METTLER TOLEDO

IND110

Load Cell Signal Converter

Technical Manual

17041600A
(10/14).01

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This device complies with Part 15 of the FCC Rules and the Radio Interference Requirements of the Canadian Department of Communications. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

METTLER TOLEDO

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RESPONSE: Include Root Cause Analysis and Corrective Action Taken.

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PRECAUTIONS

- READ this manual BEFORE operating or servicing this equipment and FOLLOW these instructions carefully.
- SAVE this manual for future reference.

WARNING!

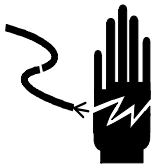
TO AVOID DAMAGE TO THE PCB OR LOAD CELL, REMOVE POWER FROM THE IND110 AND WAIT AT LEAST 30 SECONDS BEFORE CONNECTING OR DISCONNECTING ANY WIRES.

CAUTION

BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT AND/OR BODILY HARM.

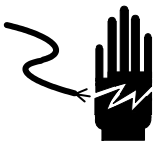
CAUTION

OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.



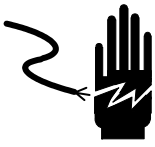
WARNING!

WHEN THIS EQUIPMENT IS INCLUDED AS A COMPONENT PART OF A SYSTEM, THE RESULTING DESIGN MUST BE REVIEWED BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF ALL COMPONENTS IN THE SYSTEM AND THE POTENTIAL HAZARDS INVOLVED. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.



WARNING

THE IND110 IS NOT INTRINSICALLY SAFE. THE LOAD CELL LINES MUST NOT BE OPERATED IN A HAZARDOUS AREA WITHOUT AN APPROVED INTRINSIC SAFE BARRIER. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.



WARNING

A CLASS 2, 24 VDC POWER SUPPLY IS REQUIRED TO POWER THE IND110 MODULE. THE IND110 MODULE IS UL APPROVED FOR USE WITH A CLASS 2 POWER SUPPLY ONLY. DO NOT SUBSTITUTE ANOTHER TYPE OF POWER SUPPLY. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

Precautions *(continued)*

CAUTION

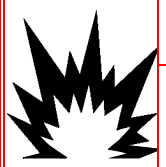
IF THE DC LOAD SUPPLY IS GROUNDED, A FORM OF ISOLATION MUST BE PROVIDED (OPTO ISOLATOR OR EQUAL). FAILURE TO OBSERVE THIS PRECAUTION WILL RESULT IN GROUND LOOPS FROM GROUNDS IN OTHER PARTS OF THE CIRCUITRY AND INACCURATE 4/20 MA DATA OR MODULE DESTRUCTION.

CAUTION

APPROPRIATE SUPPRESSION DEVICES MUST BE USED TO SUPPRESS ALL INDUCTIVE LOADS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN THE DESTRUCTION OF THE IND110 OUTPUT CIRCUIT.

CAUTION

ADDED SAFETY INTERLOCKS, PROPER DISCONNECTS, AND LINE FUSING BY THE CUSTOMER ARE REQUIRED AS THEY ARE IN ANY LOGIC CONTROL SYSTEM.



WARNING

WHEN INSTALLING THE EXPLOSION-PROOF ASSEMBLY, SEALED EXPLOSION-PROOF FITTINGS ARE REQUIRED. THE INSTALLER MUST ENSURE THAT THE FITTINGS ARE SEALED ACCORDING TO NATIONAL AND LOCAL CODE REQUIREMENTS FOR HAZARDOUS LOCATIONS.

WARNING

BEFORE CONNECTING THE IND110 TO A PLC OR OTHER SECONDARY CONTROL DEVICE THE UNIT MUST BE FIELD CALIBRATED. FAILURE TO DO SO COULD RESULT IN INCORRECT OPERATION AND/OR PROPERTY DAMAGE.

WARNING

DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, SERVICING OR CLEANING. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

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Mettler-Toledo (ChangZhou) Scale & System Ltd.
111 ChangXi Road, ChangZhou, JiangSu, People's Republic of China, 213001

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Model/Type: IND110

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Auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).
Al que se refiere esta declaración es conforme a la(s) norma(s) u otro(s) documento(s) normativo(s).
Waarnaar deze verklaring verwijst, aan de volende norm(en) of richtlijn(en) beantwoordt.
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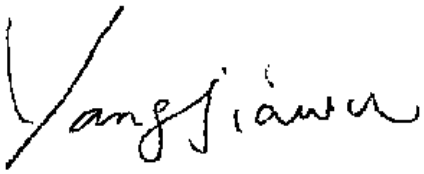
CE	73/23/EEC Low Voltage Electrical Equipment	EN61010-1

ChangZhou, May 11, 2004, Mettler-Toledo (ChangZhou) Scale & System Ltd.

David Zheng
President



Yang JiaWu
Quality Assurance Manager

Contents

Chapter 1.0

Introduction

This chapter covers

- Model Identification
- Physical Dimensions
- Specifications

Thank you for purchasing a METTLER TOLEDO® IND110 Signal Converter. The IND110 is a high-performance Signal Converter that provides a direct Interface to Programmable Logic Controllers (PLCs) and other control equipment.

The IND110 Signal Converter provides an accurate and economical way to convert an analog strain gauge load cell(s) signal to a standard analog process signal. This conversion is accomplished by conditioning the analog input, converting it to a digital signal, normalizing and filtering it, and then converting it back to an analog 4/20 mA signal. This signal is then typically sent to a remote analog input such as a PLC.

In addition to the 4/20 mA output signal, two discrete setpoint outputs are provided for high- and low-level signaling.

The IND110 is self contained in a plastic housing for installation onto a 35-mm DIN rail. Optionally, the IND110 is installed in either a stainless steel harsh enclosure when environmental protection is required, or in a cast aluminum explosion-proof enclosure when used in hazardous areas.

Model Identification

METTLER TOLEDO offers one standard plastic housing model of the IND110 Signal Converter. The IND110 is not suitable for mounting in a harsh environment without a protective enclosure. The standard IND110 Signal Converter is shown in Figure 1-1.

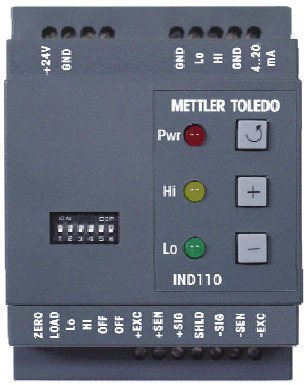


Figure 1-1: Front View of the IND110

An optional stainless-steel harsh enclosure is available separately and is shown in Figure 1-2. Order this enclosure by MT number 64053670.

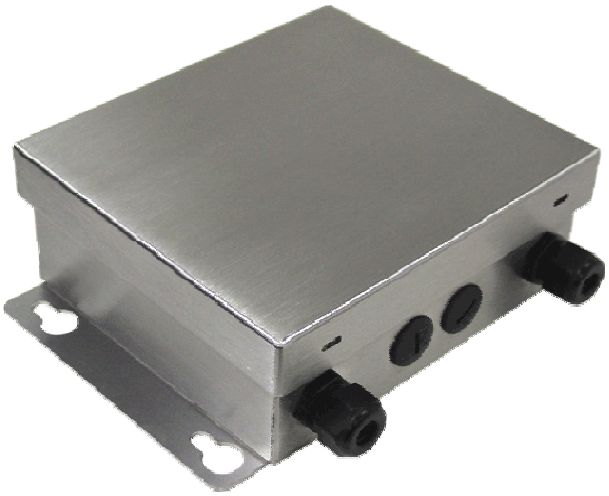


Figure 1-2: Optional Stainless-Steel Harsh Enclosure (MT #64053670)

An optional cast-aluminum explosion-proof (flameproof) assembly is available for installation in hazardous areas (Figure 1-3). Order this enclosure by MT number 64053672. **This assembly includes the enclosure and the IND110.**

The explosion-proof enclosure is rated by the manufacturer for use in a Class I Group C, D; Class II Group E, F, G; Class III Division 1; or ATEX-approved as EExd IIBH2 IP66 when installed per the manufacturer's recommendations.

Figure 1-3: Optional Cast-Aluminum Explosion-Proof (Flameproof) Enclosure and IND110 Assembly (MT #64053672)

Physical Dimensions

The IND110 Signal Converter dimensions (standard and optional enclosures) are shown in Figures 1-4, 1-5, and 1-6.

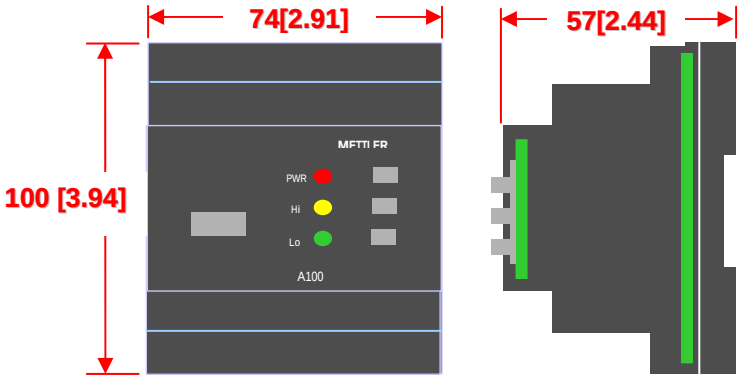


Figure 1-4: IND110 Signal Converter Dimensions

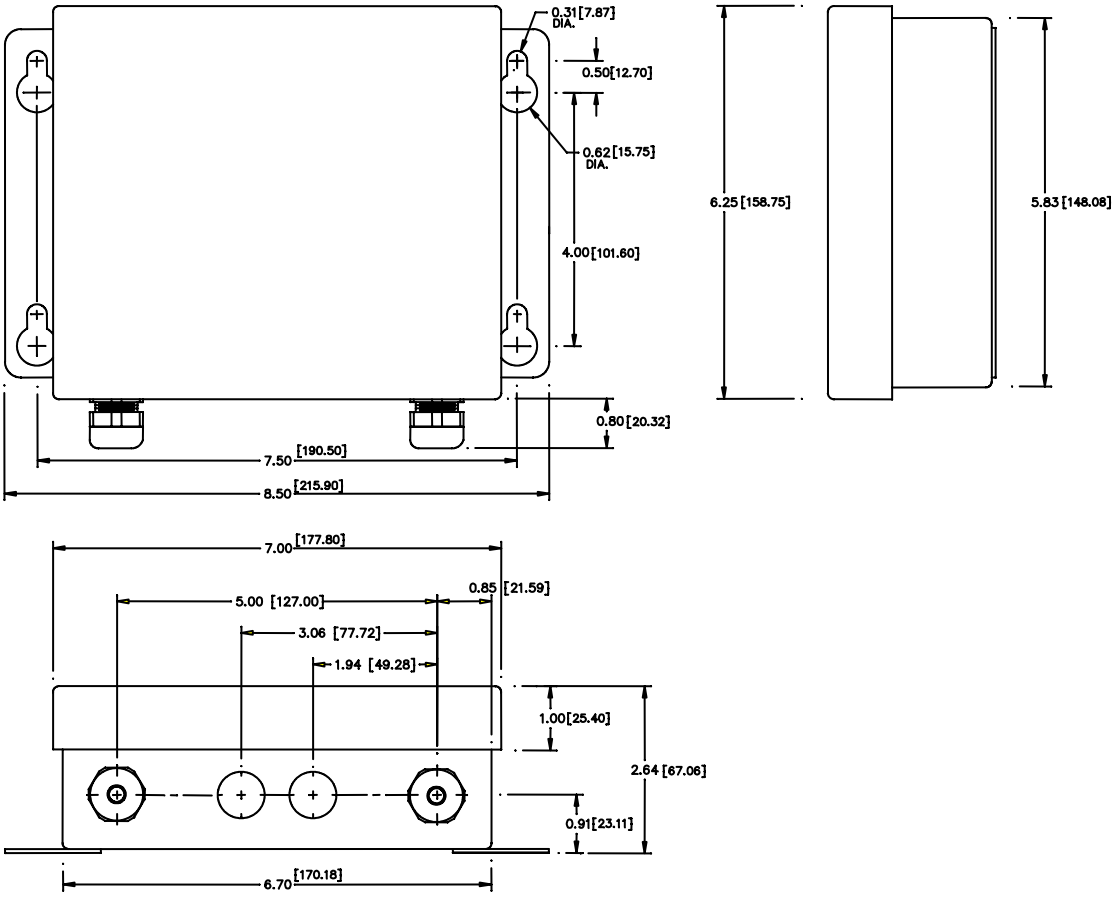


Figure 1-5: Stainless-Steel Harsh Enclosure Dimensions

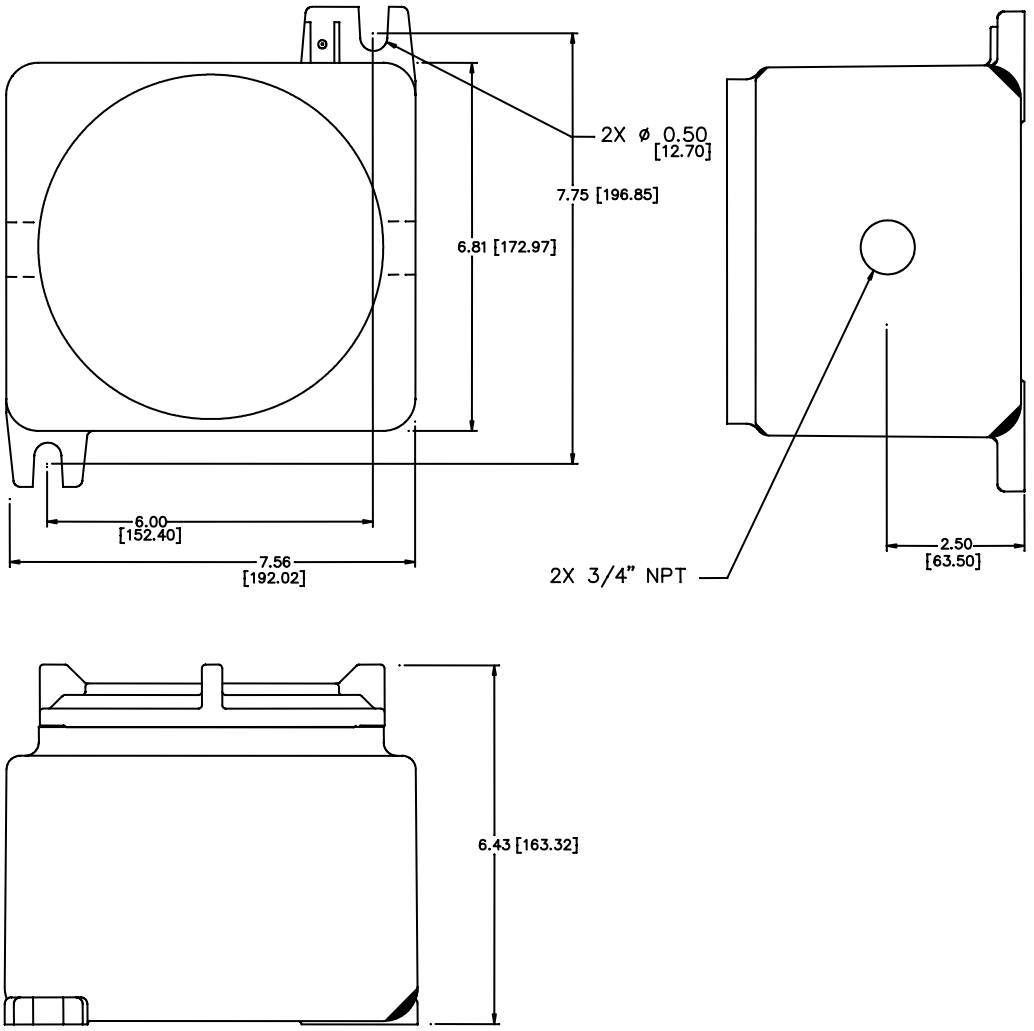


Figure 1-6: Explosion-Proof Assembly Dimensions

Specifications

The IND110 Signal Converter conforms to specifications listed in Table 1-1.

Table 1-1: Specifications

IND110 Specifications	
Physical Dimensions (W x D x H)	3.9 x 2.9 x 2.2 inches 100 x 74 x 57 mm
Enclosure Material	Plastic
Mounting	DIN rail (35 mm)
External DC Power Requirements	20 to 28 VDC, 300 mA max, 8 watts from a Class 2 power supply.
Load Cell input	Excitation: 10 VDC, 120 mA max,(4 – 350 ohm cells) Acceptable Load Cells: 1.5 to 3 mV/V with full bridge Span adjustment range: 25 to 110% of cell capacity @ 2 mV/V Zero adjustment range: 0 to 100% of load cell output @ 2 mV/V
Discrete Outputs (Setpoints)	One low- and one high-level output, open collector 5 to 30 VDC 60 mA max sink current. Transistor ON when weight < setpoint value. (Transistor emitter connected to supply common)
Analog Output	Signal: 4 to 20 mA, (1 mA and 24 mA limits) Load resistance range: 0 to 500 ohms Output Accuracy/Resolution: 1 part in 4000 min. @ 25% cell span Temp Stability: 20 PPM/°C (span), 50 PPM/°C (zero) Conversion time: 50 ms (20 updates/sec) Isolation: Circuit common connected to supply common
Calibration	DIP switch selection to enable front panel calibration of load cell zero/span and setpoint low/high limits. ↺ button: Toggle between modes + button: Increment value - button: Decrement value
LED Indicators	Power: ON with +24 VDC applied HI : ON when load cell signal ≤ HI setpoint LO : ON when load cell signal ≤ LO setpoint
Environmental Conditions	Operating temp: 14° to 112° F (-10° to 45° C) Storage temp: -4° to 158° F (-20° to 70° C) Humidity: ≤ 95% RH noncondensing Protection: IP2X DIN rail mounting (module) Cl I Gp C-D, Cl 2 Gp E-G (mounted in NEMA 7/9 explosion-proof enclosure)
RFI	RFI emissions: meets FCC class A & EN55022-A.
Agency Approvals	c UL us **UL** and **cUL** listed for USA & Canada CE **Conformité Européene**—This label is your guarantee that our products conform to the latest guidelines.

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For your notes

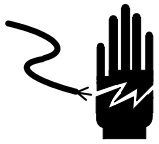
Chapter 2.0

Installation— Nonhazardous Locations

This chapter covers

- Load Cell Connections
- Load Cell Selection
- Module Mounting
- Analog Output
- Power Supply Wiring
- Setpoint Outputs

This chapter provides detailed instructions for installing the IND110 Signal Converter in nonhazardous locations. Please read this chapter thoroughly before beginning installation.



⚠ WARNING

THE IND110 IS NOT INTRINSICALLY SAFE. THE LOAD CELL LINES MUST NOT BE OPERATED IN A HAZARDOUS AREA WITHOUT AN APPROVED INTRINSIC SAFE BARRIER. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

Load Cell Connections

Up to four 350-ohm full-bridge strain gauges can be connected to the IND110 Signal Converter in parallel. The excitation voltage supplied by the IND110 is 10 VDC with a maximum source current of 120 mA.

Load cell connections must be made with shielded cable as shown in Figure 2-1. Note that the IND110 SHIELD terminal is electrically connected to the IND110 circuit and 24 VDC common. METTLER TOLEDO recommends an **isolated** 24 VDC source to prevent stray ground loop currents from affecting load cell signal integrity. The load cell cable shield should not be externally connected to any grounds and must remain floating at the load cell end.

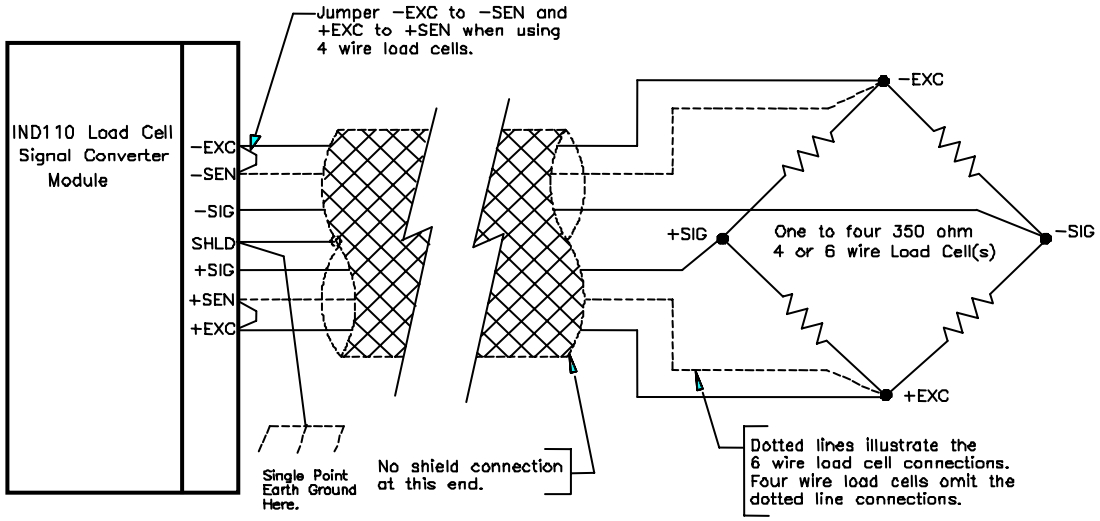


Figure 2-1: Load Cell Connections

Load Cell Selection

Before any load cells are connected, determine if the intended load cells will work correctly using the following steps:

1. Determine
   - A. Full scale system capacity
     For example: System span is 0–10,000 lb
     10,000 is the capacity
   - B. Capacity of each load cell (check nameplate rating)
   - C. Output rating of each load cell in mV/V (check nameplate)
   - D. Bridge resistance of each load cell (check nameplate)
2. Calculate
   - A. Parallel resistance of load cells by dividing bridge resistance by the number of cells
     For example: $\frac{350 \text{ ohms/cell}}{4 \text{ cells}} = 87.5 \text{ ohms}$
     87 ohms is the lowest resistance allowed

B. Full scale load cell signal output as

$$mV = \frac{\text{(system capacity) x (single cell output rating) x (excitation voltage)}}{\text{(single load cell capacity) x (number of cells)}}$$

For example:

weighing range = 10,000 pounds
Single cell output rating = 2 mV/V
Single cell capacity = 5,000 pounds
Number of cells = 4
Excitation voltage = 10

$$mV = \frac{10{,}000 \text{ lb} \times 2 \text{ mV/V} \times 10 \text{ v}}{5{,}000 \text{ lb} \times 4 \text{ cells}} \quad \frac{200{,}000}{20{,}000} = 10 \text{ mV}$$

The minimum full scale signal is 2 mV, so 10 mV is acceptable.

Another way to approximate the signal is to allow no less than 10% of the load cell capacity for span. In the above example, 10% of four 5,000 lb cells is equal to 2,000 lb. The above example weighing range is 10,000 lb, which is five times the 2,000 lb minimum acceptable weight and is acceptable.

Mounting the Module

The stainless-steel harsh enclosure has two plastic cord bushings that enable cables to pass into the enclosure. The plugged openings are provided for wiring flexibility, if needed. The installer must provide any additional fittings to meet local codes.

To mount the module, snap it onto the DIN rail located inside the enclosure while retracting the plastic module tab with a screwdriver as shown in Figure 2-2.

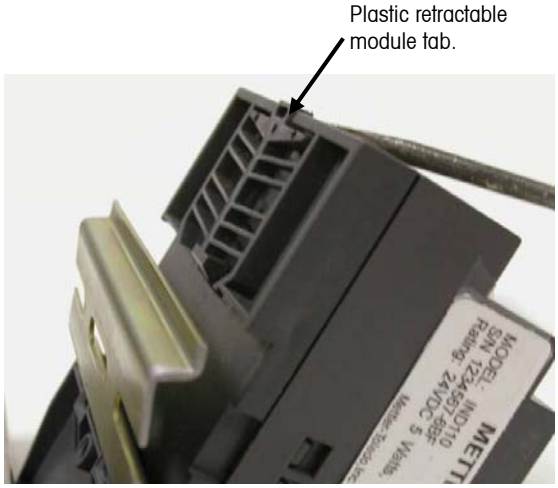


Figure 2-2: Retracting the Module Tab

Figure 2-3 shows the module properly mounted on the DIN rail inside the stainless-steel harsh enclosure.

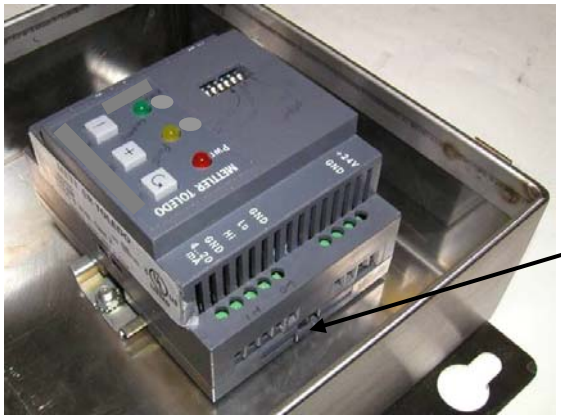


Figure 2-3: Module Mounted on DIN Rail

Analog Output 4/20 mA Connections

The output signal provided by the IND110 is a standard 4/20 mA signal commonly used for many industrial process control and PLC applications. Since this signal is analog in nature, it must be well shielded, properly grounded, and protected from higher voltage signals. Do NOT route the signal cable along side power wiring.

Proper grounding is important. The IND110 connects the load cell shield, power supply common, and 4/20 mA common lines together. As a result, connect only one of these points to an earth ground.

Many process control instruments are connected by 4/20 mA common to earth internally, which for this system would require it to remain floating without a ground connection. Test for process control equipment ground continuity before wiring is completed. If the process control equipment is not grounded, connect the IND110 at the load cell shield terminal to earth ground. If the process control equipment is connected to ground, be sure the IND110 wiring is NOT grounded.

The 4/20 mA current loop external wiring should be a two conductor #20 AWG (0.51 mm^2 minimum) shielded cable. Use Belden #8759 or equal and connect as shown in Figure 2-4.

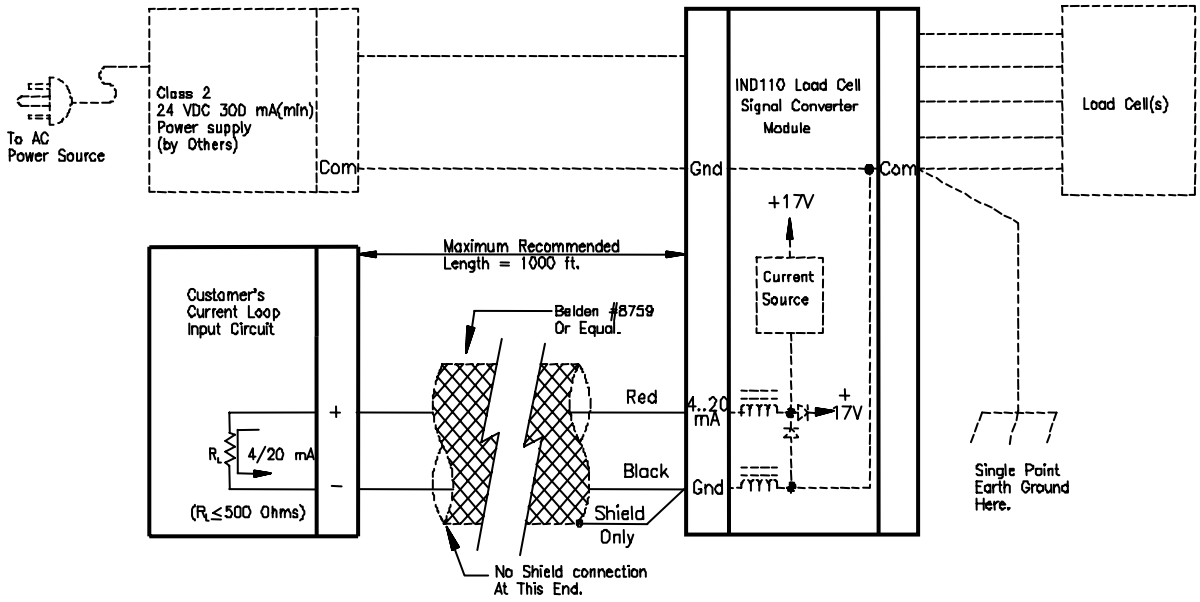
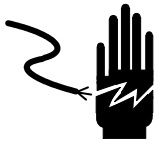


Figure 2-4: Analog Output Connections

Power Supply Wiring

The IND110 is provided with 20–28 VDC power input terminals. The user must provide a Class 2-rated 24 VDC power supply. (A Class 2 power supply is voltage- and current-limited so short-circuit conditions do not become dangerous).



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Select a power supply with an isolated output. An isolated output is important because the 24 VDC common, load cell shield, setpoint common, and the 4/20 mA common are internally connected together. These common wires must be grounded to earth—but at only ONE point. For best results, ground the load cell shield terminal. Any of the other wires can serve as an alternate single ground connection; however, there must remain **one and only one** connection to earth.

Figure 2-5 shows proper power supply wiring.

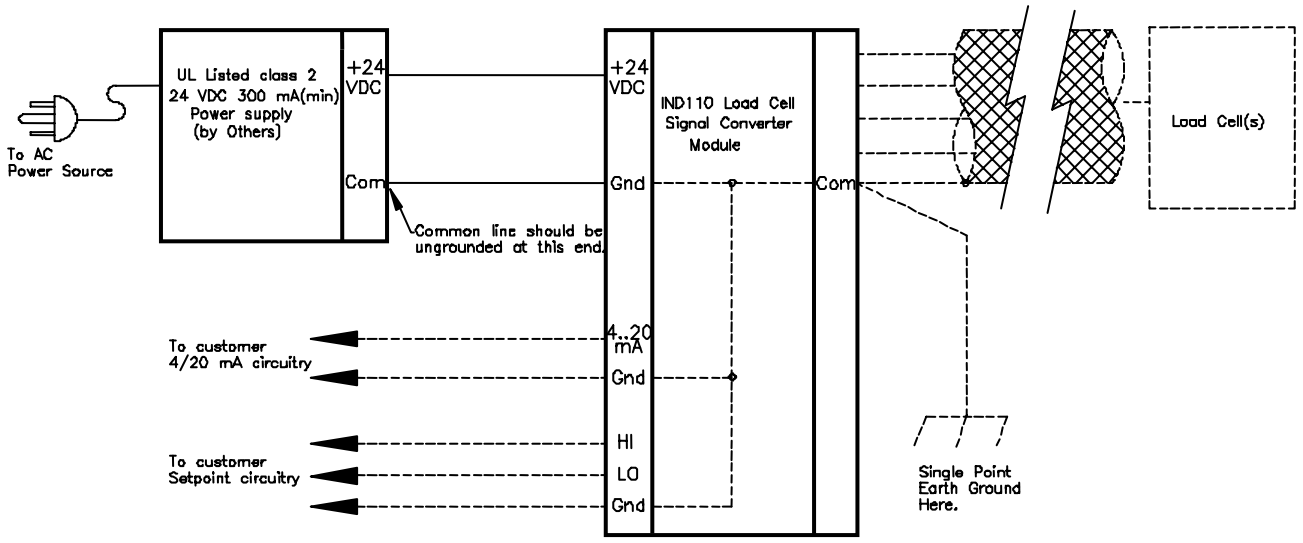

Figure 2-5: Power Supply Wiring

Setpoint Output Connections

The IND110 has two open collector transistor outputs. The LO output is turned ON when the load cell signal is below the LO setpoint and turned OFF (open collector state) when it is equal to or above the LO setpoint. The HI output is turned ON when the terminal or other PLC device signal is below the HI setpoint and turned OFF (open collector state) when it is equal to or above the HI setpoint.

Each transistor can sink 60 mA (drive a load rated at 60 mA or less). The load must be connected to an ungrounded voltage of 24 VDC or less.

CAUTION

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Suppress all inductive loads with appropriate suppression device(s) directly at the load. The typical illustration in Figure 2-6 shows an R-C type of suppression device across each solenoid. If the load is driven directly from the IND110, diodes are commonly employed as suppressors.

CAUTION

APPROPRIATE SUPPRESSION DEVICES MUST BE USED TO SUPPRESS ALL INDUCTIVE LOADS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN THE DESTRUCTION OF THE IND110 OUTPUT CIRCUIT.

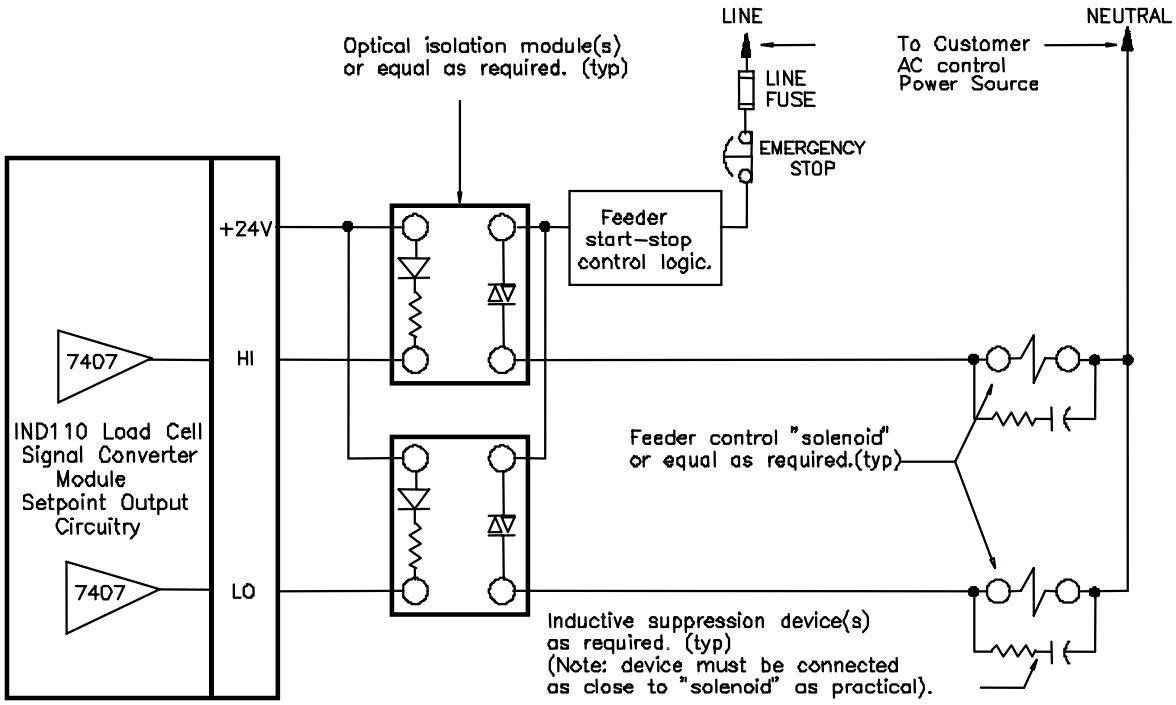

Figure 2-6: Setpoint Output Wiring

CAUTION

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For your notes

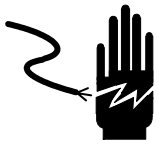
Chapter 3.0

Installation— Hazardous Locations

This chapter covers

- Load Cell Connections
- Load Cell Selection
- Module Mounting
- Analog Output
- Power Supply Wiring
- Setpoint Outputs

This chapter provides detailed instructions for installing the IND110 Signal Converter in hazardous locations. Please read this chapter thoroughly before beginning installation.



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While installing the IND110 Signal Converter in a hazardous location is similar to installing it in a nonhazardous location, there are some important differences. These differences are shown in **bold** in this chapter.

Load Cell Connections

Up to four 350-ohm full-bridge strain gauges can be connected to the IND110 Signal Converter in parallel. The excitation voltage supplied by the IND110 is 10 VDC with a maximum source current of 120 mA.

Load cell connections must be made with shielded cable as shown in Figure 3-1. Note that the IND110 SHIELD terminal is electrically connected to the IND110 circuit and 24 VDC common. METTLER TOLEDO recommends an **isolated** 24 VDC source to prevent stray ground loop currents from affecting load cell signal integrity. The load cell cable shield should not be externally connected to any grounds and must remain floating at the load cell end.

An intrinsic safe barrier is required for load cells located in hazardous areas. Load cell/barrier installation details for the cast-aluminum explosion-proof (flameproof) enclosure and IND110 assembly are shown in Figure 3-2.

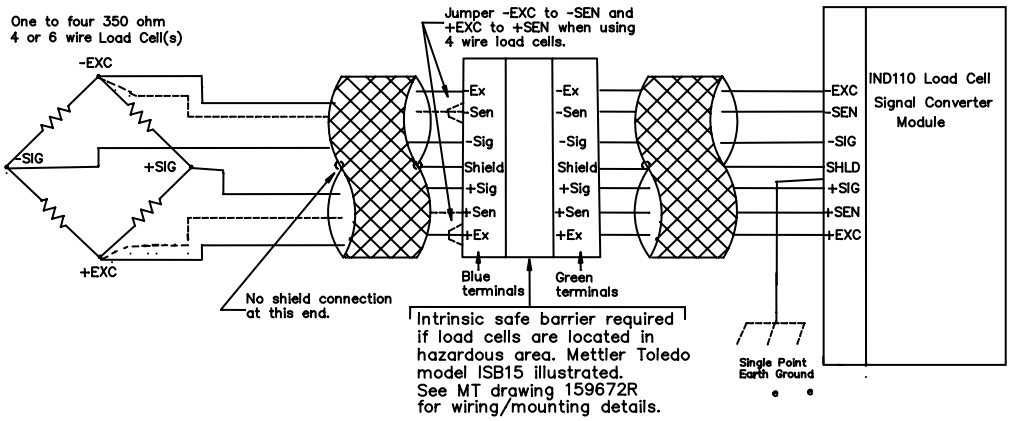


Figure 3-1: Load Cell/Barrier Cable Wiring Details

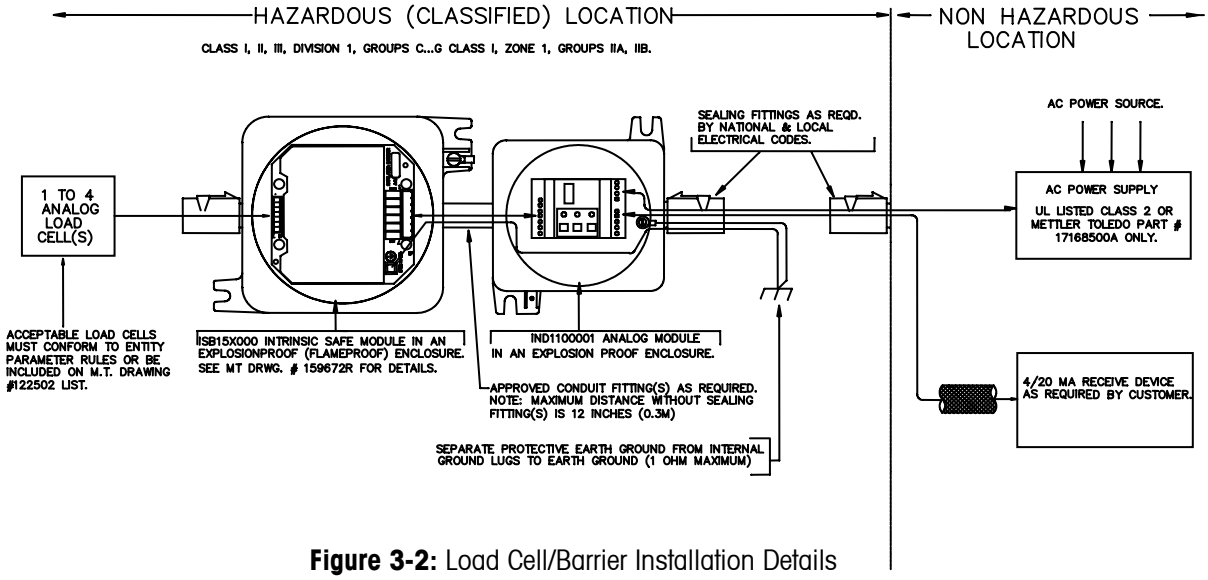


Figure 3-2: Load Cell/Barrier Installation Details

Load Cell Selection

Before any load cells are connected, determine if the intended load cells will work correctly using the following steps:

1. Determine

   A. Full scale system capacity
   For example: System span is 0–10,000 lb
   10,000 is the capacity

   B. Capacity of each load cell (check nameplate rating)

   C. Output rating of each load cell in mV/V (check nameplate)

   D. Bridge resistance of each load cell (check nameplate)

2. Calculate

   A. Parallel resistance of load cells by dividing bridge resistance by the number of cells
   For example: $\frac{350 \text{ ohms/cell}}{4 \text{ cells}} = 87.5 \text{ ohms}$
   87 ohms is the lowest resistance allowed

   B. Full scale load cell signal output as

   $$mV = \frac{(\text{system capacity}) \times (\text{single cell output rating}) \times (\text{excitation voltage})}{(\text{single load cell capacity}) \times (\text{number of cells})}$$

   For example:
   weighing range = 10,000 pounds
   Single cell output rating = 2 mV/V
   Single cell capacity = 5,000 pounds
   Number of cells = 4
   Excitation voltage = 10

   $$mV = \frac{10{,}000 \text{ lb} \times 2 \text{ mV/V} \times 10 \text{ v}}{5{,}000 \text{ lb} \times 4 \text{ cells}} \quad \frac{200{,}000}{20{,}000} = 10 \text{ mV}$$

   The minimum full scale signal is 2 mV, so 10 mV is acceptable.

   Another way to approximate the signal is to allow no less than 10% of the load cell capacity for span. In the above example, 10% of four 5,000 lb cells is equal to 2,000 lb. The above example weighing range is 10,000 lb, which is five times the 2,000 lb minimum acceptable weight and is acceptable.

Mounting the Module

The explosion-proof enclosure and IND110 assembly has only two tapped three-quarter-inch NPT holes. Sealed explosion-proof fittings are required to complete the installation. The installer must provide these fittings and ensure that they are properly installed and sealed according to national and local codes prior to use.

⚠ WARNING

WHEN INSTALLING THE EXPLOSION-PROOF ASSEMBLY, SEALED EXPLOSION-PROOF FITTINGS ARE REQUIRED. THE INSTALLER MUST ENSURE THAT THE FITTINGS ARE SEALED ACCORDING TO NATIONAL AND LOCAL CODE REQUIREMENTS FOR HAZARDOUS LOCATIONS.

To mount the IND110 module, snap the module onto the DIN rail while retracting the plastic module tab with a screwdriver as shown in Figure 3-3.

Figure 3-3: Retracting the Module Tab

Figures 3-4 and 3-5 illustrate module installation into the explosion-proof enclosure. Because of space limitations, snap the module onto the DIN rail first and then install into the enclosure as follows:

1. **Install the M6 screws loosely into the predrilled holes in the enclosure as shown in Figure 3-4.**
2. **Place the module and rail onto the screws. Slide the rail slot onto one screw and then center the module between the two screws.**
3. **Position the rail as shown in Figure 3-5 and tighten the screw.**
4. **Center the module and tighten the other screw to complete the installation.**

Figure 3-4: Sliding the DIN Rail Slot Onto One Screw

Figure 3-5: Securing the DIN Rail

Analog Output 4/20 mA Connections

The output signal provided by the IND110 is a standard 4/20 mA signal commonly used for many industrial process control and PLC applications. Since this signal is analog in nature, it must be well shielded, properly grounded, and protected from higher voltage signals. Do NOT route the signal cable along side power wiring.

Proper grounding is important. The IND110 connects the load cell shield, power supply common, and 4/20 mA common lines together. As a result, connect only one of these points to an earth ground.

Many process control instruments are connected by 4/20 mA common to earth internally, which for this system would require it to remain floating without a ground connection. Test for process control equipment ground continuity before wiring is completed. If the process control equipment is not grounded, connect the IND110 at the load cell shield terminal to earth ground. If the process control equipment is connected to ground, be sure the IND110 wiring is NOT grounded.

The 4/20 mA current loop external wiring should be a two conductor #20 AWG (0.51 mm^2 minimum) shielded cable. Use Belden #8759 or equal and connect as shown in Figure 3-6.

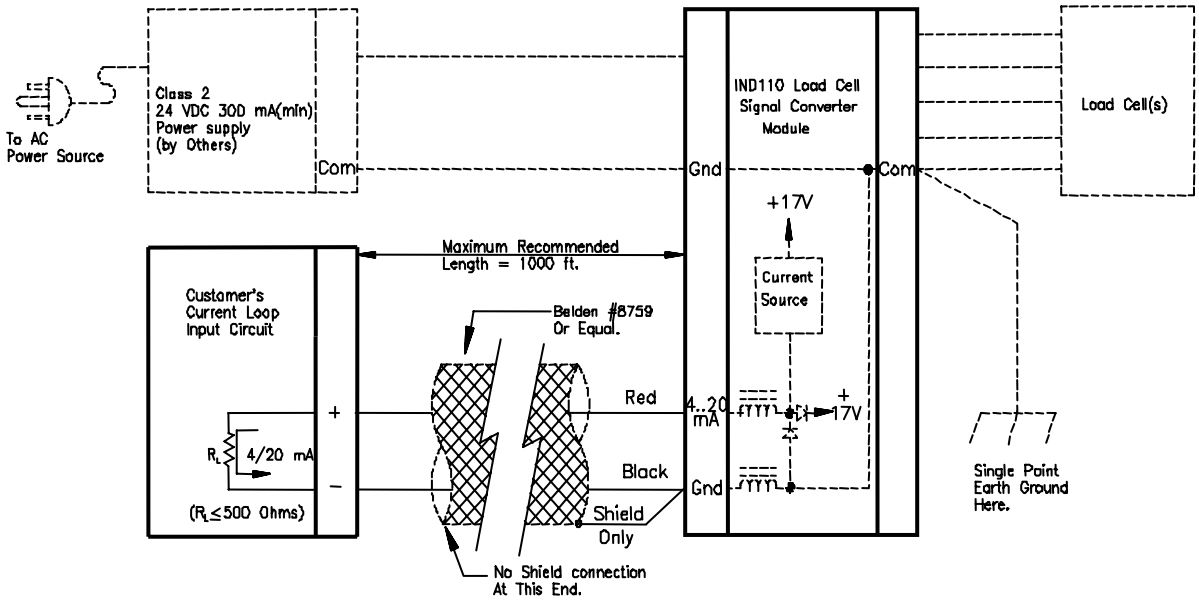
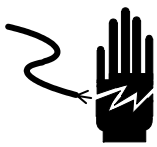


Figure 3-6: Analog Output Connections

See Figure 3-2 for additional requirements when installing the module in hazardous locations.

Power Supply Wiring

The IND110 is provided with 20–28 VDC power input terminals. The user must provide a Class 2-rated 24 VDC power supply. (A Class 2 power supply is voltage- and current-limited so short-circuit conditions do not become dangerous).



WARNING

A CLASS 2, 24 VDC POWER SUPPLY IS REQUIRED TO POWER THE IND110 MODULE. THE IND110 MODULE IS UL APPROVED FOR USE WITH A CLASS 2 POWER SUPPLY ONLY. DO NOT SUBSTITUTE ANOTHER TYPE OF POWER SUPPLY. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

Select a power supply with an isolated output. An isolated output is important because the 24 VDC common, load cell shield, setpoint common, and the 4/20 mA common are internally connected together. These common wires must be grounded to earth—but at only ONE point. For best results, ground the load cell shield terminal. Any of the other wires can serve as an alternate single ground connection; however, there must remain one and only one connection to earth.

Ensure that the power supply is mounted in a safe area or inside its own approved hazardous area enclosure.

Figure 3-7 shows proper power supply wiring.

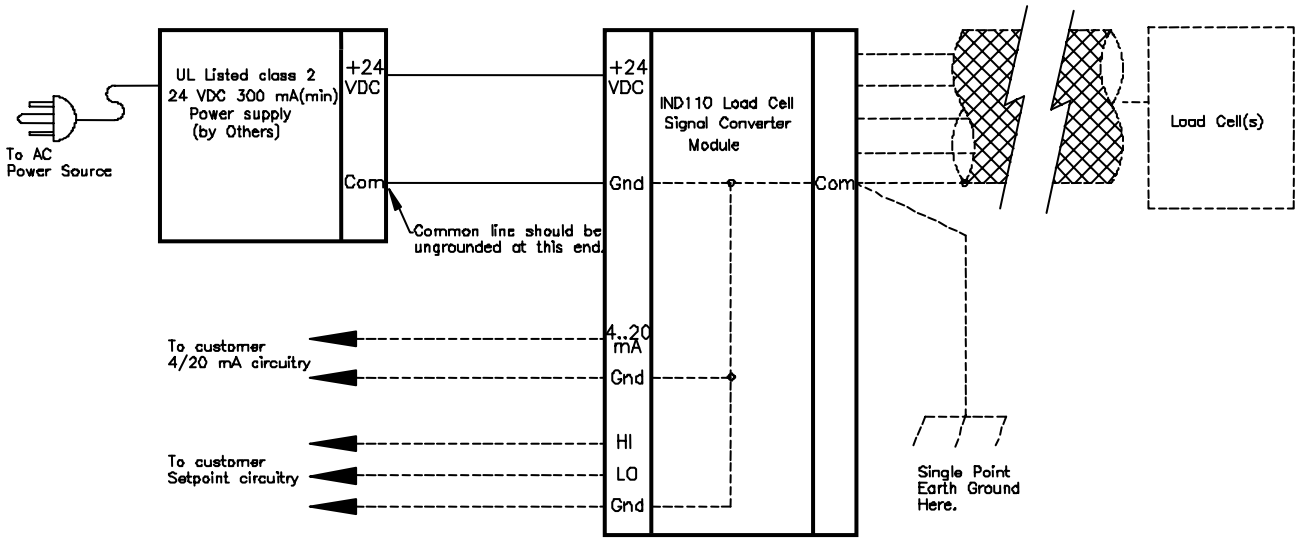


Figure 3-7: Power Supply Wiring

See Figure 3-2 for additional requirements when installing the module in hazardous locations.

Setpoint Output Connections

The IND110 has two open collector transistor outputs. The LO output is turned ON when the load cell signal is below the LO setpoint and turned OFF (open collector state) when it is equal to or above the LO setpoint. The HI output is turned ON when the terminal or other PLC device signal is below the HI setpoint and turned OFF (open collector state) when it is equal to or above the HI setpoint.

Each transistor can sink 60 mA (drive a load rated at 60 mA or less). The load must be connected to an ungrounded voltage of 24 VDC or less.

CAUTION

IF THE DC LOAD SUPPLY IS GROUNDED, A FORM OF ISOLATION MUST BE PROVIDED (OPTO ISOLATOR OR EQUAL). FAILURE TO OBSERVE THIS PRECAUTION WILL RESULT IN GROUND LOOPS FROM GROUNDS IN OTHER PARTS OF THE CIRCUITRY AND INACCURATE 4/20 MA DATA OR MODULE DESTRUCTION.

Suppress all inductive loads with appropriate suppression device(s) directly at the load. The typical illustration in Figure 3-8 shows an R-C type of suppression device across each solenoid. If the load is driven directly from the IND110, diodes are commonly employed as suppressors.

CAUTION

APPROPRIATE SUPPRESSION DEVICES MUST BE USED TO SUPPRESS ALL INDUCTIVE LOADS. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN THE DESTRUCTION OF THE IND110 OUTPUT CIRCUIT.

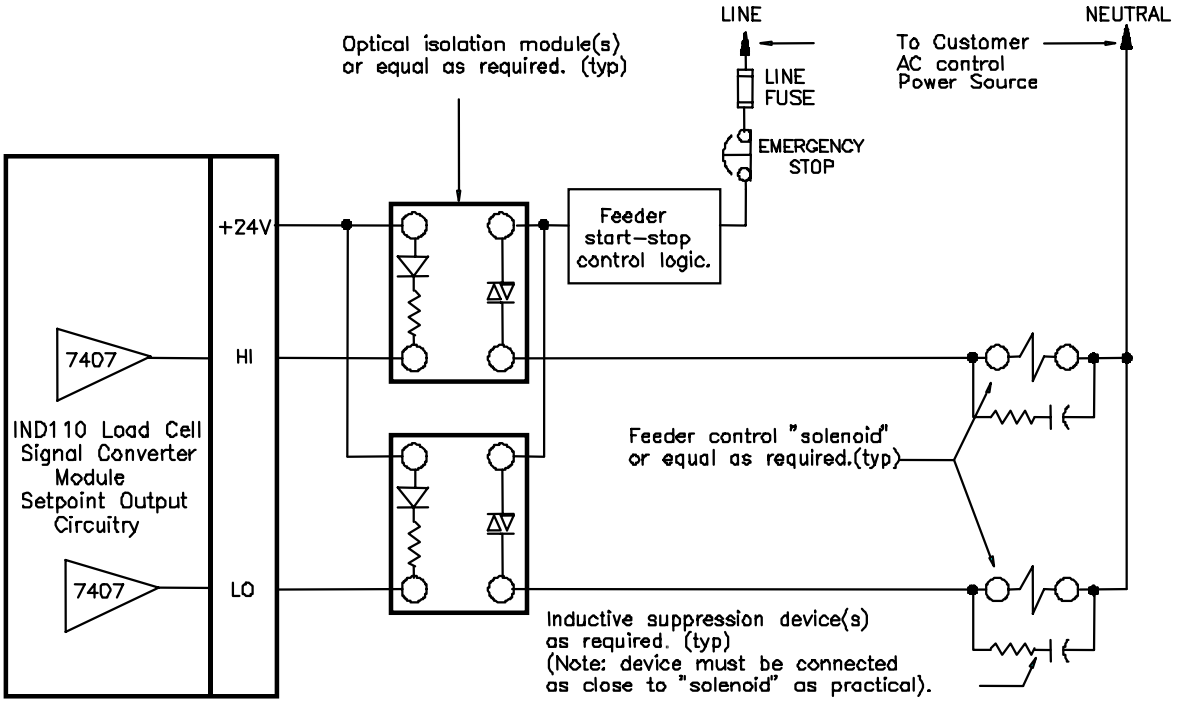


Figure 3-8: Setpoint Output Wiring

See Figure 3-2 for additional requirements when installing the module in hazardous locations.

CAUTION

ADDED SAFETY INTERLOCKS, PROPER DISCONNECTS, AND LINE FUSING BY THE CUSTOMER ARE REQUIRED AS THEY ARE IN ANY LOGIC CONTROL SYSTEM.

Chapter 4.0

Calibration

This chapter covers
- DIP Switch Functions
- Calibration Procedures

This chapter provides instructions on how to calibrate the IND110 Signal Converter. Please read this chapter thoroughly before beginning calibration.

DIP Switch Functions

Perform calibration procedures using the DIP calibration switches located on the front of the IND110 module. Figure 4-1 and Table 4-1 provide information about calibration switch locations, functions, and setup.

WARNING!

BEFORE CONNECTING THE IND110 TO A PLC OR OTHER SECONDARY CONTROL DEVICE THE UNIT MUST BE FIELD CALIBRATED. FAILURE TO DO SO COULD RESULT IN INCORRECT OPERATION AND/OR PROPERTY DAMAGE.

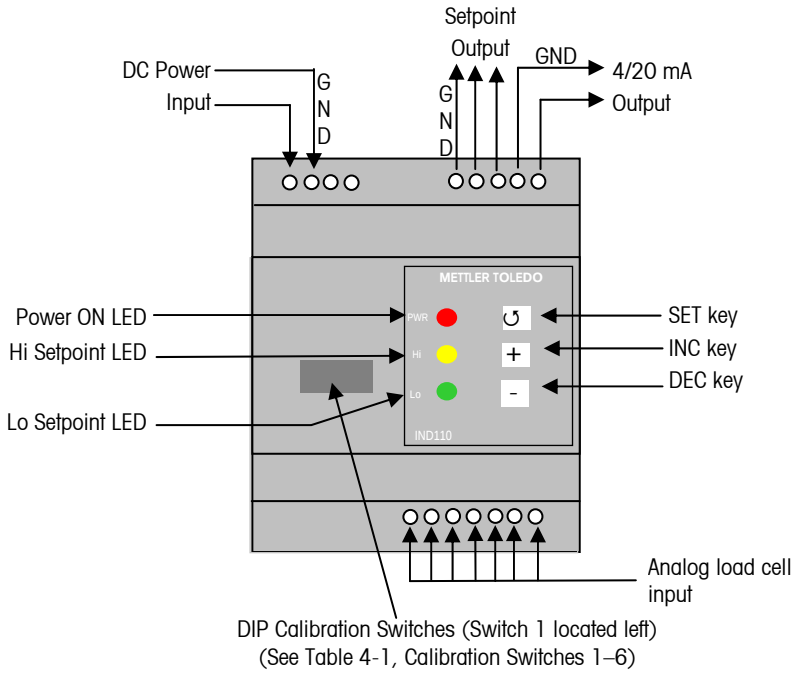


Figure 4-1: Calibration Switch Locations

Table 4-1 shows the calibration and setup functions. Position the DIP calibration switch located on the front panel to select the desired function. After calibration is complete, set switches 1–4 to OFF to store the settings.

Table 4-1: Calibration Switch Functions

Operating Mode	DIP Calibration Switches						LED Status		Conditions	Notes
	1	2	3	4	5	6	LO	HI		
Normal weigh mode	Off	Off	Off	Off	Off	Off	On	On	Weight below setpoint	Operational status: Normal conditions
							Off	On	Weight between LO and HI setpoint	
							Off	Off	Weight above HI setpoint	
Zero calibration	On	Off	Off	Off	Off	Off	Off	Flash	Coarse zero adjustment mode	Use ↺ (SET) key to toggle from coarse to fine modes. HI LED flashes for coarse. LO LED flashes for fine. Use + (INC) key to increment or Use – (DEC) key to decrement analog output voltage. Press and hold key for faster speed adjustment.
							Flash	Off	Fine zero adjustment mode	
Span calibration	Off	On	Off	Off	Off	Off	Off	Flash	Coarse span adjustment mode	
							Flash	Off	Fine span adjustment mode	
HI setpoint setting	Off	Off	On	Off	Off	Off	Off	Flash	Coarse HI setpoint adj. mode	
							Flash	Off	Fine HI setpoint adj. mode	
LO setpoint setting	Off	Off	Off	On	Off	Off	Off	Flash	Coarse LO setpoint adj. mode	
							Flash	Off	Fine LO setpoint adj. mode	

Calibration Procedures

Use DIP calibration switches 1–4 and the SET (↺), INC (+), and DEC (–) keys to implement calibration procedures. For normal weighing, all of the DIP calibration switches are OFF. For calibration, switches 1–4 are switched ON as required to calibrate

- Sw 1 ON = Weigh mode zero
- Sw 2 ON = Weigh mode span
- Sw 3 ON = LO setpoint cutoff
- Sw 4 ON = HI setpoint cutoff

Set Weigh Mode Zero

To set the weigh mode zero

1. Unload the scale.
2. Set DIP switch 1 to ON (all other switches OFF). HI LED will flash (coarse setting).
3. With a calibration current meter connected to the output, use the INC (+) and DEC (–) keys to adjust output current to the desired **zero load** value (typically 4 mA).
4. If fine adjustment is required, press the SET (↺) key until LO LED flashes. Use the INC (+) and DEC (–) keys for fine adjustment.
5. When the correct zero value is obtained, return DIP switch 1 to the OFF position. The zero load current output is stored.

Set Weigh Mode Span

To set the weigh mode span

1. Load the scale with the maximum load weight corresponding to the desired current output (typically 20 mA).
2. Set DIP switch 2 to ON (all other switches OFF). HI LED will flash (coarse setting).
3. Use the INC (+) and DEC (–) keys to adjust output current to the desired **full load** value (typically 20 mA).
4. If fine adjustment is required, press the SET (↺) key until LO LED flashes. Use the INC (+) and DEC (–) keys for fine adjustment.
5. When the correct span value is obtained, return DIP switch 2 to the OFF position. The full load current output is stored.

- Calibration can be accomplished with a value less than full load weight. Simply calculate the current output value needed to represent the load applied and adjust current output for that value. Keep in mind that the lower the value, the lower the setting accuracy obtained. Always try to use the highest calibration weight possible.

IMPORTANT

When calibrating for the high span value (typically 20 mA), the initial current could possibly be above 20 mA. When the output current is approximately 24 mA, it will remain at that level until the span is brought down within range. If the output seems like it is not changing while holding the DEC (–) key, it is because the current is too far above range. Hold the button until it comes within range. Reducing the load cell load until the output is below 20 mA will make it easier to see the span decrease.

Set HI Setpoint Cutoff Value

To set the HI setpoint cutoff value

1. Load the scale with a value equal to the desired HI setpoint cutoff point and note the 4/20 mA current output reading.

   Alternatively, calculate the output current at the desired load cutoff point. Note the output current value.

2. Turn DIP switch 3 to ON (all other switches OFF). HI LED will flash.
3. Use the INC (+) and DEC (–) keys to adjust the setting until the 4/20 mA output matches the noted output current value.
4. If fine adjustment is required, press the SET (↺) key until LO LED flashes. Use the INC (+) and DEC (–) keys for fine adjustment.
5. When the correct value is obtained, return DIP switch 3 to the OFF position. The HI setpoint cutoff value is stored.

Set LO Setpoint Cutoff Value

To set the LO setpoint cutoff value follow the same steps listed under Set HI Setpoint Cutoff Value, except use DIP switch 4 instead of DIP switch 3.

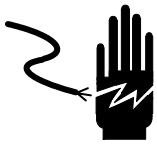
- The HI setpoint must be set for the highest cutoff value. The LO setpoint value must be lower than the HI setpoint value.
- The HI and LO setpoints are not necessary for operation of the IND110. Do not program these setpoints if they are not needed.

Chapter 5.0

Service

Ensure that the power has been removed from the IND110 Signal Converter prior to service.

There are no field replaceable parts within the IND110 Signal Converter.



WARNING

DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, SERVICING OR CLEANING. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.

METTLER TOLEDO

For your notes

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