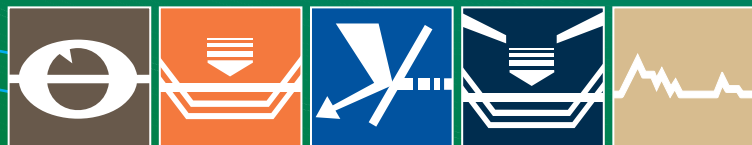


Motion Sensors

For Reliable, Non-Contacting Equipment Protection



Overview



MFA 4p motion failure alarm controller is a highly sensitive single setpoint motion sensor system, used with Milltronics MSP and XPP probes.

Application

The MFA 4p detects changes in the motion and speed of rotating, reciprocating or conveying equipment. It warns of equipment malfunction and signals through contacts to shut down machinery in case of a slowdown or failure. Its reliability makes it a cost-effective way to protect valuable process equipment.

The single setpoint system suits most industrial applications. This versatile unit can be used on tail pulley shafts, driven pulleys, motor shaft sensing, belt or drag conveyors, screw conveyor flights, bucket elevators, fans and pumps.

A special feature is the adjustable 0 to 60 second time delay, allowing the monitored device to accelerate to normal running speed before monitoring begins. A wide range of probes are available to suit specific needs, including high temperatures, corrosive, and Class I, II and III installations. The CE approval allows the MFA 4p to consistently meet the needs of the mining aggregate, cement and other primary and secondary industries.

- Key Applications: tail pulleys, motor shaft sensing, screw conveyor flights, bucket elevators

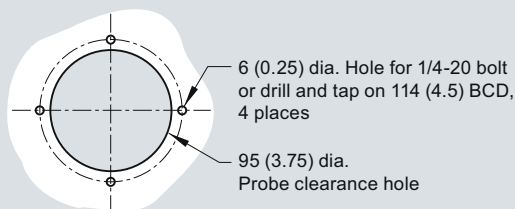
Benefits

- Up to 100 mm (4") gap between target and probe
- Switch selectable overspeed or underspeed detection
- Setpoint adjustment 0.15 to 3000 PPM (pulses/minute)
- Adjustable start-up time delay
- Visual indication of probe operation and relay status
- General purpose, suitable for majority of industrial applications; rugged probe designs provide unmatched reliability

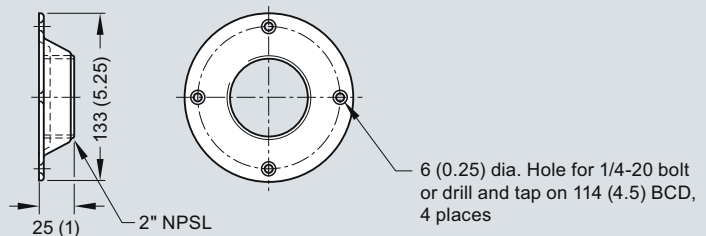
Design

Mounting

Mounting for Milltronics MSP-12, MSP-3, XPP-5

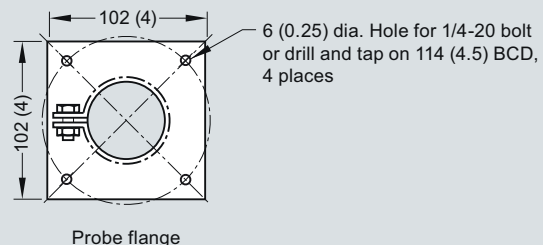
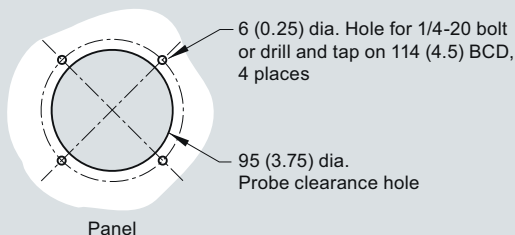


Note: For MSP-1 1.125" (29 mm) clearance hole required.



Note: Mounting flange supplied with probe.

Mounting for Milltronics MSP-9



MSP-1, MSP-12, MSP-3, MSP-9, XPP-5 mounting, dimensions in mm (inch)

Process Protection

Motion sensors

Milltronics MFA 4p

Probes



Standard Milltronics MSP-12

- Heavy-duty general purpose motion probe
- Long lasting phenolic body with internal amplifier
- Convenient mounting flange and locknut for fast installation and setup
- Temperature rating: -40 to 60 °C (-40 to 140 °F)
- Enclosure rating: Type/NEMA 4X, 6, IP67



High temperature Milltronics MSP-3

- Heavy-duty, high temperature aluminum probe designed to withstand operating temperatures to 260 °C (500 °F)
- Cast aluminum probe with convenient mounting flange and locknut
- 1.5 m (5 ft) of high temperature PTFE cable provided. Up to 30 m (100 ft) may be used.
- Amplifier remote mounted in enclosure 140 x 140 x 100 mm (5.5 x 5.5 x 4"), available in cast aluminum (½" NPT conduit entry), painted steel (Type/NEMA 4, IP65 rating), or stainless steel (Type/NEMA 4X, IP65 rating)
- Amplifier temperature rating -40 to 60 °C (-40 to 140 °F)
- Enclosure rating: Type/NEMA 4X, 6, IP67



Stainless high temperature Milltronics MSP-9

- Heavy-duty, high temperature 304 stainless steel probe
- Special construction allows operation of probe in environment up to 260 °C (500 °F)
- 1.5 m (5 ft) special high temperature PTFE cable provided. Up to 30 m (100 ft) may be used.
- Amplifier remote mounted in enclosure 140 x 140 x 100 mm (5.5 x 5.5 x 4"), available in cast aluminum (½" NPT conduit entry), painted steel (Type/NEMA 4, IP65 rating), or stainless steel (Type/NEMA 4X, IP65 rating)
- Enclosure rating: Type/NEMA 4X, 6, IP67
- Amplifier temperature rating -40 to 60 °C (-40 to 140 °F)



Miniature Milltronics MSP-1

- Miniature probe for installations with limited mounting space
- CPVC probe body complete with locknuts
- 1.8 m (6 ft) cable provided. Up to 30 m (100 ft) may be used.
- Amplifier remote mounted in enclosure 140 x 140 x 100 mm (5.5 x 5.5 x 4"), available in cast aluminum (½" NPT conduit entry), painted steel (Type/NEMA 4, IP65 rating), or stainless steel (Type/NEMA 4X, IP65 rating)
- Enclosure rating: Type/NEMA 4X, 6, IP67
- Due to smaller size, probe sensitivity is reduced, gap max. 13 mm (0.5")



Milltronics XPP-5

- CSA hazardous approval (Class I, Div. 1, Groups A, B, C & D; Class II, Div. 1, Groups E, F & G; Class III)
- Phenolic / aluminum body that is fully potted
- Convenient mounting flange and locknut
- 3/4" NPT male hub connection
- Operating temp. from -40 to 60 °C (-40 to 140 °F)
- Enclosure rating: Type/NEMA 4X, 6, IP67



Milltronics RMA (Remote Mounted Amplifier)

- Available for internal mounting within Probe, or in enclosure for remote mounting
- Enclosures available in cast aluminum (½" NPT entry), painted steel (Type/NEMA 4 rating) or stainless steel (Type/NEMA 4X, IP65 rating)
- Operating temp. from -40 to 60 °C (-40 to 140 °F)
- Enclosure rating: Type/NEMA 4X, 6, IP67

MFA 4p motion probes

Technical specifications

Mode of operation

Measuring principle

Motion monitor and alarm

Typical application

Monitoring loss of motion in tail pulley, screw flights, bucket elevators

Features

- Switch selectable overspeed or underspeed detection
- Setpoint adjustment: 0.15 ... 3000 PPM
- Adjustable start-up time delay: 0 ... 60 seconds
- Visual indication of probe operation and relay status

Output

2 relays working in unison, each providing 1 SPDT Form C relay contact, rated 8 A @ 250 V AC resistive

Performance

Repeatability

± 1 %

Dead band

± 0.25 %

Dynamic Range

0 ... 7200 PPM

Ambient Temperature Range

-20 ... +50 °C (-5 ... +122 °F)

Design

Enclosure rating

Type 4X/NEMA 4X/IP65 (standard and optional stainless steel)

Enclosure dimensions

Type 4/NEMA 4/IP65 (optional mild steel)

160 x 240 x 82 mm (6.3 x 9.5 x 3.2")

optional: mild steel or 304 (1.4301) stainless steel
203 x 254 x 102 mm (8 x 10 x 4")

Enclosure material

Polycarbonate

optional: mild steel or stainless steel

Power Supply

100/115/200/230 V AC switch selectable, 50/60 Hz, 15 VA ± 10 % of rated voltage

Certificates and approvals

CE, C-TICK, CSA_{US/C}, FM

Selection and Ordering data	Order No.
MFA 4P Motion Failure Alarm Controller A highly sensitive single setpoint motion sensor system, used with MSP and XPP probes.	C) 7MH7144-
Enclosure NEMA 4X, polycarbonate enclosure NEMA 4, painted mild steel enclosure NEMA 4X, 304 (1.4301) stainless steel enclosure	1 2 3
Input Voltage 100/115/200/230 V AC, 50/60 Hz, switch selectable	A
Speed detection version Standard, underspeed (U/S) or overspeed (O/S), switch selectable Slow speed (S/S), U/S or O/S detection, switch selectable (limit of 15 ppm)	A B
Approvals CE, C-TICK, CSA _{USIC} , FM	2

Selection and Ordering data	Order code
Further designs Please add "-Z" to Order No. and specify Order code(s).	
Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 9000	C11
Acrylic coated, stainless steel tag [69 x 50 mm (2.7 x 1.97")]: Measuring-point number/identification (max. 16 characters), specify in plain text	Y15
Painted mild steel, heated enclosure with viewing window for use down to -50 °C (-58 °F) (finished unit is mounted inside enclosure) 483 X 584 X 203 mm (19 X 23 X 8")	A35
Operating Instructions	Order No.
English	C) 7ML1998-5FM01
French	C) 7ML1998-5FM11
Spanish	C) 7ML1998-5FM21
German	C) 7ML1998-5FM31
Note: The operating instructions should be ordered as a separate item on the order.	
Spare Parts	
Relay	7MH7723-1DW
Transformer	7MH7723-1DX
Circuit Card, standard	C) 7MH7723-1DU
Circuit Card, Slow speed	C) 7MH7723-1DV
Lid with overlay for MFA 4p	C) 7MH7723-1GY

C) Subject to export regulations AL: N, ECCN: EAR99.

Selection and Ordering data	Order No.
Milltronics RMA Remote Mounted Amplifier Remote mounted amplifier for Milltronics MSP-1, MSP-3 and MSP-9 motion sensing probes.	C) 7MH7145-
Enclosure Aluminum enclosure, Type/NEMA 4X, IP65/1/2" NPT entry Painted steel, Type/NEMA 4, IP65 rating 304 (1.4301) stainless steel enclosure, Type/NEMA 4X, IP65 rating	0 A C D

Selection and Ordering data	Order code
Further designs Please add "-Z" to Order No. and specify Order code(s).	
Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 9000	C11
Acrylic coated, stainless steel tag [38 x 51 mm (1.5 x 2")]: Measuring-point number/identification (max. 16 characters), specify in plain text	Y18
Operating Instructions	Order No.
English	C) 7ML1998-5FM01
French	C) 7ML1998-5FM11
Spanish	C) 7ML1998-5FM21
German	C) 7ML1998-5FM31
Note: The operating instructions should be ordered as a separate item on the order. This device is shipped with the Siemens Milltronics manual CD containing the complete operating instructions library.	
Spare Parts	
Card, RMA	C) 7MH7723-1DT

C) Subject to export regulations AL: N, ECCN: EAR99.

Process Protection

Motion sensors

Milltronics MFA 4p

Selection and Ordering data

Order No.

Milltronics Motion Sensing Probes

C) **7MH7146-**

A series of motion sensing probes used with the MFA 4p.

Milltronics MSP-1: miniature motion sensing probe
Milltronics MSP-3: heavy-duty, high temperature aluminum

Milltronics MSP-9: heavy-duty, high temperature stainless steel

Milltronics MSP-12: heavy-duty, general purpose
Milltronics XPP-5: hazardous rated

Note: Milltronics MSP-1, MSP-3 and MSP-9 probes require the use of Milltronics RMA (amplifier)

Cable Length

Standard length (as described in Model options)¹⁾

Add order code Y01 and plain text:

"Total cable length ... m"

Extended cable length 2 ... 30 m (6.6 ... 98.4 ft)

Extended cable length 31 ... 50 m

(101.7 ... 164 ft)²⁾

Extended cable length 51 ... 100 m

(167.3 ... 328.1 ft)²⁾

Model [standard cable length/type]

MSP-1 [1.8 m (6 ft)]

MSP-3, 1/2" NPT cable inlet

[1.5 m (5 ft) high temperature cable]

MSP-9 [1.5 m (5 ft) high temperature cable]

MSP-12, 1/2" NPT cable inlet

XPP-5 [1.5 m (5 ft) cable, (CSA Class I,

Group A, B, C and D; Class II Group E, F and G)]

XPP-5 [10 m (32.8 ft) cable, (CSA Class I, Group

A, B, C and D; Class II Group E, F and G)]

XPP-5 [15 m (49.2 ft) cable, (CSA Class I, Group

A, B, C and D; Class II Group E, F and G)]

Approvals

CE, C-TICK

¹⁾ No Y01 needed in order code for standard length

²⁾ Available with Model options G, H, and J only



Selection and Ordering data

Order code

Further designs

Please add "-Z" to Order No. and specify Order code(s).

Total cable length: enter the total cable length in plain text description

Y01

Acrylic coated, stainless steel tag [13 x 45 mm (0.5 x 1.75")]:

Y17

Measuring-point number/identification (max. 16 characters), specify in plain text

Cable gland kit

A57

Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 9000

C11

Operating Instructions

Order No.

English

C) **7ML1998-5FM01**

French

C) **7ML1998-5FM11**

Spanish

C) **7ML1998-5FM21**

German

C) **7ML1998-5FM31**

Note: The operating instructions should be ordered as a separate item on the order.

This device is shipped with the Siemens Milltronics manual CD containing the complete operating instructions library.

Spare Parts

Locknut, for MSP-1

7MH7723-1CQ

Locknut, for MSP-3, MSP-4, MSP-12, XPP-5

C) **7MH7723-1CR**

Mounting flange, for MSP-3, MSP-4, MSP-12, XPP-5

7MH7723-1CS

Mounting bracket for MSP-9

7MH7723-1CT

Lid, 1/2" NPT cable inlet, for MSP-3, MSP-12

7MH7723-1CU

Lid for MSP-9

7MH7723-1CV

Lid gasket, for MSP-3, MSP-9

F) **7MH7723-1CW**

Lid gasket, for MSP-12

F) **7MH7723-1CX**

Cable gland kit

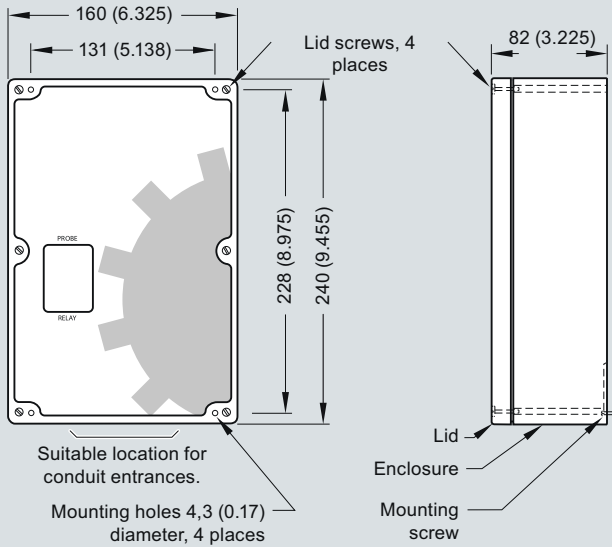
7MH7723-1JN

C) Subject to export regulations AL: N, ECCN: EAR99.

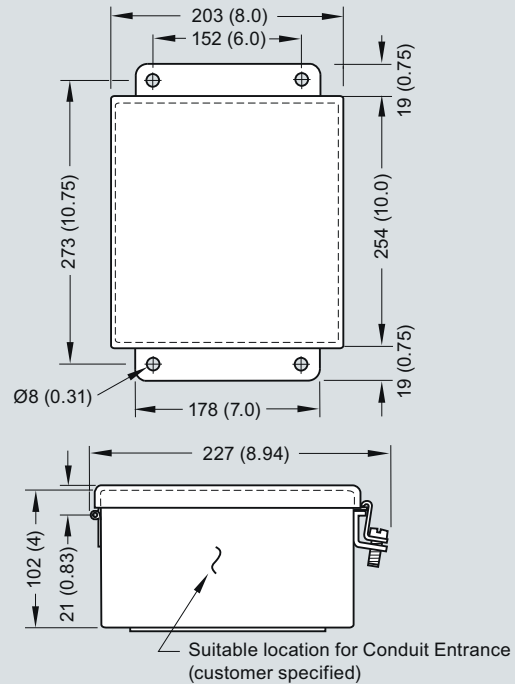
F) Subject to export regulations AL: 91999, ECCN: N.

Dimensional drawings

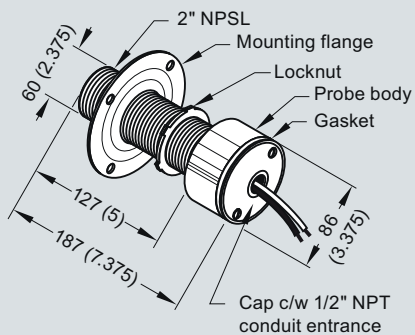
Type 4X/NEMA 4X/IP65 Polycarbonate Enclosure



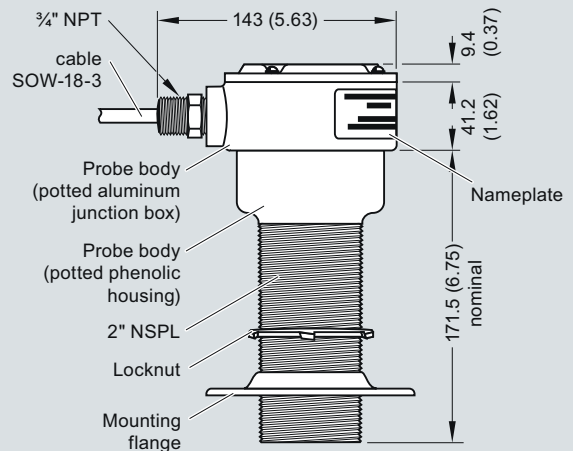
Type 4/NEMA 4/IP65 Painted Steel Enclosure & Type 4X/NEMA 4X/IP65 Stainless Steel Enclosure



Standard Probe MSP-12



Hazardous Locations XPP-5



MFA 4p and probe, dimensions in mm (inch)

SIEMENS



Motion Sensors

Milltronics MFA 4p

Operating Instructions

Edition

08/2017

SIEMENS

Milltronics

Motion Sensors Milltronics MFA 4p

Operating Instructions

<u>Introduction</u>	1
<u>Milltronics MFA 4p Overview</u>	2
<u>Installing/mounting</u>	3
<u>Connecting</u>	4
<u>Service and maintenance</u>	5
<u>Troubleshooting</u>	6
<u>Technical data</u>	7
<u>Dimension drawings</u>	8
<u>Technical Reference</u>	A
<u>Applications</u>	B
<u>Support</u>	C

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
⚠ WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
⚠ CAUTION
indicates that minor personal injury can result if proper precautions are not taken.
NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Table of contents

1	Introduction	5
1.1	Transportation and Storage	5
1.2	Unit Repair and Excluded Liability	5
2	Milltronics MFA 4p Overview	7
3	Installing/mounting	9
3.1	Location Requirements	9
3.2	Proper Mounting	9
3.3	Mounting Details	10
3.4	Wiring.....	11
4	Connecting	13
4.1	MFA 4p Circuit Board Layout.....	13
4.2	Interconnection	14
4.2.1	MSP-3 or MSP-9 Probe with RMA (remote mounted amplifier)	14
4.2.2	MSP-12 Probe with IMA (internally mounted pre-amplifier)	15
4.2.3	XPP-5 with IMA (internally mounted pre-amplifier).....	16
4.2.4	Cable length from RMA or IMA to MFA 4p	16
4.2.5	Interconnection Diagram for XPP-5.....	17
4.3	Connection to Power.....	18
4.4	MFA 4p Wiring for Automatic Start Delay	19
5	Service and maintenance	21
5.1	Calibration	21
5.2	Signal Generator Interface.....	23
5.3	Cleaning.....	24
5.4	Maintenance	24
6	Troubleshooting	25
6.1	Troubleshooting	25
7	Technical data	27
7.1	Power	27
7.2	Performance	27
7.3	Outputs	28
7.4	Construction.....	28
7.5	Approvals	28
7.6	Operating Conditions	29

8	Dimension drawings	31
8.1	MFA 4p.....	31
8.1.1	Type 4X/NEMA 4X/IP65 Polycarbonate Enclosure	31
8.1.2	Type 4/NEMA 4/IP65 Painted Steel Enclosure & Type 4X/NEMA 4X/IP65 Stainless Steel Enclosure	32
8.2	Probes	33
8.2.1	High Temperature Probe MSP-3	33
8.2.2	Stainless Steel Probe MSP-9.....	34
8.2.3	Standard Probe MSP-12.....	35
8.2.4	Hazardous Locations XPP-5.....	36
A	Technical Reference	39
A.1	Principles of Operation.....	39
B	Applications	43
B.1	Bucket Elevators	43
B.2	Bucket Elevator	45
B.3	Shafts	46
B.4	Rotating Shaft of Rotary Feeder	47
B.5	Drive Sprocket on Rotary Feeder	47
B.6	Belt Conveyors.....	48
B.7	Screw Conveyors	48
B.8	Screw Conveyor Flights	49
B.9	End Bearing on Screw Conveyor.....	49
B.10	Non-ferrous Window	50
C	Support	51
C.1	Certificates	51
	Index	53

Introduction

1

This instruction manual covers the installation, operation, and maintenance of the Milltronics MFA 4p.

This instruction manual covers the installation, operation and maintenance of the Milltronics MFA 4p. It is essential that this manual be referred to for proper installation and operation of your unit. Adhering to the installation and operating procedures will insure a quick, trouble free installation and allow for the maximum accuracy and reliability of your motion sensing alarm unit and probes.

Note

The MFA 4p (Motion Failure Alarm) is to be used only in the manner outlined in this manual, otherwise protection provided by the equipment may be impaired.

1.1 Transportation and Storage

 WARNING

Cardboard shipping package provides limited humidity and moisture protection. This product can only function properly and safely if it is correctly transported, stored, installed, set up, operated, and maintained.

1.2 Unit Repair and Excluded Liability

- The user is responsible for all changes and repairs made to the device by the user or the user's agent.
- All new components are to be provided by Siemens Milltronics Process Instruments.
- Restrict repair to faulty components only.
- Do not reuse faulty components.

Milltronics MFA 4p Overview

Milltronics MFA 4p is a highly sensitive, single setpoint motion sensor alarm unit, used with MSP and XPP probes. The probe detects an increase or decrease in the speed of rotating, reciprocating, or conveying equipment and sends the information to the MFA 4p. The MFA 4p works with a pre-amplifier which can be internal to the motion sensing probe or remote from the motion sensing probe.

Pulses generated from the probe are continually compared to the adjustable setpoint. If the pulse rate is lower than the setpoint, the alarm relays operating in a fail-safe mode will de-energize, indicating failure. The relays will not energize until the pulse rate increases above the setpoint.

Installing/mounting

Note

Installation shall only be performed by qualified personnel and in accordance with local governing regulations.

3.1 Location Requirements

The MFA 4p (and RMA if applicable) must be mounted in a non-hazardous area that is clean, dry, vibration-free, within the ambient temperature range, and non-corrosive to the electronics or its enclosure. The door should be accessible for viewing and to allow calibration of the MFA 4p.

Consider the probe location carefully before installation. Avoid strong magnetic fields (50/60 Hz) from nearby power transformers, heater elements, or large industrial motors, because these can affect the probe's performance.

Note

Do not mount MFA 4p in direct sunlight.

3.2 Proper Mounting

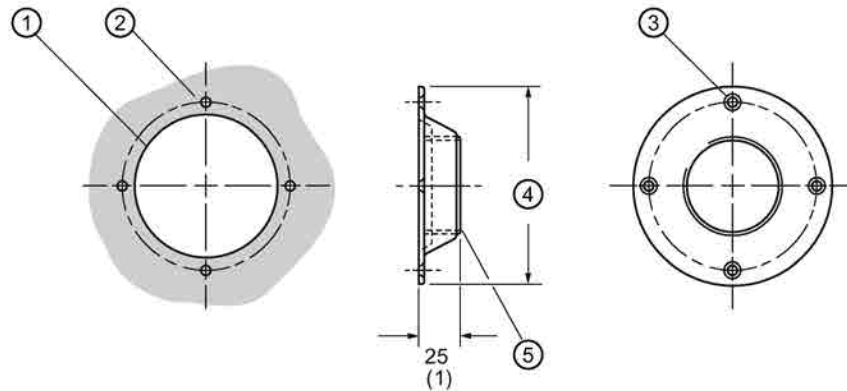
The probe should be mounted onto a vibration free structure using the mounting flange. The gap between probe and target should be large enough to prevent the target from damaging the probe. The probe environment must be within the probe's ambient temperature range and non-corrosive to the probe's body. Refer to Applications (Page 43).

The probe design detects a changing magnetic field, typically caused by a ferromagnetic target disturbing the probe's magnetic field. Extremely strong magnetic fields (like those produced by the 30 A/m requirements of 1EC 60004-8, Power Frequency Magnetic Field Immunity test) will be detected and will result in loss of functionality.

Functionality loss indicators:

- Alarm conditions by relay trip
- False pulse readings in LED1

MSP-3, MSP-12, XPP-5 Mounting Details



Dimensions in mm (inch)

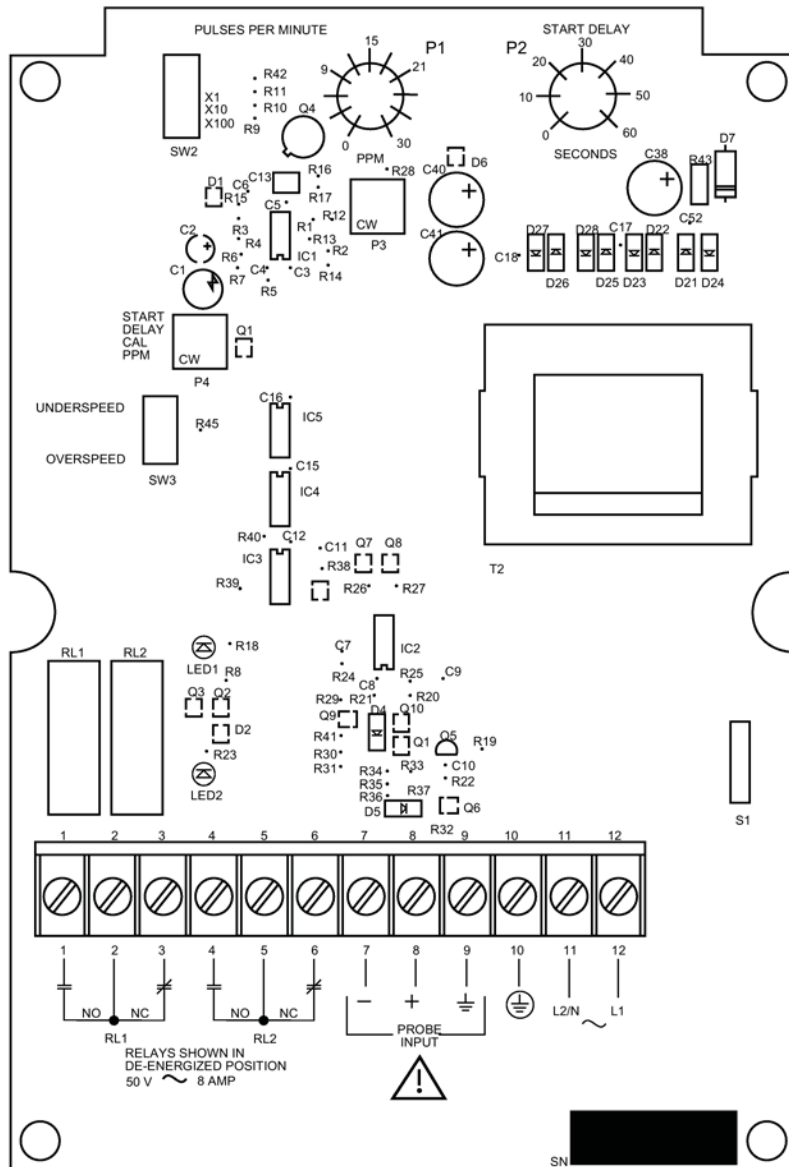
- ① 95 (3.75) \varnothing probe clearance hole
- ② 6 (0.25) \varnothing hole for $\frac{1}{4}$ - 20 nut and bolt or drill and tap, four holes on 114 (4.5) BCD
- ③ 6 (0.25) \varnothing hole for $\frac{1}{4}$ - 20 bolt on 114 (4.5) BCD, four places
- ④ 113 (5.25) O.D.
- ⑤ 2" NSPL

3.4 Wiring

Where possible, the probe components should be interconnected via flexible conduit. This allows for easier removal or adjustment of the probe and mounting flange assembly.

Connecting

4.1 MFA 4p Circuit Board Layout

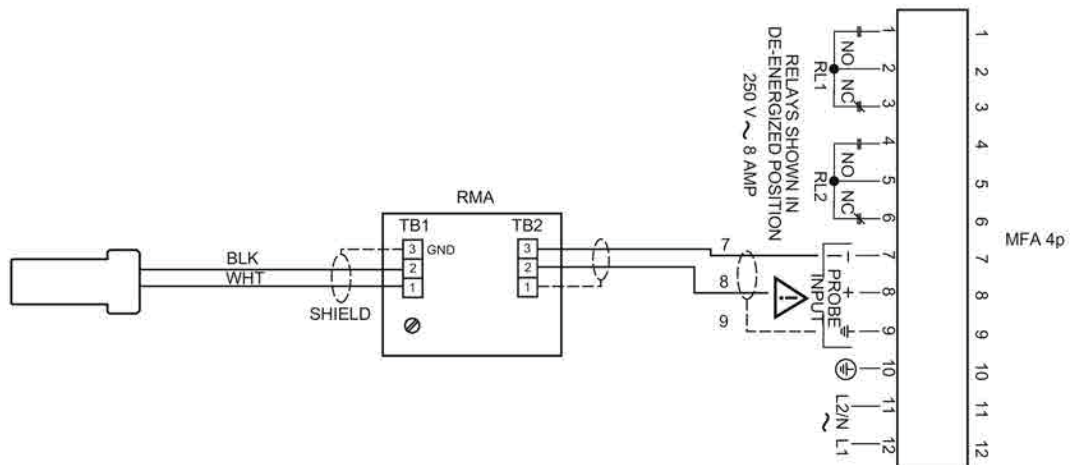


4.2 Interconnection

Note

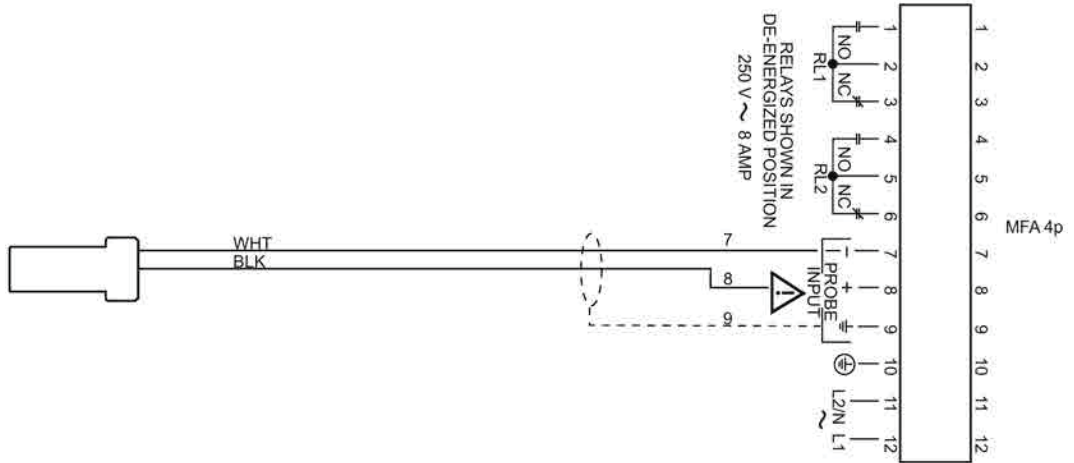
Use shielded cable and connect all cable shields to the MFA shield terminals to avoid differential ground loops.

4.2.1 MSP-3 or MSP-9 Probe with RMA (remote mounted amplifier)



Maximum cable length from probe to RMA is 30 m/100 ft of shielded cable, 18 ga. wire. See Cable length from RMA or IMA to MFA 4p (Page 16) for cable lengths from RMA to main group.

4.2.3 XPP-5 with IMA (internally mounted pre-amplifier)



XPP-5 cable must be run in dedicated, approved metal conduit, boxes and fittings and to procedures in accordance with all governing regulations. See Cable length from RMA or IMA to MFA 4p (Page 16) for cable lengths from probe at MFA 4p.

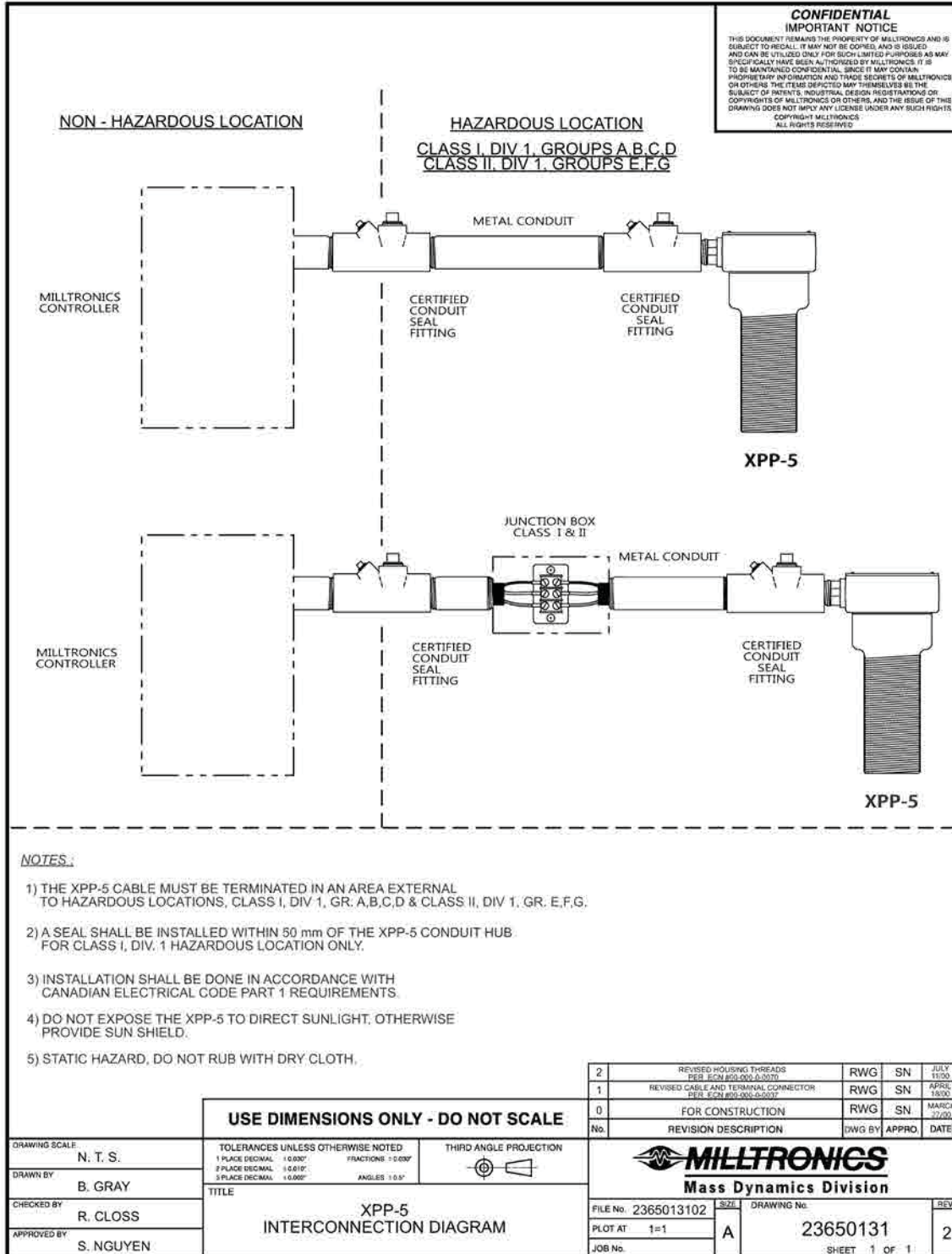
Note

Refer to Interconnection Diagram for XPP-5 (Page 17)

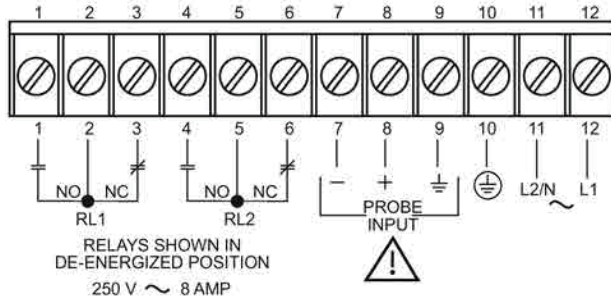
4.2.4 Cable length from RMA or IMA to MFA 4p

Wire gauge	Length in feet	Length in meters
22 AWG (0.34 mm ²)	2 500	760
18 AWG (0.75 mm ²)	5 000	1 520
12 AWG (4 mm ²)	25 000	7 600

4.2.5 Interconnection Diagram for XPP-5

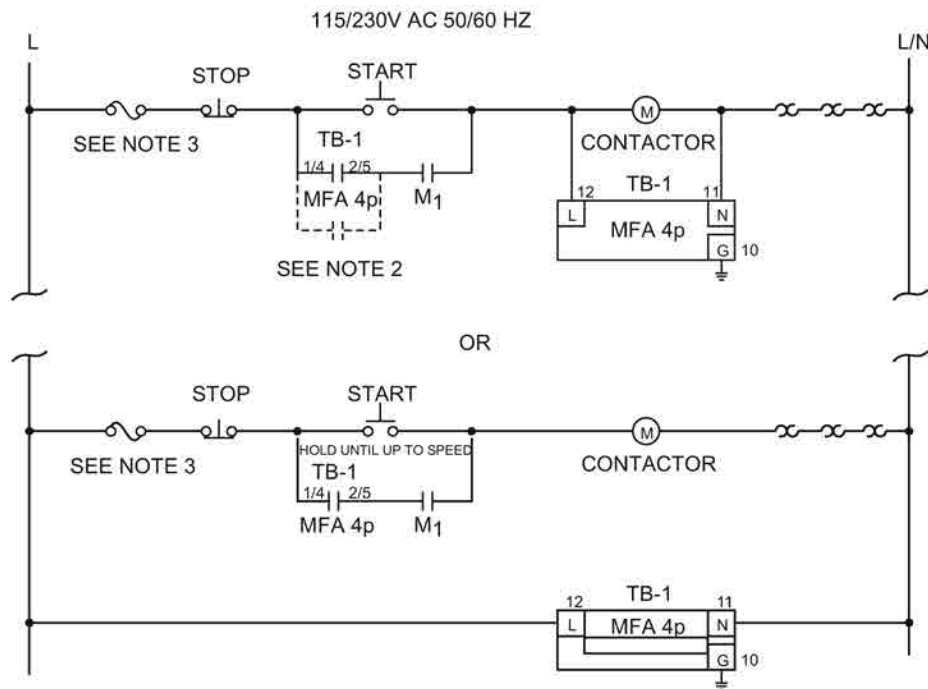


4.3 Connection to Power



- Terminal 10 must be connected to reliable ground.
- All current-carrying conductors must be protected by a fuse or circuit breaker in the building installation, having a breaking capacity of up to 15 A.
- A circuit breaker or switch in the building installation, marked as the disconnect switch, must be in close proximity to the equipment and within easy reach of the operator, and must disconnect all current-carrying conductors.
- AC input circuit, relay circuits, min. 14 AWG copper wire.
- Recommended torque on terminal clamping screws, 7 inch/lb max.
- All field wiring shall have insulation suitable for the highest applied input or relay voltage (whichever is greater).
- Relay contact terminals are for use with equipment that has no accessible live parts and wiring that has insulation suitable for at least 250 V. The maximum allowable working voltage between adjacent relay contacts shall be 250 V.

4.4 MFA 4p Wiring for Automatic Start Delay



Note

1. Interlocks and Safety Pull Switches are not shown.
2. If **START** is initiated by programmable logic controller, closure time may be too brief to allow MFA 4p contact to latch. In this case, program a timer contact into the circuit.
3. CSA requires an 8 A or less fuse to protect contacts. For 240 V AC, protect the contacts with a 1 500 VA transformer as well.

Should the **Time Delay** feature on start-up not be required, power should be applied continuously from a separate source and the potentiometer turned to zero. This is usually necessary for automatic up-stream startup of conveying devices after the down-stream drive has reached its operation speed.

Service and maintenance

5.1 Calibration

The probe and pre-amplifier require no calibration.

Connect the probe, pre-amp, and MFA 4p as shown in the Interconnection (Page 14) chapter. Connect the MFA 4p to power as shown in the Connection to Power (Page 18) diagram, and if applicable, as shown for MFA 4p Wiring for Automatic Start Delay (Page 19).

Note

To help the calibration procedure, short N.O. contacts of relays to prevent motor shutdown (terminals 1 to 2 and/or 4 to 5). This allows the system to run uninterrupted until an operating setpoint is established.

MFA 4p

Refer to MFA 4p Circuit Board Layout (Page 13)

1. Operate monitored equipment at its normal operating speed.
2. Confirm that Probe LED 1 is pulsing at a regular frequency.
3. Set **Start Delay** fully counter-clockwise (**CCW**) to **0** seconds.

Underspeed

1. Set switch **SW3** to **Underspeed**.
2. Set **pulses per minute (ppm)** switch **SW2** to **X 100** position.
3. Turn **ppm** potentiometer fully clockwise (**CW**) to **30**.
4. Determine incoming pulse rate by slowly turning **ppm** potentiometer **CCW** until relay LED 2 goes on. As the MFA 4p requires 2 pulses within range before energizing relays, low **ppm** applications (e.g. **2 ppm**) may require stepping of potentiometer at appropriate time intervals.
5. If no response is obtained when you set the **ppm** potentiometer to **3** (below this stability suffers), reset potentiometer fully **CW**, set switch **SW2** to **X 10** and then **X 1** if required, and repeat step 4.
6. When Relay LED 2 goes on, indicating the incoming pulse rate, turn potentiometer **CCW** slightly past this point to obtain an operating setpoint that allows for normal fluctuations due to load and voltage variations. For 50 % of full speed, set potentiometer (and **SW2** if required) to halfway between incoming pulse rate of normal speed and **0 ppm**.
7. Set **Start Delay** by adjusting potentiometer so that equipment being monitored can attain normal operating speed before LED 2 can turn off.

5.1 Calibration

Overspeed

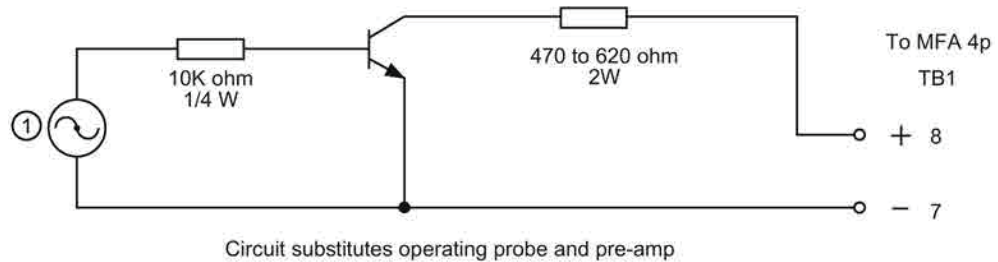
1. Set switch **SW3** to **Overspeed**.
2. Set **ppm** switch **SW2** to **X 1** position.
3. Set **ppm** potentiometer fully **CCW** to **0**.
4. Determine incoming pulse rate by slowly turning **ppm** potentiometer **CW** until Relay LED 2 goes on. Because the MFA 4p requires 2 pulses within range before energizing relays, low **ppm** applications (e.g. **2 ppm**) may require stepping of potentiometer at appropriate time intervals.
5. If no response is obtained when you set the **ppm** potentiometer to **3**, (below this stability suffers), reset potentiometer fully **CCW** and set switch **SW2** to **X 10**, and then **X 1** if required, and repeat step 4.
6. When Relay LED 2 goes on, indicating the incoming pulse rate, turn potentiometer **CW** slightly past this point to obtain an operating setpoint that allows for normal fluctuations due to load and voltage variations.

Note

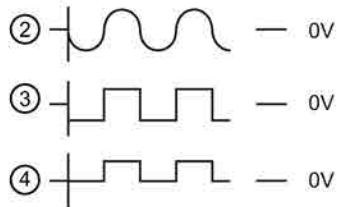
If N.O. contacts were shorted as described in final note of calibration preamble, remove them now as calibration is complete.

5.2 Signal Generator Interface

The following circuit may be used for calibrating or for troubleshooting the MFA 4p



Set ① for:



- ① Signal generator
- ② 6 V p-p sine
- ③ 6 V p-p square
- ④ 3 V p square

5.3 Cleaning

If it is necessary to clean the enclosure and circuit boards:

1. First, make sure the power is disconnected at the main breaker.
2. Use a vacuum cleaner and a clean, dry paint brush.
3. Check all electrical contacts for corrosion and arcing.

It is a good idea to periodically check the face of the probe: it should be free of material buildup, corrosion or deformation.

5.4 Maintenance

The Motion Failure Alarm MFA 4p requires no maintenance: however, we recommend a program of periodic checks.

6

Troubleshooting

6.1 Troubleshooting

	LED 1	LED 2	Term 7/8 (note 1)	C8	Term 1/2 relay 1 out	Term 4/5 relay 2 out
Normal	pulsing	on	24 V	27 V	closed	closed
Alarm	pulsing	off	24 V	27 V	open	open
Probe reversed polarity	on	off	20 V	27 V	open	open
Probe wiring open circuit	off	off	27 V	27 V	open	open
Probe wiring short circuit	off	off	0 V	27 V	open	open
Relay defective	pulsing	on	24 V	27 V	open	open

Notes:

- Voltage levels are DC, nominal values, and may appear to be pulsing, coincidental with LED 1.
- If diagnosis does not solve the malfunction, the probe, pre-amp or MFA 4p may be defective.
- If no spare circuit boards or probes are available for interchanging, the MFA 4p may be tested as follows in order to determine which section is defective:
 - To find out if the MFA 4p is defective:
 - i. Disconnect the pre-amp.
 - ii. Set ppm switch **SW2** to **X 1** position and turn potentiometer to 15.
 - iii. Connect one lead of a 530 ohm, 1 watt resistor to terminal 7 and then momentarily contact terminal 8 at a rate of once per second. If the MFA 4p is functional, the relays will energize after two pulses and de-energize approximately 8 seconds after last pulse.
 - To find out if the RMA is defective:
 - i. Disconnect pre-amp from the MFA 4p. Attach probe across terminals TB1 1/2 and a 24 V DC (floating) power supply across terminals TB2 3/2, according to the MSP-3 or MSP-9 Probe with RMA (remote mounted amplifier) (Page 14) connection diagram.
 - ii. Run equipment to be monitored at normal operating speed or pass a ferrous object in front of and as close to probe as possible at a continuous rate.
 - iii. With an oscilloscope, look for approximately 6 V peak to peak pulses or alternating hi/lo levels across ground and link 3. Or with an amp meter connected in series between the RMA and the 24 V DC power supply, look for hi/lo levels of approximately 12 mA/40 mA alternating at the rate of the passing ferrous objects.
 - To find out if the probe is defective (non-IMA type only; i.e. MSP-3 and MSP-9):
 - i. Disconnect probe from pre-amp.
 - ii. Connect an ohm meter across the black and white leads.
 - iii. Nominal probe impedances are as follows:

MSP-3 and MSP-9	750 ohms
-----------------	----------

If impedance deviates substantially from these values, an open or short circuit condition is indicated.

Note

Always use product in accordance with specifications.

7.1 Power

- 100 ... 240 V AC \pm 10 %, 50/60 Hz, 15 VA
Fuse: 5 x 20 mm, Slow Blow, 1A, 250 V

7.2 Performance

Repeatability

- \pm 1 %

Temperature coefficient (setpoint variance)

- 0.018 %/°C (0.01 %/°F)

Setpoint adjustment range

- 2 ... 3 000 ppm (pulses per minute): standard model
- 0.15 ... 15 ppm: slow speed version

Dynamic range

- 0 ... 7 200 ppm

7.3 Outputs

- 2 relays with Form C (S.P.D.T.) fail-safe contacts (relays operate in unison)

Resistive rating

- 8 A @ 250 V AC

7.4 Construction

Weight

- Polycarbonate enclosure: 1.5 kg (3.3 lb)
- Mild steel or stainless steel enclosure: 4.3 kg (9.5 lb)

7.5 Approvals

- CE, CSA_(C/US), FM
- EMC performance available on request

7.6 Operating Conditions

Location	Indoor/outdoor
Altitude	2 000 m max.
Ambient temperature	-20 ... 50 °C (-4 ... 122 °F)
Relative humidity	Suitable for outdoor (Type 4X / NEMA 4X / IP65)*
Installation category	II
Pollution degree	4

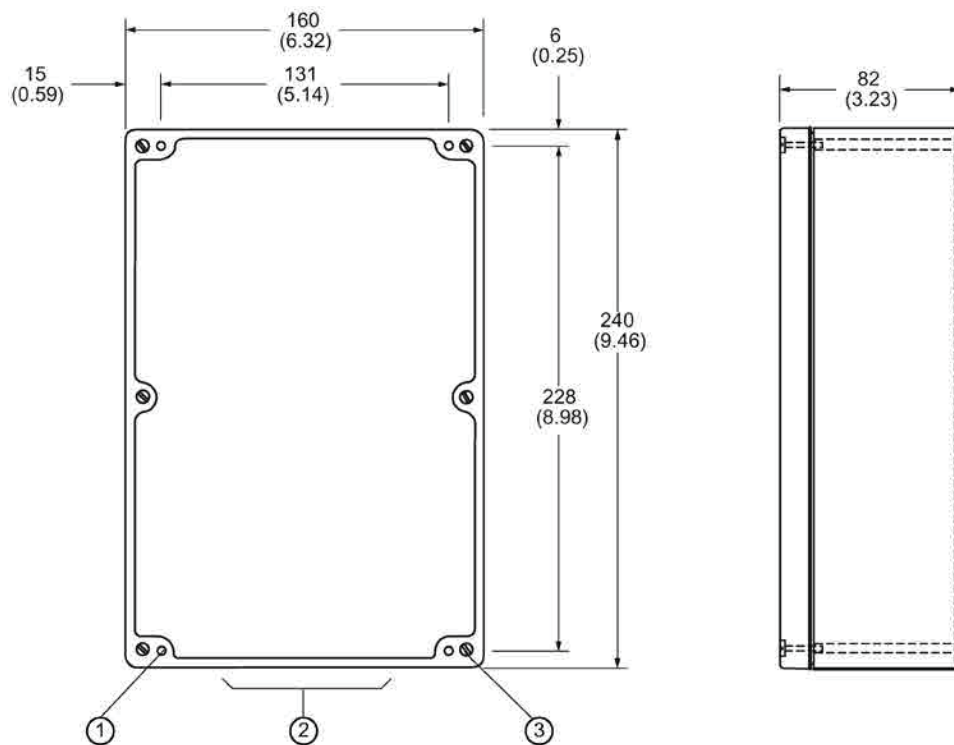
*Type 4/ NEMA 4 /IP65 with mild steel enclosure

Related Equipment	Ambient Temperature Range	Approx wt.
RMA	-40 ... 60 °C (-40 ... 140 °F)	2.3 kg (5 lb)
MSP-12	-40 ... 60 °C (-40 ... 140 °F)	1.4 kg (3 lb)
XPP-5	-40 ... 60 °C (-40 ... 140 °F)	1.8 kg (4 lb)
MSP-3	-50 ... 260 °C (-58 ... 500 °F)	1.4 kg (3 lb)
MSP-9	-50 ... 260 °C (-58 ... 500 °F)	1.8 kg (4 lb)

Dimension drawings

8.1 MFA 4p

8.1.1 Type 4X/NEMA 4X/IP65 Polycarbonate Enclosure



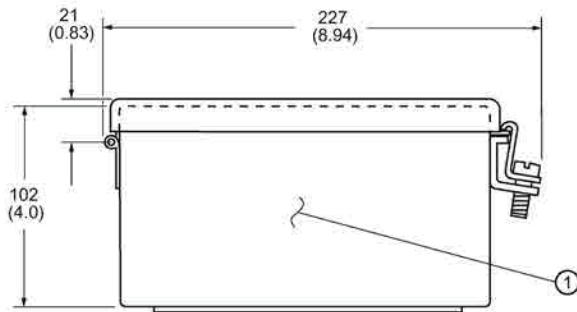
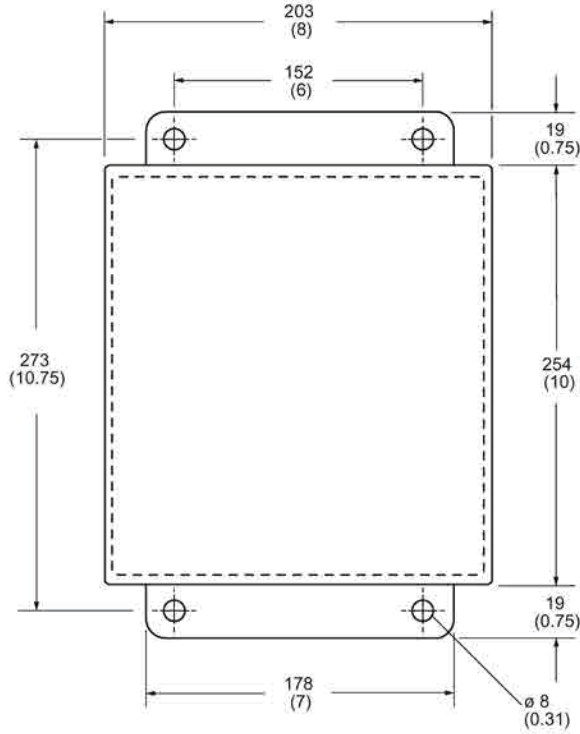
Dimensions in mm (inch)

- ① 4.3 (0.17) \varnothing mounting holes, 4 places
- ② Suitable location for conduit entrance
- ③ Lid screws

Note

- Non-metallic enclosure does not provide grounding between conduit connections: use grounding type bushings and jumpers.
 - Use only approved, suitable size hubs for watertight application.
-

8.1.2 Type 4/NEMA 4/IP65 Painted Steel Enclosure & Type 4X/NEMA 4X/IP65 Stainless Steel Enclosure



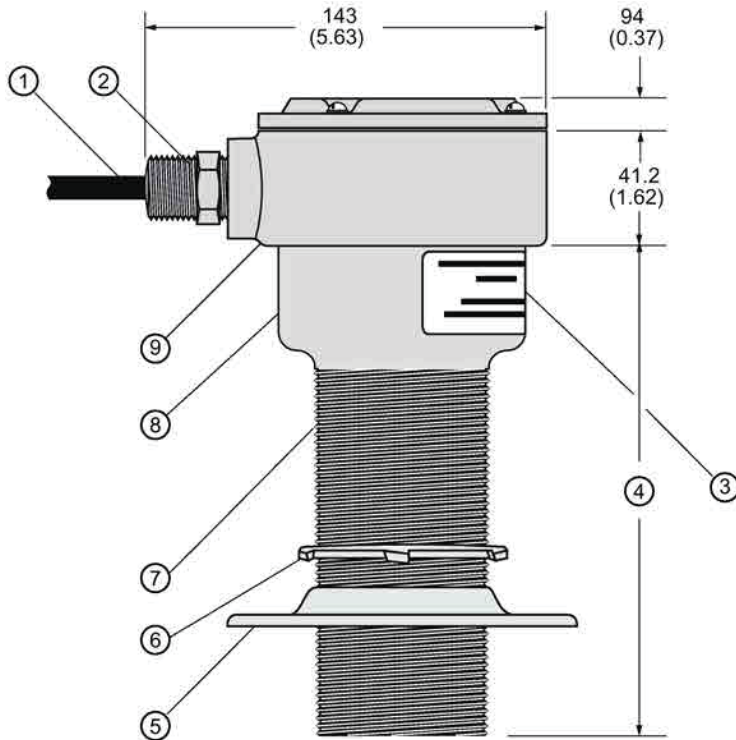
Dimensions in mm (inch)

① Suitable location for conduit entrance (customer specified)

Note

- Painted steel enclosure does not provide grounding between conduit connections: use grounding type bushings and jumpers.
- Use only approved, suitable size hubs for watertight application.

8.2.4 Hazardous Locations XPP-5



Dimensions in mm (inch)

- ① 2 conductor shielded cable
- ② ¾" NPT
- ③ Nameplate
- ④ 171.5 (6.75) nominal
- ⑤ Mounting flange
- ⑥ Locknut
- ⑦ 2" NSPL
- ⑧ Probe body (potted aluminum housing)
- ⑨ Probe body (potted aluminum junction box)

- C.S.A Approved for:
 - Class I, Div. 1, Groups A, B, C, and D
 - Class II, Div. 1, Groups E, F, and G
 - Class III
- Aluminum body with die-cast flange and zinc-plated locknut.
- Pre-amp and cable potted in the probe's body.

See also

Interconnection Diagram for XPP-5 (Page 17)

XPP-5 with IMA (internally mounted pre-amplifier) (Page 16)

Mounting Details (Page 10)