

# HEATEC TEC-NOTE

Publication No. 5-09-218

## Setting Siemens pressure transmitters used on Heatec portable fuel tanks

This document provides information on setting Siemens Pressure Transmitter 7MF4033-1CA10-1NC7-Z-B21-Y01-Y22-A01 (**Figure 2**) used on Heatec portable fuel tanks (**Figure 1**). It applies to single-wall and double-wall tanks with capacities of 10,000, 15,000, 20,000 and 25,000 gallons.

The pressure transmitter indicates the *level* of liquid fuel above the bottom of the tank and displays the levels in **inches**. This document supersedes Tec-Note 6-05-164, which applies to transmitters set up to display levels in feet above transmitter height.

This document is included with all Heatec fuel tanks equipped with the Siemens transmitters. Siemens User's Manual UMSITRPDS3-1 is also furnished. Information in these documents should enable users to set transmitters on Heatec fuel tanks in the field. Although the transmitters are preset at the Heatec factory before the tanks are shipped, users may need to change settings for different fuels.

### NOTICE

This document supplements the Siemens manual and should always be used along with the Siemens manual. Be sure to



Figure 1. Heatec portable fuel tank.



Figure 2. Siemens pressure transmitter.



Figure 3. Display on transmitter.

read all appropriate warnings and precautions in the Siemens manual before doing any work on Siemens transmitters. The following statement appears in the front of the Siemens manual and should be followed:

### Qualified Persons

The described equipment should be installed, configured, operated, and serviced only by qualified persons thoroughly familiar with this User's Manual. A copy of this manual accompanies the equipment. The current version of the manual, in Portable Document Format (PDF), can be downloaded from [www.sea.siemens.com/ia/](http://www.sea.siemens.com/ia/).

### FACTORY SETTINGS

Each transmitter is normally set at Heatec to display liquid levels in *inches* (**Figure 3**). This setting *cannot* be changed in the field by plant personnel.

However, the *specific gravity* of fuel can be changed in the field by plant personnel.

Heatec normally sets the transmitter for a specific gravity of 0.880 before the tank is shipped. This is the specific gravity of waste oil. Other fuel oils have somewhat different specific gravities.

If the specific gravity of actual fuel in your tank is either higher or lower than 0.88 the *transmitter* will give incorrect indications of liquid level. Incorrect indications can either lead to overflowing the tank when it is being filled or unintentionally running out of fuel.

Specific gravity is the weight of fuel compared to an equal volume of water at the same temperature. Pure water weighs 8.333 pounds per gallon and has a specific gravity of 1.000. Thus, the specific gravity of fuel equals the weight of fuel divided by the weight of water.

### DETERMINING SPECIFIC GRAVITY

If you don't know the specific gravity of the fuel you use, ask your supplier.

### RESETTING THE TRANSMITTER

If your fuel has a specific gravity different from 0.880 you should change the specific gravity setting of the transmitter.

**NOTE:** you cannot directly enter the numerical value for fuel specific gravity when resetting the transmitter. The numbers you actually set on the transmitter are the numbers shown in **Figure 5** for the **full scale blind settings**.

If you need to change the transmitter setting, compare the specific gravity of *your* fuel with those shown in **Figure 5**. Choose the specific gravity with a value closest to that of *your* fuel. Use the **full scale blind setting** shown for that value as the new setting of your transmitter.

The transmitter has a display window (**Figure 3**) and a set of magnetic pushbuttons (**Figure 4**). Use the magnetic pushbuttons on the transmitter to change the settings.



Figure 4. Magnetic pushbuttons.

First use pushbutton M to cause Mode 6 to show in the display window. Then use the other two pushbuttons to set the appropriate number from **Figure 5**. Press pushbutton M again to save your settings.

The only way that you can reset the fuel specific gravity is using the **full scale blind setting** or Mode 6. *Do not change any other parameter!*

### DISPLAY LEVELS VS. GALLONS

As already noted the transmitter displays levels in inches. You may need to know how many gallons of liquid that various levels represent. Please refer to Tech-Note 6-05-166 to convert levels to gallons. The column labeled "inches" refers to the numbers that are displayed on the transmitter (**Figure 3**) and on a level controller, if one is installed.

Some error is unavoidable when measuring levels and converting them to gallons of liquid stored in the tank.

**It is important to note that pressure transmitters on Heatec tanks are now set up to display the height of the liquid above the inside bottom of the tank. In the past the transmitters were set up to display the height of the liquid above the location of the transmitter sensor.**

**You should not change the position of the transmitter or the location of its sensor. Doing that would cause all indications to be wrong.**

The sensor of the transmitter is installed 6 inches above the bottom of the tank. (This distance may vary plus or minus 1/4-inch.) Consequently, the transmitter displays 6.00 inches when the fuel level is at the same height as the sensor. But because it cannot sense any level below its installed height, it will always show 6.00 inches when the tank is empty or when levels are anywhere below 6 inches.

So remember, any time the transmitter display shows 6.00, the amount of liquid in the tank is unknown.

## VERIFYING ACCURACY OF LEVELS

You should periodically verify that the level indications produced by the pressure transmitter are acceptably accurate.

The easiest way to do this is to measure the empty space at the top of the tank using a measuring tape marked in inches, as explained in **Tec-Note 6-05-166**.

Make this measurement while the tank is well over half full. Your final answer should match the level displayed on the transmitter and controller, within one inch. If the indicated level differs much more than an inch try and find the cause.

Start by checking the full scale blind setting of the transmitter. Make sure it is properly set for the liquid actually stored in the tank based on the specific gravity of the liquid at its storage temperature. Use the information under the heading "resetting the transmitter" to determine the correct settings.

Be aware that debris or anything blocking the port where the transmitter connects to the tank will cause erroneous operation of the transmitter.

## LAST RESORT

In the event that measured levels differ significantly from levels indicated by the transmitter it may be possible to use a *trial and error* method to bring the two into agreement. You might want to try this method especially when you are not sure about the specific gravity of the liquid stored in the tank.

But before proceeding with the trial and error method, carefully recheck your taped measurements and your arithmetic for errors. And then check the full scale blind scale setting on the transmitter to make sure it is correct.

If the two levels still do not agree, proceed with the trial and error method. It involves nothing more than changing the values of the full scale blind setting on the transmitter. Just arbitrarily increase or decrease the values until the displayed level indications agree with the level found with the measuring tape.

Each time you enter a new value and store it, check the transmitter to see how close it agrees with the level found using the measuring tape. Keep doing this until you get an acceptable match.

After using this method to attain agreement between the transmitter and measuring tape we recommend that you recheck one against the other several times over a period of a several days.

**Figure 5. Specific gravities of fuels and transmitter settings**

Commercial fuels	Specific gravity at 60 degrees F	Transmitter full scale blind settings (Mode 6)
	0.970	116.4
No. 6 oil	0.965	115.8
	0.960	115.2
	0.955	114.6
	0.950	114.0
No. 5 oil	0.945	113.4
	0.940	112.8
	0.935	112.2
	0.930	111.6
	0.925	111.0
	0.920	110.4
	0.915	109.8
	0.910	109.2
	0.905	108.6
No. 4 oil	0.900	108.0
	0.895	107.4
	0.890	106.8
	0.885	106.2
Waste oil	0.880	105.6
	0.875	105.0
	0.870	104.4
	0.865	103.8
	0.860	103.2
	0.855	102.6
No. 2 oil	0.850	102.0
	0.845	101.4
	0.840	100.8
	0.835	100.2
	0.830	99.6

Transmitter full scale blind settings are equal to the calibrated tank height multiplied by the specific gravity of the fuel. The calibrated tank height used for all Heatec portable fuel tanks is a diameter of 126 inches minus 6 inches = 120 inches. The same settings are used for both single-wall and double-wall tanks even though they have different inside diameters.

## **TROUBLESHOOTING TRANSMITTERS**

Pockets of air or trash trapped in the pipe where the transmitter is connected to the tank will cause erratic level readings. When filling an empty tank be sure to bleed the pipe connection at the transmitter to avoid this problem. Also bleed the connection if the tank is refilled after it was drained below the height of the transmitter.

## **REPLACING A TRANSMITTER**

All replacement transmitters need to be programmed at our factory before they are installed in a Heatec fuel tank. We pre-program all Siemens transmitters that we install in our

tanks to make settings appropriate for fuel tanks. We use special Siemens software that we only use on computers at our factory.

Only two settings can be reset in the field. One is the **full scale blind setting**, which should be set according to the specific gravity of the fuel as explained earlier.

The other is the zero setting. This setting corrects for transmitter tilt. The transmitter is normally tilted upwards for easy reading when it is installed on the tank at Heatec. If you change this tilt, you should reset the zero setting according to instructions in the Siemens manual, under the heading **6.2.5 Zero Adjustment (Position Correction)**.