

# LM200 Laser Level Sensor

## Long range continuous laser level and position sensor Level Products



### Introduction

The LM200 Laser is a laser-based distance measuring instrument used in process control systems. The on-board microprocessor calculates distance by multiplying the speed of light by the time it takes for a laser pulse to travel from the instrument to a target and back. The measuring laser uses invisible, infrared light. There is a second, visible aiming laser to help with the alignment of the measuring laser. The laser beams have very little divergence so that accurate targeting is easy even in silos or vessels that have internal structures

### Features:

- Range up to 200 ft. / 60 m (level applications) and up to 1312 ft. / 400 m (positioning applications)
- No Beam Divergence = No False Echoes
- Measures any Surface at Any Angle
- Rugged and Robust Enclosure
- Built-in Laser Pointer
- Accepts +24VDC Input Voltages
- Last Pulse Detection for Measurement with Light and Moderate Dust

### Options:

- ANSI / DIN Flanges
- Laser Communication Device (LCD2)
- Adjustable Mounting Bracket (ADJ4)
- Positioning Reflector (REFL)

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# 1.0 About This Manual

## 1.1 Purpose of Document

This document is intended for personnel using the LM200 Level Sensor for routine analysis and contains installation, user and troubleshooting instructions.

Read this manual carefully before working with the product. For personal and system safety and for optimum performance, make sure you thoroughly understand the contents before installing, using or maintaining this instrument.



All servicing of the equipment is to be performed at factory by Qualified Service Personnel only.



No user/operator adjustments inside the LM200 level sensor are necessary or recommended by the manufacturer.

## 1.2 Definition of Icons

This publication includes Warning, Caution, and Information where appropriate to point out safety-related or other important information. It also includes Tip to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:



The laser warning icon indicates the presence of a hazard related to the presence of a laser.



The electrical warning icon indicates the presence of a hazard which could result in electrical shock.



The ISO General Warning icon indicates safety information that must be followed by user. The information concerns the presence of a hazard which will, could or may result in personal injury or even death.



The information icon alerts the reader to pertinent facts and conditions in the use of the equipment.



The tip icon indicates advice on, for example, how to design your project or how to use a certain function.



The ESD icon indicates the presence of equipment sensitive to electrostatic discharge.

## 2.0 Safety Summary

### 2.1 Warnings, Cautions and Notices

User must comply with all warnings, cautions and notices indicated in this manual. Failure to comply with any of the warnings, cautions or notices can result in personal injuries and/or equipment damages. If you do not fully understand the information contained in this manual, please contact ABB. Refer to the back cover of this manual for contact information.

### 2.2 Laser Warnings

The LM200 Level Sensor uses a class 1M laser during normal operation. However, at installation and after a restart a pointing laser is activated for 2 minutes to allow positioning of the LM200 Level Sensor. During these 2 minutes the LM200 Level Sensor is a class 3R laser product.

During standard operation:



Class 1M laser (905nm) is safe for all conditions of use except when passed through magnifying optics such as microscopes and telescopes. Do not view directly with optical instruments (binoculars or telescopes).

In the first 2 minutes after start-up:



Class 3R laser radiations (635nm, 2mW output power) are present at the bottom side of the instrument, i.e. originate from the pointing laser. Do not look in the laser beam.



Use of controls or adjustment of performance or procedures other than those specified herein may result in hazardous laser radiation exposure.

### 2.3 Electrical Warnings



Ensure that the equipment and any devices or power cords connected to the LM200 Level Sensor are properly grounded.

Protective earthing connection (grounding) must be active at all times. The absence of grounding can lead to a potential shock hazard that could result in serious personnel injury. If an interruption of the protective earthing connection is suspected, ensure the equipment is not used.



Use the LM200 Level Sensor ONLY if a properly grounded power outlet is available.

Before using the level sensor, make sure the appropriate line voltage is available.

Use a power extension ONLY if it has proper conductive protection (grounding).

### 2.4 General Warnings



Do not, under any circumstances, remove the warning and caution labels. Information must be available at all times for the security of the user.

Before measuring the level of flammable products, equipment MUST be approved by local inspection authorities.



Please read this manual carefully before working with the product. For personal and system safety and for optimum performance, make sure you thoroughly understand the contents before installing, using or maintaining this instrument.

Prior to using the level sensor, Material Safety Data Sheets (MSDS) of all products being monitored to be analyzed must be available at all times for the security of the user.



Do not use the equipment if any signs of damage are present. Contact ABB service personnel.

### 2.5 Conformity Declaration

All ABB LM200 Level Sensors have the following conformity certifications:

- CE
- ATEX
- IECEX
- CSA

Refer to AA008970-01 Rev A Safety Specifications for ATEX.

## 2.6 Environmental Information

The LM200 Level Sensor has required the extraction and use of natural resources for its production. Therefore, the LM200 Level Sensor may contain hazardous substances that could impact health and environment. In order to avoid dissemination of these hazardous products into the environment and also to reduce the extraction and protect our natural resources, ABB inc. strongly recommends to use appropriate recycling systems in order to make sure materials used to produce your equipment are reused or recycled in a sound way. For European countries, at the end of life of the analyzer, contact your distributor before disposing of your equipment. The LM200 laser level sensor is not subject to the European WEEE directive based on the exemption for fixed industrial installations however most of its components are easily recyclable. The LM200 falls into this category by virtue of the fact that it is meant to be permanently installed by a qualified installer on industrial vessels in locations like petrochemical complexes, ore processing sites and food processing sites in order to measure the level of the content. The LM200 is not meant to be moved from site to site and serves no useful stand-alone purpose.

## 2.7 Lasers and Laser Safety

### 2.7.1 Lasers

LM200 Level Sensor uses the following:

Infrared Laser [class 1M]: Infrared beam (905nm) used to measure distance.

Laser Pointer [class 3R]: Visible beam (wavelength 635nm) for servicing, targeting and aiming purpose.

### 2.7.2 Laser Safety

LM200 is designated as a Class 1M laser device during all procedures of operation as it comes with pointer for servicing and targeting use only. As per IEC60825-1, Ed 1.2, 2001-08, the following safety rules apply as stated on the LM200 warning labels.

For Class 1M Laser Products: LASER RADIATION DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS (BINOCULARS OR TELESCOPES)

According to IEC 60825-1, Ed 1.2, 2001-08, this product is designated as class 3R laser device in the first 2 minutes after startup.

For Class 3R Laser Products: LASER RADIATION AVOID DIRECT EYE EXPOSURE)

Infrared Laser, class 1M (standard operation)		Visible Laser, class 3R (Laser Pointer first 2 min after start-up)	
Wavelength	905nm	Wavelength	635nm
Peak Power	45w	Power	<2mw CW
Average Power	12 mW	Diameter	5mm
Pulse Duration	20ns	Divergence	<1.5m rad
Pulse Rep Frequency	25khz		
Pulse Energy	50nJ		
Beam Diameter	20mm		
Divergence	$\Delta < 0.3^\circ$		

### 2.7.3 Labels



Figure 2- 1. LM200, Class 1M Laser Safety Label

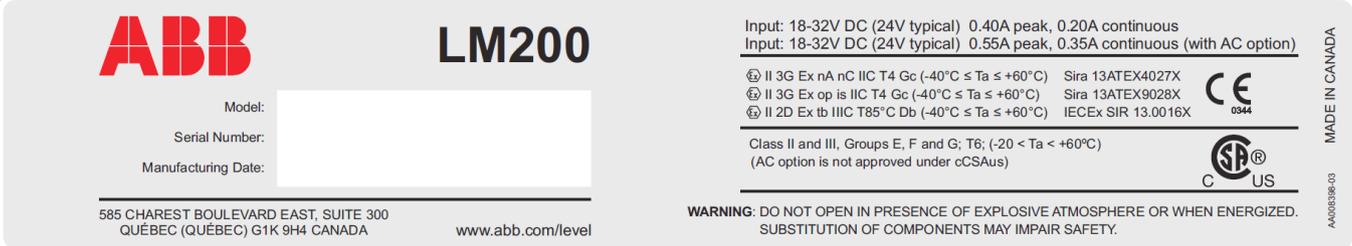


Figure 2- 2. Unit Label

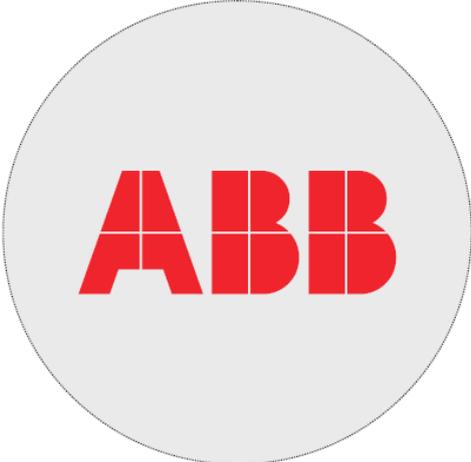


Figure 2- 3. Manufacturer Label

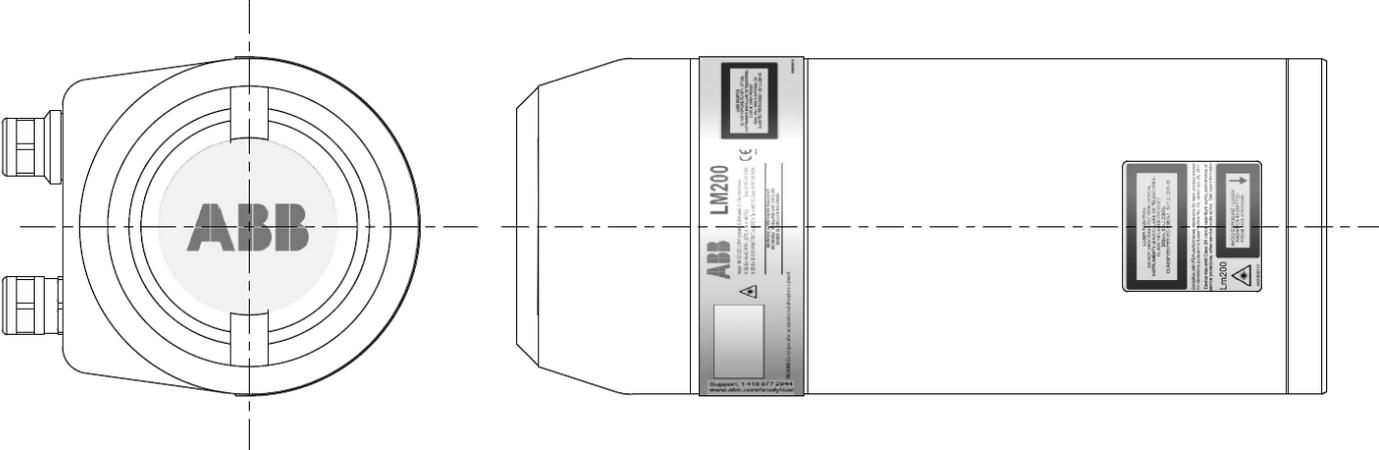


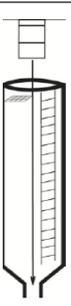
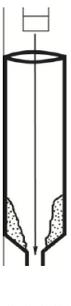
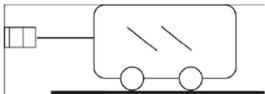
Figure 2- 4. Label Location

## 3.0 Introduction

### 3.1 Overview

The LM200 Level Sensor is a laser-based distance measuring instrument used in process control systems. The on-board microprocessor calculates distance by multiplying the speed of light by the time it takes for a laser pulse to travel from the instrument to a target and back.

The measuring laser uses invisible, infrared light. There is a second, visible aiming laser to help with the alignment of the measuring laser. The laser beams have very little divergence so that accurate targeting is easy even in silos or vessels that have internal structures.

A		Easy measurement in silos with internal structure
B		Easy measurement in silos with build-up.
C		Level silos and bins: ideal for plastic pellets, grain, coffee, dry bulk solids, opaque liquids and powders
D		Accurate, fast and long range positioning or anti-collision of moving machinery.

### 3.2 LM200 Laser Sensor Key Features

- Narrow beam for direct targeting
- Visible aiming laser
- Long distance measuring capability
- Dust ignition proof housing
- Measurements are not affected by the angle or roughness of the surface being measured
- Rapid response to moving levels and positions
- Immunity to nearby objects
- Immunity to vessel shape
- Immunity to the material of construction of the vessel
- Ability to reject momentary obstacles
- User selectable program options
- Many advanced settings available
- Not affected by material dielectric
- Below are mechanical dimensions:



Figure 3- 1. LM200 Level Sensor

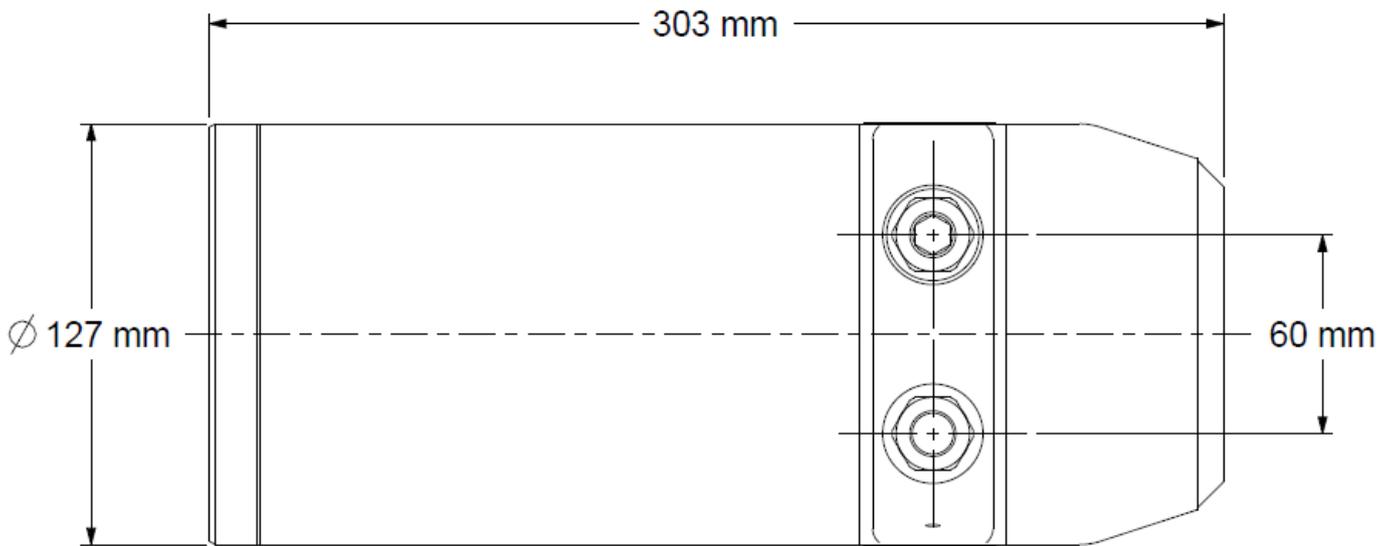


Figure 3- 2. Mechanical Dimensions of the Standard LM200 Level Sensor (1)

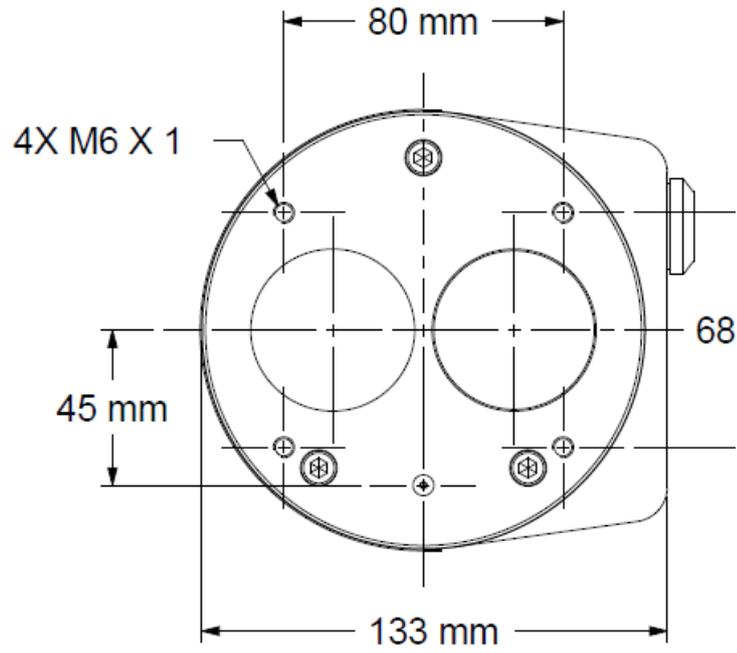


Figure 3- 3. Mechanical Dimensions of the Standard LM200 Level Sensor (2)

### 3.3 Laser Pointer

The LM200 Laser Sensor comes standard with a laser pointer that is turned off during normal operation.

The pointer will come on by software control (by hitting SPACEBAR on a laptop computer keyboard or the EXIT button on the LCD2 configuration device). When this is done the Main Menu appears, the instrument stops measuring and is accessible for activities such as aiming check and set-up. Upon measurement restart, the pointer will turn off and remain off during normal operation.

## 4.0 Installation

### 4.1 General Information

The LM200 Laser Sensor is an optical, line of sight device that is used for non-contact distance measurement. There must be no obstacles directly in the beam path.

The LM200 Laser Sensor measures in engineering units (feet or meters) so there is no need for calibration prior to installation. The instrument can simply be aimed directly towards an object and it will measure the real physical distance from its face. Any special settings required by the user may be loaded into the device inside the work area or workshop prior to mounting the LM200 Laser Sensor outside.

### 4.2 Unpacking

The product is supplied in a cardboard container with internal shock absorbing packaging. Always transport the instrument in the packaging supplied to reduce the chance of damage.

### 4.3 Handling

The product is designed to withstand many industrial environmental conditions. However, a few handling precautions will ensure reliable operation of the unit for extended periods of time.

- DO NOT DROP THE INSTRUMENT
- Remove dirt from the lens with air or if not sufficient, clean with alcohol and optical wipes.
- Do not install or connect with the power on.
- Do not open the instrument compartment or expose the internal electronics to water or dirt.
- Ensure that the cable glands or conduits are tight after connecting the external cable.
- Ensure that the lid to the terminal compartment is tight after connections have been made.
- Do not point the instrument at the sun.
- Do not open or modify the instrument.
- Store in a cool dry place.

#### 4.4 Dusty Conditions

In dusty conditions, it is strongly recommended that a Dust Tube be installed (P201/Section Accessories on page 33).

The Dust Tube is a very simple and effective device, designed to prevent dust settling on the lens. The LM200 Laser Sensor can be used in most dust present applications by using the Dust Tube accessory. However, if the dust level is very high, then using the air purge on the Dust Tube is recommended.

The Dust Tubes (P201) are equipped with 2 purge port 1/8" FNPT. Air is blown into the dust tube to create air flow inside of the dust tube and in front of the lens. The recommended flow rate is 10ft<sup>3</sup> / hr (1m<sup>3</sup> / hr) the recommended air pressure is 3 psi to 5 psi. Using air purge is recommended in very dusty applications. Clean and dry is recommended.



Make sure the air purge is free of moisture content and oil. Oil or moisture deposits settled on the protective glass may affect the LM200 performance.

#### 4.5 Alignment

The LM200 Laser Sensor is simple to install and align. It has a narrow and direct beam so there is no interference from nearby objects. The main consideration required when aligning the instrument is a clear line of sight.

The LM200 Laser Sensor will measure off a surface that is rough or is at an oblique angle to the beam. There is no need to align the instrument perpendicular to the material as it will not be affected by the cone up or down of the material. However, for liquid applications, mount the laser perpendicular as far as possible to the surface.

#### 4.6 Environmental

The LM200 Laser Sensor should be installed in an area that is within the specified temperature range, taking into consideration the enclosure ratings and the materials of construction. When installed, the LM200 Laser Sensor should be accessible for programming if necessary.



While the initial (cold start) accuracy of the LM200 Laser Sensor is likely to be within specification, a settling period of approximately 15 minutes may be required to allow the electronic components to fully warm up and the internal temperature to stabilize.

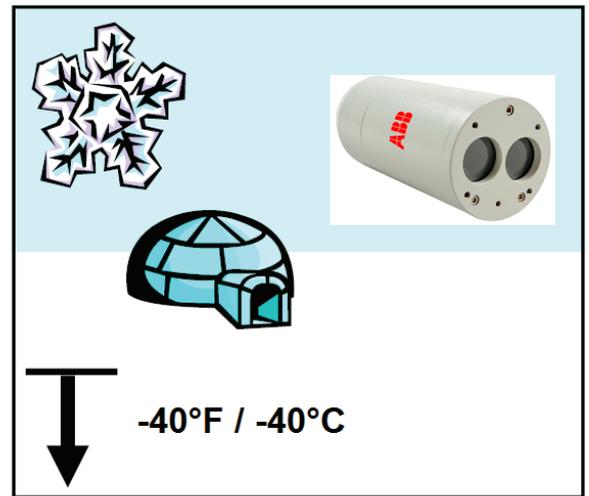
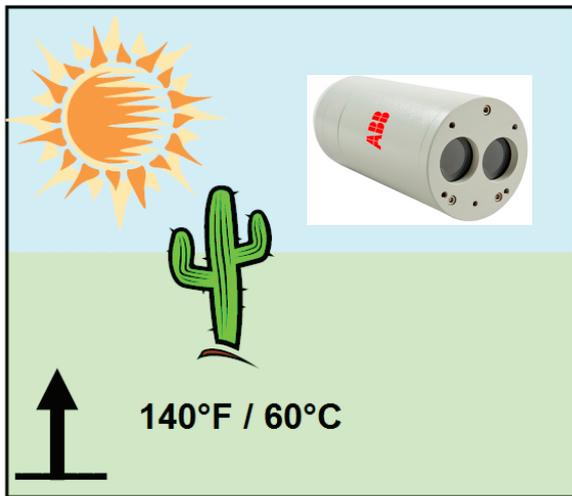


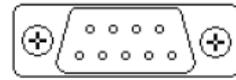
Figure 4- 1. Operating Temperature Limits

#### 4.7 ESD (Electro Static Discharge), SURGE

The LM200 Laser Sensor are manufactured to the highest quality standards. These instruments use electronic components that may be damaged by static electricity present in most work environments. Make sure all equipment is connected to good earth ground. Make sure all electrical connections are properly tight and none of them are partial or floating.

#### 4.8 Grounding

It is recommended to use a AWG 16 or 1.5 mm<sup>2</sup> wire for earth connection. For best results, ABB recommends using a size 10 earth lug with a copper body terminal per ASTM B-152, a tin plating per MIL-T-10727, and a manufacturer AMP port No. 34112 or No. 34109. The earth wire terminated with the recommended earth lug must be connected to the designated terminal for this purpose. The grounding screw is is duly identified.



RS-232 CONNECTOR  
9-PIN D-TYPE

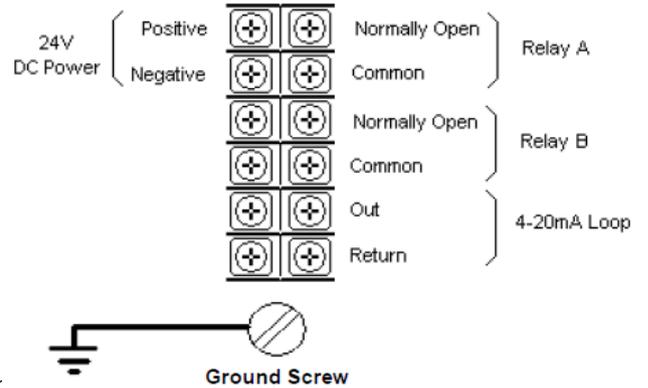


Figure 4-2. Terminal C

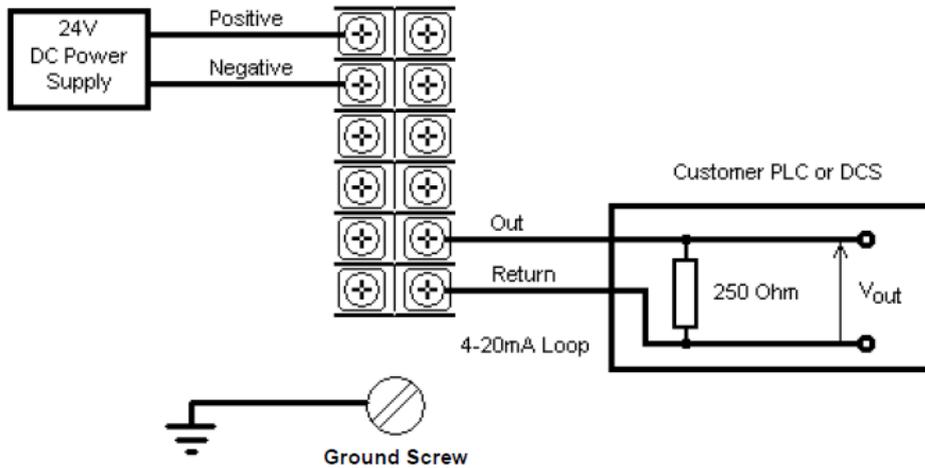


Figure 4-3. Terminal Compartment

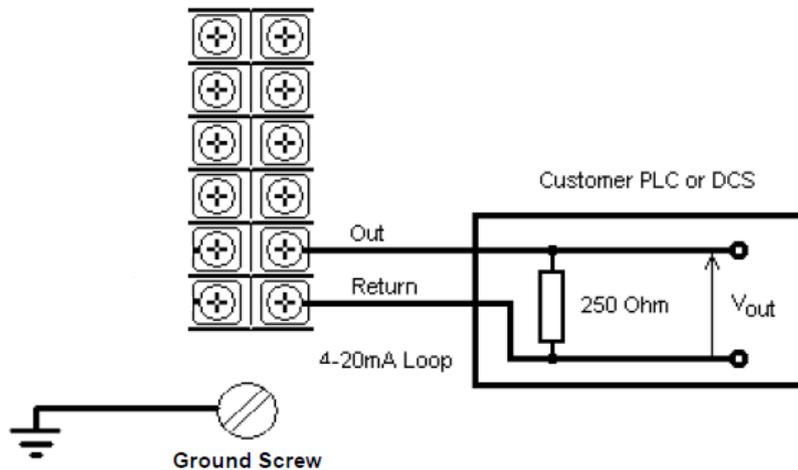


Figure 4-4. Typical Relays Connection

Once all connections are made, screw the lid by hand. To make sure the electrical compartment is not too easily accessible the compartment lid has to be firmly tightened. To do so, insert a 300 mm square bar in the slot in the top of the cover and tighten hand tight. The equipment must be protected by a 15A fuse or a circuit breaker in the building installation. A circuit breaker or switch in the building installation, marked as the disconnect switch shall be in close proximity to the equipment and within easy reach of the OPERATOR.

#### 4.11 Cables, Wiring and Routing

Always use shielded cables for power supply and signal. It is recommended to use a AWG16 or 1.5 mm<sup>2</sup> multi-core cable. The number of cores will depend upon the outputs required from the LM200 Laser Sensor. For a 4-20mA interface, use a twisted pair shielded cable. Do not install a LM200 nor route the signal cables in close vicinity to high voltage electrical nor high current cables.



In an industrial environment with extreme presence of EMI (electromagnetic interference), such as rock quarries, mines or large chemical plants, ABB recommends the use of noise filters on +24VDC power supply to the instrument and signal isolators on 4/20mA output.

Field wiring shall be rated for 150°F/60°F.

The recommended torque on terminal clamping screws is 0.6Nm. All field wiring must have insulation suitable for at least 250V.

#### 4.12 Cable Glands

The LM200 Level Sensor has ½ inch NPT cable gland entry. A suitably certified ½ inch NPT cable gland being certified to either Ex e or Ex n and having an IP rating of at least IP64 shall be used. The cable glands supplied by ABB are ATEX and CE certified and meet the above requirement.

For metric cable glands, ABB offers an optional EXd/e flameproof imperial to metric (½ inch NPT to M20) adaptor that is certified according to above standards.

These cable glands can only be used with braided shield. When installing them, make sure to fold the cable shield over the O-ring which presses the braiding against the inside wall of the body, this ensures good contact.



Figure 4-5. Cable Gland



For cable glands that are not supplied by ABB, please refer to your supplier's data sheet for proper installation.



ABB does not assume any responsibility for non ATEX or CE certified cable glands or adaptor that do not meet the requirement.

#### 4.13 Mounting

The LM200 Laser Sensor produces a narrow, straight laser beam. It should be mounted facing directly towards the area to be measured with no obstacles directly in the beam path. When aiming over a long range or to a reflective target the built-in aiming laser is a useful alignment tool. Ensure that the visible aiming laser is in the center of the target at all operating distances.

The LM200 Laser Sensor has four mounting holes on the front flange. The instrument can be bolted directly onto a flange or bracket. In applications where dust may be present (even in very small quantities) it is recommended that a dust tube accessory be used.



Avoid mounting the instrument close to a stream of material that may fall in front of it. Avoid aiming the instrument down long narrow pipes that have rough inner walls. Ensure that the instrument never points directly at or near the sun. Check the operation over the full range of conditions to be measured after installing.



The LM200 Laser Sensor may receive stronger signals in subdued lighting and dark conditions than it does in direct sunlight.



Exposure to some chemicals may degrade the sealing properties of materials used in the following devices: Relays - REL1 and REL2.



Explosion hazard. Do not disconnect equipment when a flammable or combustible atmosphere is present.



Always use thread sealant or conduit seal in order to maintain NEMA 4X rating.

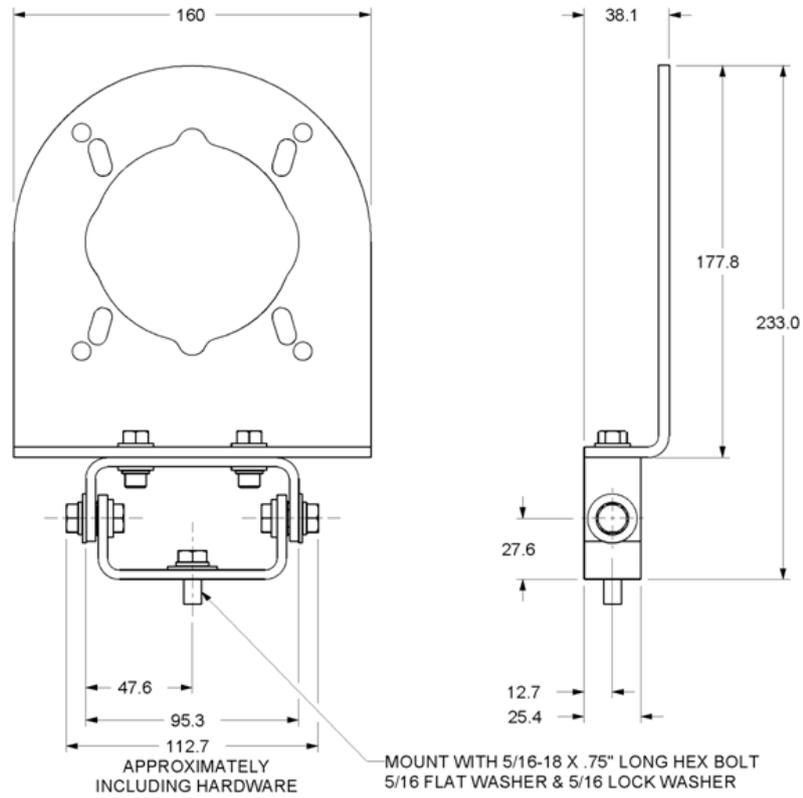


Figure 4-6. Dimensions of A200 Adjustable Pivot Bracket

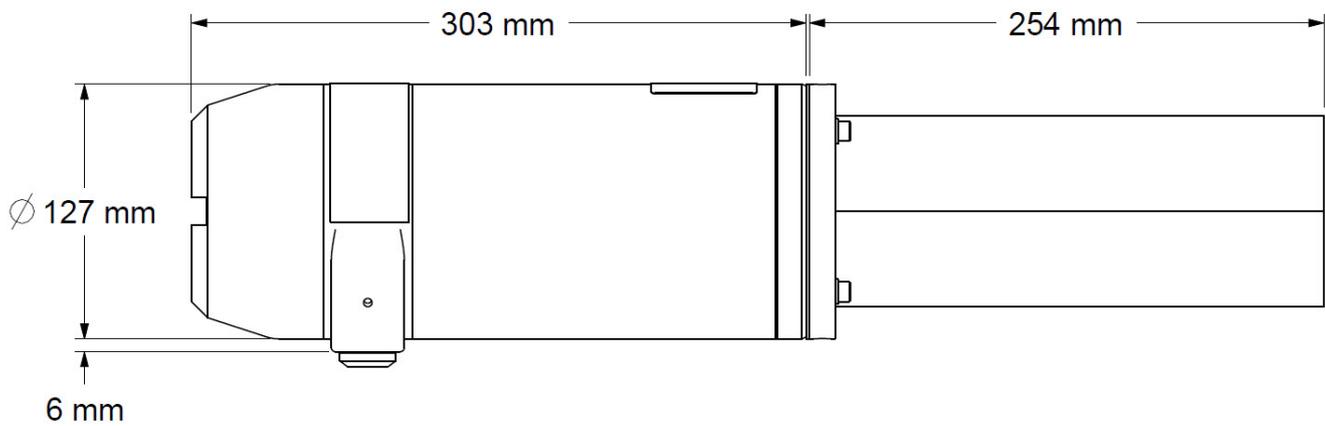


Figure 4-7 Dimensions of Standard LM200 with P201 Dust Tube Option

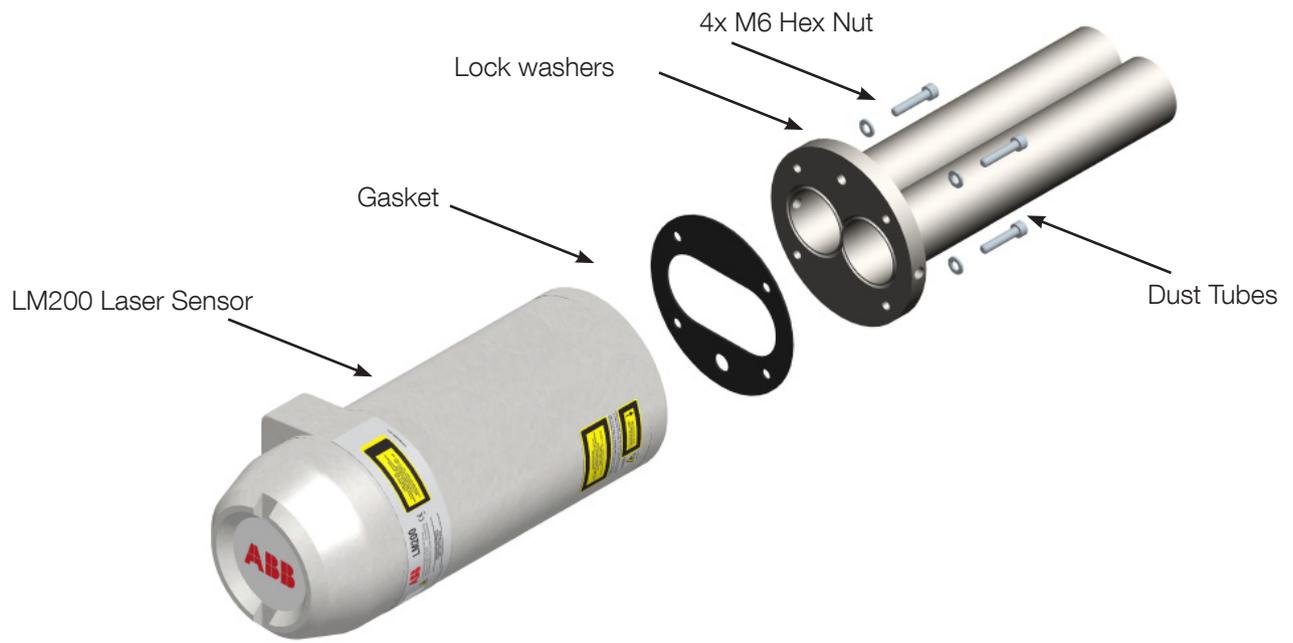


Figure 4-8. LM200 Laser Sensor with cooling tubes

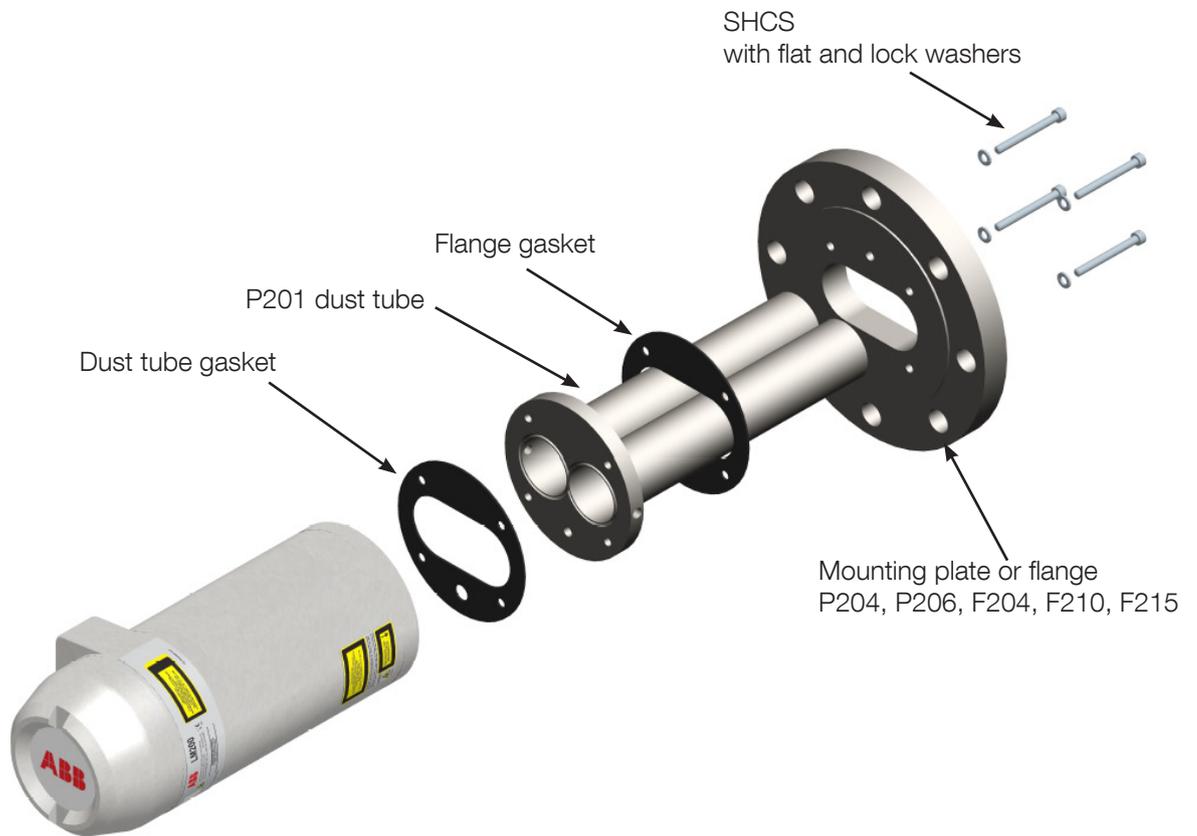


Figure 4-9. Flange Mounting Assembly

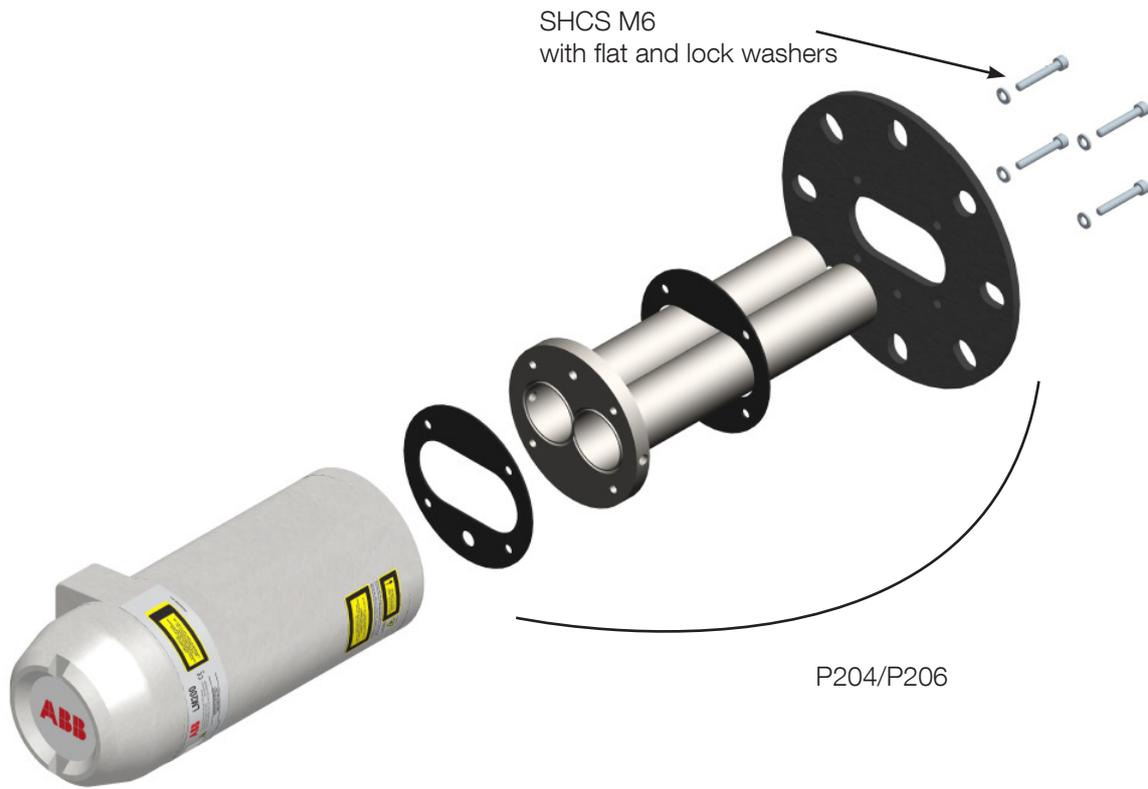


Figure 4-10. Mounting Plate Assembly

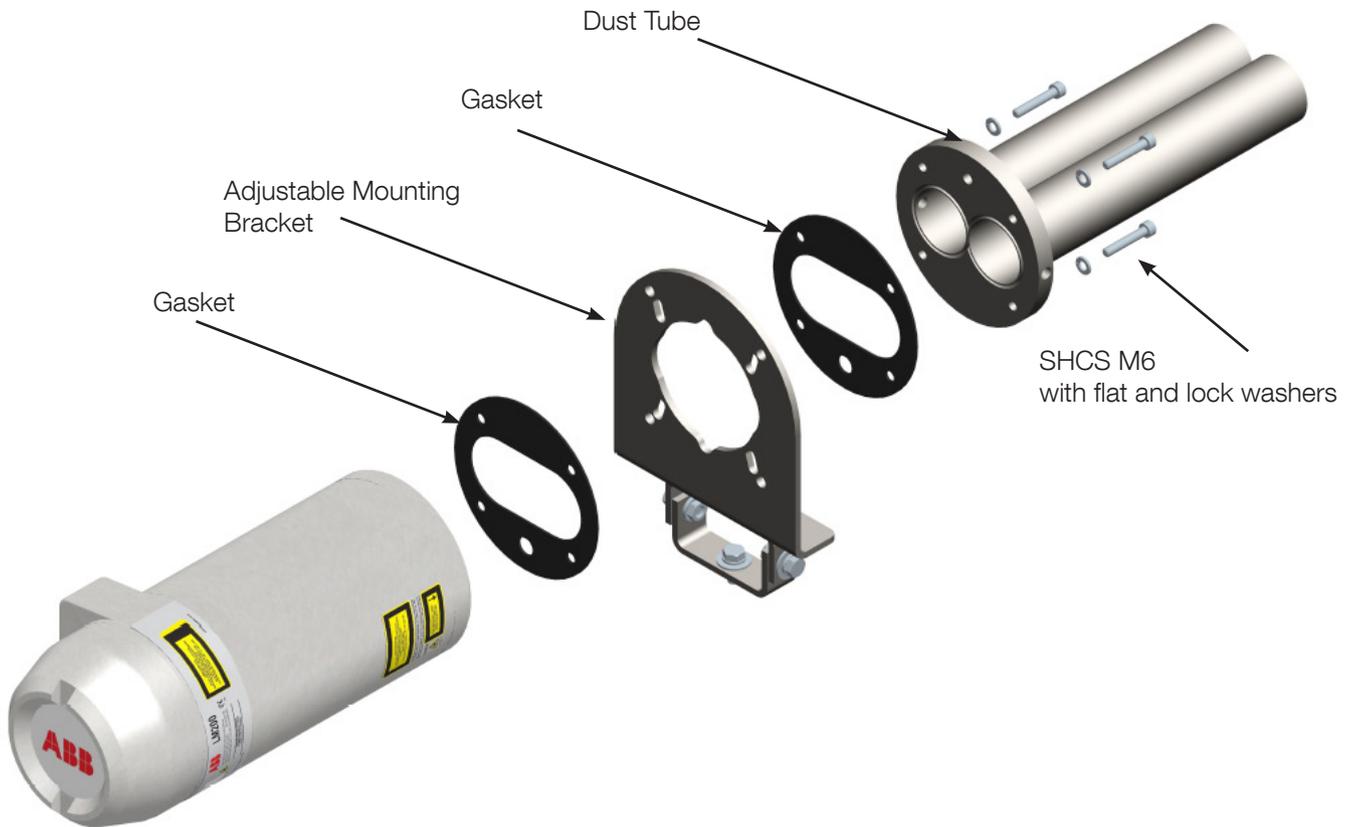


Figure 4-11. Dust Tube and Adjustable Mounting Bracket assembly

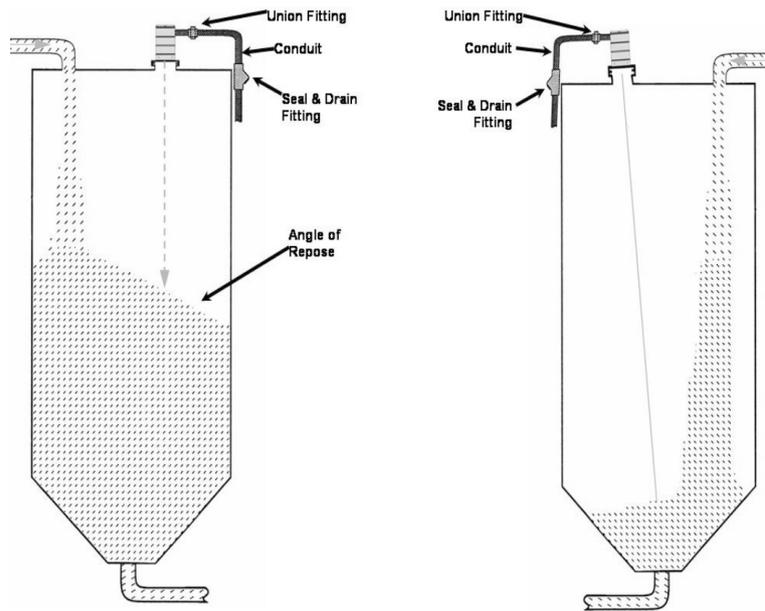


Figure 4-10. Suggested Mounting Arrangements for Solid Materials  
 For liquids we recommend the LM200.AC non-condensing option.

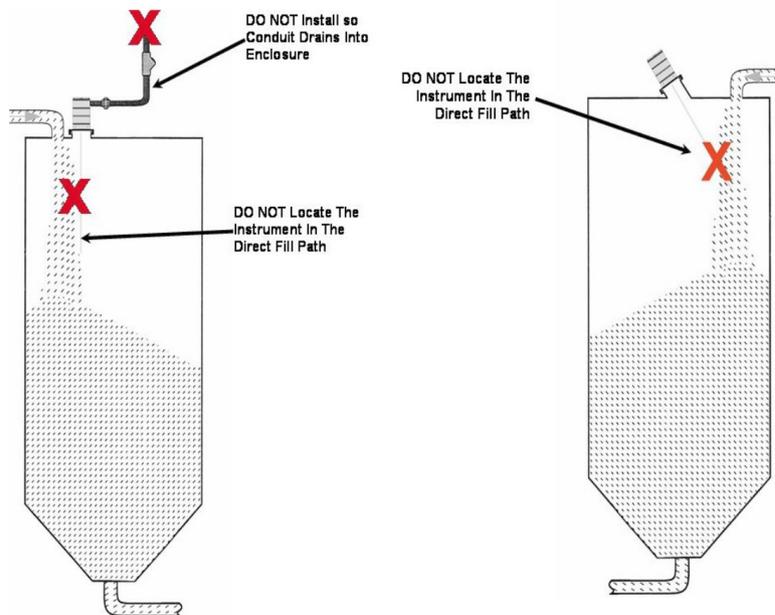


Figure 4-13. Mounting Arrangements to Avoid for Solid Materials

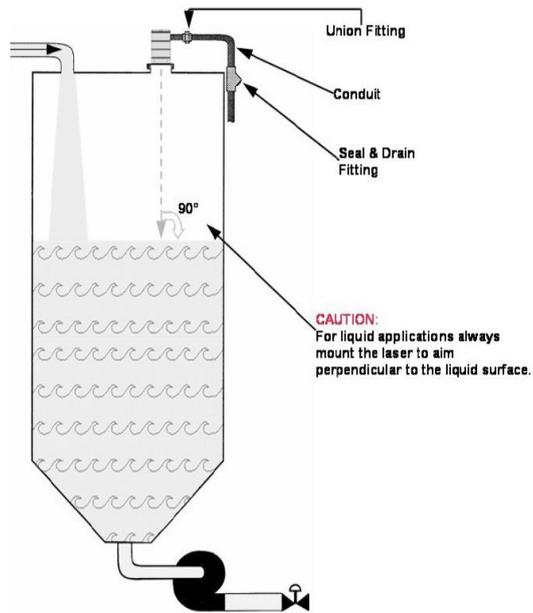


Figure 4- 14. Suggested Mounting Arrangements for Opaque Liquids or Slurries

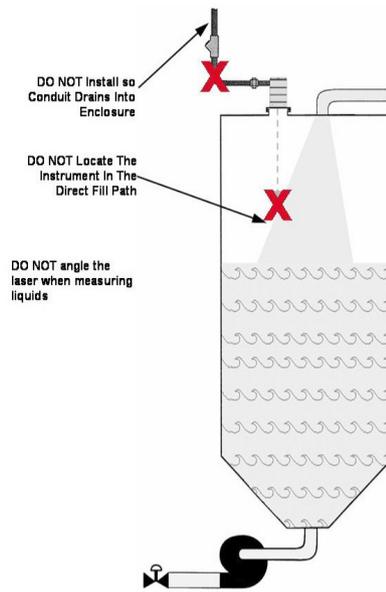


Figure 4-15. Suggested Mounting Arrangements for Opaque Liquids or Slurries

## 4.13 Quick Start Guide

### 4.13.1 Setup Procedure

1. Connect up power and 4/20ma wires to the Laser transmitter
2. For standard LM200 unit refer to Electrical Connections on page 14.
3. Switch power ON.
4. Establish communication with the LM200 unit. Refer to Section 6, Communication depending on communication device used.
5. Set 4ma and 20ma set points. Refer to The 4-20 mA Settings Menu on page 26.
6. Set Program (Program is Application Oriented Mode of Operation and it is set according to the application the unit is used for). Refer to Laser Application / Setup Table on page 29.
7. Set Fail Safe Mode. Refer to The 4-20 mA Settings Menu on page 26, point 3.
8. In Main Menu start the instrument (if LCD2 is used for communication with LM200, simply press EXIT and instrument will start measurement).

### 4.13.2 Diagnostic Checks

After installation the LM200 Laser Sensor should be checked and tested for correct wiring connections and correct operation. The example below is for the LCD2 but the same checks can be made on the PC or Laptop.

- Turn the power off.
- Remove the back lid from the LM200 Laser Sensor.
- Connect the LCD2 configuration device to the programming port.
- Connect a multi-meter or loop tester between the OUT and RETURN lines of the 4-20mA loop.
- Connect multimeter on indicators to the relays if these are to be used.
- Turn the power ON.
- After a few seconds the LCD2 will begin to display a distance reading.
- Press Exit.
- Scroll to the 4-20mA Test menu using the arrow up and arrow down keys.
- Press Enter to activate the test function.
- Force the 4-20mA to a test value using the arrow left and arrow right keys.
- Check that the reading on the 4-20mA indicator matches the test value displayed. If it does not, use the trim menu.
- Press Exit once the test is completed.
- Scroll to the Relay A Test or Relay B Test menu using the arrow up and arrow down keys.
- Press Enter to activate the test function.
- Force the relay to an ON or OFF state using the arrow left and arrow right keys.
- Check that the relay indicator matches the test condition displayed.
- Press Exit once the test is completed.
- Press Exit once more to restart the measuring process.
- Confirm that the LM200 Laser Sensor and its connections are operating correctly by measuring a range of distances under all typical conditions.
- Turn the power off.
- Remove the LCD2 communications cable and replace the cover.
- Turn the power on.



It is strongly recommended that correct operation at extremes of distance or other abnormal operating conditions be tested to ensure that unexpected results are avoided.

## 5.0 Maintenance and Service

### 5.1 Maintenance

The LM200 Laser Sensor is an optical electronic device with no moving parts. For this reason, no regular maintenance is required. When installed in a dusty environment, the LM200 Laser Sensor must be equipped with dust tubes. This will ensure long-term reliability and performance. However, before installing the LM200 Laser Sensor, it is recommended the user performs a visual check on the lenses. If particles of dust are present on the lenses, wipe them with a soft, lint free cloth.

Periodic inspection of the lenses is recommended. The higher the dust level or environmental exposure the more frequent these inspections should be.

LM200 Laser Sensor does not contain field replaceable parts and there is no scheduled maintenance required to keep this product in compliance.



Always turn the power off before removing or inspecting the LM200 LASER METER.



Do not open the LM200 Laser Meter. All service or maintenance is to be performed by qualified ABB service personnel.

## 5.2 Cleaning of Optical Lens

The optical lens is a sensitive component and must be cleaned with caution.

Clean the lens only with air or if not sufficient, clean with alcohol and optical wipes.



When cleaning with air, make sure it is at ambient temperature and humidity.



Opening the LM200 Laser Meter will void warranty.

## 5.3 Service

The LM200 Laser Sensor does not contain user serviceable parts and there is no service allowed by the customer. Service is only to be handled by authorized FACTORY TRAINED PERSONNEL. Please contact ABB, refer to back cover for contact details.

### Before Contacting ABB

If you are unable to solve a problem contact ABB. Before contacting ABB, please check the following:

- All cables are properly installed.
- The operation indicator on the electronic module is ON.
- All pertinent Troubleshooting steps in this manual have been followed.

Before sending a level sensor to ABB, you must first

- Obtain a Contamination Data Sheet from ABB's after sales service.
- Fill out and sign the Contamination Data Sheet. Do not forget to check the check boxes of the Non-contaminated Material Declaration section. Then return the fully completed Declaration to ABB.
- Obtain the authorization from ABB personnel. You must receive a Return Merchandise Authorization (RMA) prior to sending the analyzer back to ABB, otherwise reception of analyzer will be refused.

## 5.4 Repacking

To prepare the level sensor for shipment, perform reverse procedure of Unpacking on page 12. Make sure to pack the LM200 Level Sensor in its transportation box with the internal shock absorbing packaging.

# 6.0 Communication

## 6.1 Hardware

Communication with the LM200 Laser Sensor is done with an RS232 to USB cable (USBR). A wide range of computers and other devices will be able to use and establish a communication channel using a standard terminal emulation program. Settings for this program are detailed in later sections.

6- 1. Possible Communication Methods

PC to LM200		USB to Serial converter 	→		←	Connected to +24DC Power supply
Laptop to LM200		USB to Serial converter 	→		←	Connected to +24DC Power supply
LCD2			→		←	Connected to +24DC Power supply

The LCD2 includes an RS232 cable.

LCD2 (Laser communication device) is created for fast and easy communication with LM200 without the need to connect computer. LCD2 does not have its own power source and does not require set-up. The communication to the laser transmitter is conducted from the moment LCD2 is connected to the laser

## 6.2 Available User Settings

The LM200 Laser Sensor has a number of configuration settings that can be changed via the programming port located in the terminal compartment. The Laser Sensor Configuration Device accessory [LCD2] or any personal computer or laptop with USB port facilities [PC, Laptop] may be used to change these settings. The LCD2 has access to a limited number of settings options while a personal computer has full access to every available option.

A brief description of the types of available functions is provided below.

## 6.3 Set Points

The set points are distances that represent the end points for the 4-20mA output and switching points for the relays [LCD2, PC, Laptop].

A trim function is also available for the 4-20mA output that adjusts the output current to match a calibration device [PC, Laptop].

## 6.4 Test Functions

Each output can be driven to a known value using these functions. The field wiring and indication systems can be checked at the time of installation without having to physically measure a level or position [LCD2, PC, Laptop].

## 6.5 Instrument Settings

The LM200 Laser Sensor can be set to display units of feet or meters for the set points and the running screen [LCD2, PC, Laptop].

There is a facility to move the measuring datum face from the flange (factory default) to some other point such as the end of the dust tube accessory [LCD2, PC, Laptop].

There are also five program options that alter the performance of the instrument to suit the requirements of the application [LCD2, PC, Laptop].

## 6.6 Setting up a PC or Laptop to Communicate with the LM200 Level Sensor

Programming (or setting) the LM200 Laser Sensor using the USB to serial port converter cable (USB-R) and a PC or Laptop computer requires a terminal emulation program. Many terminal emulation programs are available, ABB recommends using PuTTY on Windows® or Terminal on OS/X.

## 6.7 Setting up PuTTY

1. Download PuTTY from the Internet.
2. Double-click on Putty.exe.

Under Session, change the Connect Using Box to indicate which serial port (with USB cable COM5 is typical) will be used. See Figure 6- 2.

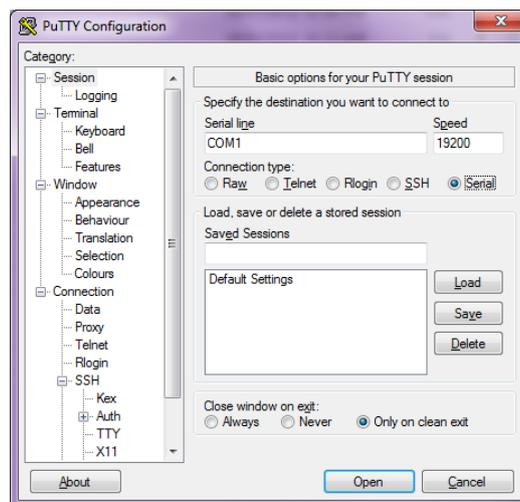


Figure 6- 2. PuTTY Configuration Dialog Box

- Click the Connection Option and then Serial (left side) and insert the correct numbers as shown below and in Figure 6- 2. Click OK to close the Configure Box and OK to close the Properties Box.

Baud Rate: 19200  
 Data Bits: 8  
 Parity: None  
 Flow Control: None  
 Stop Bits: 1

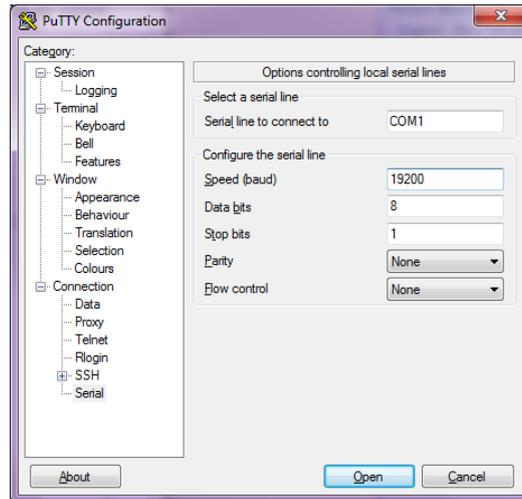


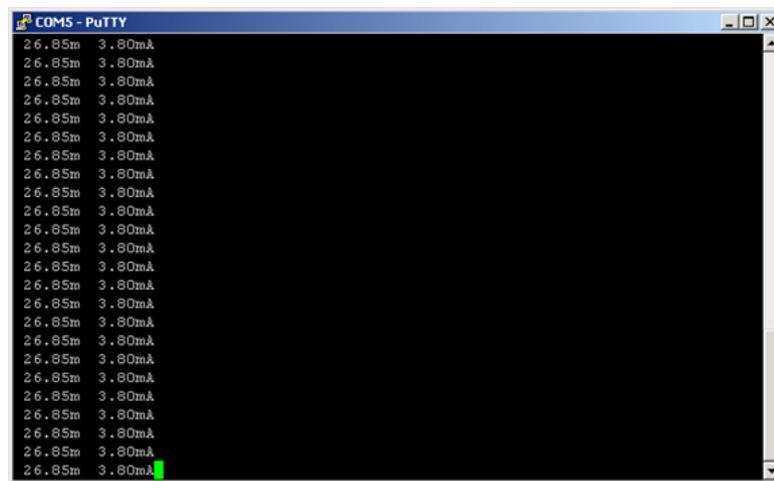
Figure 6-3. Configuration Dialog Box

- Click Open. PUTTY is now properly configured to run.

## 7.0 Menus and Program Options

### 7.1 Menu Structure for PC or Laptop

After the terminal emulation software on the PC or Laptop has been correctly set up according to Setting up PuTTY on page 23, the communication cable should be connected to the instrument. Switch on power to the instrument and the instrument will start running. After displaying the software and firmware revisions the instrument goes through an initialization sequence. It will then print out distance and mA on a continuously scrolling screen.



#### **4-20 mA Readout**

4-20 mA readout is the numerical presentation of the mA value on the 4-20 mA interface for the corresponding distance

#### **Distance**

The displayed numbers represent the distance from the LM200 LASERMETER face (the flange surface) to the object at which the invisible beam is pointed. The distance is displayed in selectable units (feet or meters).

Figure 7- 1. Normal Startup Screen

## 7.2 Programming Menu Flow Chart

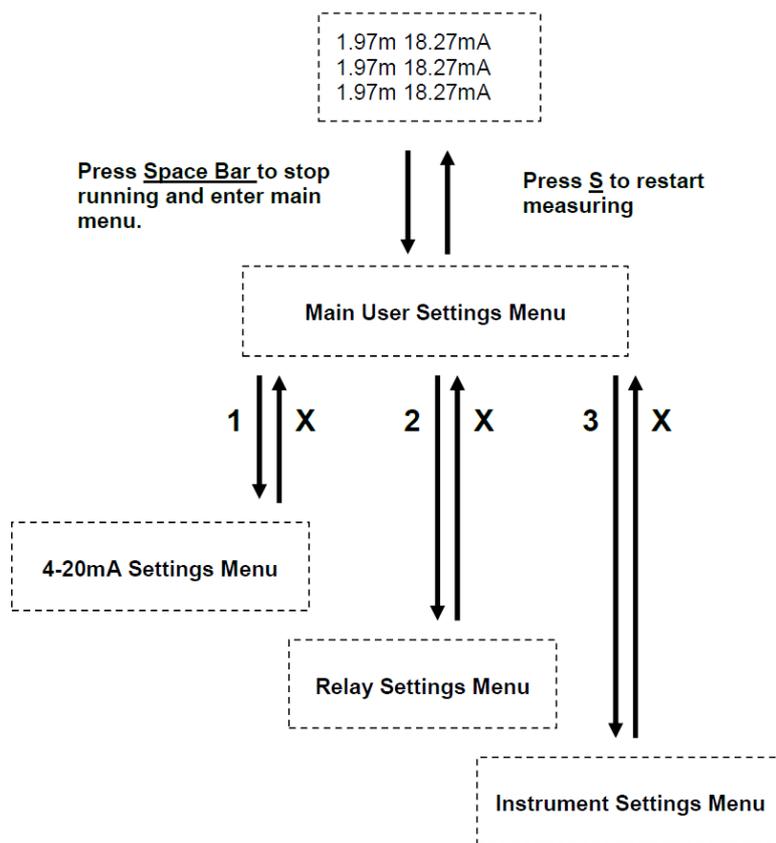


Figure 7- 2. Menu Flow Chart

## 7.3 The Main User Menu

```

                                [S]tart
-----
+          LM 200                +
+ Number AC00002   Rev 0.57    +
+ Main User Settings Menu      +
+ -----                      +
+   1:4-20mA Settings          +
+   2:Relay Settings           +
+   3:Instrument Settings       +
+                               +
+                               +
+++++

```

Figure 7- 3. The Main User Menu

Sending a Space character to the LM200 Laser Sensor will stop the measuring operation and the instrument will enter the Main User Settings Menu. Sub-menus can be selecting by pressing the numeric keys indicated adjacent to the name of each menu. Sending an “S” character restarts the measuring process. If no character is received for two minutes the instrument will auto-restart.

The Main Menu is the main starting point for the set-up, performance optimization, diagnostic and access of different features on the LM200 Laser Sensor. The Main Menu contains in its heading, important information such as:

Instrument Type - LM200: Laser Model

Serial Number - AA00122: Always use this number when requesting an RMA from Service.

Software Revision - Rev 2.02: This is the current software revision loaded to the unit.

The LM200 Laser Sensor programming menus are designed to be intuitive, self-explanatory and easy to use.

## 7.4 The 4-20 mA Settings Menu

This menu is selected from the main menu by pressing the “1” key. Items in this menu deal with the setting and testing of the 4-20mA output as well as the configuring of the fail-safe response to a lost signal.

E[x]it      [S]tart	
4-20mA settings	
1:4mA setpoint	= 10.00m
2:20mA setpoint	= 1.00m
3:Fail-safe	= Last
4:safety time	= 0.00sec
5:4-20mA test	
6:4-20mA trim	

Figure 7- 4. The 4-20mA Settings Menu

<b>1: 4mA Setting</b> = 10.00m	This option allows for the 4mA set-point to be changed to either polarity with the 4mA representing vessel full or vessel empty. Enter a value and press the ENTER key.
<b>2: 20mA Setting</b> =1.00m	This option allows for the 20mA set-point to be changed to either polarity with the 20mA representing vessel full or vessel empty. Enter a value and press the ENTER key.
<b>3: Fail Safe</b> The fail safe is LAST	This option allows for a fail-safe condition in the event of a lost signal. It can be configured to either 3.60mA, 21.00mA or LAST (hold the last good reading).
<b>4: Safety Time</b> The safety time is 0.00sec	This option allows for a time delay in seconds before the fail-safe condition is entered.
<b>5: 4-20Ma Test</b> 4-20mA test = 4.00 4-20mA test = 12.00 4-20mA test = 20.00	This option allows the user to manually drive the output current to 4mA, 12mA or 20mA. This is a toggle option. By selecting the option number, the output is changed and the menu is re-drawn.
<b>6: 4-20mA Trim</b> Connect multi-meter Enter the 4mA reading Enter the 20mA reading Instrument recalibrates itself	This option allows for adjustment to the end points of the current output loop to match the indicated display value on the user’s meter or PLC. To restore the default setting, press the “D” key.

### 7.5 The Relay Settings Menu

This menu is selected from the main menu by pressing the “2” key. Items in this menu deal with the setting and testing of the relay outputs.

```

E[x]it   [s]tart
-----
      Relay Settings
-----
1:Relay A open   =   1.00m
2:Relay A closed =   2.00m
3:Relay A test
4:Relay B open   =   4.00m
5:Relay B closed =   5.00m
6:Relay B test
  
```

Figure 7- 5. The Relay Settings Menu

<b>1: Relay A open</b> = 1.00m	This option determines the distance at which relay A will open.
<b>2: Relay A closed</b> = 2.00m	This option determines the distance at which relay A will close.
<b>3: Relay A test</b> Not active	This option allows the user to manually drive the relay output to Open or Close. This is a toggle option. By selecting the option number, the output is changed and the menu is redrawn.
<b>4: Relay B open</b> = 4.00m	This option determines the distance at which relay B will open.
<b>5: Relay B closed</b> = 5.00m	This option determines the distance at which relay B will close.
<b>6: Relay B test</b> Not active	This option allows the user to manually drive the relay output to Open or Close. This is a toggle option. By selecting the option number, the output is changed and the menu is redrawn.

### 7.6 The Instrument Settings Menu

The Instrument Setting Menu allows selecting the operating program, units and adjusting the zone position of the LM200. For example to change the units:

1. Hit space bar to get main menu

```

E[x]it   [s]tart
-----
      Instrument Settings
-----
Internal temperature  36.7C
Signal strength       0%
1:Program 0          = Standard
2:Units              = meters
3:Datum trim         = +0.00m
  
```

Figure 7- 6. The Instruments Settings Menu

This menu is selected from the main menu by pressing the “3” key. Items in this menu deal with the configuration of the LM200 Laser Sensor. This menu also shows the internal temperature of the unit and the signal strength of the last reading taken.

3. To change meters to feet, hit the “2” key on keyboard. To go back to the main menu, hit the “x” key.

1: Program 0 = Standard 1 = Light Dust 2 = Heavy Dust 3 = Position 4 = Custom	This option can take on the value of 0-4. It allows for the selection of a program that suits a particular application. The program description is displayed adjacent to the program number. Full details of the program parameters are given in a later section.
2. Units = meters	This option allows for the selection of measuring units in either feet or meters. This is a toggle option. By selecting the option number, = meters the units are changed.
Datum trim = 0.00m	This option allows the instrument datum to be adjusted by up to +1m or -1m. To change the value, enter the value that you want the instrument to read shorter or longer and press the ENTER key. To restore the default setting, press the D key.

### 7.7 Program Parameters

The user can select one of five different program types from the instrument settings menu. Each program is individually configured to suit different types of applications. The configuration parameters can be accessed via a password protection feature.

Parameter	Program 0	Program 1	Program 2	Program 3	Program 4
A: Program name	Standard	Light Dust	Heavy Dust	Position	Custom
B: Fill rate	0.00m/min	1.20m/min	0.24/min	0.00m/min	Custom
C. Empty rate	0.00m/min	0.00m/min	0.00m/min	0.00m/min	Custom
D: Pointer	On at start	On at start	On at start	On	Custom
E: Range blank	0.00m	0.00m	0.00m	0.00m	Custom
F. Buffer	8	20	25	2	Custom
G: Keep	2	2	2	2	Custom
H: Environment	Dust	Dust	Dust	Normal	Custom
I:Resolution	High	High	High	High	Custom
J: Pause	0 sec	1 sec	2 sec	0 sec	Custom

Typical applications for each program are:

Program 0 = Standard	Factory default selection Demonstration and commissioning Basic level control
Program 1 = Light Dust:	Level control where some dust is present
Program 2 = Heavy Dust	Level control in tall vessels where moderate dust is present
Program 3 = Position	Positioning with a reflective target accessor (REFL)
Program 4 = Custom	Special applications or customer configuration



The advanced settings of the LM200 Level sensor are configured to suit standard applications. The factory set default values may change from time to time.



Only trained and authorized agents should change password-protected parameters.

## 7.8 Laser Application / Setup Table

Application Type	Application Example	Settings					Notes
		Program	Buffer	Keep	Environment	Fill Rate	
Storage silo/bin with min or light dust or no dust during fill	<ul style="list-style-type: none"> <li>Granular plastics silo</li> </ul>	Light Dusts	Default	Default	Dust	Default	
Storage silo with moderate or heavy dust during fill dust settles on discharge	<ul style="list-style-type: none"> <li>Coal bunkers grain silo powders</li> <li>Roofing granular silo</li> <li>Wood chip silo</li> </ul>	Heavy Dust	Default	Default	Dust	Set fill rate in m/min or ft/min.	The rate at which the level is changing when filling or emptying the silo.
Silo/bin with rapid level movement and erratic material surface, light dust	<ul style="list-style-type: none"> <li>Crusher</li> <li>Surge Bin</li> <li>Process Hopper - granular plastics</li> <li>Granular food - dog food, cat food</li> </ul>	Custom	8 to 12	1 to 2	Dust	Default	
Opaque Liquids	<ul style="list-style-type: none"> <li>Lift station - sewer</li> <li>Ink</li> <li>Polymers</li> </ul>	Standard	8 to 16	4 to 6	Dust	Default	
Semi-Clear Liquids	<ul style="list-style-type: none"> <li>River Water</li> <li>Sea Water</li> </ul>	Standard	8 to 16	4 to 6	Normal	Default	
Reactor vessel, laser measures through sight glass	<ul style="list-style-type: none"> <li>Devoltizer reactor</li> <li>Molten Plastic</li> </ul>	Custom	8 to 16	1 to 2	Dust		Use only ABB supplied sight glass HPSG. Use ABB/ASI cooling tubes, P802 for mounting laser. Contact factory for details.
Positioning indoor min or no dust	<ul style="list-style-type: none"> <li>Tripper car in powder plant or grain elevator</li> </ul>	Positioning	Default	Default	Normal	Default	
Positioning indoor some dust / smoke	<ul style="list-style-type: none"> <li>Overhead crane in cement plant, mine, steel plant</li> </ul>	Positioning	Default	Default	Dust	Default	When laser unit is used for positioning / applications, it will be shipped from the factory as part of the positioning kit. Maximum range will be set at 150 m, this can be changed in the advanced settings menu.

## 7.9 The Laser Configuration Device LCD2

The LCD2 Configuration Device gives the user access to the settings outlined in the table on the following page. As soon as the LCD2 is plugged into the communication port it begins displaying the distance measured as well as the 4-20mA current output. Pressing the EXIT key stops the LM200 Level Sensor from running and provides access to a list of menu options. Each menu item is associated with a single parameter that can be changed. There are three types of parameters, each of which is changed in a slightly different way.

### 7.9.1 Changing Numeric Values

- To scroll between the menus use the ↑ or ↓ keys.
- To edit the value within a menu or access a test function press the ENTER key.
- To select a digit to edit use the ← and → keys.
- To edit a digit use the ↑ or ↓ keys.
- To save the new value and stop the editing mode press the ENTER key.
- To ignore the new value and stop the editing mode press the EXIT key.
- To restart the LM200 Laser Sensor in normal measuring mode press the EXIT key.

### 7.9.2 Activating a Test Function

- To scroll between the menus use the ↑ or ↓ keys.
- To access a test function press the ENTER key.
- To select between test states use the ← and → keys.
- To stop the editing mode press the ENTER key or the EXIT key.
- To restart the LM200 Laser Sensor in normal measuring mode press the EXIT key.

### 7.9.3 Selecting from a List of Options

- To scroll between the menus use the ↑ or ↓ keys.
- To access an option press the ENTER key.
- To scroll between options use the ← and → keys.
- To save the new option and stop the editing mode press the ENTER or the EXIT key.
- To restart the LM200 Laser Sensor in normal measuring mode press the EXIT key.
- Where a setting is changed from a list of options, the new value is always stored. There is no EXIT without saving.

	Display	Editing keys	Description
Plug LCD2 into LM200	12.34 m 17.65mA 12.35 m 17.66mA	Cannot be edited	Displays the distance and out-put in mA
EXIT	4mA Setpoint 0020.00 m	← → - select digit ↑ ↓ - change digit	Distance associated with a 4mA output
↑ ↓	20mA Setpoint 0001.00 m	← → - select digit ↑ ↓ - change digit	Distance associated with a 20mA output
↑ ↓	4-20mA Test 12.00mA	← → - select digit current	Forces the output to a selected current value
↑ ↓	Fail Safe Last	← → - select mode	Sets the response to a lost signal condition
↑ ↓	Safety Time 0000.00 sec	← → - select digit ↑ ↓ - change digit	Sets the response time to a lost signal
↑ ↓	Relay A Open 0001.00 m	← → - select digit ↑ ↓ - change digit	Distance associated with the opening of Relay A
↑ ↓	Relay A Closed 0002.00 m	← → - select digit ↑ ↓ - change digit	Distance associated with the closing of Relay A
↑ ↓	Relay A Test Open	← → - select relay state	Forces Relay A into a selected state
↑ ↓	Relay B Open 0004.00 m	← → - select digit ↑ ↓ - change digit	Distance associated with the opening of Relay B
↑ ↓	Relay B Closed 0005.00 m	← → - select digit ↑ ↓ - change digit	Distance associated with the closing of Relay B
↑ ↓	Relay B Test Open	← → - select relay state	Forces Relay B into a selected state
↑ ↓	Program Standard	← → - select program	Sets the mode of operation from a list of preset options
↑ ↓	Units meter	← → - select units	Sets the units of distances for all set points
↑ ↓	Datum 0000.00 m	← → - select digit ↑ ↓ - change digit	Applies an offset to all distance readings. Note that LCD2 cannot set negative trim. But this is possible with PC.
Exit	12.34 m 17.65mA 12.35 m 17.66mA	Cannot be edited	Restarts the LM200

## 7.10 Troubleshooting

Symptom	Fault	Correction
Unit Dead	<ul style="list-style-type: none"> <li>Not currently connected</li> </ul>	<ul style="list-style-type: none"> <li>Check Connections</li> <li>24V DC +- 10% - Check Power Input</li> <li>Check the Polarity of the power connections</li> <li>Check 4-20mA Connection is Dedicated to the Laser Instrument and no other Instrument</li> </ul>
Incorrect 4-20 mA DC Output	<ul style="list-style-type: none"> <li>Check the Distance Readout Using the RS232 Serial Output into a PC or LCD2</li> </ul>	
Correct Reading on Serial Port but incorrect 4-20mA on PLC or SCADA	<ul style="list-style-type: none"> <li>Incorrect Scaling of PLC or Instrument</li> </ul>	<ul style="list-style-type: none"> <li>Check that the 4 and 20mA DC Scales are the Same on the Instrument and the PLC</li> </ul>
	<ul style="list-style-type: none"> <li>Electric Interference from Closely Laid Power Supply Cables</li> </ul>	<ul style="list-style-type: none"> <li>Re-route the Cable or Screen the Cable</li> <li>Adjust trim as needed.</li> </ul>
	<ul style="list-style-type: none"> <li>Incorrect Connection to PLC through Isolator</li> </ul>	<ul style="list-style-type: none"> <li>Check Circuit Diagram on the Isolator</li> </ul>
Incorrect Reading on Serial Port	<ul style="list-style-type: none"> <li>Dirt or Obstruction on the Lenses</li> </ul>	<ul style="list-style-type: none"> <li>Check that Lenses are Clean</li> </ul>
	<ul style="list-style-type: none"> <li>Dust or Obstruction in Application</li> </ul>	<ul style="list-style-type: none"> <li>Check the Application: Can you see Surface?</li> <li>Check for the Correct Settings for Dusty Environment; test with heavy dust.</li> </ul>
	<ul style="list-style-type: none"> <li>Laser Might Not Be Aiming at Target</li> </ul>	<ul style="list-style-type: none"> <li>Check that Laser is aiming at the target all the way (pointer on target)</li> </ul>
Unit is Erratic	<ul style="list-style-type: none"> <li>Unit might not be aiming at target</li> </ul>	<ul style="list-style-type: none"> <li>Check the instrument is aiming at the target all the way (pointer on target)</li> </ul>
	<ul style="list-style-type: none"> <li>Electric interface from closely laid power supply cables</li> </ul>	<ul style="list-style-type: none"> <li>Re-route the cable or screen the cable</li> </ul>
	<ul style="list-style-type: none"> <li>Dust or obstruction in application</li> </ul>	<ul style="list-style-type: none"> <li>Check the application: can you see surface?</li> <li>Check for correct settings for dusty environment. Try heavy dust.</li> </ul>
	<ul style="list-style-type: none"> <li>Incorrectly Programmed</li> </ul>	<ul style="list-style-type: none"> <li>Check that output is as smooth as possible. Try alternate programs in Instrument Setting mode.</li> <li>Use averaging to smooth, example waveson water.</li> </ul>

# Appendix A Accessories

## A.1 Accessories

Below tables provide details on the accessories of the LM200 Level Sensor.  
For more details, please refer to the LM200 Level Sensor Data Sheet.

Dust Tubes	
Base plate diameter	127 mm (5 in) mounts on LM200 standard flange
Length	257.2 mm (10.125 in)
Material	304 Stainless Steel
Function	Static air space prevents dust buildup, can be purged

Mounting Plates		
Nominal diameter	4 in / DN 100	6 in / DN 150
Part number	P204	P206
Outer diameter	228 mm (8.96 in)	284 mm (11.18 in)
Mounting bold pattern	Dual pattern ANSI/DIN ANSI class 150 : 8 bolts, size 5/8 in, bolt circle 7.5 in DIN PN 10 : 8 bolts, size 18 mm, bolt circle 180 mm	Dual pattern ANSI/DIN ANSI class 150 : 8 bolts, size 3/4 in, bolt circle 9.5 in DIN PN 10 : 8 bolts, size 22 mm, bolt circle 240 mm
Material	304 Stainless steel	
Pressure rating	No pressure rating, atmospheric pressure only	

Mounting Flanges				
Nominal diameter	4 in raised face	6 in raised face	DN 100	DN 150
Part number	F204	F206	F210	F215
Outer diameter	9 in	11 in	220 mm	285 mm
Mounting bold pattern	ANSI class 150 8 bolts, size 5/8 in Bolt circle 7.5 in	ANSI class 150 8 bolts, size 3/4 in Bolt circle 9.5 in	PN 10 8 bolts, size 18 mm Bolt circle 180 mm	PN 10 8 bolts, size 22 mm Bolt circle 240 mm
Material	304 Stainless steel			
Pressure rating	No pressure rating, atmospheric pressure only			

Adjustable pivot bracket (A200)	
Outer diameter / width	160 mm (6.3 in)
Opening diameter	90 mm (3.54 in)
Mounting plate thickness	4.76 mm (0.19 in)
Mounting bolt	HHCS screw 5/16-18, bolt hole 8.33 mm (0.33 in)
Height of pivot	25.4 mm (1 in)
Tilt angle for aiming	Continuously adjustable over 180°
Material	304 Stainless steel

Available Optional Items	
HPSG SGO	High pressure sight glass
LCD2	Communication/configuration device and local display for programming and demo purposes. Note: Programming can also be implemented with desktop PC or laptop. Note: Not rated for dust or gas / cannot be used in hazardous area.
USBR	RS232 to USB cable for configuring LM200 using a laptop or desktop computer
REFL	Reflective panel for positioning applications up to 150 m
GCK	Set of 2 Ex cable glands with ½ inch NPT thread, size 0 / 8 mm and size 00 / 12 mm
GC1	Exd/e Flameproof imperial to metric adapter, ½ inch NPT to M20, enables use of metric M20 threaded conduits or cable glands with LM200

#### A.2 Dust Tubes (P201)

The dust tube is a very simple and effective device designed to prevent dust from settling on the laser lens. The LM200 Level Sensor will adapt to most dust-present applications by successfully using the dust tube. However, if the dust level is very high, ABB recommends using the air purge.

#### A.3 Cooling Tubes (P202)

The cooling tubes are installed ... Offset from hot process interface to allow convection cooling. They can be purged.

#### A.4 LCD2 Configuration Device

This accessory can be used to enter settings and perform interface testing. Advanced features such as program parameters cannot be set and must be accessed from a PC, Laptop.

Figure 8- 1. LCD2 Configuration Device



# Appendix B Extended Software Settings

## B.1 Extended Menu

The purpose of this addendum is to explain the extended menus of level sensor LM200. This will explain how the performance of LM200 can be enhanced, by accessing and changing some parameters.



Changing parameters can render the level sensor inoperable. Be very careful. In case the level sensor does not function anymore after a parameter adjustment attempt, default factory settings have to be restored. For further adjustments, please contact ABB.

Some important facts:

- LM200 can communicate with PC, Laptop or LCD2.

LCD2 (Laser communication device) is created for fast and easy communication with LM200 without the need to connect computer. LCD2 does not have its own power source and does not require set-up. The communication to the laser transmitter is conducted from the moment LCD2 is connected to the laser.



LCD2 however (as a difference from PC, Laptop) cannot access extended menus and it is designed for simple and easy interface to LM80/LM200.

LM200 laser transmitters have different modes of operation called PROGRAMS. The parameter Program is found under option 3. Instrument Settings in the Main Menu. Below is short description of every program:

- Standard- this program is for demonstration purposes or dust free applications. This program does not use variable gain feature.
- Light Dust – this is most commonly used program. When running in light dust Mode, the laser performs Variable gain for better signal from Separation and better performance in applications with Light and Moderate dust.
- Heavy Dust - this program is very similar to Light Dust Program. The only difference is that Heavy Dust program uses more filtering and additional features for measurement in environment with moderate dust.
- Position - the program is designed for positioning applications (tracking the movement of machinery such as overhead cranes, tripper cars, stackers, reclaimers etc.)
- Custom - this program can be configured from the end-user for specific and not typical applications, which require different parameters set-up. Such applications are rock crushers, small process Hoppers, etc.

## B.2 Passwords for extended menus and parameters set-up



All passwords must be entered with low case letters only

1. Password “agent” – access to AGENT SETTINGS Programs setup of extended menu.



This menu cannot be accessed with LCD2 communication device. To enter the password and access the extended menu, communication with LM200 must be done using PC or Laptop.

Password agent allows the end-user to enter the AGENT SETTINGS menu. While in the menu, the end-user can access any of the above described programs (application oriented mode of operations) and change some of the parameters. However it is highly recommended changes to be made to CUSTOM program only, when required. Rest of the programs which actually are applications oriented modes of operation are already preset for the applications, based on our field experience.

Access to this extended menu is not possible with LCD2. The idea is to use already factory preset programs and if changes required, to do that with a computer that gives a better visual access to prevent changing the settings in a way that will make the level sensor inoperable. If this happens, default factory settings have to be restored.



Use Standard program for demonstration purposes. If you try to use Light Dust or Heavy Dust program for demonstration, then this will slow down the laser response, due to Fill Rate and Empty rate used in the setup of these two programs.

### B.3 AGENT SETTINGS menu description and operation

- In Main Menu press p on the keyboard. On the prompt Password, enter agent (low case letters only) and then press Enter

```
[S]tart
-----
+ LM Family +
+ Number AA00191 Rev 2.20 +
+ Main User Settings Menu +
+ ----- +
+ +
+ 1:4-20mA Settings +
+ 2:Relay Settings +
+ 3:Instrument Settings +
+ +
+ +
+++++
Password: agent
```

- Next will appear the AGENT SETTINGS menu

```
-----
AGENT SETTINGS
-----
Program 0: Standard => Active
Program 1:Light Dust => Inactive
Program 2:Heavy Dust => Inactive
Program 3: Position => Inactive
Program 4: Custom => Inactive
Y: Diagnostic=> Inactive
-----
X: Exit
Enter program to edit:
```

The access to every program is done by typing the corresponding program number, for example, to access the Standard program menu, press 0. On the screen will appear the Standard program menu

### B.4 PROGRAM 0: STANDARD PARAMETERS description:

Standard Program - default settings.  
Parameters comments:

#### PROGRAM 0: STANDARD PARAMETERS

A: Program name = Standard

B: Fill rate = 0.00'/min - explained in Filtering System Section

C: Empty rate = 0.00'/min - explained in Filtering System Section

D: Pointer = On at startup - Pointer will flash 100 times and switch off. If set to On, then pointer will flash continuously

E: Range blank = 0.00' - distance where laser may lose signal

F: Buffer = 9 - max value is 25

G: Keep = 7 - max value is 9

H: Environment = Normal – this is toggle option. Other option – Dust

I: Resolution = High - this parameter can be set to low for fast response rate

J: Pause = 0sec pause between readings, max value 255 sec

X: Exit

Enter selection:

Some parameter explanations:

D: Pointer = On at startup – pointer will flash 100 times and automatically will switch OFF. Other option is ON – Pointer will flash and will never switch OFF while unit powered up.

E: Range blank = 0.00' - in silos with polished walls, such as the stainless steel vessels in Food processing Industry, the laser may lose signal when it hits the silo wall, especially in the silo con. When the laser loses signal, it will switch to Fail Safe Mode. If range blank is set to the distance where the laser may “see” polished wall (usually on emptying part of the process) and lose signal, then the device will not switch to Fail Safe Mode. It will measure the distance where signal loss occurs, output the corresponding 4/20ma interface and start measuring again, when recovering from the Signal Lost condition.

H: Environment = Normal - The parameter Environment can be set to Normal or Dust in any Program menu. When set to Normal, the laser performs measurement with “fix gain”, when set to Dust, then the laser performs measurement with “variable gain”.

#### B.4.1 Password “factory” – access to FACTORY MENU extended menu



This menu cannot be accessed with LCD2 communication device. To enter the password and access the extended menu, communication with LM200 must be done using PC or Laptop.

Password “factory” allows the user to access the FACTORY MENU extended menu. FACTORY MENU is created mainly for factory trained manufacturing and repair personnel. In this Addendum option

Special Settings and Hardware Settings will be described

- In Main Menu press “p” on the keyboard. On the prompt Password, type the password factory (low case letters only) and then press Enter

```
[S]tart
-----
+ LM Family                               +
+ Number AA00191 Rev 2.20                 +
+ Main User Settings Menu                 +
+ -----                                 +
+                                         +
+ 1:4-20mA Settings                       +
+ 2:Relay Settings                       +
+ 3:Instrument Settings                   +
+                                         +
+                                         +
+++++
Password: factory
Next will appear the FACTORY MENU
```

```
FACTORY MENU
FACTORY MENU
00: Upload to EEPROM
01: Edit settings
02: Edit product name
03: Program LCD
04: Test crystals
05: Test temperature sensor
06: Test relays and LED's
07: Test system noise
08: Test laser and receiver
09: Special settings
10: Hardware settings
11: Capture excel data
Y: DIAGNOSTICS INACTIVE
X: EXIT
```



Enter Selection  
HARDWARE SETTING Menu directly relates to the settings of fpga chip, which controls the fundamental hardware functionality of the laser unit. CHANGE ONLY THE PARAMETERS SPECIFIED IN THIS ADDENDUM. CHANGE OF ANY OTHER PARAMETER MAY RENDER THE UNIT INOPERABLE.

## B.4.2 Hardware settings

At the Enter selection prompt type 10 to access the Hardware settings menu. Second prompt Password will appear.

Type password fpga (low case letters only) and press ENTER. This is the password for enter Hardware settings menu:

Password: fpga

```
-----  
HARDWARE SETTINGS  
-----  
A:Range = 1 (46.83m)  
B:Laser pump = 79  
C:APD pump = 60  
D:Xtal A start = 230  
E:Xtal B High Res start = 55  
F:Xtal B Low Res start = 84  
G:Sweep limit = 50  
H:User setpoint limit[m] = 30  
I:4-20mA trim values = 620.05 3250.77  
X:Exit
```

By accessing the HARDWARE SETTINGS menu, the end-user can change the measuring range of the laser instrument. This is done by changing the parameter User setpoint limit[m]



The User setpoint limit is entered in numbers representing distance in meters. This number could be any number representing distance within the max range available in parameter A:Range.



The minimum range available on units with Software rev. 2.20 is Range=1 (46.83m). In order to find the max distance in feet, multiply the max distance in meters to 3.28 and you will receive the max distance in feet. See table below:

Range	0	1	2	3	4	5
Max distance in m	23.41	46.83	93.66	187.32	374.64	749.28
Max distance in ft	76.78	153.6	307.2	614.4	1228.8	2457.6

## B.4.3 Special settings

By accessing the SPECIAL SETTINGS menu, the end-user can change parameters relating to the bios control, signal width and hardware control. In this addendum we will describe option Special Settings. ABB does not recommend changing any parameter in Special Settings menu. All parameters are pre-set in order to cover broad variety of applications. In special occasions, when parameter change is required to adapt the unit to very specific application, please consult Service Department at ABB for guidance.

```
-----  
SPECIAL SETTINGS  
-----  
A:Max bias[V] = 130  
B:Min bias[V] = 40  
C:Normal attenuation[V] = 5  
D:Dust attenuation[V] = 2  
E:Operating noise[n] = 100  
F:Max signal width[c] = 200  
G:Min signal width[c] = 40  
H:Min zero width[c] = 20  
I:Auto calibration time[sec] = 3.0  
J:Calibration sweeps[N] = 16  
K:Auto restart time[min] = 1  
L:Pointer run time[sec] = 120.0  
M:Bias tracking buffer[N] = 4  
X:Exit  
Enter selection:
```

## B.5 Summary

Points to remember:

- LM200 – range max 500ft/150m positioning, 100ft/30m level, +24VDC power supply, 3" optical aperture.
- Communication to LM200 can be done with LCD2, PC or Laptop.
- LCD2 can not access the extended menus and parameters. It is designed for easy and simple communication with LM200. Extended menus and parameters can be accessed with PC or Laptop.
- LM200 level sensors are shipped with 5 different programs (application oriented operation modes), allowing limited alteration of specifications and hence performance.
- To provide increased level of access to the advanced settings and extra menus, three separate passwords are used
  - agent – allows access to AGENT SETTINGS and allows changes in the application oriented modes of operation, called PRO-GRAMS
  - factory – allows access to FACTORY SETTINGS menu
  - fpga – allows access to HARDWARE SETTINGS menu from FACTORY SETTINGS menu

# Appendix C Certifications

## C.1 CE Certificate

For the latest CE declaration of conformity version, contact ABB.



### CE DECLARATION OF CONFORMITY

**Manufacturer** : ABB Inc  
**Address** : 585 Charest Boulevard East, Suite 300  
Québec (Québec), G1K 9H4, CANADA

Herewith declares that:

**Product** : Laser Meter                      **Model** : LM200

- in accordance with the requirements of the following documents :
  - - o Quality Standard: ISO 9001:2008
- are in conformity with the provisions of the following directives:
  - - o Electromagnetic Compatibility Directive 89/336/EEC
    - o Low Voltage Directive 2006/95/EC
    - o CE Marking Directive 93/68/EEC
- and furthermore declares that the following (parts /clauses of) harmonized standards have been applied:
  - o EN 61000-6-2: Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments.
  - o EN 61000-6-4: Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial environments.
  - o EN/IEC 60825-1: Safety of laser products – Part 1: Equipment classification, requirements and user's guide.

The equipment identified above complies with all the essential requirements of the directives when installed and maintained in accordance to ABB Inc. LM200 User's Manual AA008141-01.

Place, Québec (Québec), CANADA

Thomas Buijs  
Product Line Manager

Date : 20/11/2012

Jean-René Roy  
General Manager

Date : 21/11/2012

ABB Inc.

CERT0117  
3BOM000142D0581



# Certificate of Compliance

Certificate: 2065534

Master Contract: 155295

Project: 2531454

Date Issued: July 12, 2012

Issued to: ABB Inc.  
585 Charest BLVD East  
Quebec  
PROVINCE QUEBEC  
Attention: Mr Jean Yves Nerron

*The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only*



Issued by: E.Giusti  
E. GIUSTI

## PRODUCTS

CLASS 2258 02 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations

CLASS 2258 82 - PROCESS CONTROL EQUIPMENT - For Hazardous Locations - Certified to US Standards

### PART A

Class I, Division 2, Groups A, B, C and D;

Class II and III, Groups E, F and G; T4A; (-20 < Ta < +65°C)

Ex nA nC IIC T4; Ex tb T85°C (-20 < Ta < +60°C)

Class I, Zone 2, AEx nA nC IIC T4

LM80/a/b/c/xx/yy Laser Distance Measuring Instrument; rated 18 – 32V DC, 0.25A peak, 0.15A continuous;  
Type 4X; IP66

Where:

/a = Enclosure Material: A or S

/b = Unit Options: SX, SL or HL (option "HL" is not Ex nA nC II T4; Ex tD A21 approved).

/c = Approvals – FM, CSX, CEX

/xx = option for different front plates (e.g. tri-clover, hygienic) without impact to certification

/yy = positioning application without impact to certification



**Certificate:** 2065534

**Master Contract:** 155295

**Project:** 2531454

**Date Issued:** July 12, 2012

## **PART B**

### **Class II, Groups E, F and G; Class III**

LM200/a/b. Laser Level Transmitter; rated 18 - 32 Vdc; 100-240Vac; 50/60Hz; Pmax = 7.5W; Type 4X; IP65; Temperature Class T6;  $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq +65^{\circ}\text{C}$

Where:

/a = Unit Options: SL, SC, ADJ4 or Pxxxx (x represents 4 digit numeric value for max. positioning range).

/b = Approvals: FM-CSA.

## **APPLICABLE REQUIREMENTS**

CAN/CSA C22.2 No. 0-M1991 - General Requirements - Canadian Electrical Code, Part II

CAN/CSA C22.2 No. 0.4-2004 - Bonding of Electrical Equipment

CAN/CSA C22.2 No. 25-1966 - Enclosures for Use in Class II, Groups E, F and G Hazardous Locations

CAN/CSA C22.2 No. 94-M91 - Special Purpose Enclosures

CAN/CSA C22.2 No. 142-M1987 - Process Control Equipment

CAN/CSA C22.2 No. 213-M1987 - Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations

CAN/CSA 60079-0:11 - Electrical apparatus for explosive gas atmospheres – Part 0: General requirements

CAN/CSA 60079-15:12 - Electrical apparatus for explosive gas atmospheres - Part 15: Type of protection "n"

CAN/CSA-60079-31:12 - Explosive atmospheres — Part 31: Equipment dust ignition protection by enclosure "t"

CAN/CSA 60529:2005 - Degrees of Protection Provided by Enclosures (IP Code) (identical national adoption)

FM 3810: 2005 - Approval Standard for Electrical Equipment for Measurement, Control, and Laboratory Use

ANSI/ISA-61010-1 (82.02.01): 2004 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1 General Requirements

FM 3600:1998 - Approval Standard for Electrical Equipment for use in Hazardous (Classified) Locations General Requirements

FM 3611:2004 - Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III Divisions 1 and 2, Hazardous (Classified) Locations

ISA 60079-0 (12.00.01): 2009 (IEC ed.4 2009 mod.) - Electrical Apparatus for Use in Class I, Zone 0, 1 & 2 Hazardous (Classified) Locations: General requirements

ISA 60079-15 (12.12.02): 2009 (IEC ed.3 2005 mod.) - Electrical Apparatus for Use in Class I, Zone 2 Hazardous (Classified) Locations: Type of protection "n"

ISA TR12.21.01:2004 - Explosive atmospheres - Part 28: Protection of equipment and transmissions systems using optical radiation (IEC 60079-28)

ANSI/IEC 60529:2004 - Degrees of Protection Provided by Enclosures (IP Code) (identical national adoption)

ANSI/NEMA 250:2006 - Enclosures for Electrical Equipment (1,000 Volts Maximum)

As a guide:

IEC60079-28:2006 - Explosive atmospheres - Part 28: Protection of equipment and transmissions systems using optical radiation (IEC 60079-28)



**Certificate:** 2065534

**Master Contract:** 155295

**Project:** 2531454

**Date Issued:** July 12, 2012

### MARKINGS

The following markings appear in a permanent and visible manner on each product, on CSA Accepted label(s):

- (1) Submitter's name
- (2) Model number
- (3) Serial number or date code
- (4) Electrical rating
- (5) Hazardous location designation
- (6) Special purpose enclosure designation, "TYPE 4X"
- (7) CSA monogram
- (8) Temperature code rating
- (9) Ambient temperature range

Warning labels: The following markings and cautions appear in a permanent manner.

**CAUTION: DO NOT OPEN WHEN EXPLOSIVE ATMOSPHERE IS PRESENT OR WHEN ENERGIZED**  
For Division 2 units – **WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR DIVISION 2**

Note: (Bilingual Markings)

Jurisdictions in Canada may require these markings to be also in French. It is the responsibility of the customer to provide bilingual marking, where applicable, in accordance with the requirements of the Provincial Regulatory Authorities. It is the responsibility of the customer to determine this requirement and have bilingual wording added to the "Markings".



## *Supplement to Certificate of Compliance*

**Certificate:** 2065534

**Master Contract:** 155295

*The products listed, including the latest revision described below,  
are eligible to be marked in accordance with the referenced Certificate.*

### **Product Certification History**

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<b>Project</b>	<b>Date</b>	<b>Description</b>
2065534	October 9, 2008	Original Certification.
2531454	July 12, 2012	Update to report 2065534 to cover CSAus certification and update of the documentation.

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