LM80
Laser level transmitter

Measurement made easy

Intermediate range
Level products

Introduction

The LM80 is a high performance laser level transmitter that can accurately measure level, distance and position over long ranges in extreme environments. The LM80 features advanced timing and sophisticated signal processing for pinpoint accuracy at up to 100 m/328 ft (level applications) and to 150 m (492 ft) (positioning applications).

Features:

– Range up 100 m (328 ft) (level applications) and up to 150 m (492 ft) (positioning applications)
– No beam divergence = No false echoes
– Measures any surface at any angle
– Rugged and robust aluminum enclosure
– Built-in purge port (1/8" NPT)
– No calibration required
– Easy and intuitive setup

Options and accessories:

– Stainless steel dust tubes and cooling tubes
– Stainless steel 4 and 6 inch universal mounting plates sized for ANSI 150 and DIN PN10 flanges
– Stainless steel raised face ANSI and DIN Flanges
– 4" Triclover fittings
– Handheld configuration device (LCD2)
– Batery pack (BPK)

Power and productivity
for a better world™

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The Company

We are an established world force in the design and manufacture of measurement products for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

1.0 About this manual

1.1 Purpose of document

This document is intended for personnel using the LM80 Level Transmitter 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 LM80 level Transmitter 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 LM80 laser level transmitter 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 LM80 Level Transmitter. During these 2 minutes the LM80 Level Transmitter is a class 3R laser product. It is possible to configure the LM80 to completely turn off the laser pointer. When this is done the LM80 will be a class 1M device all the time. (see section B.4.3 special settings)

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 (635 nm, 2 mW 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 LM80 Level Transmitter 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 LM80 Level Transmitter ONLY if a properly grounded power outlet is available.
Before using the level Transmitter, make sure the appropriate line voltage is available.
Use a power extension ONLY if it has proper conductive protection (grounding).

If you observe noise on the level measurement through the 4-20 mA output this can be a sign of poor or intermittent grounding.

2.4 General warnings

No connection shall be made to the D connector (RS232) inside the hazardous area.

Under certain extreme circumstances, exposed plastic (including powder coating) and un-earthed metal parts of the enclosure may store an ignition-capable level of electrostatic charge. Therefore, the user/installer shall implement precautions to prevent the build up of electrostatic charge, e.g. locate the equipment where a charge-generating mechanism (such as wind-blown dust) is unlikely to be present and clean with a damp cloth.

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.

Read this manual thoroughly before using this equipment. If you do not understand the content of this manual, contact ABB service personnel.
Prior to using the level Transmitter, 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 and certificates

ABB LM80 Level Transmitters have the following conformity certifications:
–   CE
–   ATEX
–   IECEx
–   CSA
–   FM
Refer to SM/LM80-EN Safety Specifications for ATEX.

2.6 Environmental information

The LM80 Level Transmitter has required the extraction and use of natural resources for its production. Therefore, the LM80 Level Transmitter 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 LM80 laser level transmitter is not subject to the European WEEE directive based on the exemption for fixed industrial installations however most of it's components are easily recyclable. The LM80 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 LM80 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
LM80 Level Transmitter uses the following:
Infrared Laser [class 1M]: Infrared beam (905 nm) used to measure distance
Laser Pointer [class 3R]: Visible beam (wavelength 635 nm) for servicing, targeting and aiming purpose.

2.7.2 Laser safety
LM80 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 LM80 warning labels.

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 1M Laser Products: LASER RADIATION DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS (BINOCULARS OR TELESCOPES)
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	905 nm	Wavelength	635 nm
Peak Power	45 w	Power	< 2mw CW
Average Power	12 mW	Diameter	5 mm
Pulse Duration	20 ns	Divergence	< 1.5m rod
Pulse Rep Frequency	25 khz		
Pulse Energy	50 nJ		
Beam Diameter	20 mm		
Divergence	Δ < 0.3°		

2.8 Labels

Figure 2- 1. LM80, Class 1M Laser Safety Label

Figure 2- 2. Unit Label
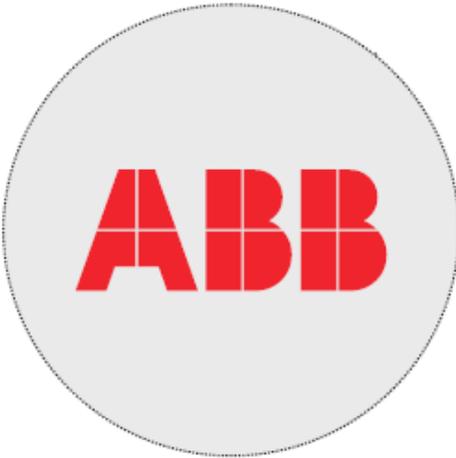
Figure 2- 3. Manufacturer Label

Figure 2- 4. Label Location

3.0 Introduction

3.1 Overview

The LM80 laser level transmitter 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.
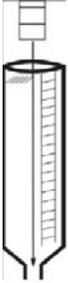
A		Easy measurement in silos with internal structure
B		Easy measurement in silos with build-up.
C		Level silos and bins: ideal for plastic pellets, grain, coffee, dry bulk solids, opaque liquids and powders
D		Accurate, fast and long range positioning or anti-collision of moving machinery.
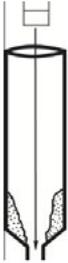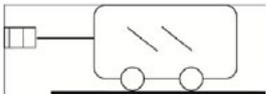
3.2 LM80 laser level transmitter key features

- Narrow beam for direct targeting
- Visible aiming laser
- Long distance measuring capability
- Dust and gas 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
- Below are mechanical dimensions:

Figure 3- 1. LM80 Level Transmitter

½ inch NPT fitting for cable gland or conduit connection

½ inch NPT cable gland part GCK

Imperial ½ inch NPT to M20 metric adapter part GC1

M5 Earth screw assembly

Standard Flange

52 mm (2 in)

30 mm (1.2 in)

172 mm (6.77 in)

9.5 mm (0.37 in)

Optical aperture 75 mm (3 in)

Diameter at base 98.2 mm (3.9 in)

Diameter at base including posts 114 mm (4.5 in)

Base Plate Diameter 140 mm (5.51 in)
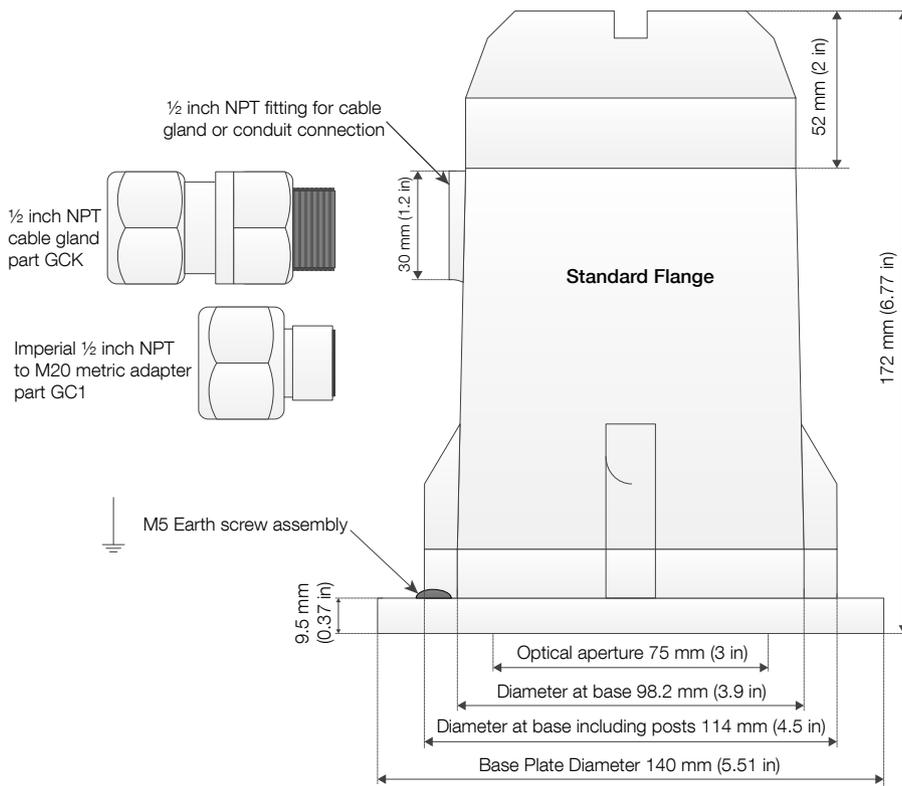
Figure 3- 2. Mechanical Dimensions of the Standard LM80 Level Transmitter (1)

M5 Earth screw assembly

Red laser pointer for aiming

Measuring laser 25 mm (1 in)

4 mounting holes 8.5 mm (0.33 in) diameter

Optical receiver 50 mm (1.97 in)

Dust tube purge outlet

120 mm (4.72 in)

140 mm (5.51 in)

Total optical aperture 75 mm (3 in)
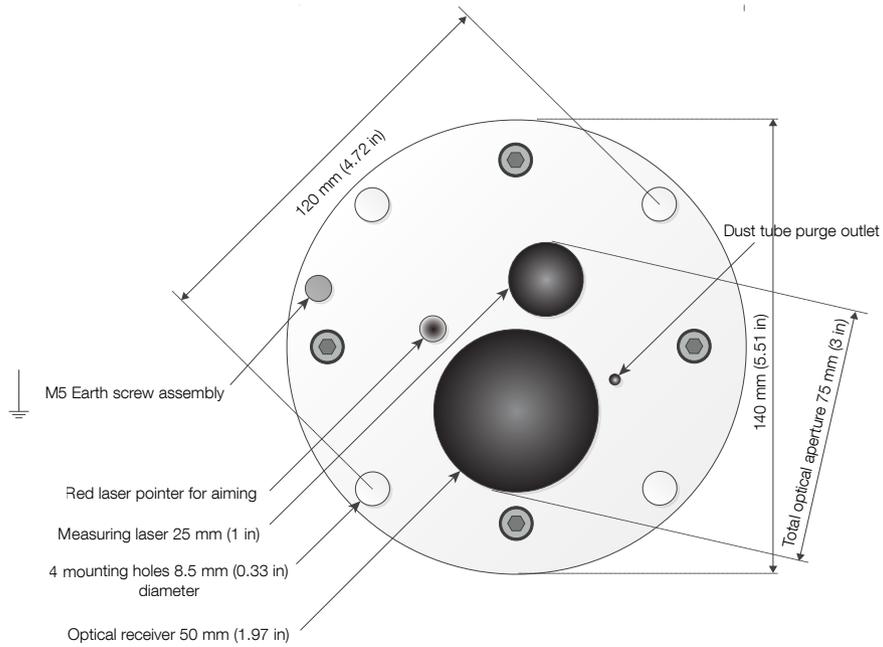
Figure 3- 3. Mechanical Dimensions of the Standard LM80 Level Transmitter (2)

Triclover Flange

52 mm (2 in)

166 mm (6.54 in)

30 mm (1.2 in)

16.1 mm (0.63 in)

6.1 mm (0.24 in)

2.6 mm (0.1 in)

Optical aperture 75 mm (3 in)

Diameter at base 98.2 mm (3.9 in)

Diameter at base including posts 114 mm (4.5 in)

Triclover Base Plate Diameter 120 mm (4.72 in)
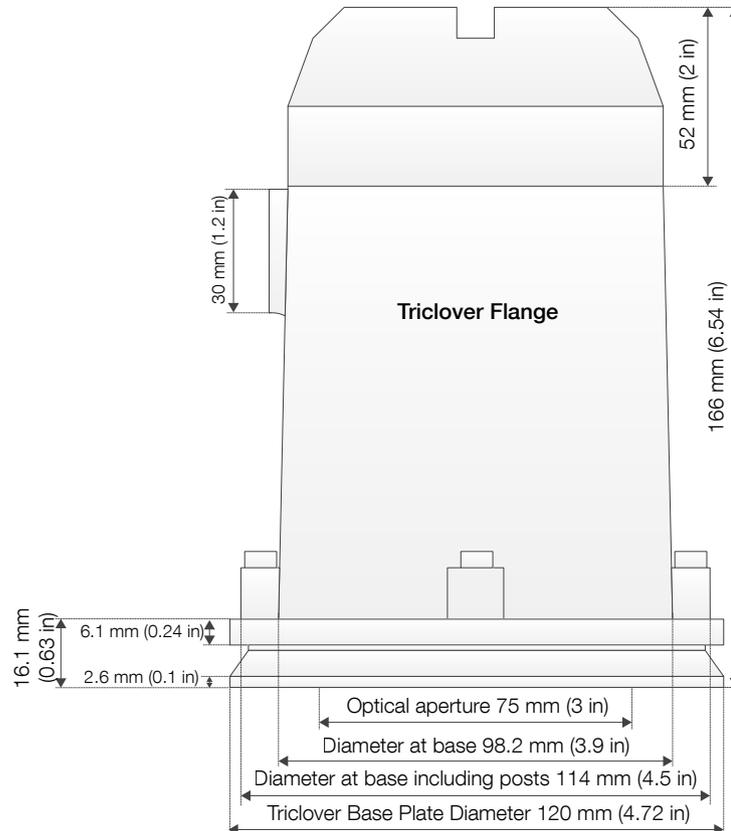
Figure 3- 4. Mechanical Dimensions of the Triclover LM80 Level Transmitter(1)
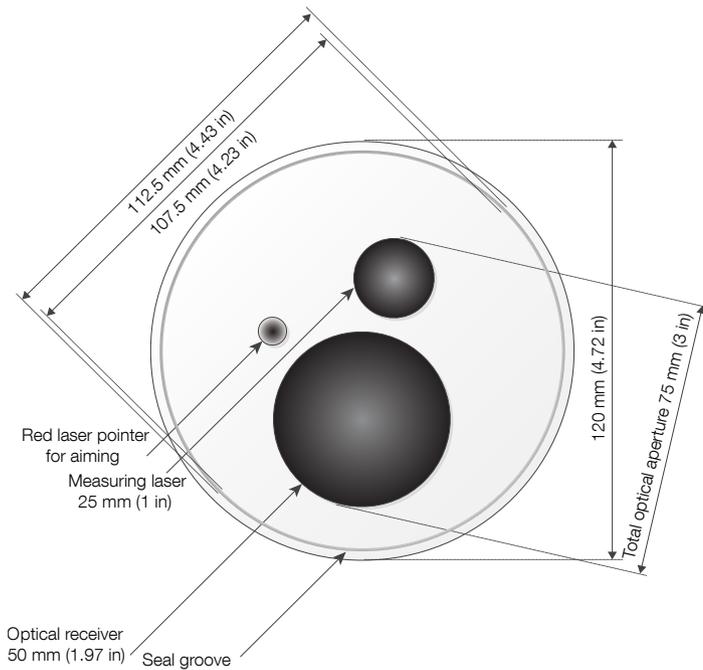
Figure 3- 5. Mechanical Dimensions of the Triclover LM80 Level Transmitter(2)

3.3 Laser pointer

The LM80 laser level transmitter 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 LM80 laser level transmitter 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 LM80 laser level transmitter 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 LM80 laser level transmitter outside.

4.2 Unpacking

The product is supplied in a cardboard container with internal shock absorbing packaging. Keep this packaging material to 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 (P801/Section Accessories on page 33).

The Dust Tube is a very simple and effective device, designed to prevent dust settling on the lens. The LM80 laser level transmitter 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 (set to 3-5 psi) on the Dust Tube is recommended.

4.5 Alignment

The LM80 laser level transmitter 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 LM80 laser level transmitter 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 LM80 laser level transmitter 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 LM80 laser level transmitter should be accessible for programming if necessary.

> ℹ️ While the initial (cold start) accuracy of the LM80 laser level transmitter 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.

4.7 ESD (electro static discharge) surge

The LM80 laser level transmitter are manufactured to the highest quality standards and are designed to survive most industrial environments. 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 mm² 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 duly designated grounding screw.

60 °C / 140 °F
45 °C / 113 °F (with heated lenses)

- 40 °C / - 40 °F
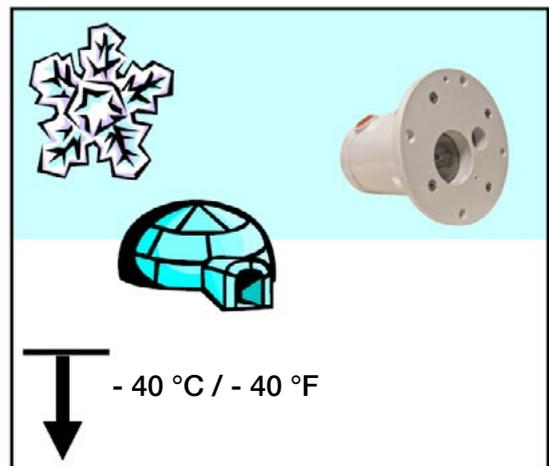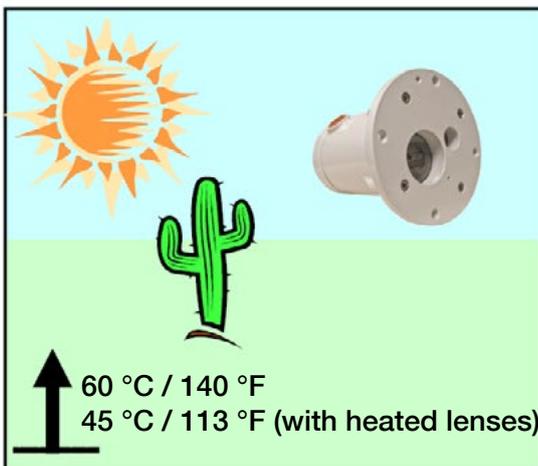
Figure 4- 1. Operating Temperature Limits

4.9 Electrical connections
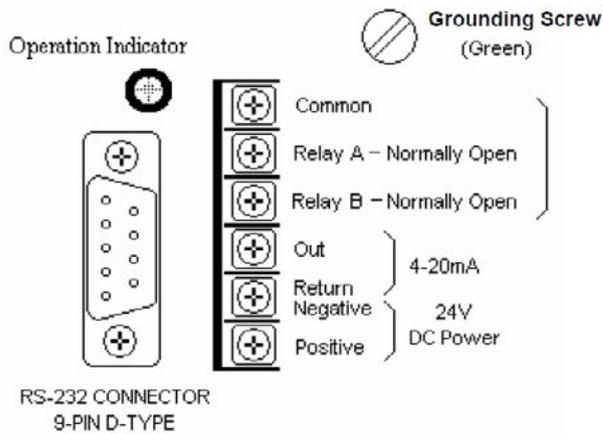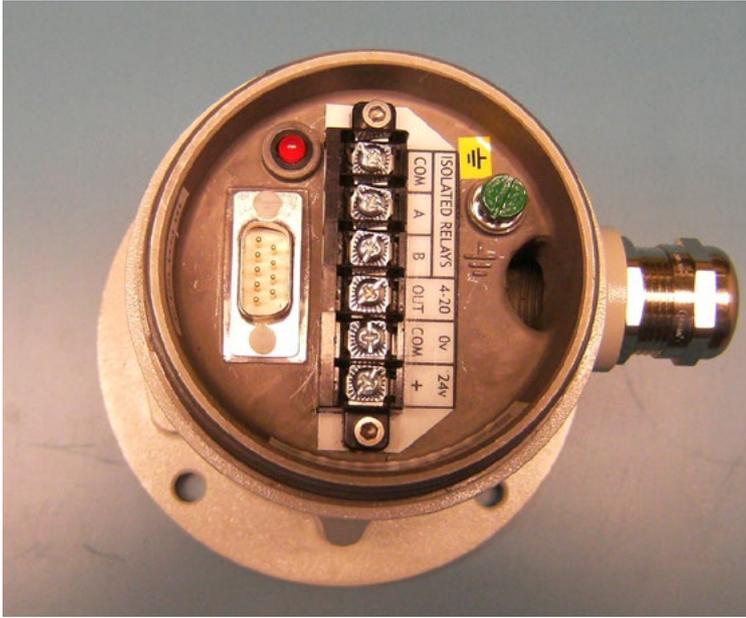
Figure 4-2. Terminal Compartment

4.10 Operation indicator

The operation indicator is a LED mounted in the terminal compartment of the LM80 laser level transmitter, which shows the stage the laser unit is currently in. When flashing, the LED indicates that the laser unit is performing measurement. When the LED is continuously lit, the LED indicates that the laser unit is in the Main Menu mode, awaiting for set-up.
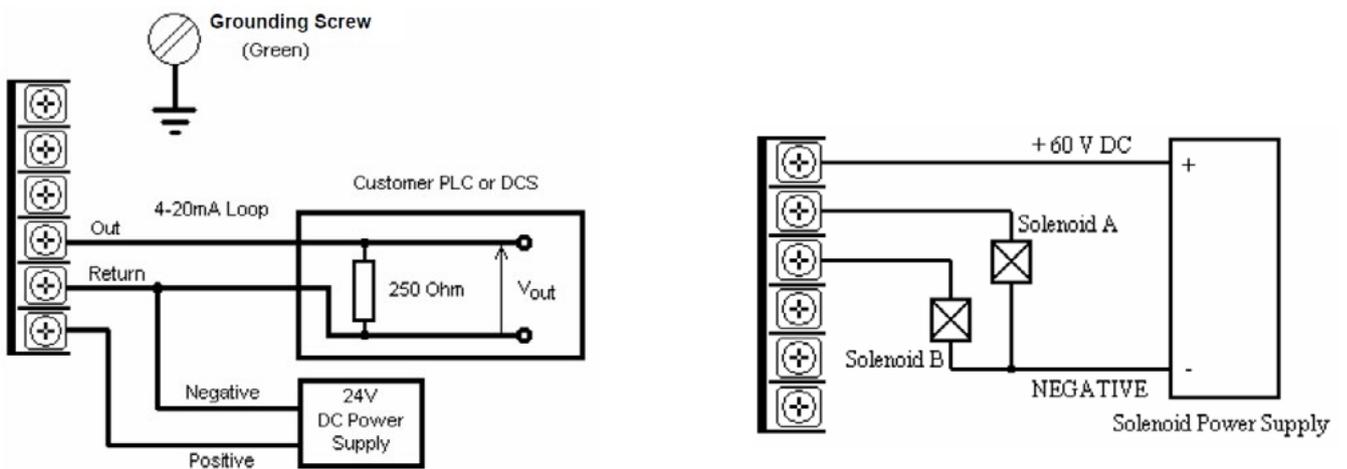
Figure 4- 3. Typical Connection

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.

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 us an AWG16 or 1.5 mm² multi-core cable. The number of cores will depend upon the outputs required from the LM80 laser level transmitter. For a 4-20 mA interface, use a twisted pair shielded cable. Do not install a LM80 laser level transmitter or route the signal cables in close vicinity to high voltage electrical 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 the +24 VDC power supply to the instrument and signal isolators on the 4/20 mA output.

Field wiring shall be rated for at least 65 °C/150 °F.

Figure 4- 4. Cable Gland

4.13 Mounting

The LM80 laser level transmitter 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 LM80 laser level transmitter 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.

> ℹ️ The LM80 laser level transmitter may receive stronger signals in subdued lighting and dark conditions than it does in direct sunlight.

4.12 Cable glands

The LM80 Level Transmitter 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 requirements.

For metric cable glands or conduits, 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 cables. 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.

> ℹ️ 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 above requirements.

> ⚠️ Exposure to some chemicals may degrade the lens or the sealing properties of the LM80 level Transmitter or degrade the lens.

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

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

> ⚠️ 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.
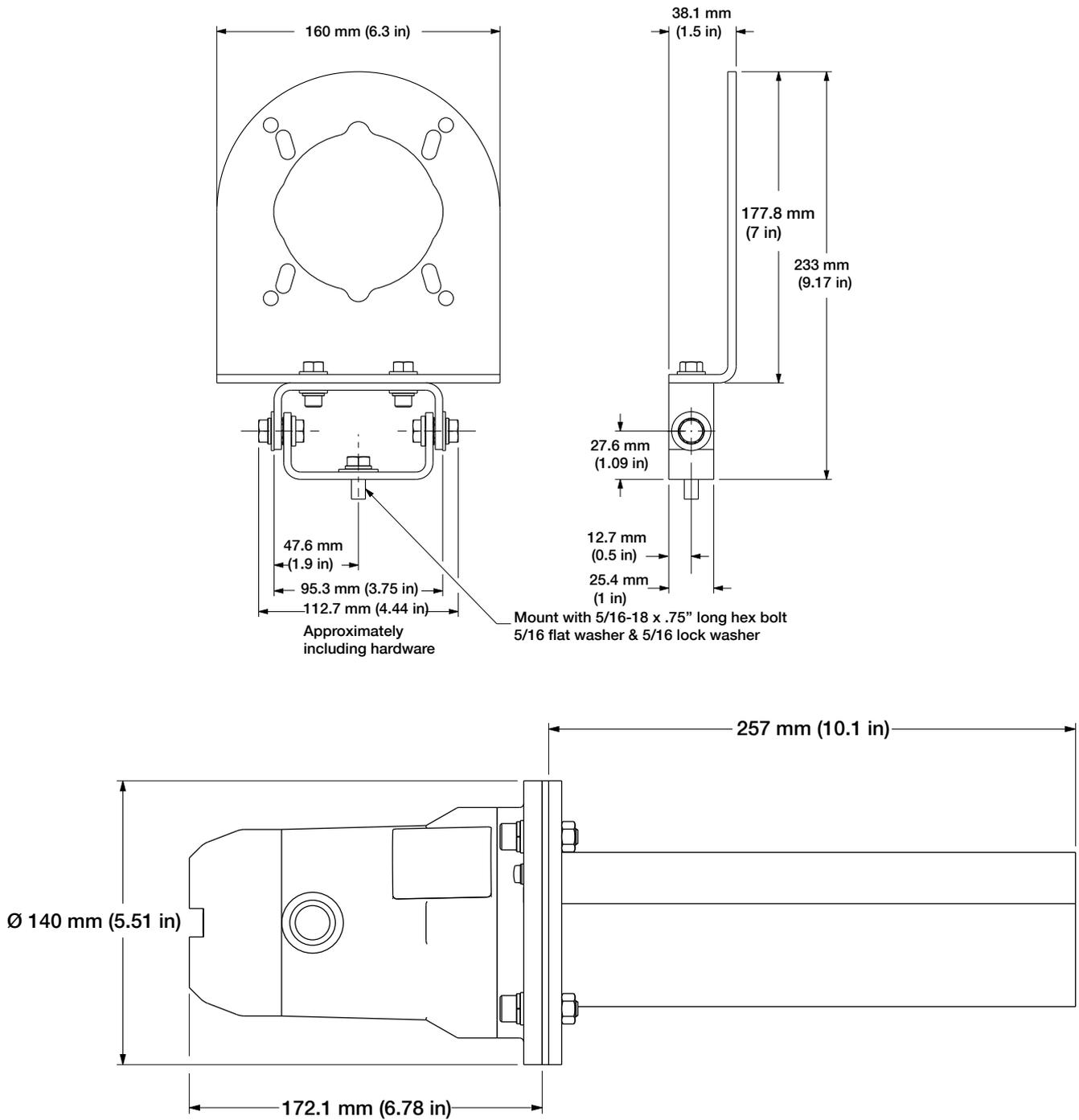
Figure 4- 5. Dimensions of Standard LM80 with P801 Dust Tube Option and A800 mounting bracket

High pressure sight glass
with spray ring and gaskets

Flange (F804, F806,
F810, F815)

G800 Gasket kit
(Flange gasket)

Cooling tubes

G800 Gasket kit
(Cooling tube gasket)

SHSC M8x1.25 x
40 mm with flat and
lock washers
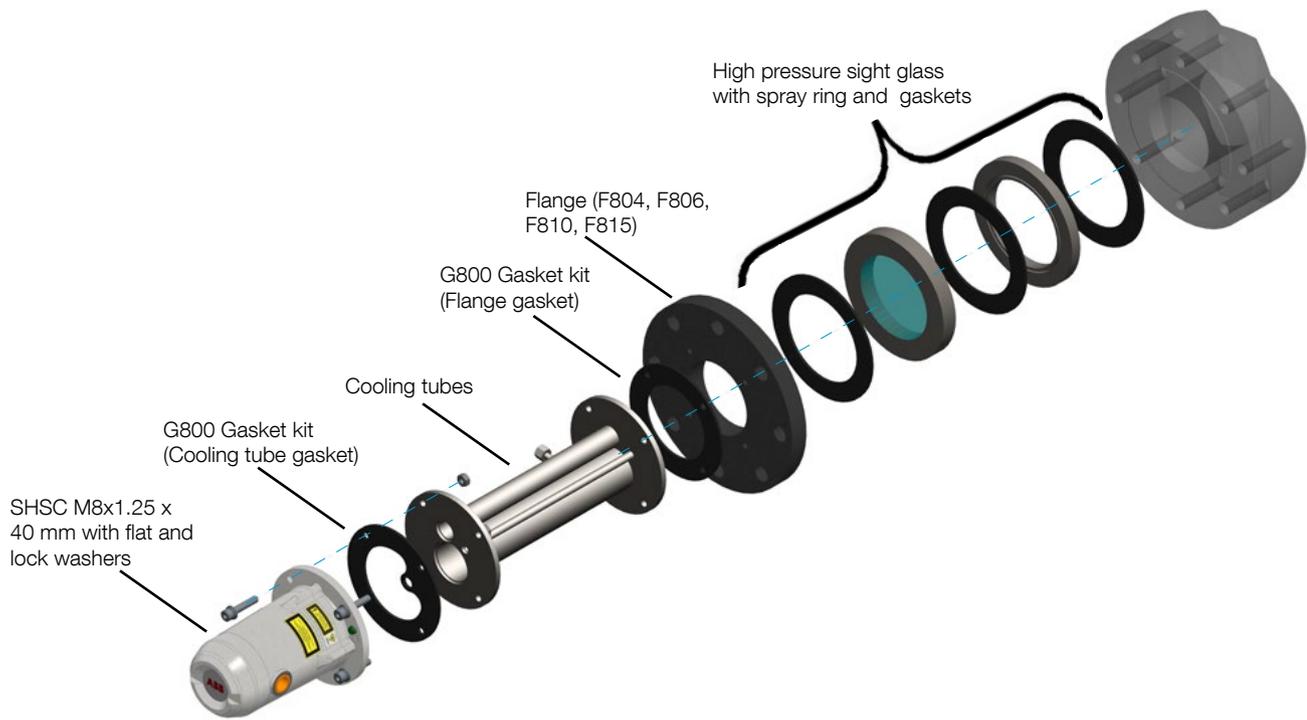
Figure 4- 6. LM80 laser level transmitter with P802 cooling tubes and HPSG

G800 Gasket Kit
(Flange gasket)

P801 dust tube

G800 Gasket Kit
(Dust tube gasket)

SHCS M8x1.25
with flat and lock washers

Mounting flange
(F804, F806, F810, F815)
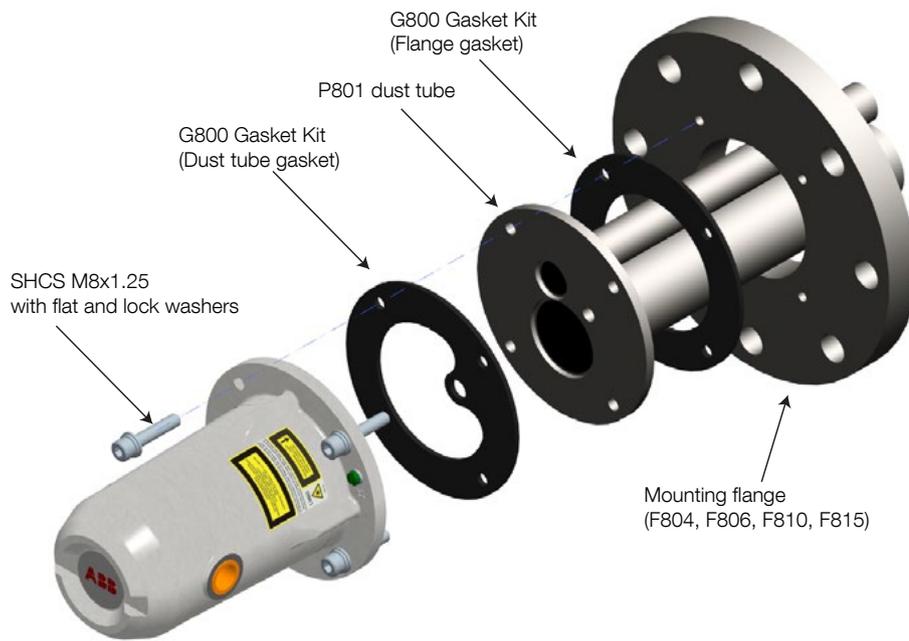
Figure 4- 7. Flange Mounting Assembly

G800 Gasket Kit
(Mounting plate gasket)

P801 Dust Tube

G800 Gasket Kit
(Dust tube gasket)

SHCS M8X1.25 x 40mm
with flat and lock washers

P804/P806
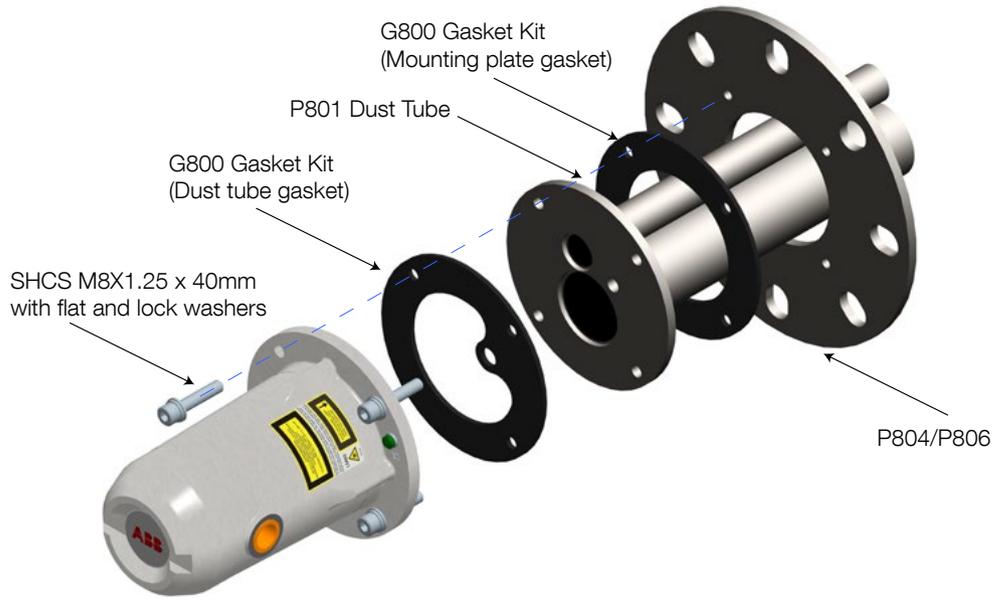
Figure 4-8. Mounting Plate Assembly

4x M8 Hex Nut

G800 Gasket Kit
(Mounting plate gasket)

Dust Tube P801

G800 Gasket Kit
(Dust Tube gasket)

SHCS M8 x 1.25
with flat and lock washers

A800 Adjustable mounting bracket
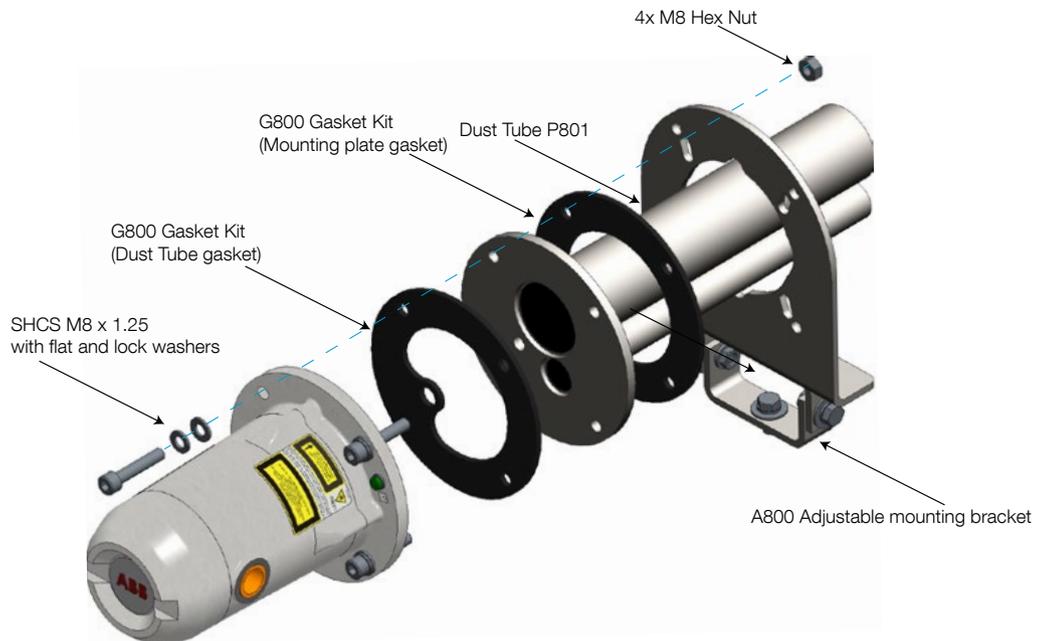
Figure 4-9. P801 Dust Tube and A800 Adjustable Mounting Bracket assembly

Swivel flange gasket

G800 gasket kit
(Mounting plate gasket)

G800 gasket kit
(Dust tube gasket)

Dust tube P801)

Swivel flange (S800)
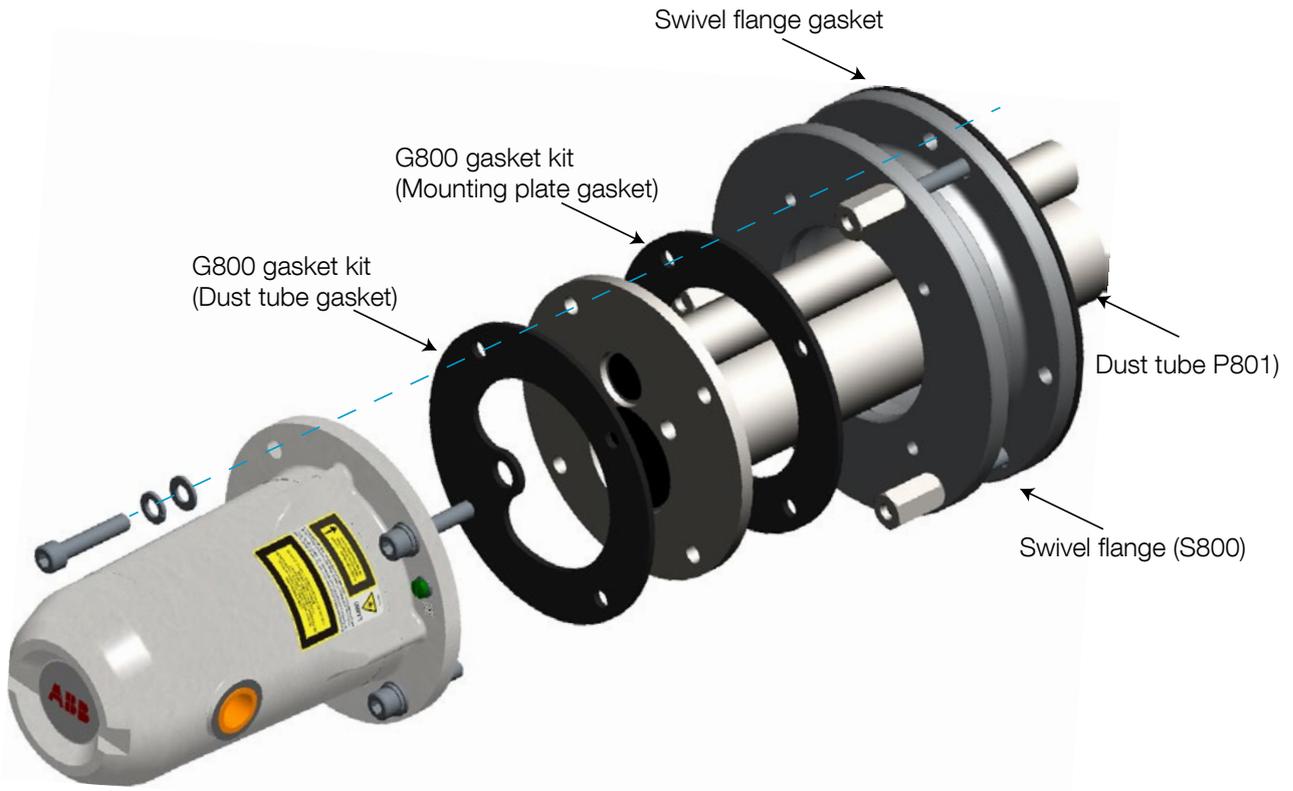
Figure 4-10. P801 Dust Tube and S800 Swivel Mounting Flange assembly

Union Fitting

Conduit

Seal & Drain
Fitting

Angle of
Repose

Union Fitting

Conduit

Seal & Drain
Fitting
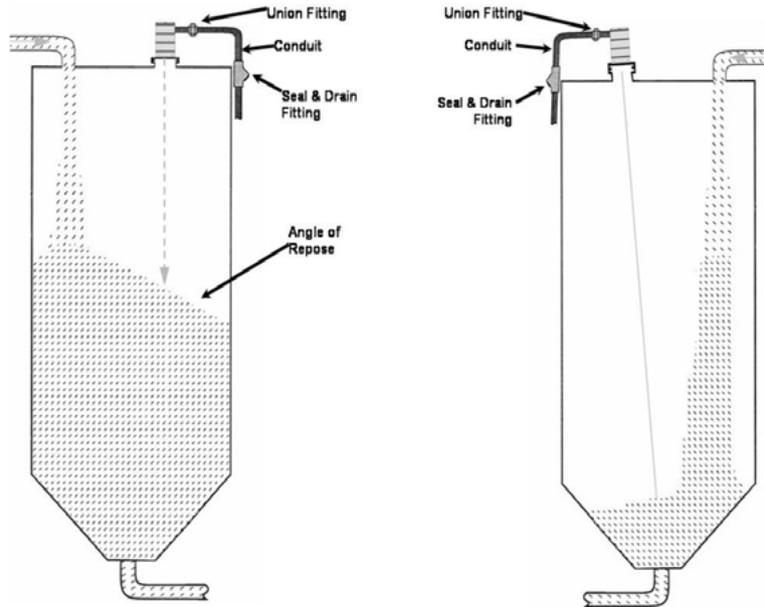
Figure 4-11. Suggested Mounting Arrangements for Solid Materials
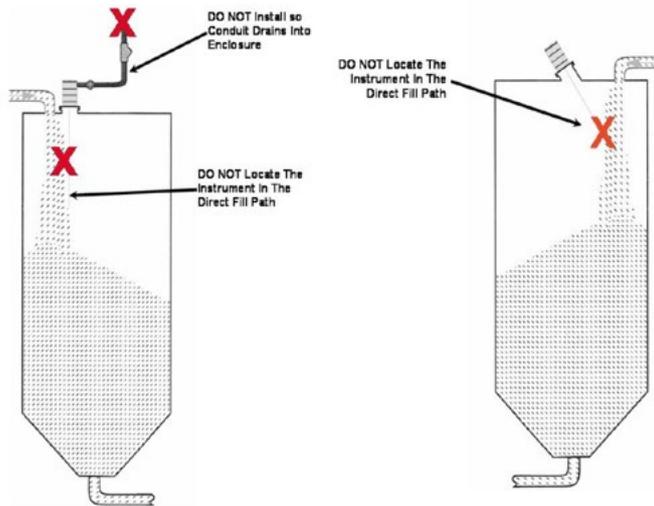
Figure 4-12. Mounting Arrangements to Avoid for Solid Materials
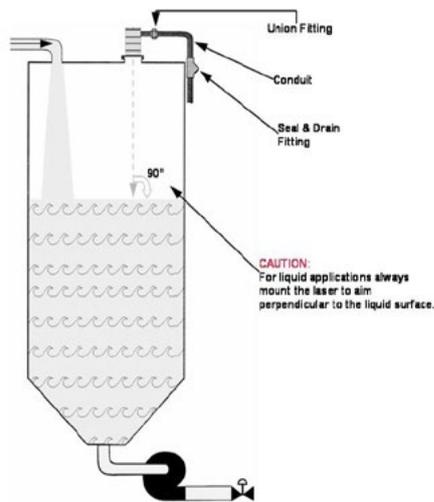
Figure 4-12. Suggested Mounting Arrangements for Liquids or Slurries
[1] For liquids we recommend the LM80.AC non-condensing option.
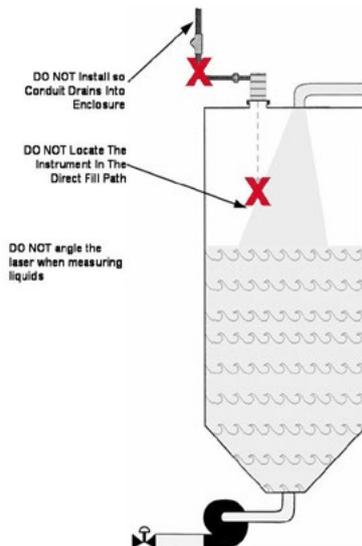
Figure 4-13. Mounting Arrangementsto avoid for Opaque Liquids or Slurries

4.14 Quick start guide

4.14.1 Setup procedure

1. Connect up power and 4/20 mA wires to the LM80 laser level transmitter
2. For standard LM80 unit refer to 4.9 Electrical connections on page 13.
3. Switch power ON.
4. Establish communication with the LM80 unit. Refer to section 6.0 Communication on page 21 depending on communication device used.
5. Set 4 mA and 20 mA set points. Refer to 7.4 The 4-20 mA settings menu on page 25.
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 7.8 Laser application / setup table on page 28.
7. Set Fail Safe Mode. Refer to 7.4 The 4-20 mA settings menu on page 25, point 3.
8. In Main Menu start the instrument (if LCD2 is used for communication with LM80, simply press EXIT and instrument will start measurement).

4.14.2 Diagnostic checks

After installation the LM80 laser level transmitter 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 using PuTTY.

– Turn the power off.
– Remove the back lid from the LM80 laser level transmitter.
– Connect the LCD2 configuration device to the programming port.
– Connect a multi-meter or loop tester between the OUT and RETURN lines of the 4-20 mA 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 4-20 mA Test menu using the arrow up and arrow down keys.
– Press Enter to activate the test function.
– Force the 4-20 mA to a test value using the arrow left and arrow right keys.
– Check that the reading on the 4-20 mA indicator matches the test value displayed. If it does not, use the trim menu. If the problem cannot be corrected with the trim menu contact ABB after sales support (see back cover for contact information).
– 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, if it does not contact ABB after sales support (see back cover for contact information).
– Press Exit once the test is completed.
– Press Exit once more to restart the measuring process.
– Confirm that the LM80 laser level transmitter 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 LM80 laser level transmitter is an optical electronic device with no moving parts. For this reason, no regular maintenance is required. When installed in a dusty environment, the LM80 laser level transmitter must be equipped with dust tubes. This will ensure long-term reliability and performance. However, before installing the LM80 laser level transmitter, it is recommended the user performs a visual check on the lenses. If particles of dust are present on the lenses, use instrument air to blow them off (see 5.2 cleaning of optical lens).

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

⚠️ LM80 laser level transmitter 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 LM80 laser level transmitter.
Do not open the LM80 laser level transmitter. All service or maintenance is to be performed at the factory 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 with instrument air or if not sufficient, clean with alcohol and optical wipes.

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

⚠️ Opening the LM80 laser level transmitter will void warranty.

5.3 Service

The LM80 laser level transmitter 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.

If you are unable to solve a problem contact ABB. Before contacting ABB, please check the following:
– All cables are properly installed.
– The STATUS display on the electronic module is ON.
– All pertinent Troubleshooting steps in this manual have been followed.

Before sending a level Transmitter 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 receipt of analyzer will be refused.

5.4 Repacking

To prepare the level Transmitter for shipment, pack it in the shock absorbing packaging it was delivered in. Make sure to pack the LM80 Level Transmitter in its transportation box with the internal shock absorbing packaging.

6.0 Communication

6.1 Hardware

Communication with the LM80 laser level transmitter is done with an RS232 to USB cable (USBR). This cable is optional, i.e. is not delivered standard with the LM80, refer to Appendix A Accessories. A wide range of computers and other devices can be used to 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 LM80		USB to Serial converter		→	
Laptop to LM80		USB to Serial converter		→	
LCD2			→		

The LCD2 includes an RS232 cable.

LCD2 (Laser communication device) allows fast and easy communication with LM80 without the need to connect to a computer. The LCD2 connects directly to the LM80 and requires no special settings, it starts communicating as soon as it is connected to the LM80 and the LM80 is powered up.

6.2 Available user settings
The LM80 laser level transmitter has a number of configuration settings that can be changed via the programming port located in the terminal compartment. The Laser Transmitter 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 available settings is provided below.

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

A trim function is also available for the 4-20 mA 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 LM80 laser level transmitter can be set to display units of feet or meters for the set points and the measurement screen [LCD2, PC, Laptop].

There is a facility to move the measuring datum face (zero point) 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 selectable program options that alter the performance of the instrument to suit the requirements of the application; you can choose from Standard, Light Dust, Heavy Dust, Positioning and Custom [LCD2, PC, Laptop].

6.6 Setting up a PC or laptop to communicate with the LM80 level transmitter
Programming (or setting) the LM80 laser level transmitter using the RS232 to USB cable (USBR) 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. The correct port can be found in the Windows Device manager. See Figure 6- 2.
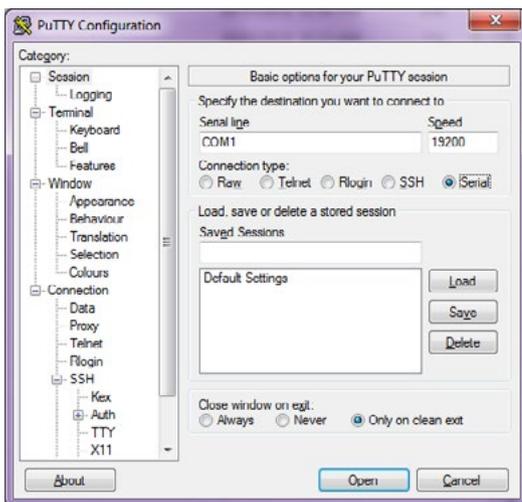
Figure 6- 2 PuTTY Configuration Dialog Box

3. 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
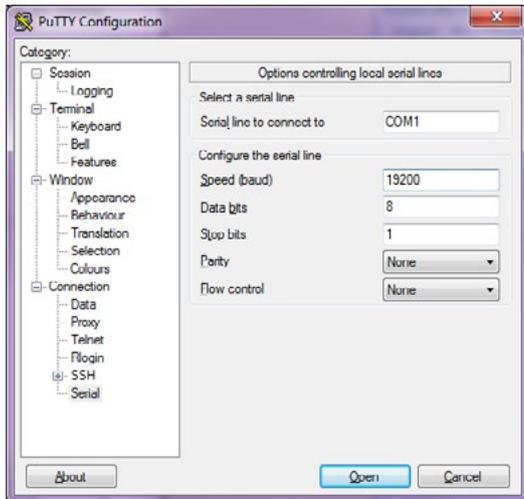
Figure 6- 3. Configuration Dialog Box

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

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 LM80 front measurement face (the flange surface) to the object at which the beam is pointed.
The distance is displayed in selectable units (feets or meters).

Figure 7- 1. Normal Startup Screen

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, 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.

7.2 Programming menu flow chart
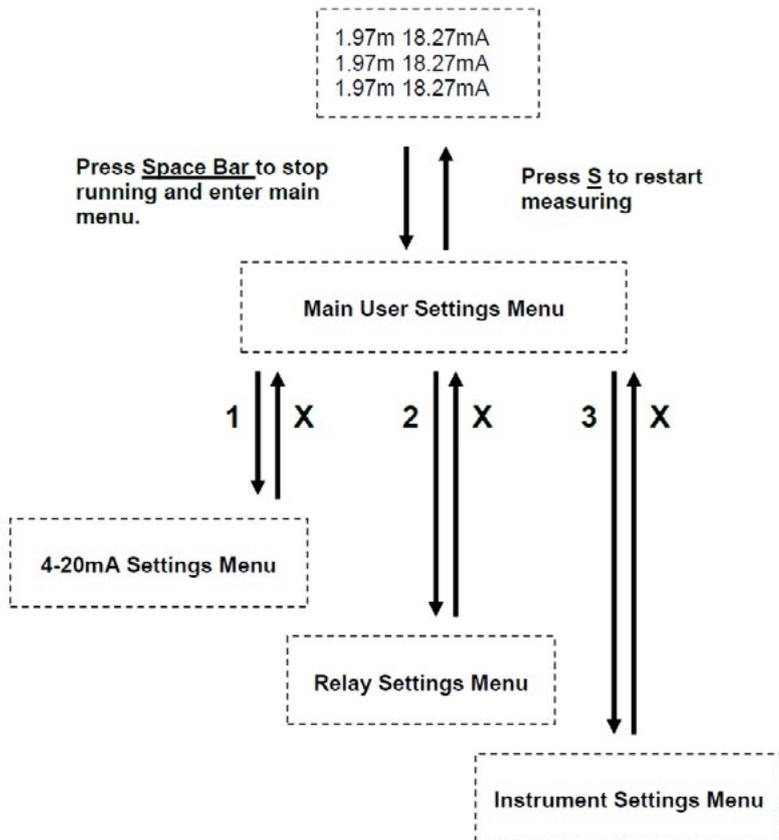
Figure 7- 2. Menu Flow Chart

7.3 The main user menu

```
                    [S]tart
    -------------------------------------------
+                    ----                      +
+                   LM 80                      +
+           Number AA00191 Rev 2.20            +
+           Main User Settings Menu            +
    +-------------------------------------+
+                                             +
+                                             +
+              1:4-20mA Settings              +
+               2:Relay Settings              +
+             3:Instrument Settings           +
+                                             +
+                                             +
        +++++++++++++++++++++++++++++++++
```
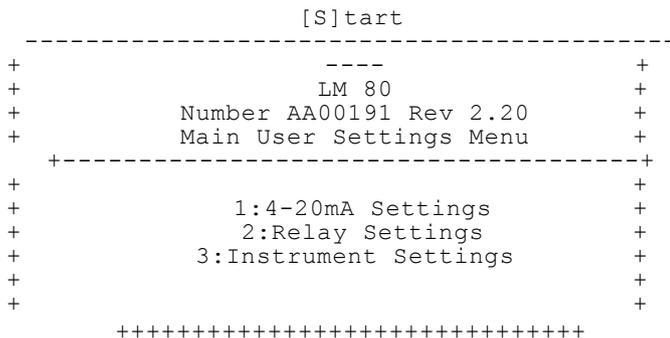
Figure 7- 3. The Main User Menu

Sending a Space character to the LM80 laser level transmitter will stop the measuring operation and the instrument will enter the Main User Settings Menu. Sub-menus can be selected 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 LM80 laser level transmitter. The Main Menu contains in its heading, important information such as:

Instrument Type - LM80: Laser Model

Serial Number - AA00191: Always use this number when requesting an RMA from Service.

Software Revision - Rev 2.20: This is the current software revision loaded in the unit.

The LM80 laser level transmitter 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 4-20 mA 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 4-20 mA Settings Menu

1: 4 mA Setting Default = 10.00 m	This option allows for the 4 mA set-point to be changed to either polarity with the 4 mA representing vessel full or vessel empty. Enter a value and press the ENTER key.
2: 20 mA Setting Default =1.00 m	This option allows for the 20 mA set-point to be changed to either polarity with the 20 mA representing vessel full or vessel empty. Enter a value and press the ENTER key.
3: Fail Safe The default 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 3.60 mA, 21.00 mA or LAST (hold the last good reading).
4: Safety Time The default safety time is 0.00 sec	This option allows for a time delay in seconds before the fail-safe condition is entered.
5: 4-20 mA Test 4-20 mA test = 4.00 4-20 mA test = 12.00 4-20 mA test = 20.00	This option allows the user to manually drive the output current to 4 mA, 12 mA or 20 mA. This is a toggle option. By selecting the option number, the output is changed and the menu is re-drawn.
6: 4-20 mA Trim Connect multi-meter Enter the 4 mA reading Enter the 20 mA 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

1: Relay A open = 1.00 m	This option determines the distance at which relay A will open.
2: Relay A closed = 2.00 m	This option determines the distance at which relay A will close.
3: Relay A test 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.
4: Relay B open = 4.00 m	This option determines the distance at which relay B will open.
5: Relay B closed = 5.00 m	This option determines the distance at which relay B will close.
6: Relay B test 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 position of the LM80. For example to change the units:

1. Hit space bar to get main menu and the "3" key to get the Instrument Settings 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

Items in this menu deal with the configuration of the LM80 laser level transmitter. This menu also shows the internal temperature of the unit and the signal strength of the last reading taken.

```
            [S]tart
-------------------------------
+          LM Family          +
+  Number AA05492  Rev. 2.20  +
+    Main User Settings Menu  +
+     -------------------     +
+ 1:4-20mA Settings           +
+ 2:Relay Settings            +
+ 3:Instrument Settings       +
+++++++++++++++++++++++++++++++
       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- 7. The Instrument Settings Menu

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 Default 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 Default = 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.
3: Datum trim Default = 0.00 m	This option allows the instrument datum to be adjusted by up to +1 m or −1 m. To change the value, enter the value that you want the instrument to read shorter or longer and press the ENTER key.

7.7 Application settings and application table
Programs are application-oriented modes of operation. Please set the correct program according to your application, see application table on page 29 for details.

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 uses "Variable gain" for better signal separation and better performance in applications with Light and Moderate dust.
Heavy Dust:	This program is similar to Light Dust Program. The difference is that Heavy Dust program uses more filtering and additional features for measurement in environment with moderate to heavy dust.
Position:	This 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 by the end-user for specific applications, which re-quire different parameters. Such applications are rock crushers, small process Hoppers, etc.

Below table shows the default settings of each program. These default parameters are set in factory and can be modified but only with the help of ABB trained personnel.

Parameter	Program 0	Program 1	Program 2	Program 3	Program 4
A:Parameter Name	Standard	Light dust	Heavy dust	Position	Custom
B:Fill rate	0.00m/min	1.20m/min	0.24m/min	0.00m/min	0.00m/min
C:Empty rate	0.00m/min	0.00m/min	0.00m/min	0.00m/min	0.00m/min
D:Pointer	On at start	On at start	On at start	On at start	On at start
E:Range Blank	0.00m	0.00m	0.00m	0.00m	0.00m
F:Buffer	8	20	25	2	16
G:Keep	2	2	2	2	16
H:Environment	Normal	Dust	Dust	Dust	Dust
I:Resolution	High	High	High	High	High
J:Pause	0 sec	1 sec	2 sec	0 sec	0 sec

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	Granular plastics silo	Light Dusts	Default	Default	Dust	Default	
Storage silo with moderate or heavy dust during fill dust settles on discharge	• Coal bunkers, grain silos, powders • Roofing granular silos • Wood chip silos	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	• Crusher • Surge Bin • Process Hopper - granular plastics • Granular food, dog food, cat food	Custom	8 to 12	1 to 2	Dust	Default	
Opaque Liquids	• Lift station - sewer • Ink • Polymers	Standard	8 to 16	4 to 6	Dust	Default	
Semi-Clear Liquids	• River Water • Sea Water	Standard	8 to 16	4 to 6	Normal	Default	
Reactor vessel, laser measures through sight glass	• Devolitizer reactor • Molten Plastic	Custom	8 to 16	1 to 2	Dust		Use only ABB supplied sight glass HPSG. Use ABB cooling tubes, P802 for mounting laser. Contact factory for details.
Positioning indoor min or no dust	• Tripper car in powder plant or grain elevator	Positioning	Default	Default	Normal	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.
Positioning indoor some dust / smoke	• Overhead crane in cement plant, mine, steel plant	Positioning	Default	Default	Dust	Default	

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 4-20 mA current output. Pressing the EXIT key stops the LM80 Level Transmitter 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 LM80 laser level transmitter 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 LM80 laser level transmitter 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 LM80 laser level transmitter 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 LM80	12.34 m 17.65 mA 12.35 m 17.66 mA	Cannot be edited	Displays the distance and output in mA
EXIT	4 mA Setpoint 0020.00 m	← → - select digit ↑ ↓ - change digit	Distance associated with a 4 mA output
↑ ↓	20 mA Setpoint 0001.00 m	← → - select digit ↑ ↓ - change digit	Distance associated with a 20 mA output
↑ ↓	4-20 mA Test 12.00 mA	← → - select digit current	Forces the output to a selected current value
↑ ↓	Fail Safe Last, 3.6 mA, 21 mA	← → - 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, close	← → - 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, close	← → - select relay state	Forces Relay B into a selected state
↑ ↓	Program Standard, light dust, heavy dust, positioning, custom	← → - select program	Sets the mode of operation from a list of preset options
↑ ↓	Units meter, feet	← → - select unit	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 LM80

7.10 Troubleshooting

Symptom	Fault	Correction
Unit Dead	• Not currently connected	• Check Connections • 24 V DC +- 10% - Check Power Input • Check the Polarity of the power connections • Check 4-20 mA Connection is Dedicated to the Laser Instrument and no other Instrument • Check correct grounding • Contact ABB for repair
Incorrect 4-20 mA Current Loop Output	• Check the Distance Readout Using the RS232 Serial Output into a PC or LCD2	
Correct Reading on Serial Port but incorrect 4-20 mA on PLC or SCADA	• Incorrect Scaling of PLC or Instrument	• Check that the 4 and 20 mA DC Scales are the Same on the Instrument and the PLC
	• Electric Interference from closely laid power supply Cables	• Re-route the Cable or Screen the Cable • Adjust trim as needed.
	• Incorrect Connection to PLC through Isolator	• Check Circuit Diagram on the Isolator
Incorrect Reading on Serial Port	• Dirt or Obstruction on the Lenses Check that Lenses are Clean	• Check that Lenses are Clean • Clean lenses
	• Dust or Obstruction in Application	• Check the Application: Can you see Surface? • Check for the Correct Settings for Dusty Environment; test with heavy dust.
	• Laser Might Not Be Aiming at Target	• Check that Laser is aiming at the target all the way (pointer on target)
Unit is Erratic	• Unit might not be aiming at target	• Check the instrument is aiming at the target all the way (pointer on target)
	• Electric interface from closely laid power supply cables • Bad grounding connection	• Re-route the cable or screen the cable • Make sure ground connection is tight and leads to proper earth ground.
	• Dust or obstruction in application	• Check the application: can you see surface? • Check for correct settings for dusty environment. Try heavy dust.
	• Incorrectly Programmed	• Check that output is as smooth as possible. Try alternate programs in Instrument Setting mode. • Use averaging to smooth, example waveson water.

Appendix A Accessories

A.1 Accessories

Below tables provide details on the accessories of the LM80 Level Transmitter.
For more details, please refer to the LM80 Level Transmitter Data Sheet.

Dust tubes (P801)

Base plate diameter	140 mm (5.51 in) mounts on LM80 standard flange
Length	257.2 mm (10.125 in)
Material	304 Stainless Steel
Function	Static air space prevents dust buildup, can be purged (3-5 psi)

Cooling tubes (P802)

Base plate diameter	140 mm (5.51 in) mounts on LM80 standard flange
Mounting plate diameter	140 mm (5.51 in) compatible with LM80 mounting accessories
Length	260.4 mm (10.25 in)
Material	304 Stainless Steel
Function	Offset from hot process interface to allow convection cooling, can be purged

Mounting plates

Nominal diameter	4 in / DN 100	6 in / DN 150
Part number	P804	P806
Outer diameter	228 mm (8.96 in)	284 mm (11.18 in)
Mounting bold pattern	Dual pattern ANSI/DIN	Dual pattern ANSI/DIN
	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
	DIN PN 10 : 8 bolts, size 18 mm, bolt circle 180 mm	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	DIN 100	DIN 150
Part number	F804	F806	F810	F815
Outer diameter	9 in	11 in	220 mm	285 mm
Mounting bold pattern	ANSI class 150	ANSI class 150	PN 10	PN 10
	8 bolts, size 5/8 in	8 bolts, size 3/4 in	8 bolts, size 18 mm	8 bolts, size 22 mm
	Bolt circle 7.5 in	Bolt circle 9.5 in	Bolt circle 180 mm	Bolt circle 240 mm
Material	304 Stainless steel			
Pressure rating	No pressure rating, atmospheric pressure only			

Adjustable swivel flange (S800)

Outer diameter	180 mm (7.1 in)
Mounting bolt pattern	4 bolt holes, 8.5 mm (0.33 in) diameter, bolt circle 160 mm (6.29 in)
Height	25.4 mm (1 in)
Tilt angle for aiming	Continuously adjustable from 0° to 6°
Material	Aluminum

Adjustable pivot bracket (A800)	
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	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 explosive dust or gas / cannot be used in hazardous area.
USBR	RS232 to USB cable for configuring LM80 using a laptop or desktop computer Note: Not rated for explosive dust or gas / cannot be used in hazardous area.
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 LM80

A.2 Dust tubes (P801)

The dust tube is a very simple and effective device designed to prevent dust from settling on the laser lens. The LM80 Level Transmitter 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 set to 3-5 psi.
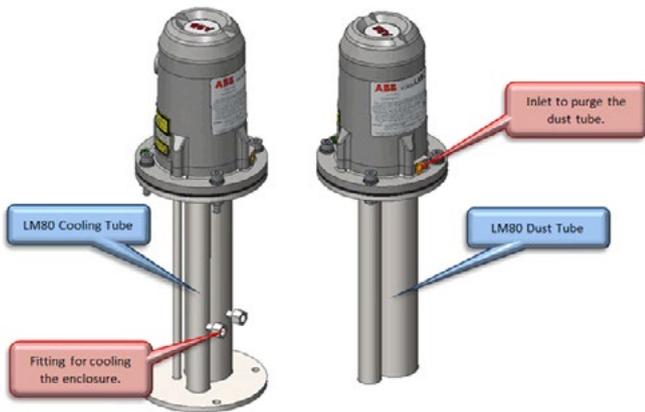
Figure A- 1. Cooling and Dust Tubes

A.3 Cooling tubes (P802)

The cooling tubes are installed to offset the LM80 from the 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 or a Laptop.

Figure A- 2. LCD2 Configuration Device

Appendix B Extended software settings

B.1 Extended menu

The purpose of this addendum is to document the advanced settings available in the hidden menus of the LM80 laser level transmitter. These advanced settings allow the LM80 to be tailored to specific applications where the standard settings are not sufficient.

⚠️	Changing parameters can render the Level Transmitter inoperable. Be very careful. In case the level Transmitter does not function anymore after a parameter adjustment attempt, default factory settings have to be restored. For further adjustments, please contact ABB.
⚠️	Please be careful when modifying the default factory settings, enabling the laser pointer using a PC or the LCD2 means the instrument is now in service mode and thus a class 3R device.

Some important facts:
LM80 can communicate with PC, Laptop or LCD2.

The LCD2 (Laser communication device) is created for fast and easy communication with LM80 without the need to connect computer. LCD2 does not have its own power source and does not require set-up. The communication to the LM80 laser level transmitter is conducted from the moment LCD2 is connected to the LM80.

ℹ️	The LCD2 is designed to provide a simple and easy to use interface to the LM80 but contrary to a PC or Laptop cannot access the advanced menus.

LM80 laser level transmitters have different modes of operation called PROGRAMS. The parameter Program is found under option 3.
Instrument Settings in the Main Menu. Below is a short description of each 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 uses variable gain for better signal 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 to heavy dust.
– Position - 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 by the end-user for specific and atypical applications, which require different parameters set-up. Such applications are rock crushers, small process Hoppers, etc.

B.2 Passwords for advanced settings

All passwords must be entered with low case letters only.
Password "agent"

Password agent allows the end-user to enter the AGENT SETTINGS menu. While in this 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 application-oriented modes of operation are already preset for the applications, based on field experience.

The STANDARD program is recommended for demonstration purposes since it provides the fastest response time. The light dust and heavy dust programs makes use of fill rate and empty rate settings which slow down the response time of the LM80.

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 - Maximum filling rate in meters or feet per minute; when this setting is used any change in level that is faster than the fill rate will be smoothed out, this filters out fast transients from the results

C: Empty rate = 0.00 - Maximum emptying rate in meters or feet per minute; when this setting is used any change in level that is faster than the empty rate will be smoothed out, this filters out fast transients from the results.

D: Pointer = On at startup - Toggle between "On" and "On at startup", determines when the red pointer is on. By default the red pointer will come on and flash for 2 minutes at startup then switch off. If this parameter is set to ON the pointer will flash continuously. Note that this behavior can be changed in the factory menu.

E: Range blank = 0.00 - Distance in meters or feet (depending on units setting) at which the LM80 may lose signal. in silos with polished walls, such as the stainless steel vessels in the Food processing Industry, the laser may lose signal when it hits the silo wall, especially in the silo cone. 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 continue reporting the distance at which the signal was lost until a new signal is received.

F: Buffer = 9 - Size of the rolling buffer. Must be a value between 0 and 25

G: Keep = 7 - Number of readings to keep in the averaging buffer. Readings are removed starting with the shortest reading. The number must be a value between 0 and the value entered for the F: Buffer parameter

H: Environment = Toggle between Normal and Dust. The Environment parameter can be set to either "Normal" or "Dust" for any of the preset programs. When set to Normal level measurements are performed using fixed gain whereas when set to Dust measurements are performed using variable gain.

I: Resolution = High - Toggle between High and Low, Low is used to provide faster response time.

J: Pause = 0 - pause time in seconds between readings, must be a value between 0 and 255

X: Exit

Enter selection:

B.4.1 Factory settings menu description and operation

> **i** This menu cannot be accessed with LCD2 communication device. To enter the password and access the extended menu, communication with LM80 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
  00: Upload to EEPROM
  01: Edit settings
  02: Edit product name
  03: Program LCD
  04: Test crystals
  05: Test temperature Transmitter
  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. A second prompt Password will appear. Type password fpga (low case letters only) and press ENTER. This is the password for enter Hardware settings menu:

⚠️ Settings B, C, D, E and I are factory settings and should not be modified.

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
```

The hardware menu is used to change the measuring range of the LM80 level transmitter; this range is set to 30 m at the factory. The "H:User setpoint limit" is used to change the measuring range and should be set to the range required by the application. The "A:Range" setting will be automatically adjusted to the lowest range that contains the value entered into the "H:User setpoint limit" parameter (see table below). Care should be taken when adjusting the "H:User setpoint limit" because the response time of the LM80 is related to the selected range; e.g. the higher the range the slower the response.

[i] Even though the "H:User setpoint limit" can be set to much higher values, in practice the LM80 is limited to a range of about 100 m for most surfaces and 150 m with a reflector. Attempting to measure further will result in unreliable performance.

The hardware menu can also be used to modify the laser output power with the "B:Laser pump" setting. Increasing this setting can sometimes help the LM80 penetrate further into fog or dust. The maximum value for this parameter is 150.

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

B.4.3 Special settings

By accessing the 09: SPECIAL SETTINGS menu, the end-user can change parameters relating to the bios control, signal width and hardware control. Most of the settings in this menu are only used for factory adjustments but settings C, D, K and L can be useful for certain applications.

The parameters "C:Normal attenuation" and "D:Dust attenuation" allow fine tuning the attenuation factors related to the environment setting in the agent menu; either Normal or Dust. This can sometimes help to penetrate further and/or to increase the reliability of readings in some dusty conditions.

The "K:Auto restart time" setting determines the amount of time the LM80 will wait for interaction when in the setting menus before it return to measurement mode, the default setting is 1 minute.

The "L:Pointer run time" setting determines how long the red laser pointer will blink for at power on, setting this value to 0 will completely turn off the laser pointer in normal operation. The factory default is 120 second which corresponds to the 2 minutes of operation of the laser pointer at power on.

⚠ All special settings are factory settings and should not be modified unless required for particular conditions. Make sure trained ABB support is available for modifications of these settings.

```
-------------------------------
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] = 0
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:
– Maximum range is about 100 m (328 ft) for level applications and about 150 m (492 ft) for positioning applications with a reflector. The optical aperture of the LM80 is 7.6 cm (3 in).
– Communication to LM80 can be done with LCD2, PC or Laptop.
– LCD2 cannot access the extended menus and para-
– meters. It is designed for easy and simple communication with LM80. Extended menus and parameters can be accessed with PC or Laptop.
– LM80 level Transmitters 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 PROGRAMS
  • factory – allows access to FACTORY SETTINGS menu
  • fpga – allows access to HARDWARE SETTINGS menu from FACTORY SETTINGS menu

Appendix C Certifications

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

ABB

CE DECLARATION OF CONFORMITY

Manufacturer	: ABB Inc.
Address	: 3400, Rue Pierre-Ardouin
	Québec (Québec), G1P 0B2, CANADA

Herewith declares that:

Product : Laser Meter   **Model** : LM80 series

- in accordance with the requirements of the following documents :
  - Quality Standard: ISO 9001:2008

- are in conformity with the provisions of the following directives:
  - ATEX Directive 94/9/EC
  - Electromagnetic Compatibility Directive 2004/108/EC
  - Low Voltage Directive 2006/95/EC
  - CE Marking Directive 93/68/EEC

- and furthermore declares that the following (parts / clauses of) harmonized standards have been applied:
  - EN 60079-0:2012, EN 60079-15:2010, EN 60079-28:2007, EN 60079-31:2009(&2014)
  - EN/IEC 61326-1 - Electrical equipment for measurement, control and laboratory use - EMC requirements.
  - EN/IEC 60825-1 - Safety of laser products – Part 1: Equipment classification, requirements and user's guide.

- ATEX Certificate identification:
  - SIRA 07ATEX4179X Issue 5   ⓧ II 3G Ex nA nC IIC T4 Gc
    ⓧ II 3G Ex op is IIC T4 Gc
  - SIRA 07ATEX9180X Issue 5   ⓧ II 2D Ex tb IIIC T85°C Db
  - Ambient Temp. : $-40°C \leq Ta \leq +60°C$ or $-40°C \leq Ta \leq +45°C$ with heated lenses option (AC & SC)

Notified Body: SIRA Certification Service (0518) Rake Lane, Eccleston, Chester, CH4 9JN, England

Factory surveillance: Dekra Certification B.V. (0344) Meander 1051, 6825 MJ Arnhem, Netherlands

The equipment identified above complies with all the essential requirements of the directives when installed and maintained in accordance to ABB Inc. LM80 Operating instruction OI/LM80 and LM80 Safety Report SM/LM80.

Place: Québec (Québec), CANADA

Nicolas Hô	Andreas Strauch	Marc Corriveau
Product Line Manager	ATEX Responsible	General Manager
Date : 01/09/2015	Date : 01/09/2015	Date : 09/09/2015

ABB Inc.

CERT0115
3BOM000142D0578_revD

CSA Group

Certificate of Compliance

Certificate: 22065534

Project: 70000579

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

Master Contract: 155295

Date Issued: May 06, 2013

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

C ⓒ US

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;
Ex nA nC IIC T4; Ex tb IIIC T85°C
Class I, Zone 2, AEx nA nC IIC T4
Class I, Zone 2, AEx opis IIC T4 Gc
Class II, AEx tb IIIC T85°C

LM80series Laser Distance Measuring Instrument; input rated
- 18-32V DC (24V typical) 0.40A peak, 0.20A continuous (standard version)
- 18-32V DC (24V typical) 0.52A peak, 0.32A continuous (with heated lenses option (AC & SC option));
Type 4X; IP66. Temperature Class T4;
-40°C ≤ Tamb ≤ +60°C
-40°C ≤ Tamb ≤ +45°C (with heated lenses option (AC & SC option));

DQD 507 Rev. 2012-05-22

Page 1

Certificate: 2065534

Master Contract: 155295

Project: 70000579

Date Issued: May 06, 2013

LM80series - Equipment type / model:

Application	Equipment Type / model	Description
Level measurement & Positionning	LM80.A	Aluminum Enclosure
	LM80.Axxxx	Aluminum Enclosure & accessories
	LM80.AC	Aluminum Enclosure with heated lenses
	LM80.ACxxxx	Aluminum Enclosure with heated lenses & accessories
	LM80.ACT804	Triclover unit option with heated lenses
	LM80.S	Stainless Steel Enclosure
	LM80.Sxxxx	Stainless Steel Enclosure & accessories
	LM80.SC	Stainless Steel Enclosure with heated lenses
	LM80.SCxxxx	Stainless Steel Enclosure with heated lenses & accessories

Where xxxx represent the different unit options without impacting certifications.

PART B

Class I, Division 2, Groups A, B, C and D
Class II, Groups E, F and G; Class III
Ex nAnC IIC T4
Ex tb IIIC T85°C
Class I, Zone 2, AEx nAnC IIC T4
Class II, AEx tb IIIC T85°C
Class I, Zone 2, AEx opis IIC T4 Gc

LM200series Laser Level Transmitter; input rated
- 18-32V DC (24V typical) 0.40A peak, 0.20A continuous (standard version)
- 18-32V DC (24V typical) 0.55A peak, 0.35A continuous (with heated lenses option (AC);
Type 4X; IP66; Temperature Class T6; -40°C $\leq$ Tamb $\leq$ +60°C

LM200series - Equipment type / model:

Application	Equipment Type / model	Description
Level measurement & Positionning	LM200.A	Aluminum Enclosure
	LM200.Axxxx	Aluminum Enclosure & accessories
	LM200.AC	Aluminum Enclosure with heated lenses
	LM200.ACxxxx	Aluminum Enclosure with heated lenses & accessories

Where xxxx represent the different unit options without impacting certifications.

Certificate: 2065534	**Master Contract:** 155295
Project: 70000579	**Date Issued:** May 06, 2013

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"
ANSI/ISA-60079-31 (12.10.03)-2009 - Explosive atmospheres — Part 31: Equipment dust ignition protection by enclosure "t"
ANSI/ISA-60079-28 (12.21.02)-2012- 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)

MARKINGS

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

FM Approvals

FM Approvals
1151 Boston Providence Turnpike
P.O. Box 9102 Norwood, MA 02062 USA
T: 781 762 4300 F: 781-762-9375 www.fmapprovals.com

CERTIFICATE OF COMPLIANCE

HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

LM80./a/b/c Laser Level Transmitter
NI/I/2/ABCD/T4A -40°C ≤ Ta* ≤ 60°C; DIP/II, III/1/EFG/T6 -40°C ≤ Ta* ≤ 60°C;
I/2/AEx nA nC/IIC/T4 -40°C ≤ Ta* ≤ 60°C; 21/AEx tb/ IIIC/ T85°C -40°C ≤ Ta* ≤ 60°C;
Type 4X, IP66
a= Enclosure: A or S.
b= Type: Blank, C or P.
c= Options: P150, T804, P801,P802, P803, P804, P806, F804, 806, F810, F815, A800, S800,
HPSG, HPSGF804, HPSGF806, HPSGF810, HPSGF815, REFL, G800, G601.

Special Conditions for Safe Use:
1) * Derated to -40°C ≤ Ta ≤ 45°C with option AC or SC.
2) USBR/LCD2: This configuration is only to be performed in a non-hazardous environment.
No connection shall be made to the D connector (RS232) inside the hazardous area.
3) Non-conductive materials of the equipment's enclosure present a potential risk for
electrostatic sparking. Clean equipment only with a damp cloth.

Equipment Ratings:

Non-Incendive for Class I, Division 2, Groups A, B, C, and D; Dust-Ignitionproof Class II and III,
Groups E, G, and F; Non-sparking with Enclosed Break Contacts for Class I, Zone 2, AEx nA
nC Group IIC; and as Protection by enclosure for Class III AEx tb IIIC T85 hazardous
(classified) location; indoor/outdoor location Type 4X/IP66.

FM Approved for:

ABB Inc (Quebec, Canada)
Quebec, QC Canada

To verify the availability of the Approved product, please refer to www.approvalguide.com
FM Approvals HLC 5/13   «PeopleSoft_Project_ID»
Page 1 of 2

This certifies that the equipment described has been found to comply with the following Approval Standards and other documents:

FM Class 3600	2011
FM Class 3611	2004
FM Class 3616	2011
FM Class 3810	2005
ANSI/NEMA 250	1991
ANSI/IEC 60529	2004
ANSI/ISA 60079-0	2009
ANSI/ISA 60079-15	2009
ANSI/ISA 60079-31	2009

Original Project ID: 3049053   Approval Granted: January 15, 2014

Subsequent Revision Reports / Date Approval Amended
    Report Number   Date   Report Number   Date

FM Approvals LLC

J.E. Marquedant
Group Manager, Electrical

15 January 2014
Date

To verify the availability of the Approved product, please refer to www.approvalguide.com
FM Approvals HLC 5/13   «PeopleSoft_Project_ID»
                                      Page 2 of 2

Operating Instruction | OI/LM80-EN Rev. F   45

Notes

Notes

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