ME930-223	Hex nut, 1/2"-13 UNC-2B
ME930-224	Stud bolt, 1/2"-13 UNC-2A
ME930-222	4" Dial mounting bracket
ME940-206	8" Dial mounting bracket
ME930-905	4" Dial, LPG & NH3, 5% - 95%
ME940-905	8" Dial, LPG & NH3, 3% - 97%
ME930-211	Float bulb - 2" dia. x 4 1/4" long
ME930-903-72	Float bulb and Arm assembly for 72 dia. DOT tank
ME930-903-79	Float bulb and Arm assembly for 79 dia. DOT tank
ME930-903-84	Float bulb and Arm assembly for 84 dia. DOT tank
ME940-903-108	Float bulb and Arm assembly for 108 dia. ASME stationary tank
ME940-903-130	Float bulb and Arm assembly for 130 dia. ASME stationary tank

Accu Max Limited Warranty

Marshall Excelsior warrants Accu-Max float gauges and repair kits to the original buyer to be free of defects in material and workmanship under normal service and use for two years from the manufactured date. If a buyer perceives a product to have a defect, the buyer must notify Marshall Excelsior's home office in writing within 20 days of known perceived defect and the product must be post-marked and shipped F.O.B. origin within 30 days to Marshall Excelsior's home office after known perceived defect. Marshall Excelsior will not accept any product that does not have a Return Material Authorization (RMA) number from the home office in Marshall, MI. After Marshall Excelsior has inspected the product and deems the product to be defective, at its discretion, Marshall Excelsior will repair, replace or refund the purchase price of the defective product. If the buyer does not comply with the above stated, the buyer will waive unconditionally and absolutely any and all claims arising out of such perceived defect.

Trouble Shooting

SYMPTOM	LOOK FOR:
Gauge not reading at low extreme when installed in empty tank.	<ul style="list-style-type: none"> • Float striking obstruction such as dip pipes or baffles. • Float or counterbalance striking tank wall. <ul style="list-style-type: none"> - <i>Incorrect gauge.</i> • Float not dropping under its own weight. <ul style="list-style-type: none"> - <i>Defective gauge.</i> • Float arm too short for counterbalance.
Gauge continues reading at low extreme when tank is full.	<ul style="list-style-type: none"> • Obstruction on tank bottom. • Float improperly counterbalanced for liquid being gauged. - <i>Order correct gauge.</i> • Float leaks and is filled with liquid. <ul style="list-style-type: none"> - <i>Replace float.</i>
Gauge indicator staying at some midpoint regardless of liquid level.	<ul style="list-style-type: none"> • Float hung not allowing float to follow liquid level. - <i>Defective gauge.</i> • Float partially sunk due to leakage or improper counterbalancing. <ul style="list-style-type: none"> - <i>Replace float or gauge.</i> • Dial pointer is stuck due to damage or corrosion. <ul style="list-style-type: none"> - <i>Replace dial.</i> • Incorrect or modified float arm installed or gauge. - <i>Replace float arm or gauge.</i>
Gauge indicating liquid level inaccurately.	<ul style="list-style-type: none"> • Gauge not fitting tank. - <i>Order right gauge</i> • Gauge mounting adapter not aligned with tank axis. • Tank is not level. • Liquid-temperature volume changes not accounted for.
Gauge face not straight on tank.	<ul style="list-style-type: none"> • Mounting adapter lined up improperly. • Centerline gauge used on straddle mount adapter.

The minimum adapter opening diameter the float and counterbalance must pass through is 2.25" (57.2mm). Any adapter used must be installed with its axis truly aligned with the tank axis. This enables the installed gauge to be exactly horizontal and provide accurate gauge readings.

Inspection & Assembly of Gauge

When the Accu-Max float gauge is received, inspect it to make sure it is in operating condition. Use the screws and nuts provided to install the float arm and dial onto the gauge. Make sure the float will fall under its own weight by moving the float arm slowly through its range to detect any binding or restriction. The dial pointer should move slightly past the extreme ends of the dial scale when the float arm reaches the limits of its travel.

Ensure the gauge is calibrated properly by aligning the float arm with the support arm. The 50% graduation on the dial is located at the 12 o'clock position after the gauge is installed in its adapter. At alignment, the gauge should read 50% in turn. To properly align the gauge, use the appropriate orientation below:

- 1) Horizontal Mount – Align float arm to be in line with support arm.
- 2) Top Mount – Hold float arm at 90° to support arm.
- 3) Angle Mount – Hold float arm horizontally and support arm at installation angle.

Accuracy Precaution

Before installing your Accu-Max gauge, be sure it fits your tank properly. Check the length of the float arm, measuring from the pivot point to the center of the float bulb. This dimension should be approximately .465 times the inside diameter of any horizontal cylindrical tank, and .428 times the inside diameter for mobile tanks.

Before filling the tank, be sure the gauge moves freely inside. Many storage tanks contain dip pipes, baffles, or other obstructions which may interfere with free movement of the gauge float arm, preventing proper performance.

Accurate measurement of Liquefied-Petroleum Gas (LP Gas) or anhydrous ammonia (NH₃) requires converting a volume measured at an observed temperature to the volume at a standard base temperature of 60° F. LP Gas is usually a mixture of propane, butane and possibly other gases, so the conversion factor is usually determined from a chart when the specific gravity of the LP Gas at 60°F is known.

CAUTION

NEVER EXCEED THE MAXIMUM SAFE FILLING LEVEL

The temperature chart for various specific gravities (mixtures) of LP Gas is based on the permitted filling densities as given in the NFPA 58, liquefied petroleum gas code. This chart is required for an LP Gas liquid-level gauge to be listed by Underwriters Laboratories, Inc. The chart indicates the maximum safe level for LP Gas when the specific gravity and liquid temperature are known. This safe level allows space in the tank for liquid expansion if the liquid temperature rises.

WARNING

The gauge is not a substitute for a fixed or adjustable liquid level gauge which is required for filling by the NFPA 58, liquefied petroleum gas code. Do not use float gauge for filling.

Installing The Gauge

If the gauge has not been assembled, read the section on inspecting and assembling the gauge.

1. Place the seal locators on the short end of the studs as shown with the lips outward and install these studs in the gauge adapter.



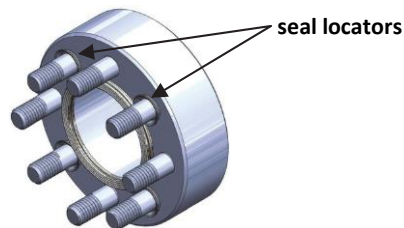
Placement of Studs and Seal Locators

2. Place spiral-wound gasket over hole and under seal locators' lips. Never re-use a gasket.



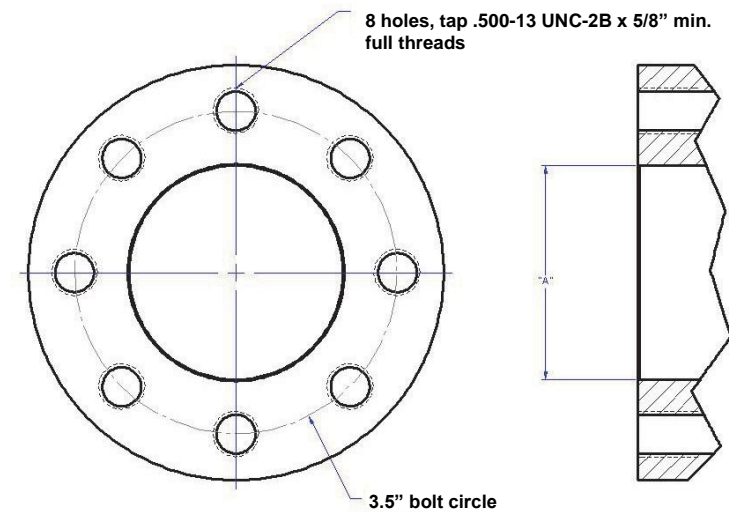
Placement of Spiral-Wound Gasket

3. Place two more seal locators over studs as shown. Install these and the remaining studs. The gasket is now centered and retained.



Placement of Studs and Seal Locators

1. Basic dimensions of the American National Standard Taper Pipe Thread are given in inches to 4 or 5 decimal places. While this implies a greater degree of precision than is ordinarily attained, these dimensions are the basis of the gauge dimensions and are also expressed for the purpose of eliminating errors in computations.
2. Also length of thin ring from gauging notch to small end of plug gauge.
3. Also pitch diameter at gauging notch (handtight plane).
4. Also length of plug gauge.
5. The length L5 from the end of the pipe determines the plane beyond which the thread form is incomplete at the crest. The next 2 threads are complete at the root. At this plane, the cone formed by the crests of the thread intersects the cylinder forming the external surface of the pipe. $L5=L2-2p$.
6. Given as information for use in selecting tap drills.
7. Military Specification MIL-P-7105 gives the wrench makeup as three threads for sizes 3 & smaller.
8. Reference dimension.



"A" = 2.320" FOR STANDARD

Note: Materials and specifications are subject to change without notice.
Pressure ratings subject to change due to temperature and other environmental considerations.

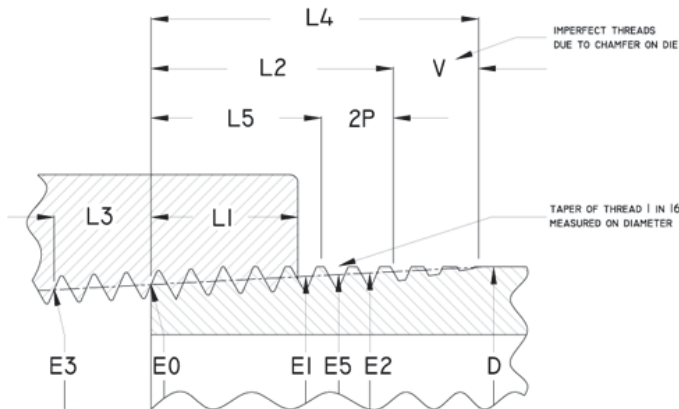


Accu-Max Gauge Adapter Machining Standard

ISO 9001: 2000 REGISTERED

AN AMERICAN NATIONAL STANDARD
PIPE THREADS, GENERAL PURPOSE (INCH)

ANSI / ASME B1.20.1

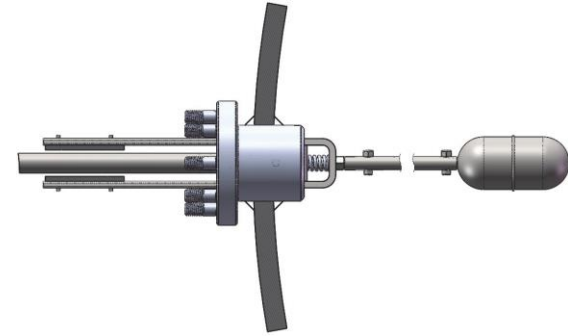


**BASIC DIMENSIONS OF AMERICAN NATIONAL STANDARD TAPER PIPE
THREAD, NPT¹**

Nominal Pipe Thread	O.D. of Pipe (D)	Thread/in. (n)	Pitch of Thread (P)	Pitch dia. at beginning of external thread (EQ)	Handtight engagement			Effective Thread External		
					Length 2 (L1)		Dia. 3 (E1)	Length 4 (L2)		Dia. (E2)
					Inch	Threads		Inch	Threads	
1	2	3	4	5	6	7	8	9	10	11
2	2.375	11.5	0.08896	2.28902	0.436	5.01	2.29627	0.7565	8.70	2.31630
2.5	2.876	8	0.12500	2.71953	0.682	5.46	2.76216	1.1375	9.10	2.79062

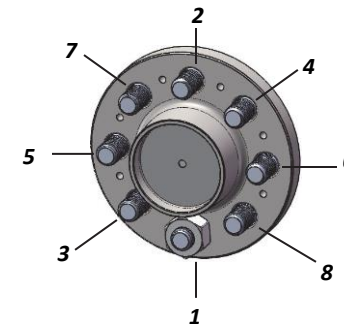
Nominal Pipe Size	Length L1 Plane external Thread (L2-L1)		Wrench Makeup Length for Internal Thread 7			Vanish Thread (V)		Overall Length External Thread (L4)	Nominal Complete External Threads		Height of Thread (H)	Increase Dia./ Thread (0.0625/n)	Basic Minor Dia. At Small End of Part (KO)
	Inch	Thread	Length (L3)		Dia. (E3)	Inch	Thread		Length (L5)	Dia. (E5)			
			Inch	Thread									
1	12	13	14	15	16	17	18	19	20	21	22	23	24
2	0.3205	3.69	0.2609	3	2.25272	0.3017	3.47	1.0582	0.5826	2.30543	0.06957	0.00543	2.1995
2.5	0.4555	3.64	0.2500	2	2.70391	0.4337	3.47	1.5712	0.8876	2.77600	0.10000	0.00781	2.6195

- Align the float arm with the support and counterbalance mechanism and rotate "50%" mark on the dial to the 9 o'clock position, then insert the gauge float through the adapter into the tank. Slowly rotate the gauge until the "50%" mark on the dial is at the 12 o'clock position.



Inserting The Gauge in the Tank

- Slip the gauge head onto studs and start the mounting stud nut at the 6 o'clock position. Remove the dial and install remaining nuts finger-tight. Tighten nuts near the bottom of head just enough to make the head parallel to the adapter face. Tighten in sequence while increasing torque gradually. Make sure the gap between the head and adapter remains the same all the way around. If it is not, loosen nuts near the narrow gap slightly and tighten nuts near the wide gap. After the nuts have been partially tightened and head is parallel with flange, apply about 10 ft./lbs. torque using nut tightening sequence. Now, apply about 20 ft./lbs. using nut tightening sequence. Then apply a final torque of 25 to 35 ft./lbs. to each nut several more times in sequence.



Nut Tightening Sequence

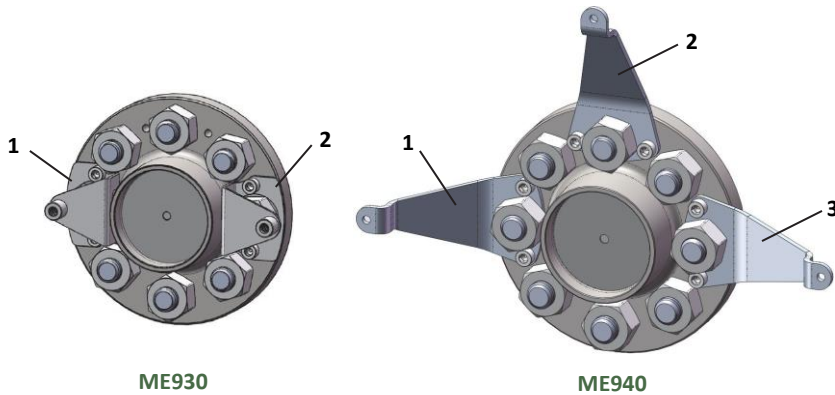
WARNING

Uneven or excessive nut torque can damage gasket and/ or gauge head.

6. Installation Inspection

Purge the vessel if necessary. Pressurize it to at least one-third the rated tank pressure if it is a pressure vessel. Check for leakage between head and adapter and around each mounting bolt head. Over-tightening of mounting bolts may cause cracks or warp the head. If no leaks or other defects are detected, fill the vessel.

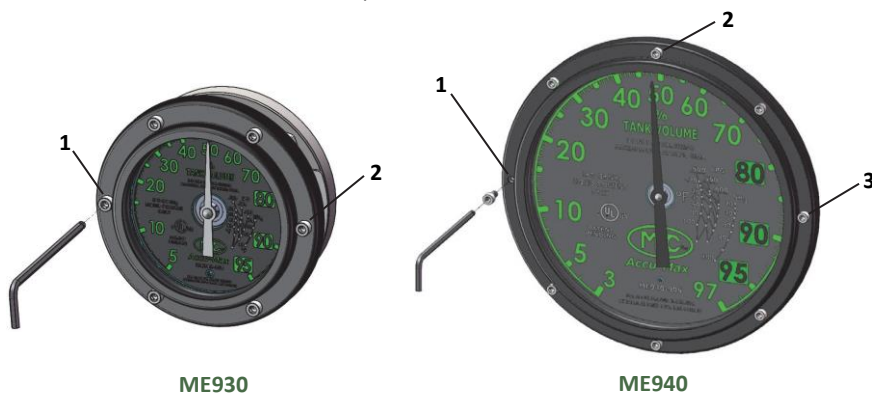
7. Install dial mounting brackets—4" DOT model at the 9 and 3 o'clock positions, 8" Stationary at the 9, 12, and 3 o'clock position as shown



CAUTION

The back of the dial chamber must be seated in the gauge head and all brackets touching the dial chamber without rocking. If they do not, carefully bend the bracket arms forward until even.

8. Attach dial chamber—4" DOT Model at the 9 and 3 o'clock position, 4" Stationary model at the 9, 12 and 3 o'clock position as shown.



NOTE

The Accu-Max dial face is Argon filled and factory sealed to prevent moisture and fogging. Do not remove dial face screws other than those shown as this may break dial seal releasing the Argon.

9. Installation Inspection

Check for pointer movement after 5% full, prior to filling to the desired level.

WARNING

DO NOT TEST THE FLOAT FOR LEAKAGE BY ANY MEANS

If the dial indicates a lower liquid level than what is known, then the gauge float may be leaking and may be filled with liquid. Place the removed float in a safe, isolated and well-ventilated area to give the LP Gas or NH3 a chance to diffuse. With these liquefied gases and other similar products, a danger of float explosion exists due to liquid or gas expansion resulting from warming a float from any source.

Precautions Regarding Removal of Gauge

If gauge removal appears necessary, this should only be done by a qualified individual under competent supervision. Make sure pressure is entirely blown down and wind cannot carry fumes near open flames.

Fire Hazard Warning

A hazard of fire or explosion may exist if proper methods are not used when installing or removing gauge from vessels containing pressurized liquid or gas, flammable liquids, oxidizers, NH3 or LP Gas.

Removing the Gauge

When removing gauges, do not strain or force the parts, especially in lining up the counterbalance. After mounting stud nuts have been removed, replace the dial chamber and slowly rotate the gauge left or right until the pointer is at the 50% level. In this position, the counterbalance will be parallel to the support arm and can be easily withdrawn through the opening.