Installation

WARNING: Your warranty will be void 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.

Figure AC-1, K-BAR 2000B, Type 1, 3 sensors.

Review System Design. What did you buy?

As most K-BAR systems are custom made to the application, reviewing your documentation used to design the system will make the installation go a lot smoother. Many system are purchased with Kurz field service to do the installation which takes the edge off the installation. So checkout what you bought before diving into it.

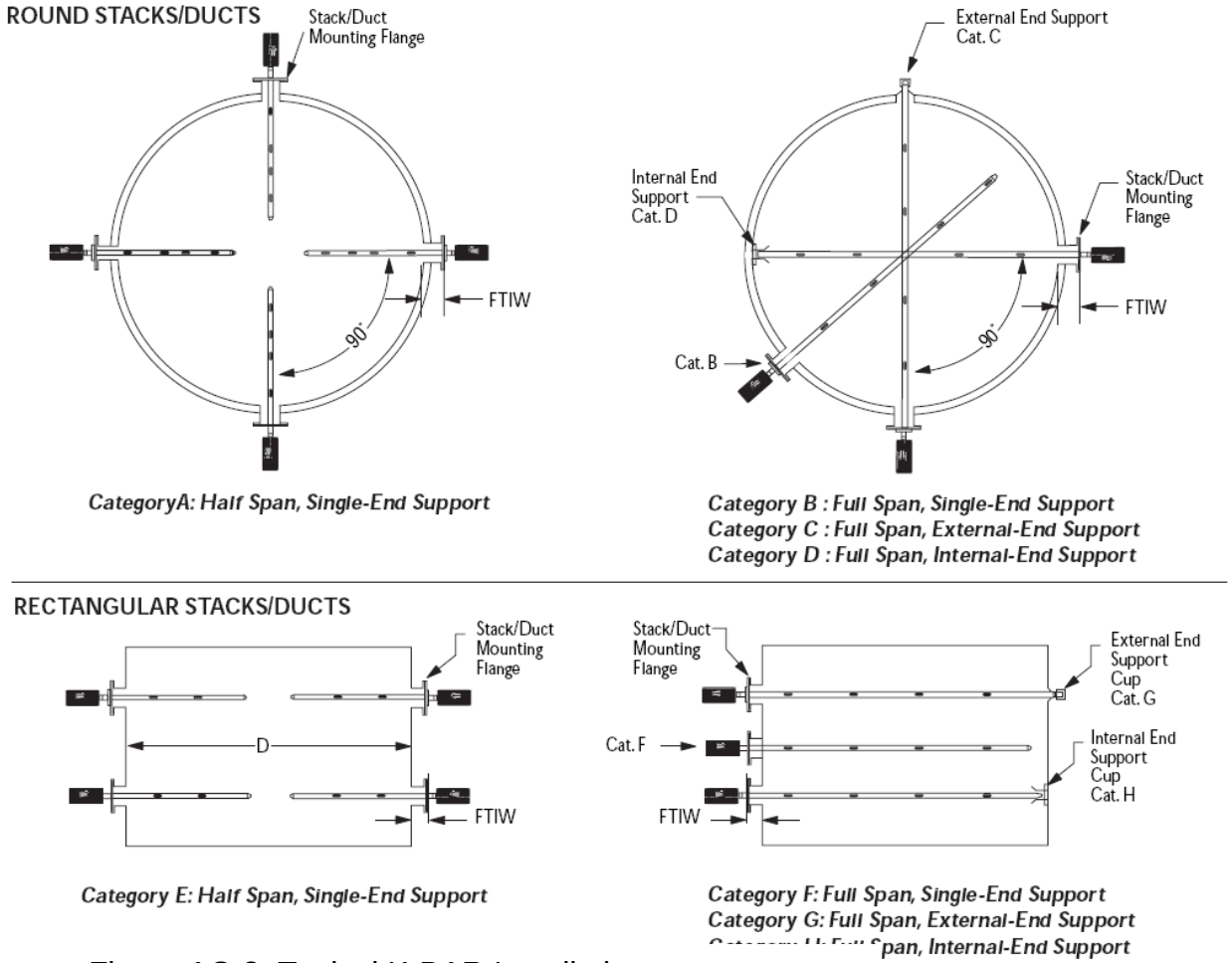
Step 1. Find your system configuration drawing which shows the dimensions and mounting requirements for the Bars you received. See example drawing.

Step 2. Find the wiring and programming configuration information for the flow computer setup. See example files.

Mounting

The K-BAR length required to support the duct or stack size is the principle driver behind the mounting configuration used. See Figure 2. Not only must the bar be stiff enough to hold up to the vibrations of the process but you must have enough clearance around it for installation and maintenance.

The “single end” mounting means the bar is cantilever mounted from a flange off the duct as shown for the category A, E and F half-span bars in Figure 2. The duct FMA (Flange Mounting Adaptor) size and lengths depend on the Bar type 1, 2 or 3.



CategoryA: Half Span, Single-End Support

Category B : Full Span, Single-End Support
Category C : Full Span, External-End Support
Category D : Full Span, Internal-End Support

Category E: Half Span, Single-End Support

Category F: Full Span, Single-End Support
Category G: Full Span, External-End Support
Category H: Full Span, Internal-End Support

Figure AC-2. Typical K-BAR Installation Configurations.

For high vibration applications or those whose access is limited to one side, a double end mounting method works best. This also allows the sensors to pickup the flow across the whole diameter of a duct from one access side. The double end support uses an external end support cup (category C and G) or internal end support cup (category D and H) for the far side of the duct opposite the mounting flange. The length cut-off between single end and double end mounting is in the brochure. The largest diameter ducts are best covered with K-BARs coming in from all sides.

Required mounting materials.

- bolts & nuts
- flange gaskets (always Kurz provided)
- Raised face, flange mounting adaptor (FMA) whose spacing off the duct matches your K-Bar fabrication drawing provided by Kurz.
- Duct reinforcement for the flange mount or FMA.

The above materials can be provided with the K-BAR order from Kurz or customer provided.

Purge cleaned versions of the K-BAR have additional installation requirements defined in section AG.

K-BAR-2000B duct insertion

The majority of K-BAR installations are flange mounted. The clearance opening between the bar and FMA and its ID causes a significant blow-by if the duct pressure does not match the ambient. It is recommended to install the K-BAR during a planned outage of the process to prevent hot, dirty gas from being a safety risk during the installation. Again, the man-handling of a K-BAR long during installation is much easier and safer if done at ambient temperature and pressure.

Sensor Electronics Configurations

There are several ways of layout and locating the electronics and their interconnecting wire. The choice depends on the application environment, the weather, typical temperatures ,vibration, etc. The maintenance needs will often be a big factor in where the electronics are mounted.

There are two major installation cases shown in Figure 3.

- transmitter attached (also know a directly attached, A) and
- transmitter separate (remote, B).

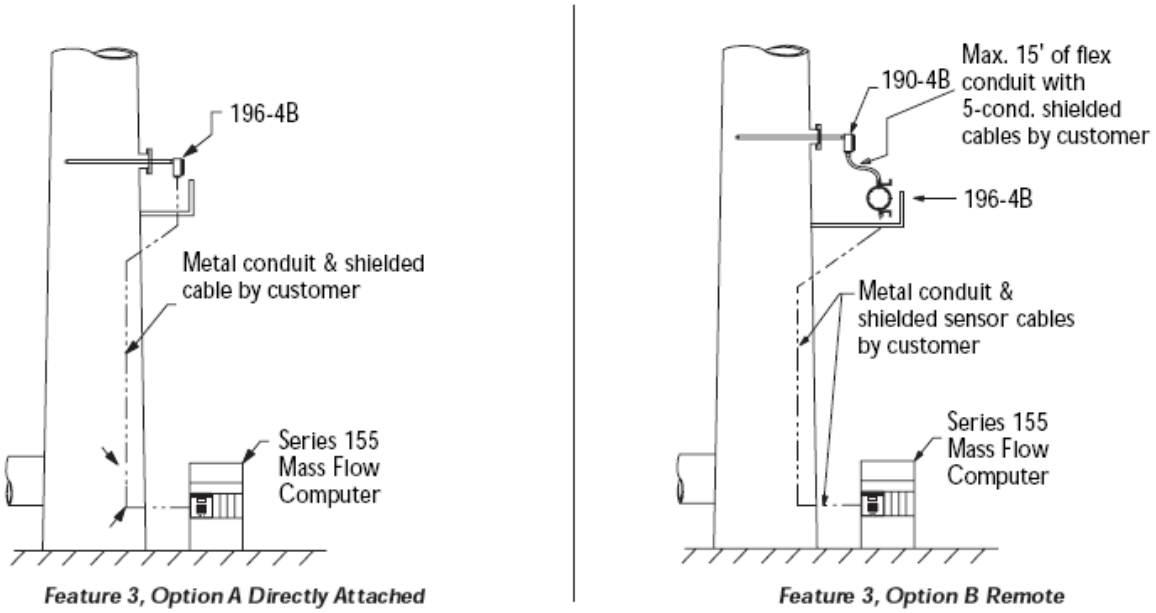


Figure AC-3, Sensor electronic configurations.

In the transmitter attached case, (Option A) a linearized 4-20 mA flow signal is sent to the flow computer. Each sensor has its electronics on the end of the K-BAR. This is the preferred mode as the wiring and EMC requirements are minimized.

In the transmitter remote case (Option B) a short service loop is often used between the transmitter electronics and the sensor wire junction box (on the end of the probe). Depending on the wire gage and conduit shielding, you can run the sensor wires more than 600 ft if needed. The wire run from the K-BAR to the transmitter electronics must be shielded in solid conduit, EMT or braded shielded cable using peripheral bonds at each end.

Field Wiring

Proper wiring installation of the K-BAR-2000B flow transmitters may include some or all the flowing issues:

- Safety Grounding connections.
- Water ingress protection
- DC or AC power requirements and connection.
- Analog Output configuration and wiring of the 4-20 mA signals.

- 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 (see section below)
- Clip-on Ferrite for all signal wires if not in shielded conduit
- Flexable electrical connection probe for field service.

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

The field wiring drawings, 342040 and 342041 show the terminal numbers and explanation of what each one is for a general 4 sensor K-BAR system.

The transmitter electronics shown in Figure 4, needs 24 VDC power (TB-2) to the common I/O block and sending the 4-20 mA signals from the electronics board (SC-TB1, sensor 1 to 4)) for each sensor to the flow computer.

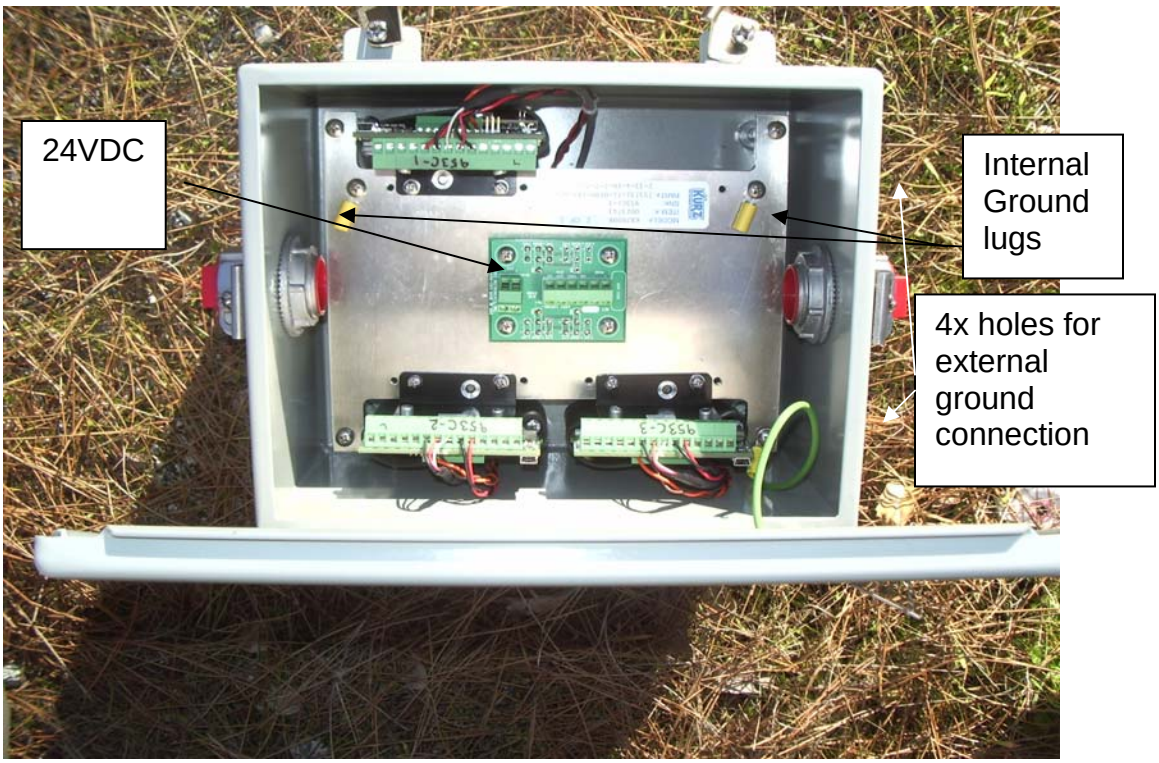


Figure AC-4, Electronic enclosure for a K-BAR 2000B.

The power 24 VDC ground is the same as chassis. From each sensor electronics board, the 4-20 mA signal returns are sent to the 155 flow computer(see section on wiring the 155 to a K-BAR 2000). The typical wiring from a 3 sensor unit as shown in Figure 4 is as follows:

Table AC-1. Three point K-BAR 2000B wiring example.

Wire #, AWG	Description	Wire Source	Wire Destination
1, 18	+24 VDC power (0.5 A per sensor)	155 flow computer	I/O distribution board (420366), TB-2 +
2, 18	24 VDC Ground	155 flow computer and chassis	I/O distribution board (420366), TB-1 -
3, 22	Sensor 1, 4-20 mA Flow	SC board on sensor #1, TB1-12	155 flow computer
4, 22	Sensor 1, 4-20 mA temperature	SC board on sensor #1, TB1-14	155 flow computer
5, 22	Sensor 2, 4-20 mA Flow	SC board on sensor #2, TB1-12	155 flow computer
6, 22	Sensor 2, 4-20 mA temperature	SC board on sensor #2, TB1-14	155 flow computer
7, 22	Sensor 3, 4-20 mA Flow	SC board on sensor #3, TB1-12	155 flow computer
8, 22	Sensor 3, 4-20 mA temperature	SC board on sensor #3, TB1-14	155 flow computer

If the system contains purge sensor cleaning, EPA zero span triggers or a Modbus RS-485 interface, then the TB-1 terminals will be needed as described on 342041. The optional connections on the I/O board (420366, center of the enclosure) are pre-wired by Kurz to each sensor so you have a common connection for all the above less the 4-20 mA outputs.

TS Remote J-box

The transmitter separte configuration use the enclosure shown in Figure AC-4 and AC-5 shown below for the sensor wires.

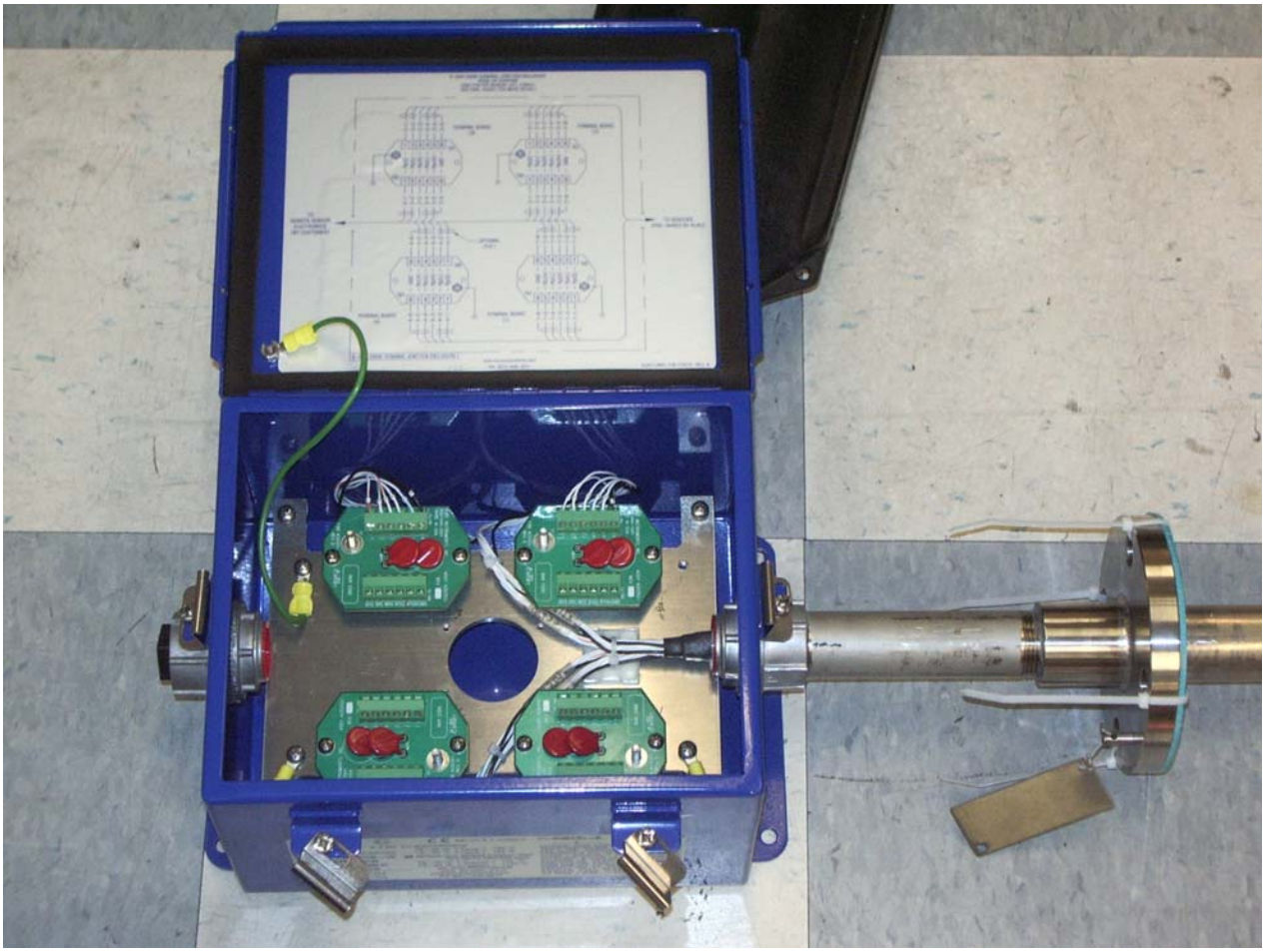


Figure AC-5. TS configuration, remote J-box for 5-wire sensor junction.

The 5-wire sensor extension to the sensor control boards (Figure AC-4) requires the wiring be in a well shielded run, either solid conduit or braded shielded cable. As can be see in the above photo, the basic wiring diagram is attached to the inside of the enclosure lid. The sensor wires must be no more than 1 ohm per wire and matched to 0.01 ohm. The larger wire gage permit longer runs. Up to 12 AWG solid wire or 14 AWG stranded can be used with a direct connection to the terminal blocks at each end. See the field wiring drawings 342040 and 41 for more details on this type of installation.

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 A-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 A-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.
- Braded Shielded cable with peripheral bonded shield cable glands

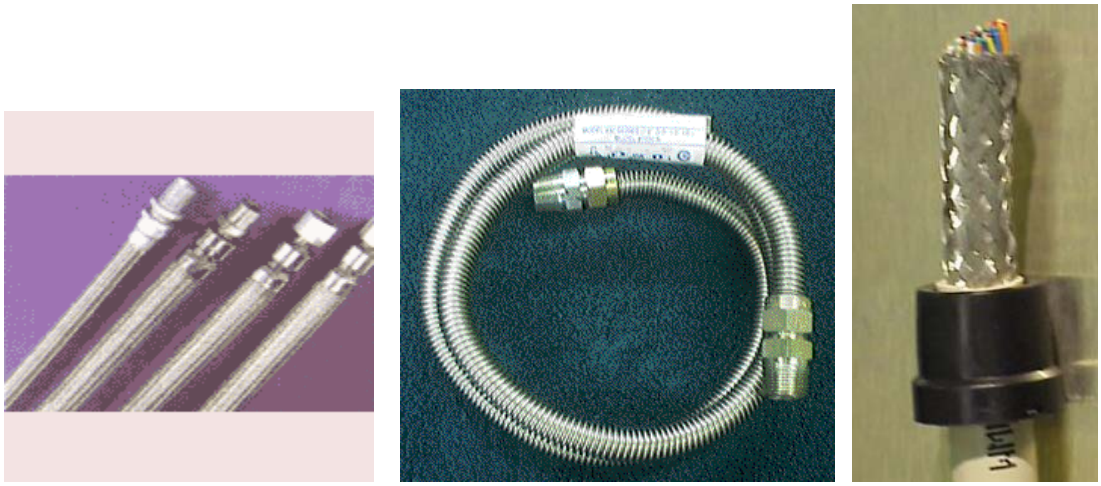


Figure AC-6. Metal Braid Hydraulic Lines, corrugated gas appliance line and braided shielded cable all work well for EMC shielding of 5-wire sensor connections.

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

Electrical Safety

As all wiring is low voltage class 1 circuits (less than 30 V) it can share the same electrical conduit or cable for power, control signals and 4-20 mA signals.

Local building codes or site codes will often require dedicated ground wires. Two locations on the sensor control board mounting plate have been provided as shown in Figure 4. Some locations also require external electrical grounding. There are four mounting holes on the enclosure feet than can be use along with a nut, bolt, internal tooth lock washer and ring lug (all customer provided hardware).

On the inside of the lid shown in figure 4, there is a simplified wring drawing which should help prevent wiring errors during installation or field maintenance.

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.

- Routing of conduit or cable using a water loop and automatic drain near the enclosure ports
- Keep the enclosure lids on tight using the supplied enclosure fasteners and gaskets.
- 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.
- 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 by each sensor control board. This will set an alarm (Modbus and NE-43) when excessive leakage is observed. Unless prompt action is taken, the electro corrosion will de-plate or grow shorts where they do not belong requiring the boards to be replaced.

Analog Output

The 4-20 mA linear output is a loop powered isolated signal but has been jumpered to the local 24 VDC power of each sensor control board. So the 4-20 mA outputs are not isolate but as their outputs are sent back to the same flow computer that provide the power in the first place, this is not a problem. The positive output terminal is diode protected against reverse voltage. The 4-20 mA circuit has an 11 V compliance at the full 20 mA current. So, on a 24 VDC 4-20 mA circuit, at least 11 V 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 V power supply, you can drive 600 Ω 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.

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. Sensor kickouts low and high will cause less than 3.6 mA or more than 21 mA respectively. Other meter faults are also indicated

with either a low or high alarm on the 4-20 mA output. (see diagnostic section for more information)

Serial Communications

There are two independent serial ports on each sensor control board. A miniature 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 in 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 for a K-BAR is clear as you have multiple meters on the bus allowing access to all of them from one location, your heated/cooled office or control room. All that is required to make this work is each sensor has a unique address on the Modbus network. Whether you are using KZComm to remotely configure the K-bar sensor electronics, download error logs etc. or another system to pole the data, there is a lot less wiring required vs. a 4-20 mA pair for each channel.

USB

Any serial communications 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 Hyper Terminal. After this you may be asked for your Windows disk so this may be installed. 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/htpe. After installing the program configure it as described in the previous paragraph. You may want to put a short cut to this program in your Start menu.

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 par, 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) between the network bus and instrument drop is recommended so instruments may be removed for service without interruption to the network bus.

Figure AC-6. EasySync USB to RS-485 industrial interface module.

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 manufacture. 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 for help in installing the device.

The Modbus interface must be set for device address, protocol, baud rate, and byte order. See 342042 for more information on how to configure or verify Modbus communications settings. Once properly connected and configured, you will not only see the red LED flash for RS-485 receive activity, you will see the second red LED flash for transmit or response of the flow transmitter. The full protocol specification and register variable map is found in the serial communications section of the manual.

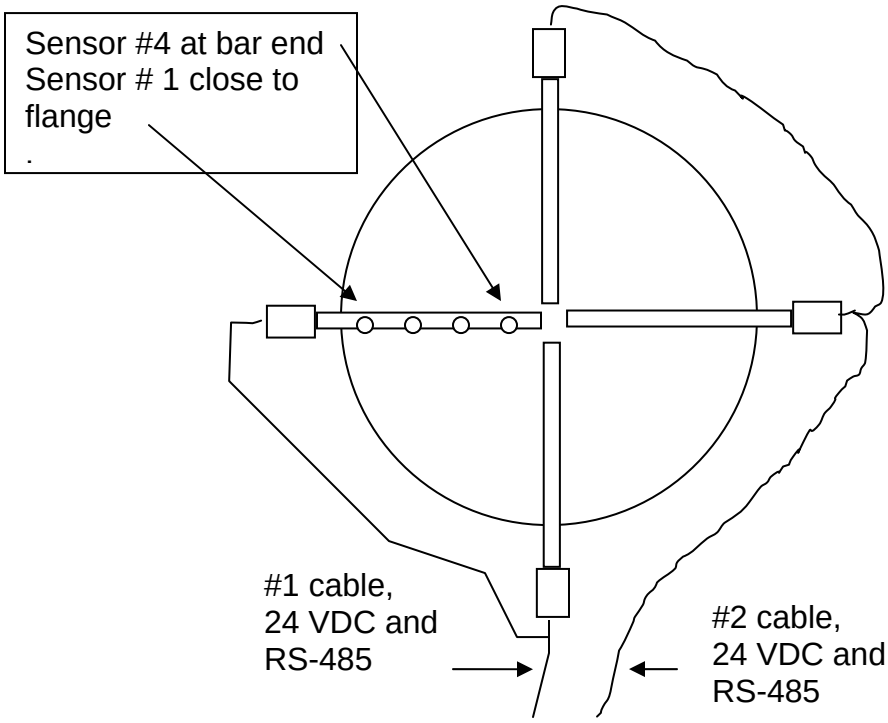


Figure AC-7. Example application with 16 sensors, split into two independent power and RS-485 networks so a single wiring fault does not disable the whole process measurement.

5-Wire Sensor Connections

For the TS version you must field install the wiring between the sensor and its electronics enclosures. In addition to the field wiring diagram 342040 you need to refer to 342041for the TS part. This is a 5-wire connection which must use quality wire whose wire resistance is less than 1 Ω per wire. Each wire must be matched within 0.01 Ω or 10 mΩ 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 multiconductor 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), makes a whole line of cable glands for shielded cable. Some of these sizes and cable are also available as accessories from Kurz.

Table AC-2. Not recommend for CE compliance on the 5-wire sensor connections of the TS configuration:

Type	Reason not to use it.
Unshielded twisted Pair, UTP	No shielding.
Armor Cable	Spiral wrap armor wires are not an EMI shield. Looks like 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.

Optional Clip-on Ferrite for Signal Wires

If the I/O connections, 24 VDC, Modbus, analog outputs, or analog inputs (4-20 mA) are not connected by a shielded connection, conduit or multi-conductor braded shield cable, then these wires must be clipped in a ferrite to meet the EMC specifications. The recommended clip on Ferrite has a 12.5 mm or ½" ID for wring to pass through.

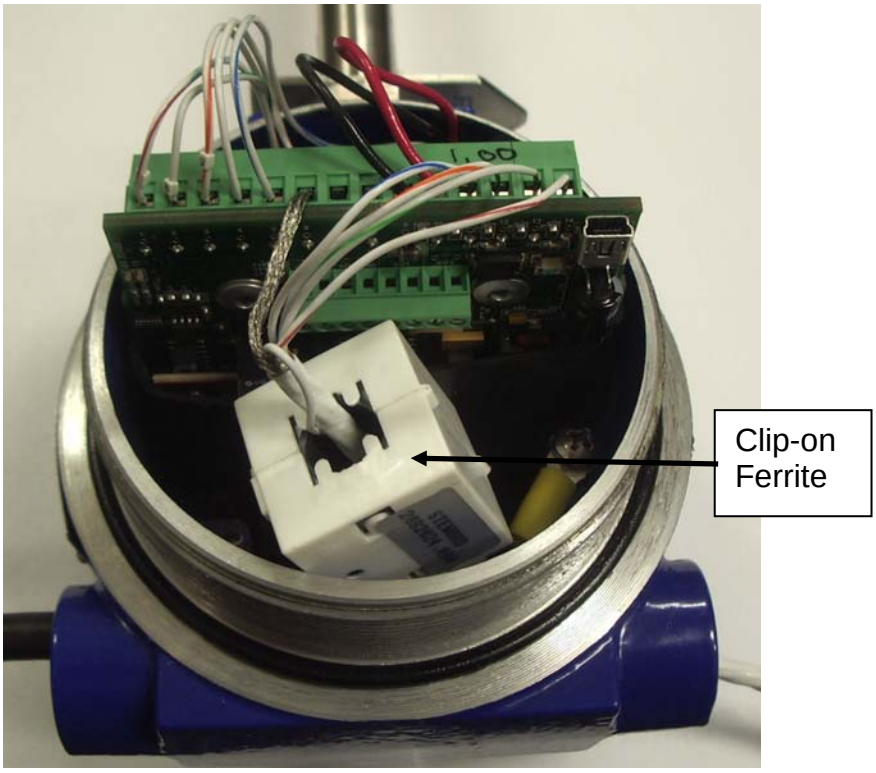


Figure AC-8 Clip-on Ferrite for I/O wires to be CE compliant without proper cable or conduit shielding. 454FTB example shown.

The Ferrite 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 Digikey (www.digikey.com)