MI3 Installation Guidelines

1. Introduction:

MI3 sensors are sensitive to electro magnetic interference & ground loops.To minimize the effect of electromagnetic interference,damage to equipment due to harsh environment & to avoid ground loop following guidelines should be followed:

1. Take into account ambient temperature; atmosphere quality & possible electromagnetic interference source in the location. Based on evaluation; install appropriate accessory on sensing head. Mount the unit as far away as possible from potential sources of electrical interference, such as motorized equipment, which can produce large step load changes.
2. The desired spot size on the target will determine the maximum measurement distance. Target spot size must completely fill the field of view of the sensor. Use online Raytek Spot Size Calculator from the following link to determine the maximum measurement distance"http://tools.raytek.com/spotsize/Default.aspx".
3. Use shielded wire for all input and output connections.
4. To avoid ground loops, make sure that only **one point** is earth grounded.
   a. In event of a single sensor head installation it is recommended that sensing head be grounded to machine & communication box & SMPS be left isolated from ground.
   b. In event of multiple head installation it is recommended that the sensing head be isolated from the machine & either the communication box, multichannel box or the SMPS be earth grounded.
5. The total sensing head cable length for all networked sensing heads must not exceed 30 m (98 ft) for MI3 and 2x30 m (2x98 ft) for MI3M! In an event the sensor is exposed to environment where heavy electromagnetic interference exist the network sensing head cable limit (30 m for MI3 and 2x30 m for MI3M) may have to be reduced.
6. The cable length may be shortened but it is not advised to reduce the length below 20cm.
7. Sensing head with various cable lengths can be factory ordered. It is not recommended to use a third party cable to extend the length of sensing head cable. However if the situation demands to extend the length of the cable only shielded cable with the following specifications should be used" 80pf/m for conductors, 120 pf/m for shield, conductor 90 ohm/km"
8. Use laser targeting for 1M & 2M models to determine centre of spot size on target. For other models aim the sensor on the target & try to locate the max temp spot by observing values on display. Lock the sensor at a position where the highest temperature reading is obtained.
9. The laser functions only to locate and mark surface measurement targets. Do not aim the laser at others.

2. Important Symbols:

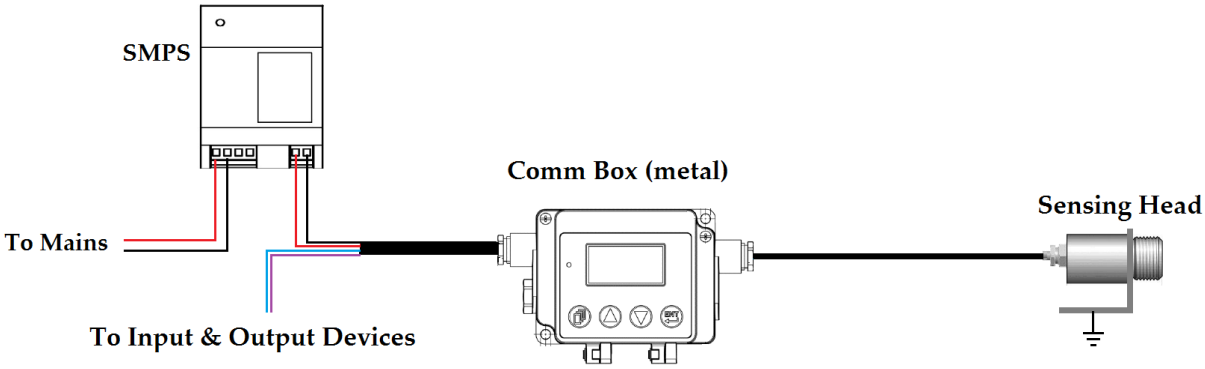
Important information.

Helpful information regarding optimal use of the instrument.

Earth Ground. Symbol used only as reference to indicate that the particular component is earth grounded.

3. Installation Overview:

3.1 Recommendations for installing a single MI3 sensing head & comm box (metal) with Local Power Supply:



1. Review the ambient temperature; atmosphere quality & possible electromagnetic interference source in the location. Based on evaluation; install appropriate accessory on sensing head.
2. Use Online Spot Size Calculator to determine the maximum measurement distance so that the spot on the target fills the field of view of the sensor i.e the spot size formed on the target covers entire area of the surface whose temperature needs to be measured.
3. Use adjustable /fixed mounting bracket for installing sensing head.
4. When using single sensing head it's recommended that the head is earth grounded with the machine body. The comm box (metal) & the power supply must be isolated & earth grounded only through sensing head.
5. *Installing the sensing head:*
   Install the sensing head & ensure it is earth grounded.
6. *Connection between sensing head & comm box (metal):*
   Ensure that shield of sensing head cable is connected to comm box (metal) & secured properly.
7. *Connection between comm box (metal) & Local Power Supply:*
   Use shielded cable for providing power supply to comm box (metal). Ensure that shield is connected at comm box (metal) end as well as power supply end. Ensure that power supply is isolated from earth ground.
8. *Connection between comm box (metal) & input output devices:*
   Use shielded cable for connection between comm box (metal) & input output device. Ensure that shield is connected at comm box (metal) end only!

9. Use laser targeting for 1M & 2M models to determine centre of spot size on target. Configure the sensor through front panel keys on comm box (metal). For other models aim the sensor head on the target & try to locate the max temp spot by observing values on display. Lock the sensor in a position where the highest temperature reading is obtained.

After connecting shield to devices as recommended; all devices will be at the same earth ground potential as the sensing head.

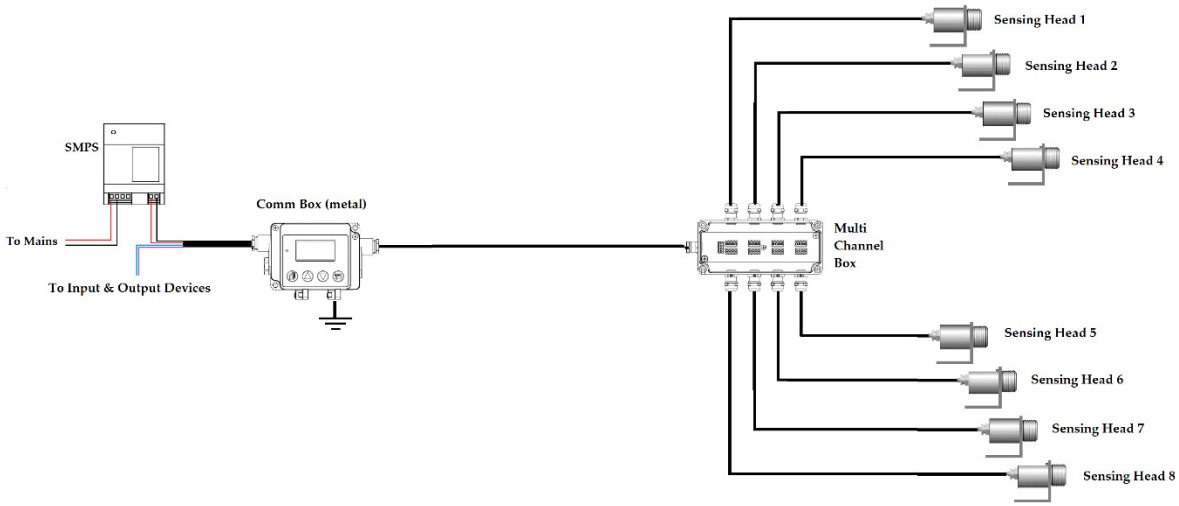
The term "isolated" refers to installing the components in such a manner that they are not earth grounded individually through physical contact.

Recommendations for installing a single MI3 sensing head & comm box (metal) with Power Supply installed at a remote location.

In case the power supply for the sensor is provided from a source installed at a remote location it cannot be ensured that the power supply is isolated. For such installations the recommendations remain the same with an exception about the way in which cable is connected between comm box metal & power supply installed at a remote location.

Connection between comm box (metal) & Power Supply installed at a remote location:
Use shielded cable for providing power supply to comm box (metal). Ensure that shield is connected at comm box (metal) end only!

3.2 Recommendations for installing multiple MI3 sensing heads (max 8nos) with comm box (metal) using Multi-Channel Box & Local Power Supply:



1. Review the ambient temperature; atmosphere quality & possible electromagnetic interference source in the location. Based on evaluation; install appropriate accessory on sensing heads.
2. Use Online Spot Size Calculator to determine the maximum measurement distance so that the spots on the target/s fills the field of view of the sensors i.e the spot size formed on the target/s covers entire area of the surface whose temperature needs to be measured.
3. Fix adjustable /fixed mounting brackets for installing sensing heads. Use air purge jacket or isolation kit to isolate the head from earth ground. Selection of jacket/kit depends on the model no of the sensing head.
4. When using multiple sensing heads it's recommended that the comm box (metal) is earth grounded with the panel. The sensing heads, multi-channel box & the power supply must be isolated & should be connected to earth ground only through comm box (metal).
5. *Installing the sensing head:*
   Using one of the available isolation accessories (discussed later in the document) isolate the sensing head from earth ground. Using suitable mounting bracket install the sensing head.
6. *Connection between sensing heads & multichannel box:*
   Ensure that shield from the sensing head cables are connected to multi-channel box & secured properly. Shield of cable from multi-channel box to comm box (metal) must also be connected at both ends & secured properly.

7. *Connection between comm box (metal) & Local Power Supply:*
   Use shielded cable for providing power supply to comm box (metal). Ensure that shield is connected at comm box (metal) end as well as power supply end. Ensure that power supply is isolated from earth ground.
8. *Connection between comm box (metal) & input output devices:*
   Use shielded cable for connection between comm box (metal) & input output device. Ensure that shield is connected at comm box (metal) end only!

After connecting shield to devices as recommended; all devices will be at the same earth ground potential as the comm box (metal).

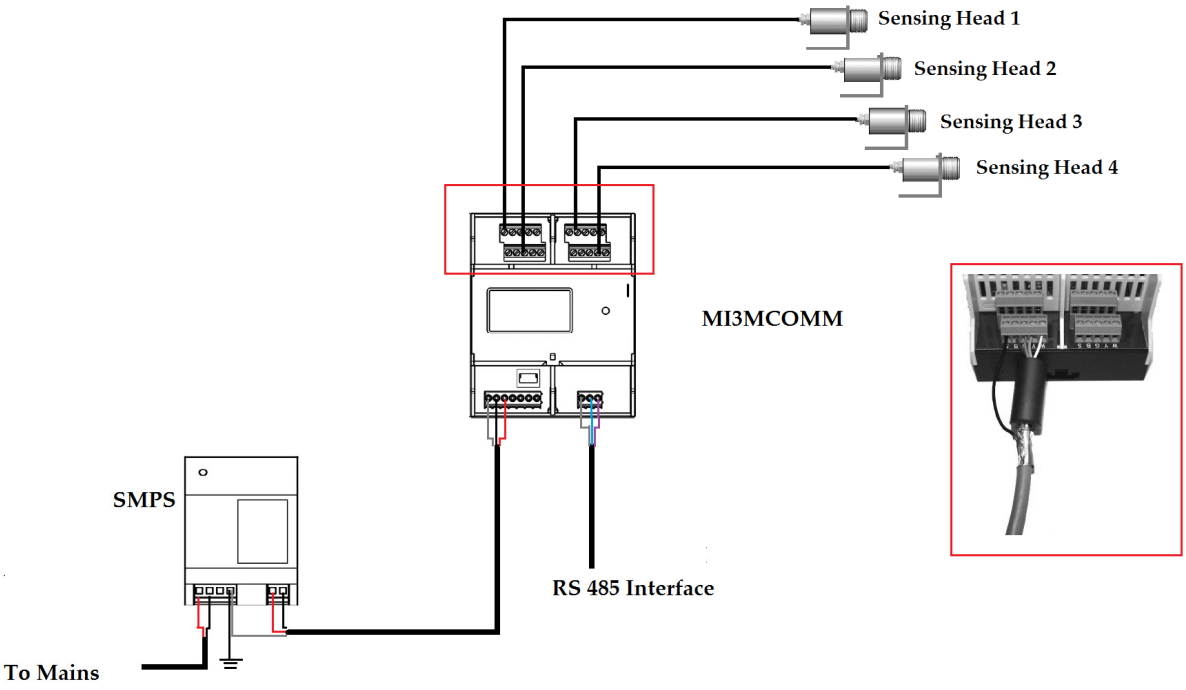
The term "isolated" refers to installing the components in such a manner that they are not earth grounded individually through physical contact.

Recommendations for installing multiple MI3 sensing heads & comm box (metal) with Power Supply installed at a remote location.

In case the power supply for the sensors is provided from a source installed at a remote location it cannot be ensured that the power supply is isolated. For such installations the recommendations remain the same with an exception about the way in which cable is connected between comm box metal & power supply installed at a remote location.

Connection between comm box (metal) & Power Supply installed at a remote location:
Use shielded cable for providing power supply to comm box (metal). Ensure that shield is connected at comm box (metal) end only!

3.3 Recommendations for installing multiple MI3 sensing heads with MI3MCOMM Din 3TE,4TE&6TE with Local Power Supply:



1. Review the ambient temperature; atmosphere quality & possible electromagnetic interference source in the location. Based on evaluation; install appropriate accessory on sensing heads.
2. Use Online Spot Size Calculator to determine the maximum measurement distance so that the spots on the target/s fills the field of view of the sensors i.e the spot size formed on the target/s covers entire area of the surface whose temperature needs to be measured.
3. Fix adjustable /fixed mounting brackets for installing sensing heads. Use air purge jacket or isolation kit to isolate the head from earth ground. Selection of jacket/kit depends on the model no of the sensing head.
4. When using multiple sensing heads it's recommended that the local power supply is earth grounded. The sensing heads & MI3MCOMM must be isolated & should be connected to earth ground only through local power supply.
5. *Installing the sensing head:*
   Using one of the available isolation accessories (discussed later in the document) isolate the sensing head from earth ground. Using suitable mounting bracket install the sensing head.

6. *Connection between sensing heads & MI3MCOMM:*
   Ensure that shield from the sensing head cables are connected to MI3MCOMM ; ferrite core is placed over cables & cables shied are secured properly.
7. *Connection between MI3MCOMM & Local Power Supply:*
   Use shielded cable for providing power supply to *MI3MCOMM*. Ensure that shield is connected at *MI3MCOMM* end as well as power supply end. Ensure that power supply is earth grounded.
8. *Connection between MI3MCOMM & input output devices:*
   Use shielded cable for connection between *MI3MCOMM* & input output device. Ensure that shield is connected at *MI3MCOMM* end only!

After connecting shield to devices as recommended; all devices will be at the same earth ground potential as the local power supply.

The term "isolated" refers to installing the components in such a manner that they are not earth grounded individually through physical contact.

Recommendations for installing multiple MI3 sensing heads with MI3MCOMM Din 3TE,4TE&6TE having Power Supply installed at a remote location.

In case the power supply for the sensors is provided from a source installed at a remote location it cannot be ensured that the power supply is isolated. For such installations the recommendations remain the same with an exception about the way in which cable is connected between MI3MCOMM & power supply installed at a remote location.

Connection between MI3MCOMM & Power Supply installed at a remote location:
Use shielded cable for providing power supply to MI3MCOMM.Ensure that shield is connected at MI3MCOMM end only & earth ground the MI3MCOMM through panel earth!

4. Isolation Methods:

4.1 Isolating the Sensing Head

To avoid ground loop problems it is advised that the MI3 sensor be earth grounded either at sensing head, comm box or power supply end.
In case the MI3 is grounded at comm box or power supply end the sensing head needs to be isolated from earth ground.

For LT, G5 & LTH sensing heads

For LT, G5 & LTH sensing heads the air purge jacket acts as an isolation accessory between the sensing head & earth ground

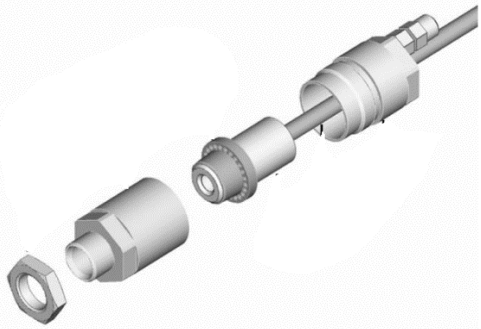


Fig: Air Purge Jacket XXXMIACAJ

For 1M & 2M sensing heads

Isolation kit Model no MI3100ISOKIT can be used for isolating 1M & 2M sensing heads.

Fig: Isolation kit with adjustable mounting bracket MI3100ISOKIT

4.2 Isolating the Comm Box (metal)

Drill holes into the mounting plate for fixing comm box (metal).Based on installation scheme it may be required to isolate the comm box (metal) from earth ground.

One way of isolating the comm box (metal) from the mounting plate is use of plastic nut, bolt & washers. It prevents metal body of the comm box to come in contact with mounting plate.

An alternative to using plastic nut, bolts & washers is the method explained below:

1. Cover threads of metal bolts partially using insulation tape. This avoids metal part of comm box making contact with threads of bolt.
2. Place a rubber washer onto the bolt; insert the bolt from back of the mounting plate, thus avoiding head of bolt being in contact with back of mounting plate.
3. Place second rubber washer onto the bolt; mount the comm box(metal). The second rubber washer will prevent the metallic back of comm box to be contact with mounting plate.
4. Finally place the third rubber washer & secure the comm box (metal) with nut.

If isolation is not required mount the comm box (metal) directly onto the mounting plate & connect the panel to earth ground.

4.3 Isolating the communication box "Comm box DIN"

Install a DIN rail on the mounting plate inside the panel. Install the comm box DIN directly onto the DIN rail.
If the installation scheme requires the Comm box DIN to be earth grounded, connect the ground terminal on the Comm box DIN to earth ground.
If the installation scheme needs the Comm box Din to be isolated from earth ground, don't connect the ground terminal on Comm box DIN to earth ground.

4.4 Isolating the Multi-Channel Box

Drill holes into the mounting plate inside the panel as per the mounting holes in the Multi-Channel Box.
With multiple heads connected on a single box the possibility of ground loop related issues are high if the Multi-Channel Box is earth grounded. Hence it is advised that Multi-Channel Box be isolated from earth ground.
For isolating Multi- Channel Box from earth ground follow the same procedure as illustrated for comm box (metal).

4.5 Isolating the Power Supply

To avoid physical contact of metallic surface of power supply with mounting plate; follow the following method:

1. Fix the power supply over a metal plate. Drill holes near to the four edges of the metal plate.
2. Fix the power supply on the mounting plate. Following the procedure illustrated for isolation of comm box (metal) isolate the power supply from earth ground.

Power supply with body & mount made up of plastic may not need to follow the procedure mentioned above & prove to be naturally isolated from earth ground due to method of construction.

If the installation scheme requires the power supply to be earth grounded simply install the power supply with its back placed directly on the panel mounting plate or connect the ground terminal of the power supply to earth ground.

5. Installing the sensing head:

5.1 Determining distance of sensing head to object

The desired spot size on target will determine the maximum measurement distance. Use Online Spot Size Calculator to determine the maximum measurement distance such that the spot size on the target is less than or equal to target size.

The Online Spot Size Calculator can be accessed from the following link "http://tools.raytek.com/spotsize/Default.aspx".

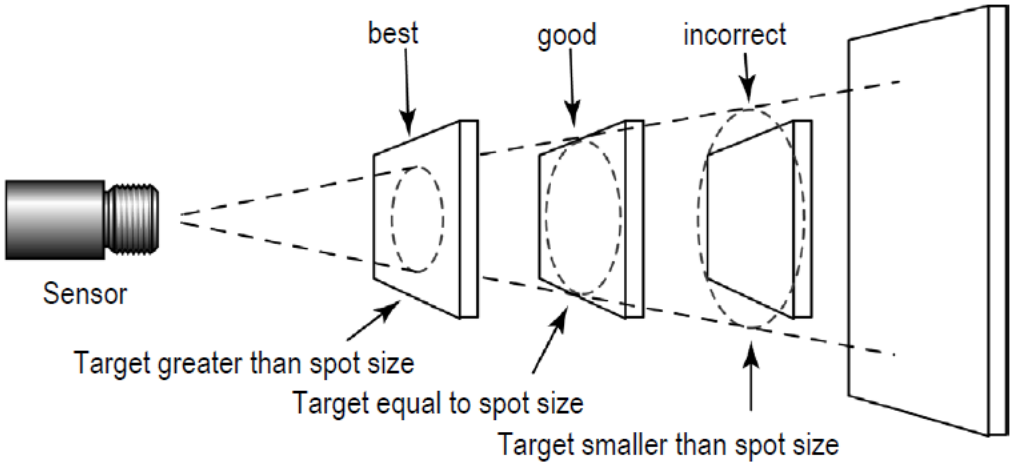


Fig: Recommended Spot Size on Target

5.2 Installing the mounting bracket

Once the maximum measurement distance is determined, a fixed or adjustable mounting bracket may be selected to install the sensing head.
A fixed mounting bracket will facilitate horizontal alignment of sensing head while adjustable mounting bracket allows sensing head to be aligned along horizontal as well as vertical axis.
Ensure that mounting area is free from vibration for accurate measurement of the spot.
The area between pyrometer & target should be free from dust, fumes & vapours for accurate measurement.

5.3 Mounting the sensing head

Areas where deposition of dust on lens or high ambient temperature introduce challenge in measurement; suitable air purge collar & housing must be installed on the sensing head.

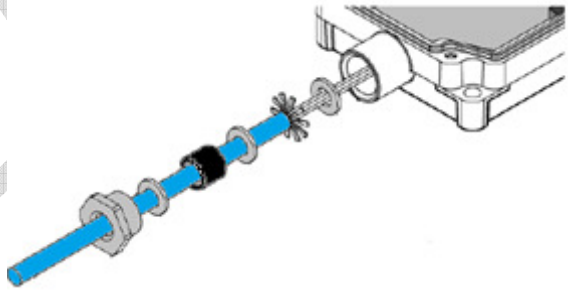
Based on the installation scheme it may be required to isolate sensing head from earth ground. Select appropriate air purge jacket or isolation kit based on the model no. of sensing head. If isolation is not required; install sensing head directly on mounting bracket & ensure that mounting bracket is earth grounded. Ensure that sensing head is secured properly on bracket by tightening nut.

Refer to the section at the end of the document for selecting the correct accessory based on installation requirement.

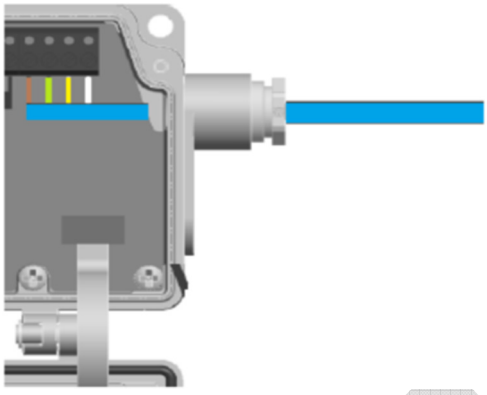
6. Connecting the sensing head cable to comm box:

6.1 Connecting the sensing head to Comm box (metal)

1. Open the communication box by removing the two Phillips head screws and pulling off the lid. Unscrew the pressure screw and remove the metal washers & rubber washers.
2. Put pressure screw, rubber washer & metal washers in the following order.
3. Insert the pressure screw such that it's thread face the comm box (metal) followed by a first metal washer.
4. Then insert rubber washer followed by second metal washer.
5. Expose shield of sensing head cable by removing its outer sleeve. Spread the shield & insert third metal washer.
6. Insert wires into communication box far enough to connect to terminals & tighten pressure screw into comm box (metal).

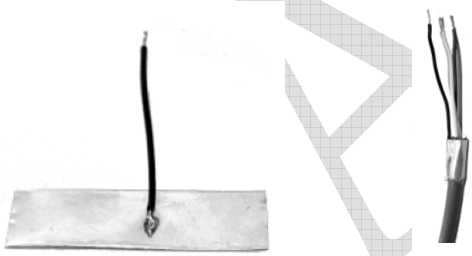


Connect wires to terminals on PCB as shown in figure below:

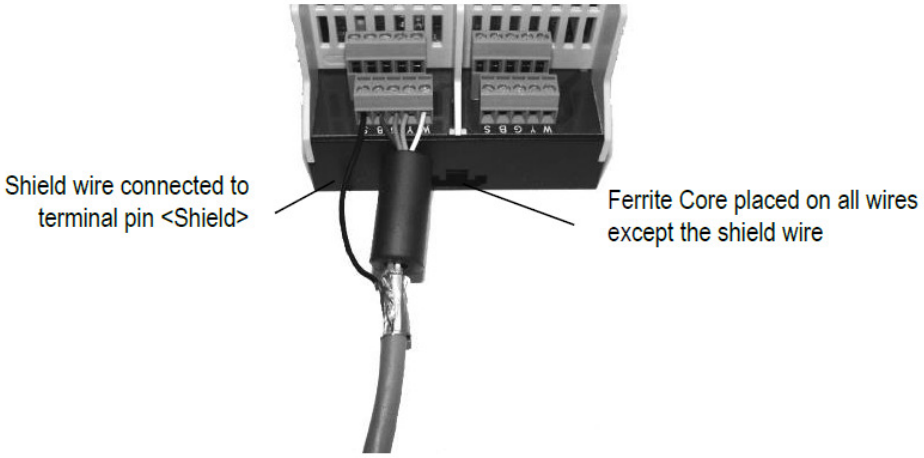


6.2 Connecting the sensing head to Comm box DIN

Expose shield of sensing head cable by removing its outer sleeve. Wound self-adhesive shield tape around the shield of shield of sensing head cable.



Place ferrite core around 4 wires of sensing head cable. Avoid placing ferrite core around shield cable. Connect the 4 wires & shield wire to the terminals on PCB.



Install the sensing communication box based on the selected installation scheme with either the box being isolated or else connected to earth ground.
Power ON the sensor & follow the procedures explained below.

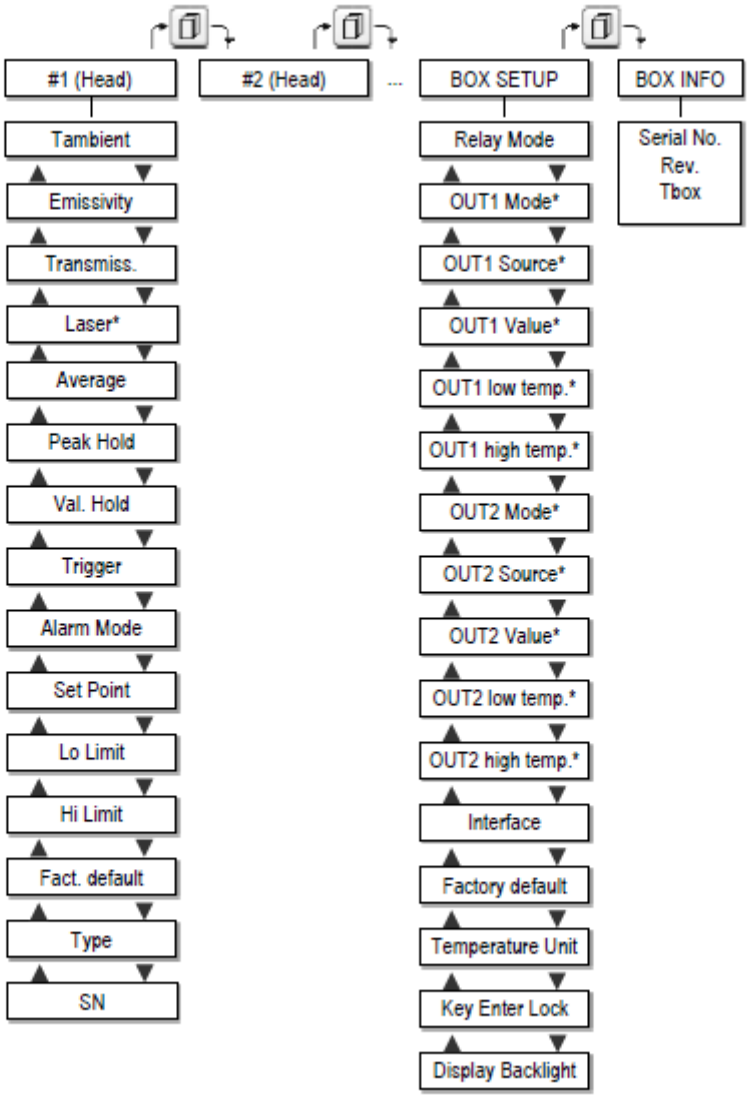
7. Targeting the sensing head:

For LT,G5 & LTH sensing heads point the sensor towards the target. Looking at temperature display in comm box adjust sensing head to identify the maximum temperature spot on the target. Lock the sensing head once at a position where maximum temperature reading is obtained.

For 1M & 2M sensing heads turn on the laser by selecting the leaser option from the comm box menu. Point the laser towards the target whose temperature is to be measured. Lock the sensing head once the spot is identified. Laser indicates centre of the spot size created by the sensing head on the target.

8. Configuring the sensor:

Enter the parameters in the comm box based on the application & required post processing.



* not available for all models
4 output channels for Comm Box DIN 6 TE, analog

9. Accessories:

Take into account ambient temperature; atmosphere quality & possible electromagnetic interference source in the location. Based on evaluation; install appropriate accessory on sensing head.

9.1 Ambient Temperature

For LT, G5 & LTH sensing heads

For high temperature air purge ambient jacket can be used. The air purge jacket withstands ambient temperatures up to 180°C (356°F) and has limited use for cooling purposes.
For LT & G5 sensing heads Air Purge Jacket model no XXXMIACAJ can be used.
For LTH sensing heads, the Air Purge Jacket is only available pre-mounted from the factory (XXXMIACAJI).

Fig: Air Purge Jacket XXMIACAJ

The LT & G5 sensing head can operate in ambient temperatures up to 200°C (392°F) with the air-cooling system model no XXXMIACCJ. The air-cooling system comes with a T-Adapter, air hose and insulation. The T-adapter allows the air-cooling hose to be installed without interrupting the connections to the box.

The Air Cooling System cannot be combined with LTH heads!

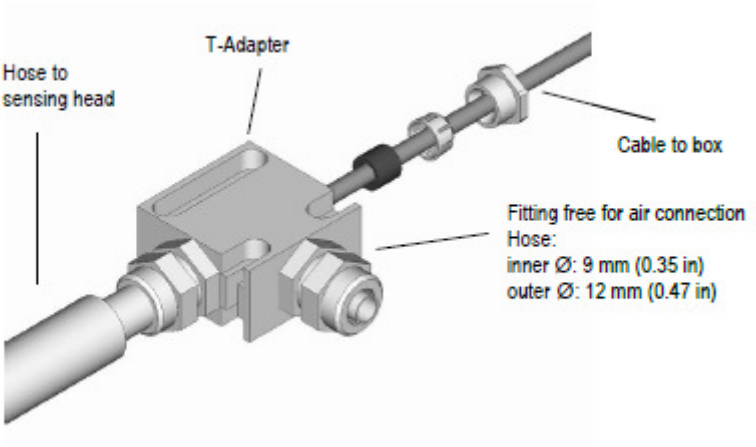


Fig: Cooling system XXXMIACCJ

For 1M & 2M sensing heads

For 1M & 2M sensing heads for ambient temperature upto 180 Deg C Water Cooled Housing option can be used. The flow rate should be approximately 1 to 2 litres/min at a temperature between 10 and 27°C (50 to 80.6°F). Chilled water below 10°C (50°F) is not recommended. The scope of delivery also contains the air purge collar Model no: XXXMI3100AP

Fig: Water Cooled Housing WS

9.2 Atmosphere Quality

The air purge jacket is used to keep dust, moisture, airborne particles, and vapors away from the sensing head. Clean, oil free air is recommended for purging.

For LT, G5 & LTH sensing heads

For LT & G5 sensing heads Air Purge Jacket model no XXXMIACAJ can be used.

For LTH sensing heads, the Air Purge Jacket is only available pre-mounted from the factory (XXXMIACAJI).

The recommended air flow rate is 30 to 60 litres / min (0.5 to 1 cfm). The max. pressure is 5 bar (73 PSI).

For 1M & 2M sensing heads

Air Purge Collar model no XXXMI3100AP can be used with 1M & 2M sensing heads. Air flows into the fitting and out the front aperture. The pressure of air should be 0.6 to 1 bar (8.7 to 15 PSI). Clean, oil free air is recommended.

Fig: Air Purge Collar XXXMI3100AP

9.3 Electromagnetic Interference

Mount the sensing head as far away as possible from potential sources of electrical interference, such as motorized equipment, which can produce large step load changes.Use shielded cable for all input output connections.

9.4 Mounting Bracket

Install the sensor head at a location from where target is clearly visible. Ensure mounting frame/stand is free from vibration.

Mount sensor on bracket. An option of fixed or adjustable mounting bracket is available. Fixed mounting bracket facilitates horizontal alignment of sensing head, whereas adjustable mounting bracket allows horizontal as well as vertical alignment of the sensing head. Select mounting bracket based on requirement.

For LT, G5 & LTH sensing heads

Fig:A. Fixed mounting bracket XXXMIACFB Fig:B Adj mounting bracket XXXMIACAB

For 1M & 2M sensing heads

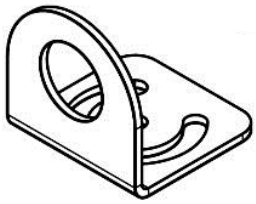


Fig:A. Fixed mounting bracket XXXMI3100FB

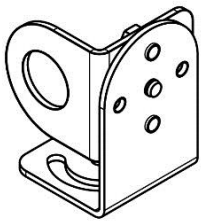


Fig:B. Adj mounting bracket XXXMI3100ADJB

9.5 Right Angle Mirror

The Right Angle Mirror is used to turn the field of view by 90° against the sensor axis. It is recommended when limited space or excessive radiation do not allow for direct alignment of the sensor to the target. The mirror must be installed after the bracket and after the Air Purge Collar and screwed in fully. In dusty or contaminated environments, air purging is required to keep the mirror surface clean.

For LT, G5 & LTH sensing heads

The right angle mirror comes in two different versions:

- Model no XXXMIACRAJ right angle mirror as accessory for air purge jacket or air cooling system
- Model no XXXMIACRAJ1 right angle mirror with integrated air purge (not available for LTH sensing heads)

The right angle mirror withstands ambient temperatures up to 180°C (356°F).

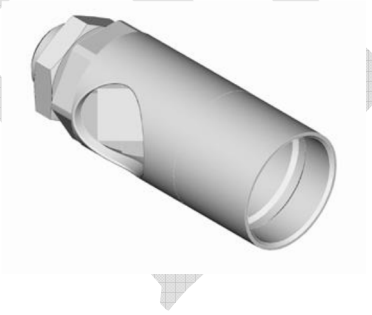


Fig:A. Right Angle Mirror XXXMIACRA

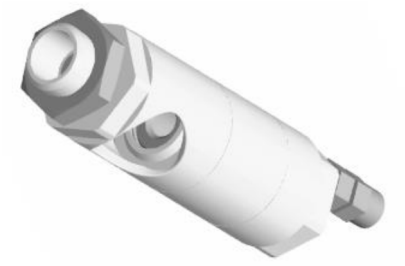


Fig:B. Right Angle Mirror with integrated air purge XXXMIACRAJ1

For 1M & 2M sensing heads

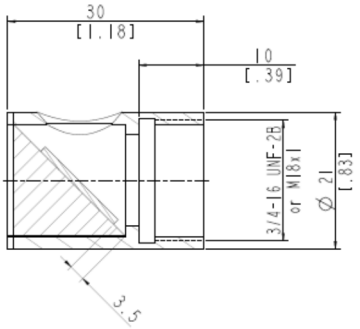


Fig: Dimensional drawing of right angle mirror.
Model no: XXXMI3100RAM

9.6 Protective Window

Protective windows can be used to protect the sensing head from dust and other contamination.
The protective window can be directly screwed onto the sensing head.

For LT, G5 & LTH sensing heads

Fig: Protective Window

Model no	Material	Transmission	T ambient
XXXMIACPW	holder: stainless steel window: Zinc Sulfide (visually transparent, flat)	0.75 ±0.05 (for LT, G5 models)	180°C (356°F)
XXXMI3ACPWP	holder: stainless steel window: Polymer (milky transparent, flat)	0.7 ±0.02 (LT models only)	65°C (149°F)

For 1M & 2M sensing heads

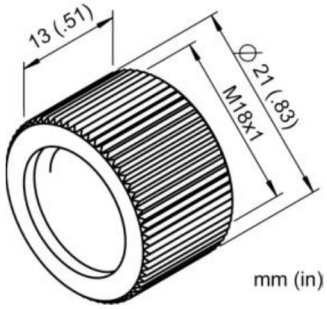


Fig: Protective Window

Model no	Material	Transmission	T ambient
XXXMI3100PW	holder: stainless steel window: fused silica	0.93 ±0.05 (for 1M, 2M models)	120°C (248°F)

9.7 Isolation Accessories

To avoid ground loop problems it is advised that the MI3 sensor be earth grounded either at sensing head, comm box or power supply end.

In case the MI3 is grounded at comm box or power supply end the sensing head needs to be isolated from earth ground.

For LT, G5 & LTH sensing heads

For LT, G5 & LTH sensing heads the air purge jacket acts as an isolation accessory between the sensing head & earth ground

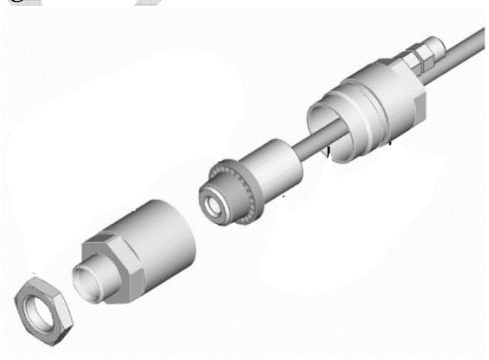


Fig: Air Purge Jacket XXXMIACAJ

For 1M & 2M sensing heads

Isolation kit Model no MI3100ISOKIT can be used for isolating 1M & 2M sensing heads.

Fig: Isolation kit with adjustable mounting bracket MI3100ISOKIT