
User's Manual

Model MLX Loop Powered Process Indicator

IM 60A02S01-01E-A



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1. Introduction

Thank you for purchasing the Model MLX Loop Powered Process Indicator. Your Model MLX Process Indicator was precisely calibrated at the factory before shipment. To ensure both safety and efficiency, please read this manual carefully before you operate the instrument.

The Model MLX field mounted indicator receives DC current signals from electronic transmitters and indicates process measurement values. This instruction manual gives instructions on handling, mounting, and wiring of the indicator.

■ Regarding This Manual

- This manual should be provided to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Yokogawa sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instruments.
- Please note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.
- The following safety symbols are used in this manual:



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION**

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

 **IMPORTANT**

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

 **NOTE**

Draws attention to information essential for understanding the operation and features.

1.1 Safe Use of This Product

For the safety of the operator and to protect the instrument and the system, please be sure to follow this manual's safety instructions when handling this instrument. If these instructions are not heeded, the protection provided by this instrument may be impaired. In this case, Yokogawa cannot guarantee that the instrument can be safely operated. Please pay special attention to the following points:

(a) Installation

- This instrument may only be installed by an engineer or technician who has an expert knowledge of this device. Operators are not allowed to carry out installation unless they meet this condition.
- All installation shall comply with local installation requirements and the local electrical code.

(b) Wiring

- The instrument must be installed by an engineer or technician who has an expert knowledge of this instrument. Operators are not permitted to carry out wiring unless they meet this condition.
- Before connecting the power cables, please confirm that there is no current flowing through the cables and that the power supply to the instrument is switched off.

(c) Operation

- Do not open the covers when an explosive atmosphere is present.

(d) Maintenance

- Please carry out only the maintenance procedures described in this manual. If you require further assistance, please contact the nearest Yokogawa office.
- Care should be taken to prevent the build up of dust or other materials on the display glass and the name plate.

(e) Modification

- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.

1.2 Warranty

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurring during the warranty period shall basically be repaired free of charge.
- If any problems are experienced with this instrument, the customer should contact the Yokogawa representative from which this instrument was purchased or the nearest Yokogawa office.
- If a problem arises with this instrument, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- The party responsible for the cost of fixing the problem shall be determined by Yokogawa following an investigation conducted by Yokogawa.
- The purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:
 - Improper and/or inadequate maintenance by the purchaser.
 - Malfunction or damage due to a failure to handle, use, or store the instrument in accordance with the design specifications.
 - Use of the product in question in a location not conforming to the standards specified by Yokogawa, or due to improper maintenance of the installation location.
 - Failure or damage due to modification or repair by any party except Yokogawa or an approved representative of Yokogawa.
 - Malfunction or damage from improper relocation of the product in question after delivery.
 - Reason of force majeure such as fires, earthquakes, storms/floods, thunder/lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

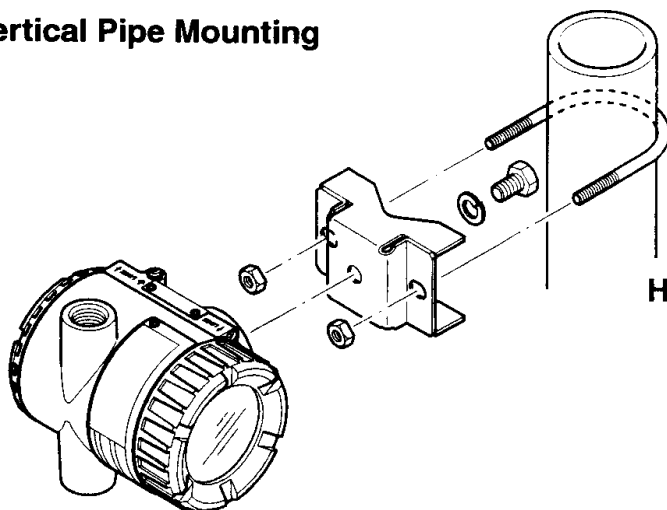
2. Handling Cautions

This chapter provides important information on how to handle the MLX Loop Powered Process Indicator. Read this carefully before using the indicator.

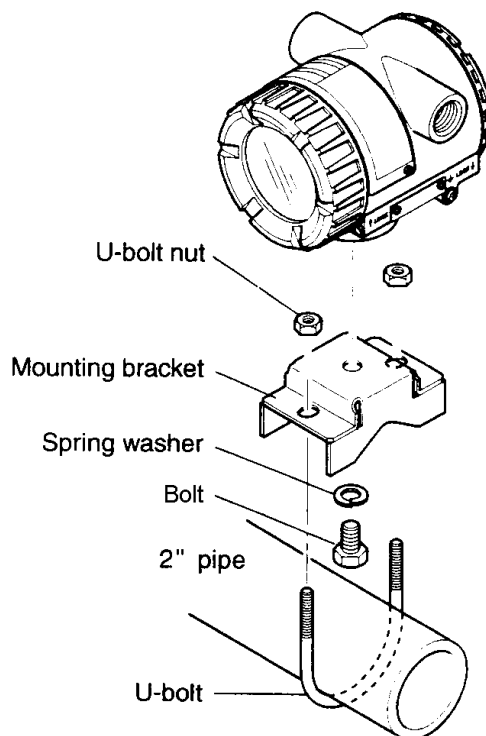
The MLX indicator is thoroughly tested at the factory before shipment. When taking delivery of an instrument, visually check it to make sure that no damage occurred during shipment.

Also check that the indicator mounting hardware shown in figure 2.1 is included. After checking the indicator, carefully repack it in its box and keep it there until you are ready to install it.

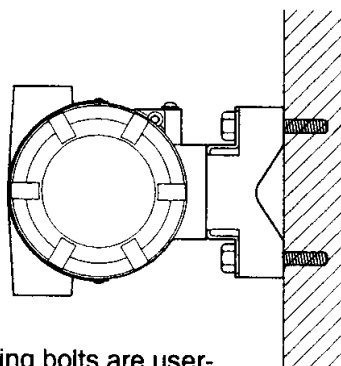
Vertical Pipe Mounting



Horizontal Pipe Mounting



Wall Mounting

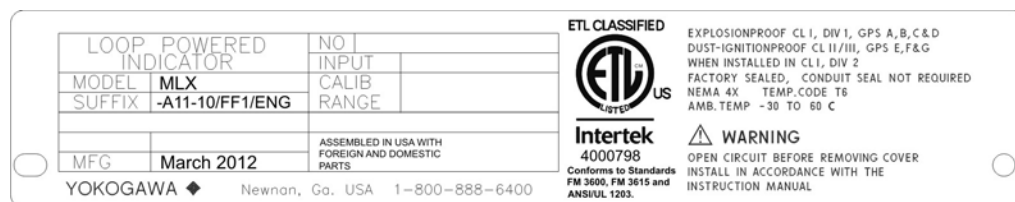


Note: Wall mounting bolts are user-supplied.

Figure 2.1 MLX Mounting Hardware

2.1 Model and Specifications Check

The model name and specifications are written on the name plate attached to the case.



MODEL: Specified model code.

SUFFIX: Specified suffix code.

MFG: Year of manufacture.

NO.: Serial number.

INPUT: Input signal (4-20mA).

CALIB RANGE: Specified calibration range.

Figure 2.2 MLX Name Plate

2.2 Unpacking

Keep the indicator in its original packaging to prevent it from being damaged during shipment. Do not unpack the indicator until it reaches the installation site.

2.3 Storage

The following precautions must be observed when storing the instrument, especially for a long period.

- (a) Select a storage area which meets the following conditions:
 - It is not exposed to rain or subject to water seepage/leaks.
 - Vibration and shock are kept to a minimum.
 - It has an ambient temperature and relative humidity within the following ranges.
 - Ambient temperature: -40 to 85°C (approval codes may affect limits)
 - Relative humidity: 0% to 100% R.H.
 - Preferred temperature and humidity: approx. 25°C and 65% R.H.
- (b) When storing the indicator, repack it carefully in the packaging that it was originally shipped with.

2.4 Selecting the Installation Location

- (1) The MLX is designed to withstand severe environmental conditions. However, to ensure that it will provide years of stable and accurate performance, take the following precautions when selecting the installation location.
- (2) Ambient Temperature

- (3) Avoid locations subject to wide temperature variations or a significant temperature gradient. If the location is exposed to radiant heat from plant equipment, provide adequate thermal insulation and/or ventilation.
- (4) Ambient Atmosphere
- (5) Do not install the indicator in a corrosive atmosphere. If this cannot be avoided, there must be adequate ventilation as well as measures to prevent the leaking of rain water and the presence of standing water in the conduits.
- (6) Shock and Vibration
- (7) Although the MLX is designed to be relatively resistant to shock and vibration, an installation site should be selected where this is kept to a minimum.

2.5 Insulation Resistance and Dielectric Strength Test

Since the MLX has undergone insulation resistance and dielectric strength tests at the factory before shipment, normally these tests are not required. If the need arises to conduct these tests, heed the following:

- (1) Do not perform such tests more frequently than is absolutely necessary. Even test voltages that do not cause visible damage to the insulation may degrade the insulation and reduce safety margins.
- (2) Never apply a voltage exceeding 500 V DC (100 V DC with an internal lightning protector) for the insulation resistance test, nor a voltage exceeding 500 V AC (100 V AC with an internal lightning protector) for the dielectric strength test.
- (3) Before conducting these tests, disconnect all signal lines from the transmitter terminals. The procedure for conducting these tests is as follows:
 - **Insulation Resistance Test**
 - (1) Short-circuit the + and – SUPPLY terminals in the terminal box.
 - (2) Turn OFF the insulation tester. Then connect the insulation tester plus (+) lead wire to the shorted SUPPLY terminals and the minus (–) lead wire to the grounding terminal.
 - (3) Turn ON the insulation tester power and measure the insulation resistance. The voltage should be applied as briefly as possible to verify that the insulation resistance is at least 20 M Ω .
 - (4) After completing the test and being very careful not to touch exposed conductors disconnect the insulation tester and connect a 100 k Ω resistor between the grounding terminal and the short-circuiting SUPPLY terminals. Leave this resistor connected at least one second to discharge any static potential. Do not touch the terminals while it is discharging.
 - **Dielectric Strength Test**
 - (1) Short-circuit the + and – SUPPLY terminals in the terminal box.
 - (2) Turn OFF the dielectric strength tester. Then connect the tester between the shorted SUPPLY terminals and the grounding terminal. Be sure to connect the grounding lead of the dielectric strength tester to the ground terminal.
 - (3) Set the current limit on the dielectric strength tester to 10mA, then turn ON the power and gradually increase the test voltage from ‘0’ to the specified voltage.
 - (4) When the specified voltage is reached, hold it for one minute.
 - (5) After completing this test, slowly decrease the voltage to avoid any voltage surges.

2.6 Installation of an Explosion-Protected Instrument

WARNING

If a customer makes a repair or modification and the instrument is not restored to its original condition, its safety may be compromised and the instrument may be hazardous to operate. Please contact Yokogawa before making any repair or modification to an instrument.

CAUTION

This instrument has been tested and certified as being Explosionproof. Please note that severe restrictions apply to this instrument's construction, installation, external wiring, maintenance and repair. A failure to abide by these restrictions could make the instrument a hazard to operate.

WARNING

Maintaining the safety of Explosionproof equipment requires great care during mounting, wiring, and piping. Safety requirements also place restrictions on maintenance and repair. Please read the following sections very carefully.

2.6.1 Factory Mutual (FM) Certification

1) Technical Data

a. FM Explosionproof Type

Caution for FM Explosionproof type.

Note 1. Model MLX Loop Process Indicator with optional code /FF1 for potentially explosive atmospheres:

- Certificate No. 4000798
- Applicable Standard: FM 3600, FM 3615, FM 3810, NEMA 250
- Explosionproof for Class I, Division 1, Groups A, B, C, and D.
- Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G.
- Enclosure rating: NEMA 4X.
- Temperature Class: T5
- Ambient Temperature: -30 to 60°C

Note 2. Wiring

- All wiring shall comply with National Electrical Code ANSI/NEPA70 and Local Electrical Codes.
 - "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED".
-

Note 3. Installation

- Strictly observe the “WARNING” on the attached nameplate.
WARNING: OPEN CIRCUIT BEFORE REMOVING COVER. “FACTORY SEALED, CONDUIT SEAL NOT REQUIRED”. INSTALL IN ACCORDANCE WITH THE INSTRUCTION MANUAL.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void Factory Mutual Explosionproof Approval.

Note 5. Special Conditions for Safe Use

- In the case where the enclosure of the MLX is made of aluminum, it must be installed such, that, even in the event of rare incidents, ignition sources due to impact and friction sparks are excluded.

2.7 EMC Conformity Standards

EN61326-1 Class A, Table 2 (for use in industrial locations)

EN61326-2-3

3. Installation

The MLX can be mounted on a wall or a 2” pipe. The housing is NEMA 4X rated so it can be mounted outside in the field.

"O Ring" seals MUST be carefully examined after opening to ensure that the NEMA 4X protection is maintained. Damaged seals MUST be replaced.

The complete electrical circuit in the hazardous area MUST be capable of withstanding an AC test voltage of 500V RMS to earth or frame of the apparatus.

Where there is a possibility of attack by aggressive substances, the MLX must be protected by a suitable enclosure, capable of protecting it from the environment and the effects of impact, thermal or mechanical stress.

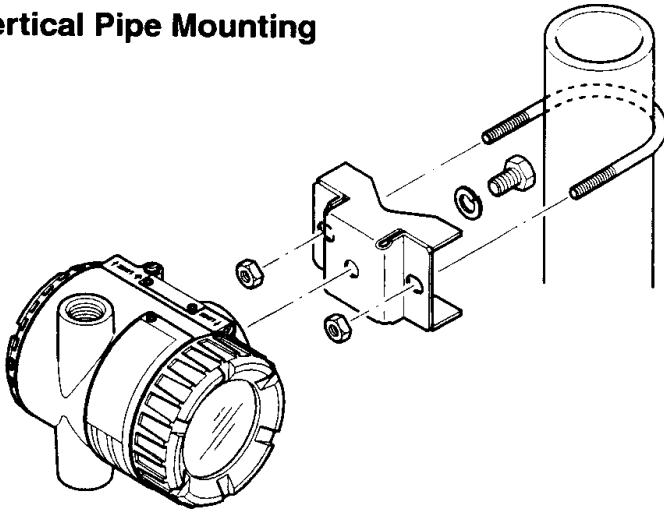
Do not install the MLX in the following conditions:

- Extreme Temperatures beyond the temperature rating of the instrument.
- High vibration areas above the vibration rating of the instrument.
- Extremely corrosive environments.

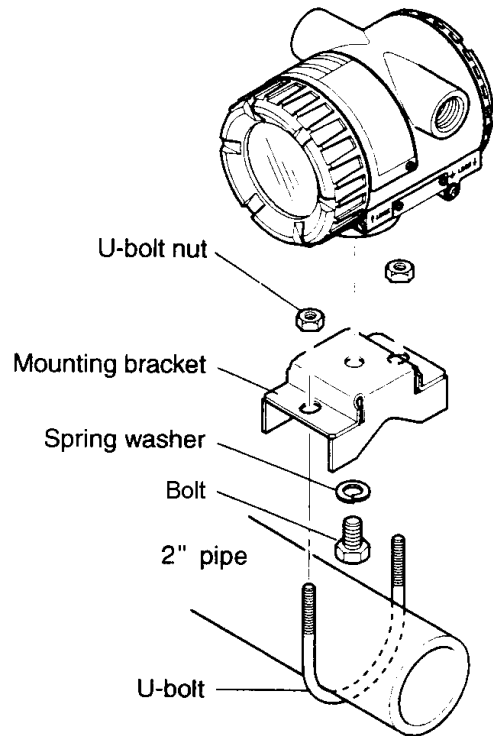
Installation MUST comply with the requirements specified in FM 3600 and must be performed by suitably qualified staff only.

3.1 Mounting Examples

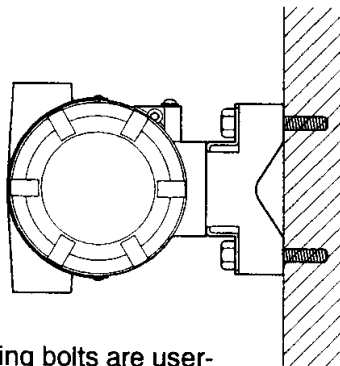
Vertical Pipe Mounting



Horizontal Pipe Mounting



Wall Mounting



Note: Wall mounting bolts are user-supplied.

Figure 3.1 Mounting configurations

4. Wiring

4.1 Wiring Precautions



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- Lay wiring as far as possible from electrical noise sources such as large capacity transformers, motors, and power supplies.
 - Remove the electrical connection dust cap before wiring.
 - To prevent noise pickup, do not pass signal and power cables through the same ducts.
 - Explosion-protected instruments must be wired in accordance with specific requirements (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion-protected features.
-

The MLX is powered by the current output loop and does not require external power. All devices must be wired in series with the current loop. Twisted pair shielded cable is recommended.

4.2 Selecting the Wiring Materials

- (a) Use stranded leadwires or cables which are the same as or better than 600 V grade PVC insulated wire or its equivalent.
- (b) Use shielded wires in areas that are susceptible to electrical noise.
- (c) In areas with higher or lower ambient temperatures, use appropriate wires or cables.
- (d) In environment where oils, solvents, corrosive gases or liquids may be present, use wires or cables that are resistant to such substances.
- (e) It is recommended that crimp-on solderless terminal lugs (for 4 mm screws) with insulating sleeves be used for leadwire ends.

4.3 Wiring

4.3.1 Loop Configuration

The following is a typical wiring example of the MLX connected to an EJA Pressure Transmitter.

(1) General-use Type

(Note: The EJA Transmitter below can be replaced with any 4-20mA 2 wire device.)

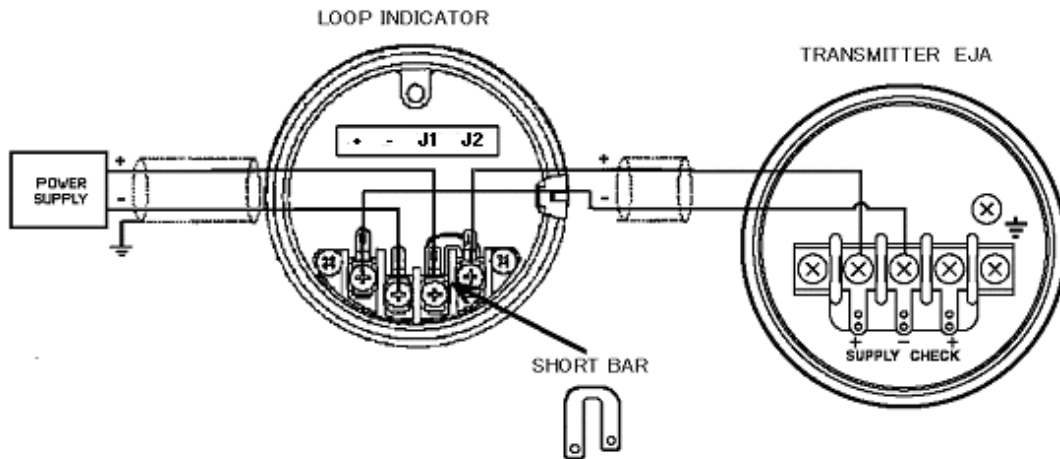


Figure 4.1 General-use Type wiring examples

5. Operation

5.1 Overview

The MLX is loop powered. Connect it in series with a 4-20mA loop as per Section 4 “Wiring”. Observe correct polarity as the indicator is protected against reversed connections but will not display a reading. After properly connecting the indicator to a transmitter or other 4-20mA source, the display will indicate the value of the current flowing in the loop (0-100% for the standard model or other specified engineering units can be user defined).



IMPORTANT

Connecting directly across a 24 V supply without a transmitter or similar device to regulate the loop current will result in damage to either the power supply or the MLX.

The MLX can easily be ranged to display virtually any engineering units by properly calibrating and selecting the desired units to be displayed.

The MLX uses a 4-key touchpad for operator input. Each key may have multiple functions assigned to it based a particular menu operation. These keys allow the user to access setup parameters, enter engineering units, zero and full-scale values, select display symbols and modify display functions. Figure 5.1 illustrates the keyboard.

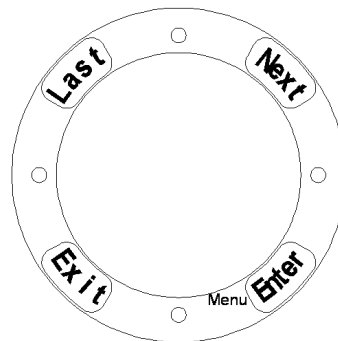


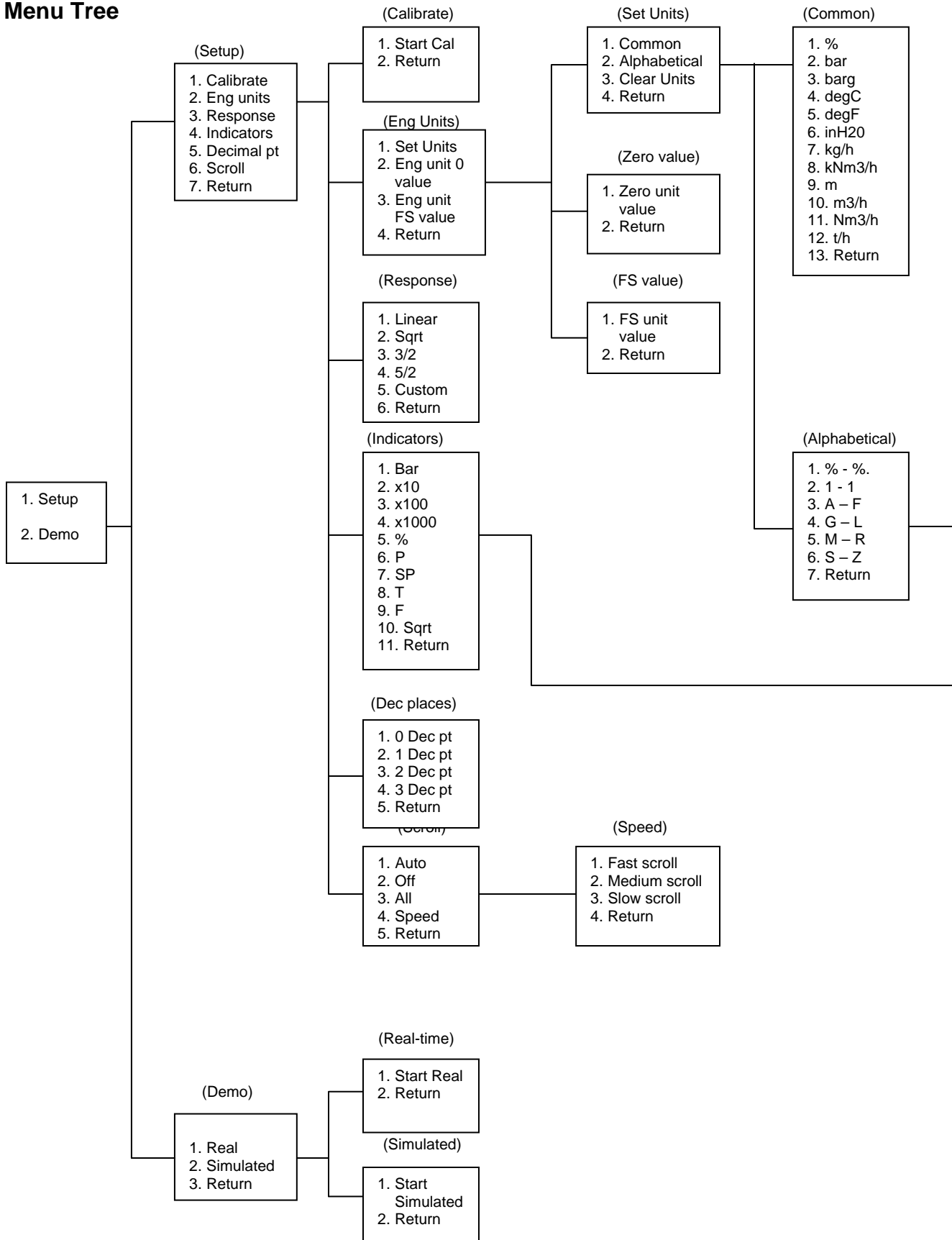
Figure 5.1 MLX 4-key Touch keypad.

Each key serves to navigate the menu systems and select a particular value or function. The overall function of each key is shown in Table 5.1.

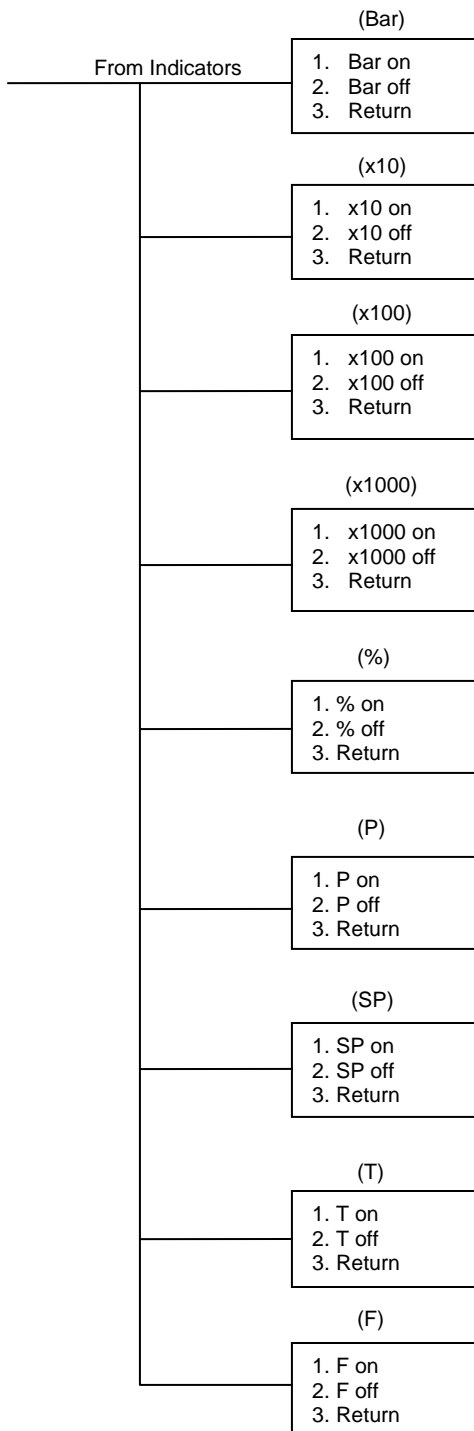
Table 5.1 MLX key functions

Key	Function
Last	Selects the previous menu item or menu level
Next	Selects the next menu item or menu level
Enter	Selects the current menu item or menu level
Exit	Exits the menu item or menu level and returns the MLX to normal functions.

MLX Menu Tree



MLX Menu Tree (cont.)



MLX Menu Tree (cont.)**List of alphabetical engineering units (from Alphabetical)**

%	BTU/SCF	F	HL/H	kg/d
%C	c/s	FNU	hPa	kg/h
%CH4	cal	foot	hPaabs	kg/l
%CO	cal/kWh	foot/p	hPaG	kg/m2
%CO2	CC/MIN	foot/s	Hz	kg/m2G
%CP	Cel	footAq	in	kg/m3
%H2	CelD.P.	footAqabs	in/s	kg/min
%H2O	cf/d	footH2O	inAq	kg/mm2
%LEL	cf/h	footH2Oabs	inAqabs	kg/mm2G
%N2	cf/min	ftH2O	inAqG	kg/p
%O2	cf/p	ftH2Oabs	inH2O	kg/s
%R.H.	cf/s	g	inH2Oabs	kgal/d
%RF	CFM	g/cm2	inH2OG	kgal/h
%RH	cft/min	g/cm2G	inHg	kgal/min
%RV	cm	g/cm3	inHgabs	kgal/p
%VH	cm/min	g/d	inWC	kgal/s
1/min	cm/s	g/h	inWCabs	kgf
1/s	cm2	g/l	inWG	kgf.m
A	cm3	g/m2	inWGabs	kgf/cm2
ABS	cm3/d	g/m3	J	kgf/cm2abs
at	cm3/h	g/min	K	kgf/cm2G
ata	cm3/min	g/ml	kA	kgf/m2
atg	cm3/p	g/mm2	kbbbl/d	kgf/m2G
atm	cm3/s	g/mm2G	kbbbl/h	kgf/mm2
BACARA	cmAq	g/Nm3	kbbbl/min	kgf/mm2G
bar	cmAqabs	g/p	kbbbl/s	kgfm
BARA	cmAqG	g/s	kbbbl_b/d	kHz
barabs	cmH2O	G/T	kbbbl_b/h	kJ
bare	cmH2Oabs	gal/d	kbbbl_b/min	kl
bareG	cmH2OG	gal/h	kbbbl_b/p	kl/d
barG	cmHg	gal/min	kbbbl_b/s	kl/h
bbl/d	cmHgabs	gal/p	kbbbl_o/d	kl/min
bbl/h	CO2ppm	gal/s	kbbbl_o/h	kl/p
bbl/min	COS	GBq	kbbbl_o/min	kl/s
bbl/s	cP	Gcal/h	kbbbl_o/p	klb/d
bbl_b/d	cpm	gf	kbbbl_o/s	klb/h
bbl_b/h	cps	gf.m	KC/NM3	klb/min
bbl_b/min	cSt	gf/cm2	kcal	klb/p
bbl_b/p	d	GHz	kcal/Nm3	klb/s
bbl_b/s	D.P.	GJ	kcf/d	KLEENH
bbl_o/d	dB	GJ/h	kcf/h	klx
bbl_o/h	deg	GOhm	kcf/min	km
bbl_o/min	degF	GPM	kcf/p	km/h
bbl_o/p	degR	gpm	kcf/s	km3
bbl_o/s	degree	GW	kg	km3/d
Bq/cm2	DEWPOINT	GW.h	kg/cm2	km3/h
Bq/cm3	dm2	h	kg/cm2abs	km3/min
BRIX	Fl m	H2%	kg/cm2G	km3/s

km3N/h	m3/h	Mgal_p	mmWG	NI/min
KMHO	m3/min	mgal_p	mmWGabs	NI/s
kN	m3/p	mGy/h	MN	Nm3/d
kN.m	m3/s	mH2O	mN	Nm3/h
kN/m2	m3N/h	mH2Oabs	mN.m	Nm3/min
kN/m2abs	mA	mH2OG	MN/m2	Nm3/s
kN/m2G	mAq	mHg	MN/m2G	ns
kNm3/h	mAqabs	mHgabs	MNGF	nSv/h
knot	mAqG	MHO	MOhm	NTU
kOhm	mb	MHO/CM	mOhm	Ohm
kPa	mbar	MHz	MOhm.cm	Ohm.cm
kPaabs	mbarabs	micron	MOhm/cm	Ohm-1
kPaG	mbare	min	mol	OPm
kt	mbareG	min-1	MOLWT	P
kt/h	mbarG	MJ	MPa	Pa
kV	mbbl/d	mJ	mPa	pA
kvar	mbbl/h	MJ.m-2	mPa.s	Paabs
kW	mbbl/min	MJ/m2	MPaabs	PaG
kW.h	mbbl/s	MJ/Nm3	mPaabs	pF
kW.m-2	mbbl_b/d	mK	MPaG	pF/m
kW/m2	mbbl_b/h	ml	mPaG	pH
KWH/M3	mbbl_b/min	MI/d	MPM	ppb
l	mbbl_b/p	MI/h	mR/h	PPHM
L.E.L.	mbbl_b/s	ml/h	mS	ppm
l/d	mbbl_o/d	MI/min	ms	ppmCO
l/h	mbbl_o/h	ml/min	mS/cm	ppmCO2
l/min	mbbl_o/min	MI/p	mS/m	ppmH2S
l/p	mbbl_o/p	MI/s	MSCFD	ppmN2
l/s	mbbl_o/s	ml/s	MSI/CM	ppmNOX
lb	mBq	MLB/H	mSv/h	ppmO2
lb/cf	mcf/d	mm	Mt/h	ppmSO2
lb/d	mcf/h	mm/h	MV	psi
lb/gal	mcf/min	mm/min	mV	psia
lb/h	mcf/p	mm/s	Mvar	psiabs
lb/in2	mcf/s	mm2	MW	psig
lb/min	mF	mm3	mW	R.M
lb/p	Mg	mmAq	MW.h	R/h
lb/s	mg	mmAqabs	MW/m2	R/min
lbf/in2	mg/cm2	mmAqG	mWC	rad
lbf/in2abs	mg/l	MMAT	mWG	rpm
lbw/in2	MG/LO2	MMCE	N	rps
lx	MG/LT	mmH2O	N.m	S
m	mg/m3	mmH2Oabs	N/m2	s
m/h	mg/Nm3	mmH2OG	N/m2abs	S.G.
M/H2	Mgal/d	mmHg	N/m2G	s-1
m/min	mgal/d	mmHgabs	N2ppm	SCFH
m/p	Mgal/h	MMHO	nA	SCFM
m/s	mgal/h	mmol/l	nF	Sm3/h
m/s2	Mgal/min	mmP-P	nGy/h	St
m2	mgal/min	MMSCFD	Nkm3/d	Sv/h
m3	Mgal/s	mmWC	Nkm3/h	t
m3/d	mgal/s	mmWCabs	NI/h	t/d

t/h	ubbl_o/p	VAC
t/min	ubbl_o/s	var
t/p	uF	vol%
t/s	ug	vol%O2
TF	ug/l	volpct
THz	ug/m3	W
TM	uGy/h	W.h
Torr	uHg	W.s
TPm	um	W/m2
TR/min	UMHO	wt%
uA	UMHO/CM	wtpct
ubbl/d	umP-P	wtpctS
ubbl/h	uOhm	wtppb
ubbl/min	uPa	wtppm
ubbl/s	uS	X10L
ubbl_b/d	us	
ubbl_b/h	uS/cm	
ubbl_b/min	uS/m	
ubbl_b/p	USI/CM	
ubbl_b/s	uSv/h	
ubbl_o/d	uV	
ubbl_o/h	uW/cm2	
ubbl_o/min	V	

5.2 Setting Engineering Units

The standard configuration of the MLX sets the engineering units to 0-100%. Also, after calibration, the MLX will be set to 0-100%. (Refer to the Maintenance section for instructions on calibrating the MLX.) If other engineering units are desired, they must be setup. The following procedure illustrates an example of using units of 200-400 m³/h.

- (a) Touch the “Menu” button to enter the menu system.
The alphanumeric display reads “Setup”.
- (b) Touch **Enter** to begin the setup routine.
The alphanumeric display reads “Calibrate”.
- (c) Touch **Next** to advance to the next menu item.
The alphanumeric display reads “Eng units”.
- (d) Touch **Enter** to select the Eng units routine.
The alphanumeric display reads “Units”.
- (e) Touch **Enter** to select the Units routine.
The alphanumeric display reads “Alphabetical”. The choices here are:
 1. Alphabetical – Use to select units from an alphabetical list
 2. Units of Measure – Use to select units by specifying the units of measure (i.e, volume, time, etc.)
 3. Common units – Use to select units from a common set of units
 4. Custom – Allows a custom unit to be specified
 Touch **Enter** to select alphabetical or **Next** to select another desired method. In this example, we will use Common units.
- (f) Touch **Next** to display the Units of Measure routine.

- The alphanumeric display reads “Units of Measure”.
- (g) Touch **Next** to display the Common units routine.
The alphanumeric display reads “Common units”.
- (h) Touch **Enter** to select the Common units routine.
- (i) Touch **Next** to scroll forward through the units (or **Last** to scroll backwards).
- (j) When the desired unit is shown (in this case, m³/h), touch **Enter** to select the unit.
The alphanumeric display shows “Eng units 0 value”. The numeric display shows the current engineering unit zero value with the least significant digit blinking. At this point, the menu buttons are redefined as in Table 5.2.

Table 5.2 MLX key functions (when in Engineering units mode)

Key	Function
Last	Selects the digit to modify (digits advance from least significant to most significant to the sign symbol and back to least significant – 6 digits plus sign).
Next	Increments the selected digit (values roll over from 9 to 0).
Enter	Decrements the selected digit (values roll over from 0 to 9).
Exit	Accepts the modified value as the current engineering unit zero or full-scale (FS) value.

- (k) Touch **Next** to increment the least significant digit to the desired valued (the digits roll over from 9 to 0).
- (l) Touch **Last** to move to the next digit.
- (m) Touch **Next** to increment the selected (blinking) digit to the desired valued.
- (n) Repeat Steps (l) and (m) until desired value is indicated (including sign value).
- (o) Touch **Exit** to accept the entered value as the engineering units zero value.
The alphanumeric display shows “Eng units 0 value”. The numeric display shows the current engineering unit zero value.
- (p) Touch **Next** to move to the next menu item.
The alphanumeric display reads “Eng units FS value”. The numeric display shows the current engineering unit FS value with the least significant digit blinking.
- (q) Repeat Steps (k) through (o) set the engineering units FS value.
- (r) Touch **Exit** to exit the setup routine and resume measurements.

6. Maintenance

6.1 Overview

The electronics of the MLX is maintenance free. This chapter describes the procedures for calibration and rotating the display within the enclosure. Please carefully and thoroughly read the following sections for information on how to perform these maintenance procedures.

6.2 Calibration Instruments Selection

Table 6.1 lists the instruments that can be used to calibrate the MLX. When selecting an instrument, consider the required accuracy level. Exercise care when handling these instruments to ensure they maintain the specified accuracy.

6.3 Calibration

The MLX is factory calibrated to 0-100%. Products ordered with the /ENG Engineering Units option other than 0-100% use 0-100% as the basis for the desired engineering units. Use the procedure below to check instrument operation and accuracy during periodic maintenance or troubleshooting.

- (2) Connect the instruments as shown in Figure 6.1 (red wire to + OUT on current source, black wire to - OUT on current source) and warm up the instruments for at least five minutes.

Table 6.1 Instruments Required for Calibration

Name	Yokogawa-recommended Instrument	Remarks
Current Standard	Model CA11 Voltage/Current Calibrator or Model CA71 Multifunction Calibrator	4-20mA source

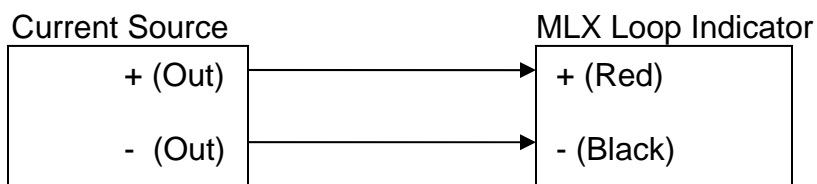


Figure 6.1 Calibrating the MLX

- (3) Using the values in Table 6.2, check the MLX readings by setting the current source to each of the table values. Check all points in the table and verify unit is within specification.

Table 6.2 Percent vs. Current Values

Value	Current
0%	4.0mA
25%	8.0mA
50%	12mA
75%	16mA
100%	20mA

- (4) If a re-calibration is required, use the following method:
- Touch the “Menu” button to enter the menu system.
The alphanumeric display reads “Setup”.
 - Touch **Enter** to begin the setup routine.
The alphanumeric display reads “Calibrate”.
 - Touch **Enter** to begin the calibrate routine. Follow the instructions given on the display. For each calibration point, after adjusting the current standard to the value indicated, press the “Menu” button.

6.4 Rotating Display Direction

The MLX display is designed so that it can be rotated in increments of 90 degrees. When there is a need to change the orientation of the display, use the following procedure:

- Remove power from the MLX.
- Remove the glass cover from the display side.
- Remove the two anchor nuts from the MLX module assembly.
- Remove and rotate the display assembly to the desired orientation.
- Re-install and tighten the two nuts on the module assembly.
- Replace the glass cover.

6.5 Cleaning

Cleaning should be restricted to wiping with a damp cloth or approved anti-static cleaner to avoid the danger of ignition due to electrostatic charges.

7. General Specifications

7.1 Standard Specifications

□FUNCTIONAL SPECIFICATIONS

Input: 4-20mA DC 2-wire

Voltage Drop: 3.5V at 20mA

LCD Display

Numerical: Six 7-segment digits

Alpha-numerical: Six 14-segment characters

Bar graph: 20-segment Bar graph.

Symbols: P, SP, T, F, %, $\sqrt{\quad}$, x10, x100, x1000

Configuration: User configurable for desired engineering units.

Method: User configurable from front panel

Zero & Span: Zero and span can be set between ± 999999 .

Turn-on Time: 12 second (includes power on self-test and memory integrity check)

Update Time: 1 second

Isolation: Input/Output/Ground isolated to 500V DC

□PERFORMANCE SPECIFICATIONS

Accuracy: $\pm 0.05\%$ of full scale +1 digit

Operating Current: 3.6mA to 28mA

Ambient Temperature: -30 to +60°C (-22 to 140°F)

Ambient Humidity: 0 to 100%RH at 23°C (73°F)

Ambient Temperature Effect: 0.1°C per 10°C

Over range: 200mA without damage

Maximum error: +0.02%, -0.03% (of full scale)

Conformity (Linearity): 0.03%

Hysteresis error: 0.03%

Repeatability: 0.03%

Vibration: 3G @ 10-150Hz

Shock: 50G

Explosion Protection: FM (CSA, ATEX, and IEC pending)

□PHYSICAL SPECIFICATIONS

Enclosure

Material

Housing: Low copper cast aluminum alloy with Polyurethane resin baked finish - Deep sea moss green (equivalent of Munsell 0.6GY3.1/2.0) or SUS316 cast stainless steel (ASTM CF-8M)

Name plate: Black anodized aluminum or 316 SST

Tag: 304 SST or 316 SST

Wired tag: 304 SST or 316 SST

Degrees of Protection: NEMA 4X, IP67

Mounting: Nominal 2" (50mm) pipe mount or surface. (horizontal or vertical)

Weight: 1.25kg (2.70 lbs)*

*: Without mounting bracket

Add 0.8 kg (0.35 lbs) for mounting bracket

Electrical Connection: ½ NPT female or M20 female

7.2 Model and Suffix Codes

MODEL AND SUFFIX CODES

Model	Suffix Codes	Description
MLX	Loop Indicator
Input signal	-A	4 to 20mA DC
Mounting	1 2	2 inch Horizontal Pipe 2 inch Vertical Pipe (or wall mount)
Housing	1 2	Cast aluminum alloy SUS316 cast stainless steel and ASTM CF-8M
Communication	-1 -2	Standard HART Communications (To be announced later)
Electrical Connection	0 1 2 3 4	ANSI ½ NPT female, two electrical connections without blind plugs ANSI ½ NPT female, two electrical connections and a 304 SST blind plug ANSI ½ NPT female, two electrical connections and a 316 SST blind plug ISO M20 female, two electrical connections without blind plugs ISO M20 female, two electrical connections and a 316 SST blind plug
Optional Codes		/ <input type="checkbox"/> Optional specification

OPTIONAL SPECIFICATIONS (For Explosion Protected Type)

Item	Description	Code
Factory Mutual (FM)	FM Explosion-proof Approval Applicable Standard: FM3600, FM3615, FM3810, ANSI/NEMA 250 Explosionproof for Class I, Division 1, Groups A, B, C and D, Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G, in Hazardous locations, indoors and outdoors (NEMA 4X) Temperature class: T5, Ambient Temperature: -40 to 85°C (-40 to 185°F)	FF1
	FM Intrinsically Safe/FM Explosion-proof/FM Non-incendive Approval (Pending) Applicable Standard: FM3600, FM3610, FM3611, FM3615, FM3810, ANSI/NEMA 250 Intrinsically Safe for Class I, Division 1, Groups A, B, C & D, Class II, Division 1, Groups E, F & G and Class III, Division 1, Class I, Zone 0, in Hazardous Locations, AEx ia IIC Non-incendive for Class I, Division 2, Groups A, B, C & D, Class II, Division. 2, Groups E, F & G, and Class III, Division 1, Class I, Zone 2, Group IIC, in Hazardous Locations Enclosure: "NEMA 4X", Temp. Class: T5, Amb. Temp.: -40 to 85°C (-40 to 185°F) Intrinsically Safe Apparatus Parameters [Groups A, B, C, D, E, F and G] Vmax=30 V, Imax=200 mA, Pmax=0.9 W, Ci=6 nF, Li=0 _H [Groups C, D, E, F and G] Vmax=30 V, Imax=200 mA, Pmax=0.9 W, Ci=10 nF, Li=0 mH	FU1
CENELEC ATEX	ATEX Intrinsically Safe/ATEX Flameproof/Non-incendive Approval (Pending) Flameproof Applicable Standard: EN 60079-0, EN 60079-1, EN 60079-31 II 2G, 2D Ex d IIC T5 Ex tD A21 IP6X T85 Degree of protection : IP66 and IP67 Temperature class: T5, Ambient Temperature: -40 to 85°C (-40 to 185°F) Intrinsically safe Applicable Standard: EN 60079-0, EN 60079-11, EN 60079-26 II 1G, 1D Ex ia IIC T5 Degree of protection : IP66 and IP67 Temperature class: T5, Ambient Temperature: -40 to 85°C (-40 to 185°F) Entity parameters : Ui=30 V, li=200 mA, Pi=0.9 W, Ci=10 nF, Li=0 mH Non-incendive Applicable Standard: EN 60079-0, EN 60079-11 II 3G Ex ic IIC T5 Temperature class: T5, Ambient Temperature: -40 to 85°C (-40 to 185°F) Entity parameters : Ui=30 V, li=200 mA, Pi=0.9 W, Ci=10 nF, Li=0 mH	KU21

Item	Description	Code
Canadian Standards Association (CSA) Canadian Standards Association (CSA)	CSA Intrinsically Safe/CSA Explosionproof Approval (Pending) Applicable C22.2 No.25, C22.2 No.30, Standard: FM 3600, FM 3615, UL 1203, UL 50, UL 50E, C22.2 No.94, C22.2 No. 94.2 Explosionproof for Class I, Division 1, Groups A, B, C and D, Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G Enclosure: TYPE 4X, Temp. Code: T5 Ex d IIC T5 Enclosure: IP66 and IP67 Amb.Temp.:–40 to 85°C(–40 to 185°F) for T5 Applicable Standard: C22.2 No.0, FM 3600, FM 3610, FMRC 3611, UL 60079-0, UL 60079-11, C22.2 No.60079.0, CAN/CSA E60079-11, C22.2 No.213, CAN/CSA C22.2 No.157 Intrinsically Safe for Class I, Division 1, Groups A, B, C & D, Class II, Division 1, Groups E, F & G, Class III, Division 1, Non-incendive for Class I, Division 2, Groups A, B, C & D, Class II, Division 2, Groups E, F & G, Class III, Division 1 Enclosure: Type 4X, Temp. Code: T5 Amb. Temp.:–40 to 85°C(–40 to 185°F) Electrical Parameters: [Intrinsically Safe] Vmax=30V, Imax=200mA, Pmax=0.9W, Ci=10nF, Li=0 [Non-incendive] Vmax=30V, Ci=10nF, Li=0 [For CSA E60079] Ex ia IIC T5, Ex ic IIC T5 Enclosure: IP66 and IP67 Amb. Temp.:–40 to 85°C(–40 to 185°F) Electrical Parameters: [Ex ia] Ui=30V, Ii=200mA, Pi=0.9W, Ci=10nF, Li=0 [Ex ic] Ui=30V, Ci=10nF, Li=0	CU1
IECEx Scheme	IEC Intrinsically Safe/IEC Flameproof Approval (Pending) Intrinsically safe and type n Applicable Standard: IEC 60079-0, IEC 60079-1, IEC 60079-11, IEC 60079-26, IEC 60079-31 II 1G, 1D Ex ia IIC T5, II 3G Ex ic IIC T5 Degree of protection : IP66 and IP67 Amb. Temp.:–40 to 85°C(–40 to 185°F) Electrical Parameters: [Ex ia] Ui=30V, Ii=200mA, Pi=0.9W, Ci=10nF, Li=0 [Ex ic] Ui=30V, Ci=10nF, Li=0 Flameproof Applicable Standard: IEC 60079-0, IEC60079-1 II 2G, 2D Ex d IIC T5 Ex tD A21 IP6X T85 Degree of protection : IP66 and IP67 Amb.Temp.:–40 to 85°C(–40 to 185°F) for T5	SU2
Combination of Approvals	Combination of FU1, CU1 and KU21 Approvals	V1U
INMETRO (Brazil) Certificate	INMETRO Intrinsically Safe/INMETRO Flameproof Approval (Pending)	BU1
GOST (Russian) Certificate	Russian GOST certificate (Pending)	QR1

OPTIONAL SPECIFICATIONS

Item	Description	Code
Paint	Epoxy resin paint Polyurethane-Epoxy combination paint (Anti-corrosion coating)	X1 X2
Calibration	Calibration range and scale	ENG
Stainless steel tag plate	Stainless steel tag screw attached to housing Stainless steel tag wired to housing	SST SSW

ORDERING INFORMATION

Specify the following when ordering:

1. Model and suffix codes.
2. Option codes.
3. Tag number
4. Calibration range desired (optional)

OPTIONS

The MLX is fully field configurable from the front panel. To order a pre-configured unit, specify the /ENG option followed by the desired setpoints (zero, full scale, and engineering units).

□ **Example Ordering Information:**

MLX-A11-10/FF1/ENG/SST

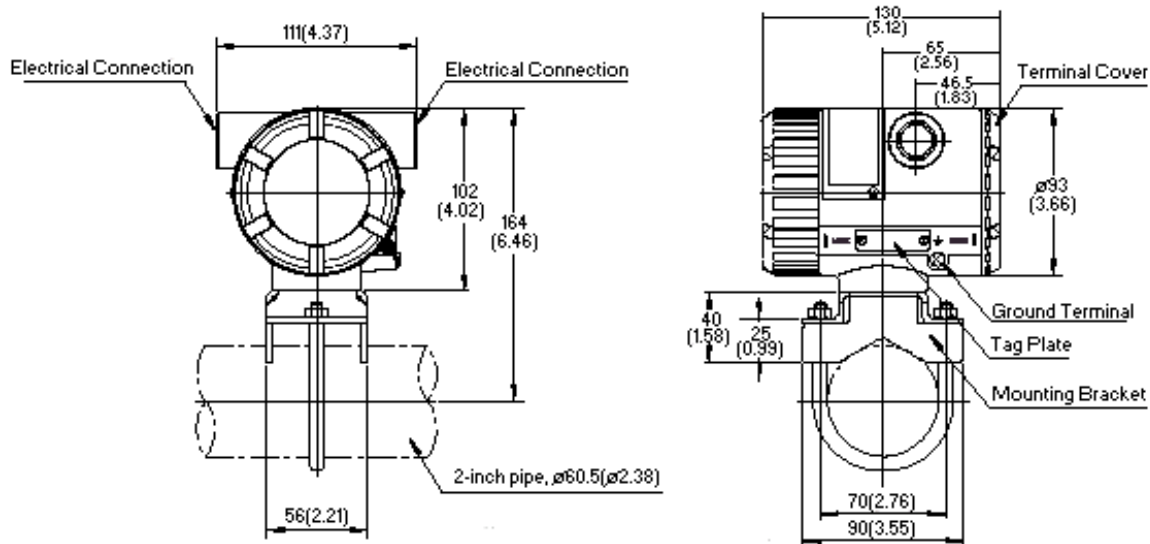
(Field Mounted Loop Indicator, 4 to 20mA DC, 2" Horizontal Pipe mount, aluminum housing, standard communication, ANSI ½ NPT electrical connection without blind plugs, FM Explosion-proof approval)

0-200 InH2O Scale in Engineering Units. Please specify Scale and Engineering units when ordering /ENG.

FT-201 Specify Tag Number when ordering /SST and/or /SSW.

7.5 Dimensions

Unit: mm (Approx. inch)



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Edition	Date	Page	Revised Item
1st	January 2012	--	New publication
2nd	March 2012	14, 21	Removed J12 reference; modified Specifications