

# Installation



Figure AH-1 504FTB and 534FTB with venturi flow conditioner.

**WARNING:** Your warranty will be voided if your unit is not installed in accordance with this user's guide. Make sure you read and thoroughly understand the installation portion of this guide before you attempt to install your unit. If you have any questions, contact your Kurz customer service representative before attempting installation.

## ***Mounting***

The 504 and 534FTB In-line flow transmitters are generally mounted with a flange pipe fitting but thread is sometimes used on smaller line sizes. See the product brochures (DCN [367524](#) for the 504FTB and DCN [367523](#) for the 534FTB) for Kurz mounting accessories. It is important for the mounting design to consider the force that will be exerted on the flow body from the piping. It is recommended (and often required by the plumbing code) to support the process piping on both sides of the flow meter so it may be removed without the piping bending or moving and making it difficult to re-install.

### **Flow Body Location and Orientation:**

The In-Line flow meters are available for  $\frac{1}{2}$ " to 6" piping. The principle difference

between the 504FTB and 534FTB is the type and efficiency of flow conditioner which can be seen in the two photographs shown above.

- 504FTB has only a small perforated plate flow conditioner. Its installation requires straight runs in the 15 to 40 D range to obtain field data within 2% of the laboratory calibration. So field calibration may be needed depending on the accuracy needed.
- 534FTB has a venturi flow conditioner. This has no straight run requirements to be within 2% of the laboratory calibration. Field calibration is generally not needed.

The quick start [guide](#) shows this very clearly in the second figure for in-line meters. In addition to what is shown here, the double elbow case not shown, will introduce swirl that can further aggravate the data and straight run length requirements.

### Horizontal Mounted Meters

Any orientation works fine.

If there is condensate running along the bottom of the pipe, the sensor will last longer if its electronics head is vertical up tilting down to no more than to 8 AM or 4 PM positions.

### Vertical Mounted Meters

Flow going up works well under all conditions

Flow going down works well except near the zero flow region, below 50 SFPM or 0.25 SMPS.

### High Dew Point applications

If the application is near the dew point, it will condense inside the pipe walls when the gas is cooling as it flows along. Insulating the piping will reduce the condensate on the inside walls. In these cases, it is best to mount the sensor from the bottom at about 7:30 or 4:30. Vertical from the top can cause water to flow on to the stings, or if mounted from the bottom the condensate will aggravate sting corrosion. Condensate (water or other liquids) on the sensor will cause false high flow readings as the sensor evaporates the liquid.

### Hot or cold process fluid

Insulation on the piping will reduce any temperature gradients that will introduce a false high or low reading. Hot fluid in a pipe with cold walls will tend to read low for sensors which are center line mounted and read high for Cold fluids in a warmer ambient.

**Pump or Fan inlets**

Vacuum or pump inlets from ambient air can result in extra sensor cleaning schedules to remove dirt build up. The fan inlet is often below atmospheric pressure and when the humidity is near 100% there will be condensation formed at these locations. The condensate will allow dirt to stick to the sensor more than in the absence of condensate. A better solution is to place the flow meter after the fan or pump where the pressure is higher, thus the relative humidity will be lower and avoid condensation and dirt sticking to the sensor.

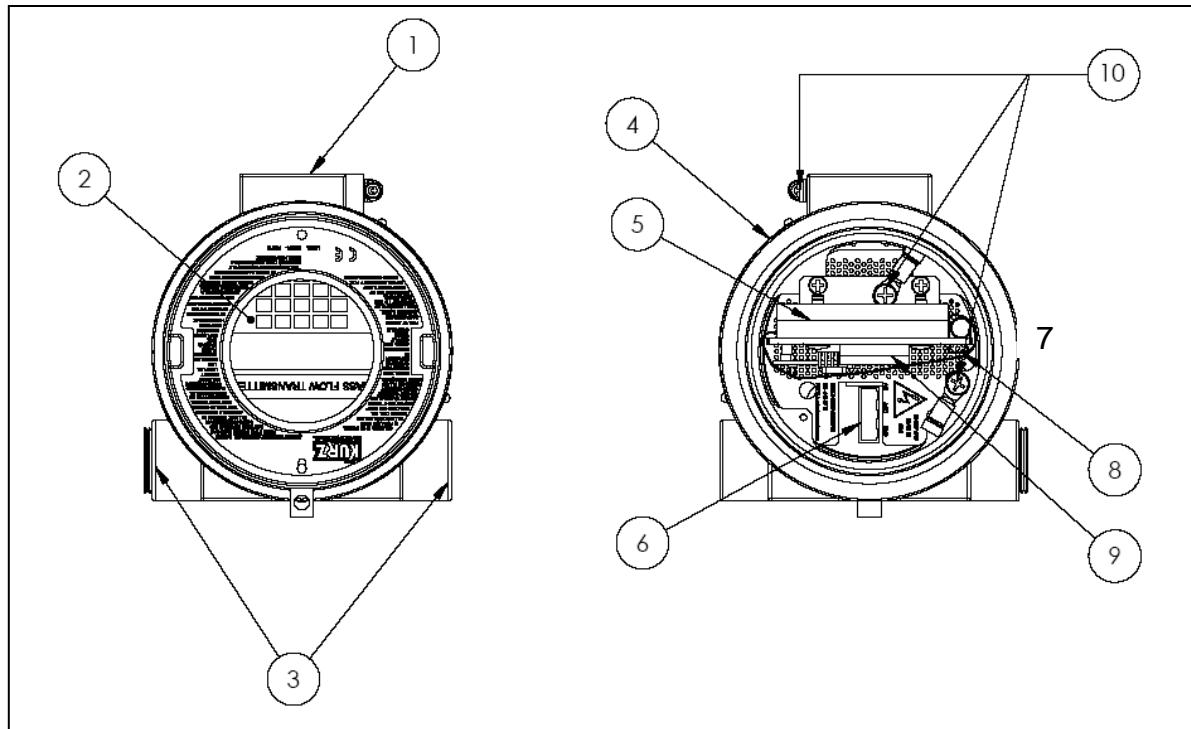


Figure AH-2. Location of major components

1.  $\frac{3}{4}$ " FNPT Sensor support port (TA or Transmitter Attached version)  
Conduit or cable port (TS or transmitter separate version)
2. Backlit 2x16 LCD and 20 key button interface
3.  $\frac{3}{4}$ " FNPT signal and power conduit ports.
4. Safety Label and Product ID tag.
5. Main I/O wiring terminal block for sensor, power, RS-485 and 4-20 mA outputs, TB1
6. AC power input. 85 to 265 VAC 50/60 Hz. 1 phase.
7. Power indicator: Green LED, right side of TB1
8. USB mini-B connector
9. Optional hardware, AI, DO, DI, Purge valve, I/O connector TB6
10. External and internal ground lug locations. Shielded wire pig-tail termination location.

### ***Electronics Head Orientation***

The electronics head is provided in two standard orientations compared to the sensor flow arrow or flow direction. When looking at the display and the flow is to the right, this is the normal configuration (see figure AH-1) and flowing to the left is reverse. This option is selected in the model part number when the unit is ordered.

*Rotating the head in the field can damage the sensor wires and result in a loose connection which results in water leakage or other warranty and hazardous area safety violations.*

### ***Transmitter Separate (TS) Version***

For transmitter separate (TS) versions the flow meter is shipped in two enclosures – the Sensor Enclosure and the Electronics Enclosure as shown in Figure AH-3. The sensor enclosure mounts as described above and contains the sensor wire terminal board.

Sensor Wires

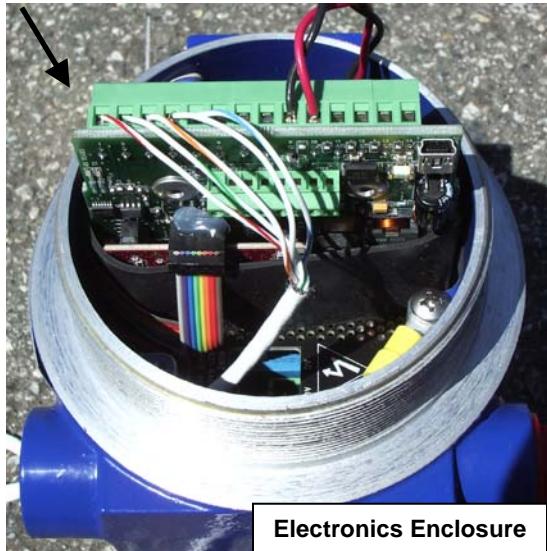


Figure AH-3. Sensor electronics enclosure and sensor J-box with covers removed

The electronics enclosure contains the sensor control board, optional AC power supply and LCD/keypad and is mounted via the pipe nipple as shown in Figure AH-4. Two U

clamps around the pipe nipple to a metal mounting adaptor (Optional Kurz part # 700494-) frame or pipe stand are sufficient. It is important to note that the sensor serial number on the electronics enclosure and the sensor enclosure must match. These two parts are not interchangeable unless the electronics configuration file is matched with the sensor serial number.

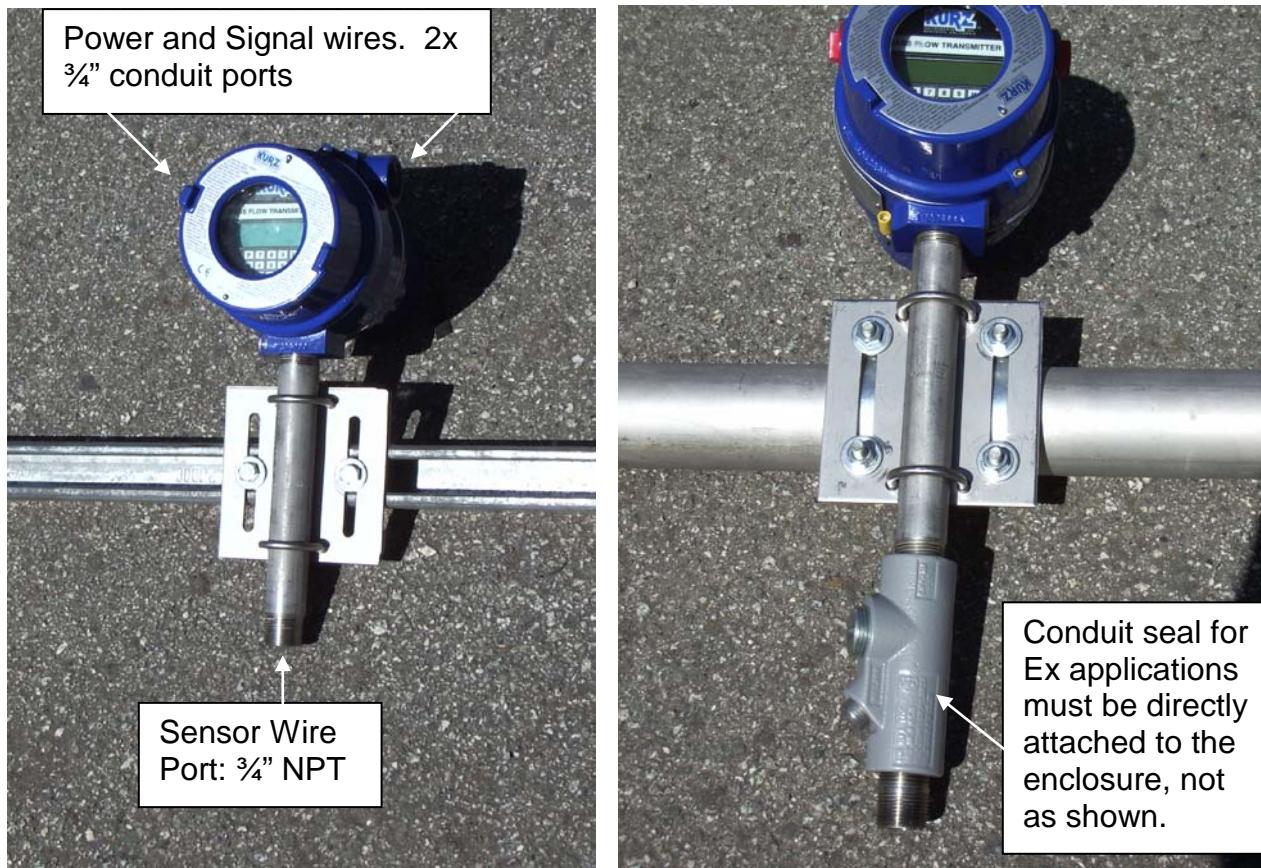


Figure AH-4. Examples of Unistrut and Pipe mounting of the TS configured electronics using the optional mounting kit, 700494-.

## ***Field Wiring***

Proper wiring installation of the MFT B-Series flow transmitters may involve some or all the following topics:

- Safety Grounding and Explosion-Proof enclosure connections.

- Water ingress protection
- DC or AC power requirements and connection.
- Analog Output configuration and wiring of the 4-20 mA signals.
- Discrete Alarms
- Purge sensor air solenoid
- Zero/Mid/Span daily drift test (EPA 40 CFR part 60 or 75 support)
- Serial Digital Interface
- 5-wire sensor connection for the TS configuration
- Clip-on Ferrite for all signal wires if not in shielded conduit
- Flex service connection to sensor probe support.

*Please read the complete text of the sections and study the wiring diagram examples which are relevant to your model before performing the installation.*

## **Safety**

To ensure compliance with General Safety requirements the metal enclosures must be grounded to minimize the chance of electrical shock. For Explosive Atmospheres, proper grounding minimizes the chance of sparks occurring, potential ignition sources, outside an enclosure at its mechanical interfaces if a fault current was to flow. Both internal and external grounds are available; see the wiring diagrams DCN [342038](#) and [342039](#).

For hazardous gas areas, wiring going into and out of the explosion-proof enclosures must be done through a conduit seal or cable gland rated for explosion-proof applications (Class 1 Div. 1 or Zone 1) attached directly to the enclosure. See Figure A-4. These seals are not needed for non-incendiary designs (Class 1 Div. 2 or Zone 2) except where extra protection from water damage is wanted.

**For hazardous areas it is important to not connect or disconnect any wiring when the circuits are energized, the resulting spark could cause ignition.**

**For hazardous areas: Do not open the enclosure when potentially explosive atmosphere is present.**

Three 3/4" FNPT fittings are provided on the electronics enclosure. The one pointing out radially is used for the sensor probe support or its wiring in a TS configuration. The

other two ports exiting opposite the sensor port are for power and signal wiring. One port is typically used for AC power and the other for the signal wires. DC powered models can use both ports for signal/power wiring. Consult your local electrical code for installation requirements.

**For hazardous areas, if there is an unused conduit port, then an approved Ex d plug (3/4" ) must be used on that port and fully threaded in.**

The safety labels and ratings for CSA, and ATEX Ex n and Ex d applications along with the T-code for both the enclosure ambient environment and the sensor process environment are shown [section AM](#) of the manual.

The electronics board used for the Ex applications is certified as the -01, -03 and -04 for the FD sensors (used in 454 and larger 5xx models) and -06 and -07 on the MD sensors (2" and smaller 5xx models). This configuration is provided at the factory when the equipment is ordered but if a field replacement of the SC board is done, it is important to ensure the board is compatible with the sensor. See [section I](#) for more detail on this.

## **Water Ingress Protection**

The leading cause of a malfunctioning flow transmitter is water penetration in to the sensor electronics or wiring terminals. The electronics enclosures have a NEMA 4X or IP66 rating but the transmitters are still subject to water damage if not properly installed and maintained.

Protective measures for keeping water out of the flow transmitter components.

- Installation of conduit seals ([Ex type potting Y work well](#)) near the enclosures on all ports.
- Most [cable gland](#) designs not only provide for shielded cable termination but an environmental seal against dirt and water.
- Routing of conduit or cable using a water loop and drain near the enclosure ports
- Keep the enclosure lids on tight using the supplied o-rings.
- Positive pressure dry purge air to the enclosure will keep condensation out (few PSI from a regulator).

Conformal coating of the circuit boards is standard but this only protects against condensation of trapped water vapor which forms from cooling inside the enclosures/conduit. Every 10 minutes a sensor and wiring leakage test is performed. This will set an alarm (Modbus, LCD and NE-43) when excessive leakage is observed.

## **Flex Wiring Connection for Sensor Inspections**

To support periodic and preventative maintenance, the sensor electrical connections should be done with extra cable or flex conduit length. This allows the sensor to be removed from the process for inspection and or cleaning without disconnecting the wiring. The transmitter attached (TA) versions have only power and 4-20 mA wires are being routed out and use standard electrical wring practice as shown in Figure AH-5.

However, the trouble is maintaining the EMC requirements on the wiring at the same time. If we are using a transmitter separate (TS) version, the sensor is remote from its electronics, we must use an approved shielding method. The 5-wire sensor connections are described in a [later section](#).



Figure AH-5. Flex sensor connection for service loop, TA version using Liquid Tight Conduit.

### **Approved EMC tight flexible, shielded electrical connections for the TS 5-wire sensor wiring**

- Braid reinforced pneumatic hose; Hydraulic line hose
- Corrugated Stainless Steel tubing, with compression fitting at each end. Gas appliance flex fittings may be long enough and are available at local home

- improvement outlets.
- Braided Shielded cable with peripheral bonded shield cable glands



Figure AH-6. Metal Braid Hydraulic Lines, corrugated gas appliance line and braided shielded cable all work well for EMC shielding of 5-wire sensor connections.

**Do not** use Liquid tight Flex conduit for 5-wire sensor connections, shielding is not effective.

### ***Typical Hook-Up Wiring Diagrams***

For both the AC & DC powered versions of the MFT B-Series, typical summarized wiring diagrams for most applications are available as defined in DCN [342038](#). This covers the transmitter separate (TS) and transmitter attached (TA) configurations. Examples for 4-20 mA connections and Modbus are shown along with the terminal definitions and cable wiring notes.

For the transmitter separated (TS) enclosure configuration, the 5-wire sensor connections must be made as shown in DCN [342039](#). The connection between the enclosure groups must be shielded to maintain the CE rating.

### ***24 VDC Powered Flow Transmitters***

The 24 VDC power is a nominal voltage since all circuits have a regulated supply and will work between 18 and 30 VDC. You may also use an unregulated power supply with 50 to 60 Hz ripple as long as the instantaneous voltage is between 18 and 30 VDC.

Surge currents during sensor warm up could require up to 1 A and will fall off after it warms up in about 20 seconds. At no flow the current will be about 0.1 A and about 0.3 A for high flow rates (12,000 SFPM). The power is protected against reverse polarity so if no current flows or there is no output signal you may want to check the polarity against the wiring diagram, DCN [342038](#).

The flow transmitter is grounded. The 24 VDC power and 4-20 mA signal have MOVs (metal oxide varistors) to clamp voltage spikes going into the unit. These are 56 V nominal (voltage level at 1 mA) and do not conduct significant current below about +/- 36 VDC relative to ground. Consequently, the isolated 4-20 mA signals, alarms etc., can not have a significant common mode or bias voltage to prevent leakage currents on the MOVs, which can cause an error in the flow measurement if occurring on the 4-20 mA output.

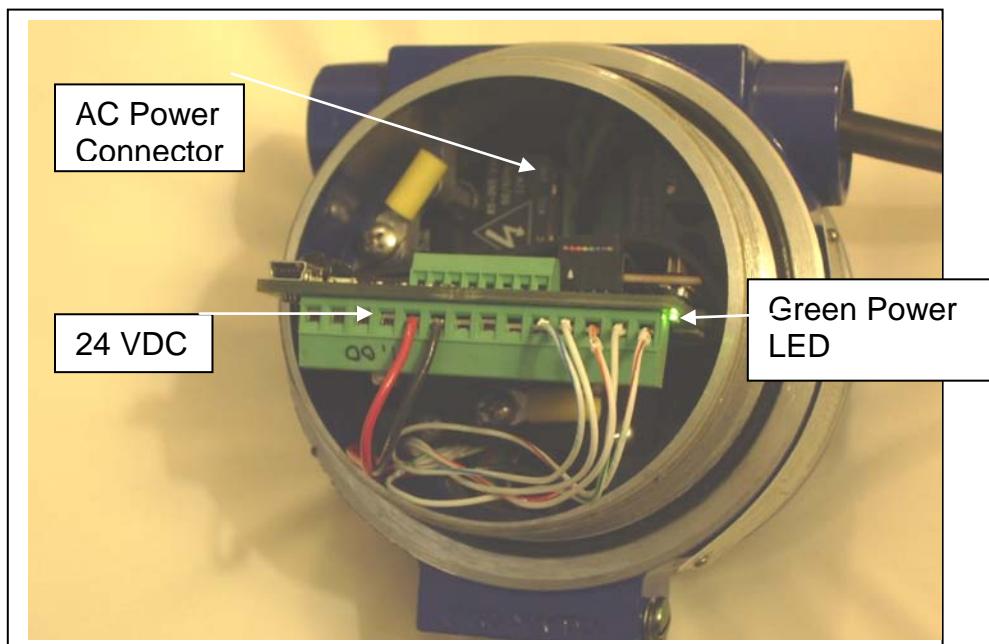


Figure AH-7. DC and AC power connection.

## AC Powered Units

A universal input 85-265 VAC and 50-60 Hz supply generates a nominal 24 VDC to power the unit. The AC wiring uses one of the two  $\frac{3}{4}$ " conduit ports for the signal wiring. The AC powered units have a long pull tab attached to the plug so it is easy to remove the plug and connect the AC wiring with a 1/8" screw driver.



Figure AH-8 AC power pull tab to be removed.

Discard the pull tab as the power wiring can be used to guide the plug in/out of the power supply.

These wires must be inside the plastic insulator sleeve to prevent the wires from catching in the threads of the explosion proof lid. The internal ground can be made via the AC power plug or a 10-32 stud on the PCB.

There is no means of disconnecting power for this unit. You will need a disconnect per your local electrical code.

## Analog Output

**Loop powered wiring:** The 4-20 mA linear output is a loop powered isolated signal. The positive output terminal is diode protected against reverse voltage. The principle wiring diagrams for these are [342038](#) and [342039](#).

**Self powered wiring:** The output may be self-powered in the non-isolated mode by jumpering +24 VDC to one of the two + 4-20 mA terminals. Then the 4-20 mA output would be taken from the 4-20 mA negative terminal to ground. A simplified AO wiring drawing for this mode of operation is shown in diagram [342045](#). To use it in the non-isolated mode, the receiving current should be sensed with an isolated input to avoid ground loop currents.

**AO capabilities:** The 4-20 mA circuit has a 11 VDC compliance at the full 20 mA current. So, on a 24 VDC 4-20 mA circuit, at least 11 VDC will be dropped across the 4-20 mA output, the balance on the load resistor and wiring. For example, with a 250 ohm

load, at 20 mA the voltage drop will be 5 V on the load resistor, 19 V across the 4-20 mA output or AO terminals. With higher voltage supplies, you have correspondingly higher load resistance available. As a loop-powered 4-20 mA output and a 24 VDC power supply, you can drive 600  $\Omega$  and still support the 21 mA NE-43 alarm. Do not exceed 36 VDC on the loop-powered interface or you may have leakage current from the protective MOVs causing an error in the measurement. In summary, a loop-powered configuration places a customer provided DC power source, the MFT B-Series output and load resistance(s) all in series.

**NE-43 alarm** support on the 4-20 mA signal is also provided. This means normal operation is clipped between 3.8 and 20.5 mA. Meter faults or sensor kickout are indicated with either a low or high alarm on the 4-20 mA output. See the [diagnostic](#) section for more information.

### ***Clip-on Ferrite for all Signal Wires***

The I/O connections, 24 VDC, Modbus, analog outputs, or analog inputs (4-20 mA) must be clipped in a ferrite to meet the EMC specifications. Figure A-9 shows an example of this type of wiring.

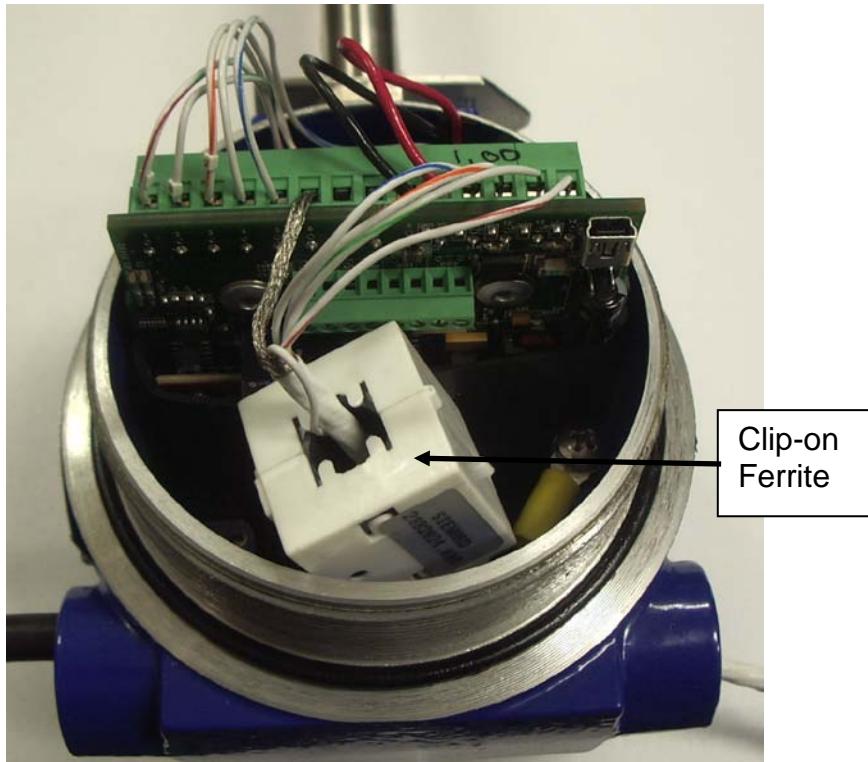


Figure A-9 Clip-on Ferrite for I/O wires to be CE compliant without proper cable or conduit shielding.

The exception for this is if the I/O wiring are in a multi-conductor braided shield cable with peripheral bonded termination or solid conduit (ridged or EMT). Liquid tight flex does not provide shielding.

One Ferrite kit ships with each meter. More can be purchased from Kurz as part number 600029- or from the following manufactures:

Steward 28A2024.0A2

Fair-rite: 0443164151:

Stock available from Kurz or Digi-Key Corporation ([www.digikey.com](http://www.digikey.com) )

## **Alarms**

The two optically coupled solid state relays (SSR), may be used for various functions such as sensor error output or totalizer mode pulses. Each SSR is rated for 0.5 A, 24 V AC/DC. As with the other I/O terminals, there are 48 V MOVs for surge protection on this device. You must not exceed 36 V to ground or you will cause leakage and may

overheat and damage the MOV which can fail in a short. Again, see the wiring diagram [342038](#) for the specific alarm terminals.

## ***Serial Communications***

There are two independent serial ports on the MFT B-Series. A mini-type B USB connector with [Kurz driver](#) can act as a COM port so “remote” terminal operation is possible or the RS-485 port can be used for the Modbus protocol and multipoint communications. The USB port can be used instead of the small LCD/keypad option to view data, configure the meter or extract diagnostic data. The upload or download of the meter configuration can be done on either the USB or Modbus port using the Kurz provided program [KzComm](#). The advantage of the Modbus port is greatest when you have multiple meters on the bus allowing access to all of them from one location such as your heated or cooled office or control room.

## **USB**

Any terminal emulator program may be used to act as a remote terminal to the MFT B-Series. HyperTerminal, which comes with all Windows versions except for Vista, is sufficient and supports Xmodem for transferring and storing the MFT B-Series configuration files. See below for Windows Vista. This takes about five seconds at 9600 baud, the only supported USB driver baud rate. The character format is 1 start bit, 1 stop, 8 data, and no parity. The program [KzComm](#) may also be used if you only need to save/print the configuration files, but it is not a terminal emulator.

If HyperTerminal is not installed on your computer you may add it by going to the Add/Remove Programs within the Control Panel and clicking the Windows Setup tab. Then choose the Communication group and within it you will find the button to select HyperTerminal. After this you may be asked for your Windows disk to continue the installation. Refer to your Windows documentation if you need more information on HyperTerminal. Once the program is installed, you start HyperTerminal which will prompt you for a name of the connection, ie Kurz MFT B-Series, then an icon. Next you select the communications port, ie COM 4 and finally you press Configure and set the baud rate to 9600, data bits to 8, parity to none, stop bits to 1 and flow control to none. Once you have verified this works, save the configuration under File, Save.

Windows Vista machines do not include HyperTerminal so you will need to download and install it. This program is available for download from its designer at the following web site: <http://www.hilgraeve.com/hyperterminal.html>. After installing the program

configure it as described in the previous paragraph. You may want to put a shortcut to this program in your Start menu or on your desktop.

## RS-485/Modbus

The RS-485 interface is half duplex and supports baud rates of 9600, 14400, 19200, 38400 and 57600. Wiring is a shielded twisted pair with two signal lines and one shield connection. The signal lines can be connected in any order provided the 485 bus is biased so the flow meter knows which signal is positive. See [342038](#) for a wiring example of this. A junction tee (see [www.turck.com](http://www.turck.com)) between the network bus and instrument drop is recommended so instruments may be removed for service without interruption to the network bus.



Desk computers and laptops can interface to the RS-485 devices using a USB dongle converter. We recommend the industrial version from [EasySync](#), available from Kurz (PN 700491) or the manufacturer. This device is optically isolated, screw terminal interface with metal enclosure and status LEDs, with a biased bus allowing the auto-polarity detection to work. .

EasySync's devices have a known issue with the Microsoft Windows Vista operating system. Contact EasySync at [support@easysync-ltd.com](mailto:support@easysync-ltd.com) for help in installing the device.

The Modbus interface must be set for device address, protocol, baud rate, and byte order. See the [serial communications section](#) for more information on how to configure or verify Modbus communications settings. Once properly connected and configured, you will not only see the yellow LED flash for RS-485 receive activity, you will see the green LED flash for transmit or response of the flow transmitter. The MFT B-Series unit has two red LEDs used for receive and transmit, respectively. The full protocol specification and register variable map is found in the [serial communications](#) section of the manual.

## 5-Wire Sensor Connections

For the transmitter separate (TS) version you must field install the wiring between the sensor and its electronics enclosures. In addition to the field wiring diagram [342038](#) you need to refer to [342039](#) for the TS part. This is a 5-wire connection which must use

quality wire whose wire resistance is less than  $1\ \Omega$  per wire. Each wire must be matched within  $0.01\ \Omega$  or  $10\ m\Omega$  so the lead length compensation can work properly. Without this, the Factory calibration and temperature compensation will not hold in the field. If the individual wires do not meet the matching specification, their length must be trimmed or extended until they match. The terminal strip for the sensor wire will accept up to 12 AWG wire (2.05 mm) which is good for 630 feet (192 m) between the sensor and electronics. However, the electronics terminal block TB1 is rated for 14 AWG (1.63 mm) max wire size.

To maintain the CE compliance of the product in the TS configuration, one must maintain a good shield around the 5 wires. This can be done with rigid conduit, EMT or a braided shielded multi-conductor cable between the sensor junction box and the sensor electronics enclosures. Conduit seals directly to the enclosures are still needed to meet the explosion-proof ratings. Peripherally bonded shielded cable glands work well but a simple cable gland and shield pigtail ground connection is sufficient. Hawke America (281 445 7400, [www.ehawke.com](http://www.ehawke.com)), makes a line of cable glands for shielded cable. Their Model [501 universal](#) is one of many and has Exd safety ratings too, see [installation](#) info also. Some of these sizes and cable are also available as accessories from Kurz. See [section above](#) with more recommend wiring methods for the 5-wire sensor connections.



**Cable Gland Example with Braided Shielded cable on a TS configuration.**

**Not recommend for CE compliance on the 5-wire sensor connections of the TS configuration:**

Type	Reason not to use it.
Unshielded twisted Fair, UTP	No shielding
Armor Cable	Spiral wrap armor wires are not an EMI shield. Behaves as an inductor at RF frequencies.
Flex Conduit	Spiral wrap shell is not an EMI shield.
Liquid Tight Conduit	Better shield than flex conduit but will not hold up well over time due to oxidation of the metal wrap joints that degrade the EMI shield.

## ***Orientation of the LCD Keypad***

*Turn the power off to the unit before performing this procedure to prevent damage and protect you from explosions ignited from electrical sparks.*

Within the electronics head, the LCD keypad can be mounted in any one of four 90° rotated positions for best viewing and hand access. It mounts to four standoffs using the screws accessible on the keypad. When performing the display rotation, standard electronics handling procedures to prevent ESD must be used. Use a wrist strap between yourself and the enclosure body before taking the display board out to rotate it.

The short ribbon cable between the sensor electronics and display board must have its connectors fully seated in the PCBs before you carefully screw down the board using the provided screws. RTV works as an adhesive to keep the connector attached to the display board. It is applied between the outside of the connector and PCB, not the inside on the electrical pins. The ribbon cable connectors have a pin 1 mark which must match that of the PCB connector at each end. The ribbon cable will route towards the center of each PCB when [properly mounted](#).

There is an LCD contrast adjustment on the back of the LCD/keypad board which can be adjusted with a small flathead screwdriver as needed for best viewing of the screen. However, it is Factory set for equal viewing at 0 and 60 degrees C so it is not optimized at room temperature. When too cold the display is white and when too hot, the display will be dark.



Figure AH-10. 90° display rotation options.