SIEMENS

SITRANS

Motion Sensors
SITRANS WM300 MFA

Operating Instructions

7MH77-.....(WM300 MFA)

06/2019
A5E45090709-AB

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

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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.

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Introduction 1

1.1 Purpose of this documentation

These instructions are a brief summary of important features, functions and safety information, and contain all information required for safe use of the device. Read the instructions carefully prior to installation and commissioning. In order to use the device correctly, first review its principle of operation.

The instructions are aimed at persons who install and commission the device.

To realize optimum performance from the device, read the complete operating instructions.

1.2 Document history

The following table shows major changes in the documentation compared to the previous edition.

Edition	Note
06/2019	Corrections to Technical data
01/2019	First edition

1.3 FW revision history

Firmware revision	Date	Changes
1.00.00	January 1, 2019	• Initial release

1.4 Checking the consignment

1. Check the packaging and the delivered items for visible damages.
2. Report any claims for damages immediately to the shipping company.
3. Retain damaged parts for clarification.
4. Check the scope of delivery by comparing your order to the shipping documents for correctness and completeness.

⚠ WARNING

Using a damaged or incomplete device

Risk of explosion in hazardous areas.

- Do not use damaged or incomplete devices.

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly packaged to provide sufficient protection during transport. Siemens cannot assume liability for any costs associated with transportation damages.

⚠ CAUTION

Insufficient protection during storage

The packaging only provides limited protection against moisture and infiltration.

- Provide additional packaging as necessary.

1.5 Unit repair and excluded liability

All changes and repairs must be done by qualified personnel, and applicable safety regulations must be followed. Please note the following:

- The user is responsible for all changes and repairs made to the device.
- All new components must be provided by Siemens.
- Restrict repair to faulty components only.
- Do not re-use faulty components.

Note

This product is intended for use in industrial areas.

In a domestic environment this device may cause radio interference.

SITRANS WM300 MFA Overview

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SITRANS WM300 MFA is a highly sensitive, dual 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 SITRANS WM300 MFA. The SITRANS WM300 MFA 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 or higher 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 or below the setpoint.

The relays can be reset automatically or manually. See Motion Failure Alarm (Page 32).

The SITRANS WM300 MFA is configured for a specific application and must be programmed and hardwired according to application requirements. Unused inputs or outputs have no effect on the devices specific operation and must not be wired to any other any other peripheral equipment.

Installing/mounting

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3.1 Safety Note

Note

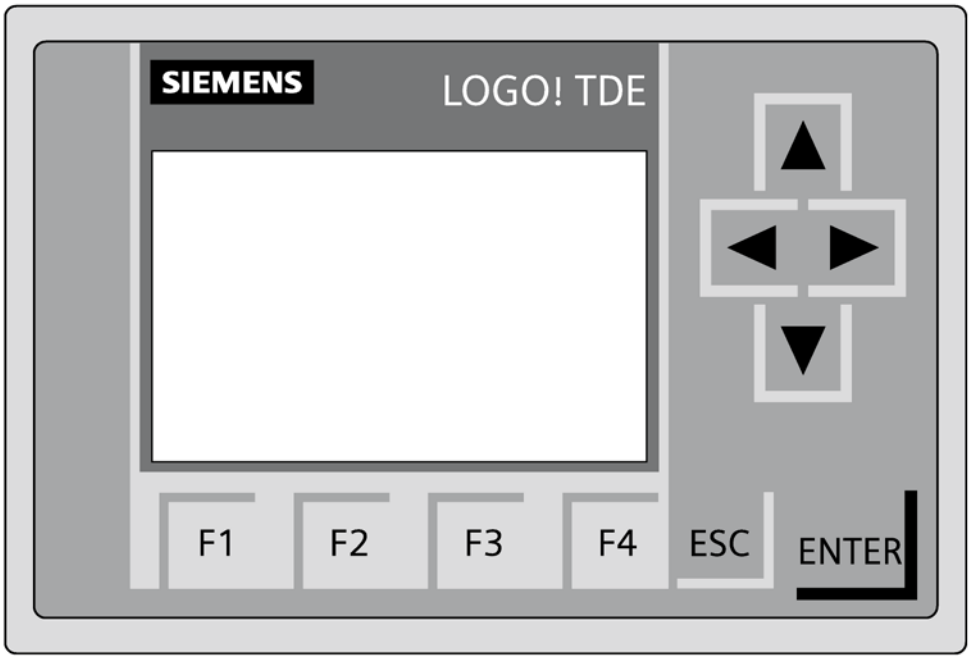
Installation shall only be performed by qualified personnel and in accordance with local governing regulations.

3.2 Location Requirements

The SITRANS WM300 MFA (and RMA or NCT and power supply converter 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 cabinet door should be accessible for viewing and to allow calibration of the SITRANS WM300 MFA.

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.

An additional remote display can be connected to the SITRANS WM300 MFA for access to the unit within an enclosure.



Note

Do not mount SITRANS WM300 MFA in direct sunlight.

The SITRANS WM300 MFA can be DIN or wall mounted. In a stand-alone enclosure or panel arrangement, the device can use a power transformer to take AC to DC voltage. An additional NCT analog output module is necessary to be integrated into the SITRANS WM300 MFA bus connection and additional RMA depending on the application requirements.

3.3 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 69).

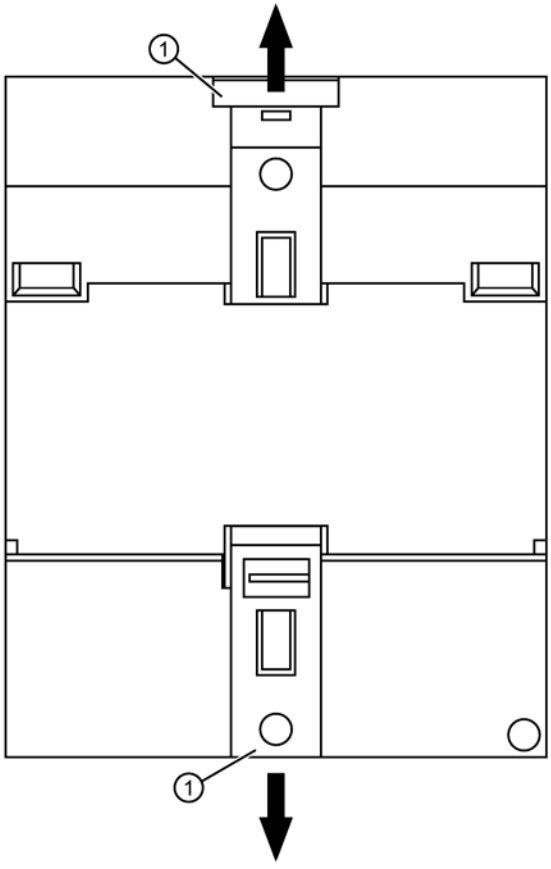
The probe design detects a changing magnetic field, typically caused by a ferromagnetic target disturbing the probe's magnetic field. Extremely strong magnetic fields (like those produced by the 30 A/m requirements of 1EC 60004-8, Power Frequency Magnetic Field Immunity test) will be detected and will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

Functionality loss indicators:

- Alarm conditions by relay output

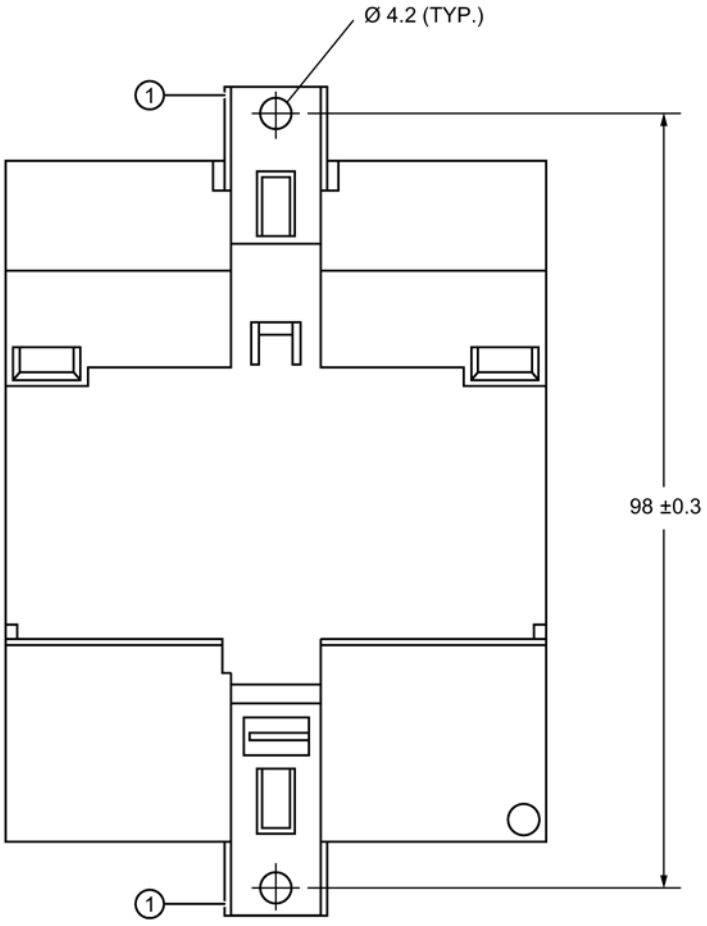
3.4 Mounting Details

To mount the SITRANS WM300 MFA or other components, slide the DIN rail mounting clips outside of the enclosure and to the mounting holes.



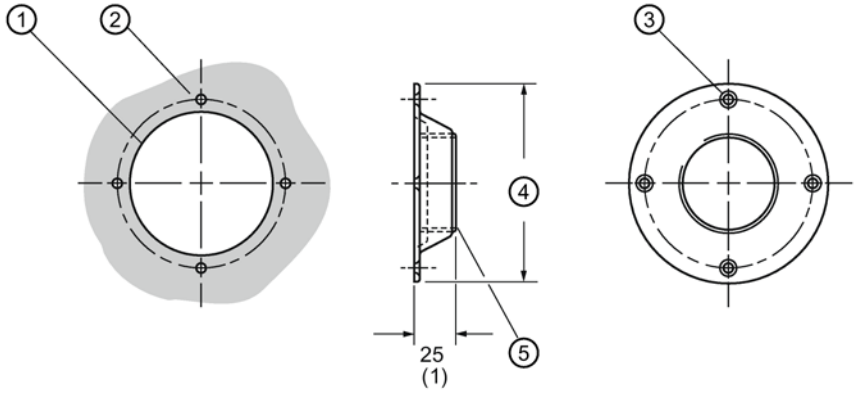
① Mounting slide

For wall mounting slide the tabs out and mount to the wall/post with M4 screws.



① Mounting slide

MSP-3, MSP-7, MSP-12, XPP-5 Mounting Details



Dimensions in mm (inch)

① 95 (3.75) ∅ probe clearance hole

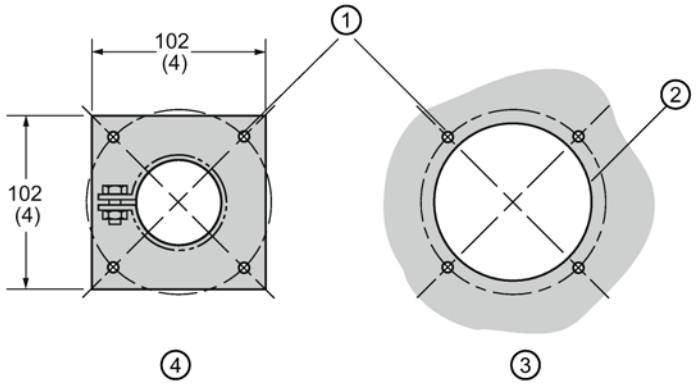
② 6 (0.25) ∅ hole for ¼ - 20 nut and bolt or drill and tap, four holes on 114 (4.5) BCD

③ 6 (0.25) ∅ hole for ¼ - 20 bolt on 114 (4.5) BCD, four places

④ 113 (5.25) O.D.

⑤ 2" NSPL

MSP-9 Mounting Details



Dimensions in mm (inch)

① 6 (0.25) ∅ 4 holes equally spaced on a 114 (4.5) BCD

② 95 (3.75) ∅ probe clearance hole

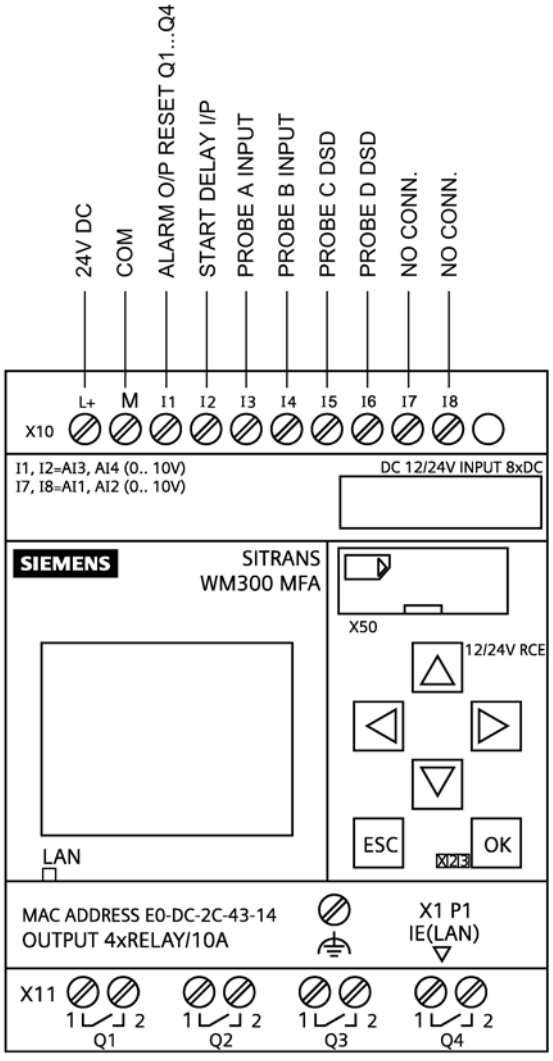
③ Panel cutout

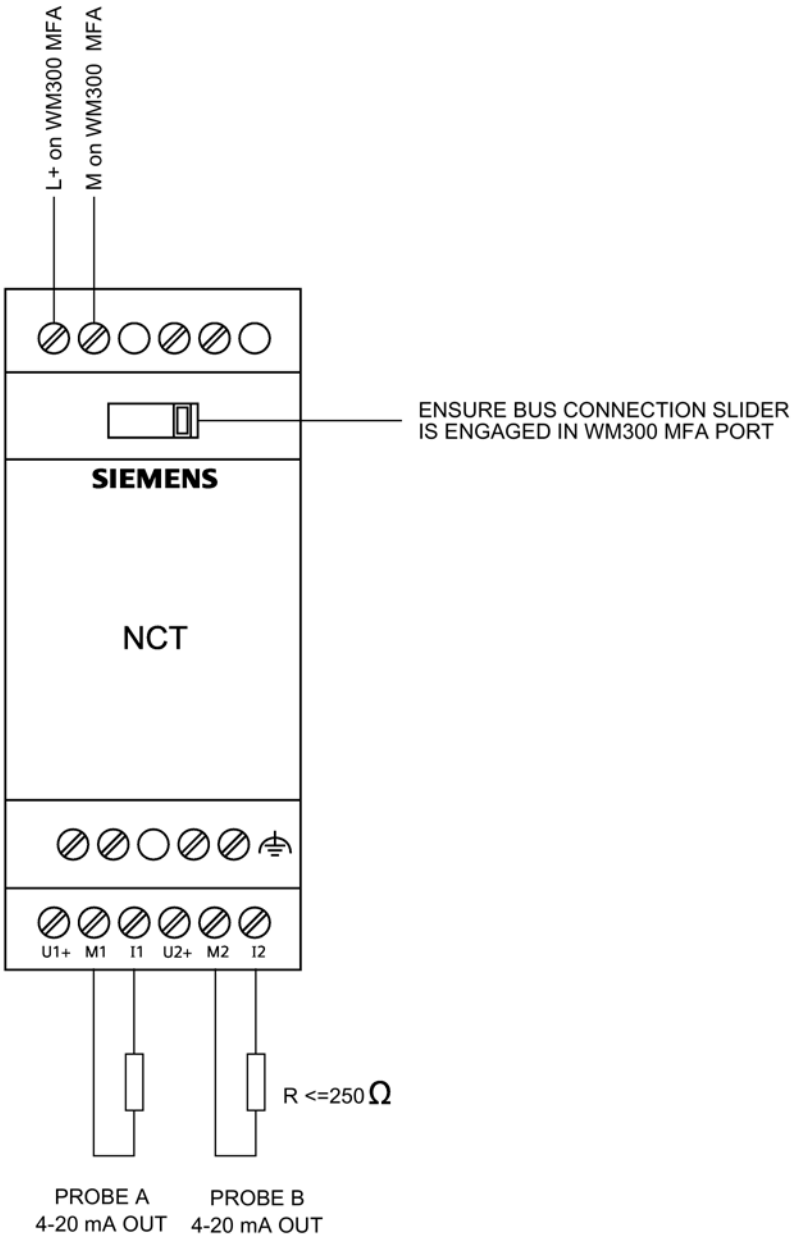
④ Probe flange

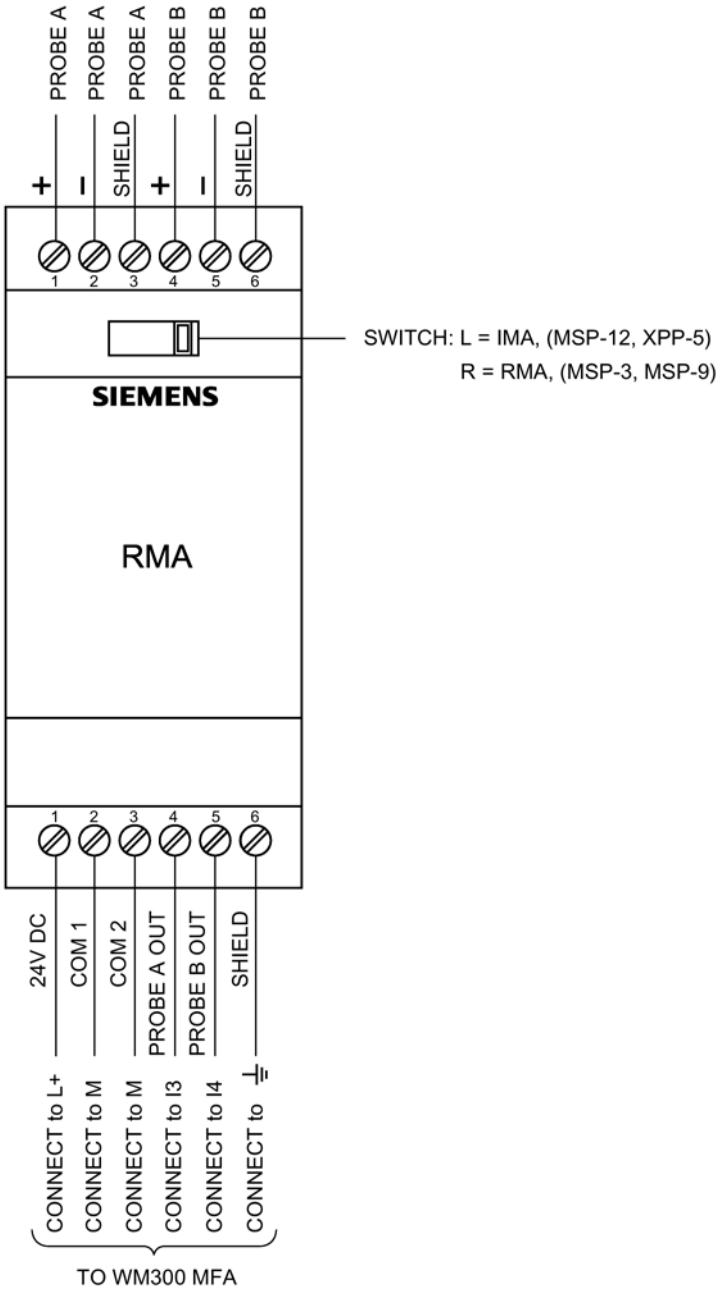
- For high temperature and corrosion resistant applications
- 304 stainless steel body comes with stainless steel clamp and silicone gasket

3.5 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.




L+ on WM300 MFA
M on WM300 MFA
ENSURE BUS CONNECTION SLIDER
IS ENGAGED IN WM300 MFA PORT
SIEMENS
NCT
U1+ M1 I1 U2+ M2 I2
R <=250 Ω
PROBE A
4-20 mA OUT
PROBE B
4-20 mA OUT



Note

RMA not required for use with MSP-7. Proper switch selection must be made to ensure correct signal conditioning. Improper switch selection may damage the device.

Connecting

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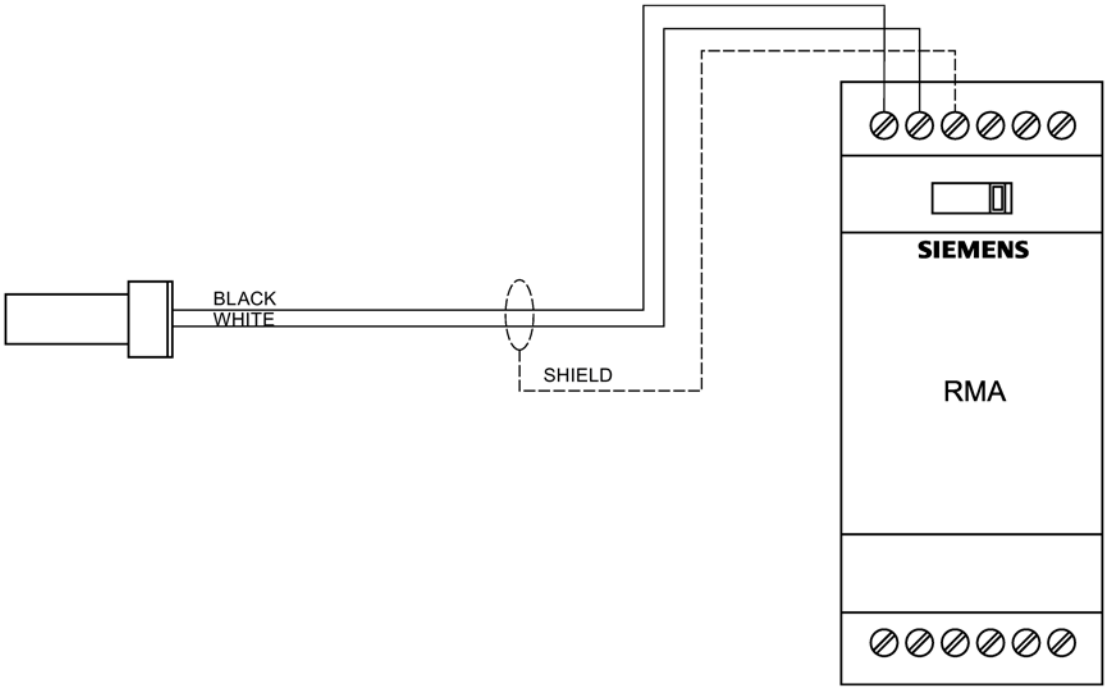
4.1 Interconnection

Note

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

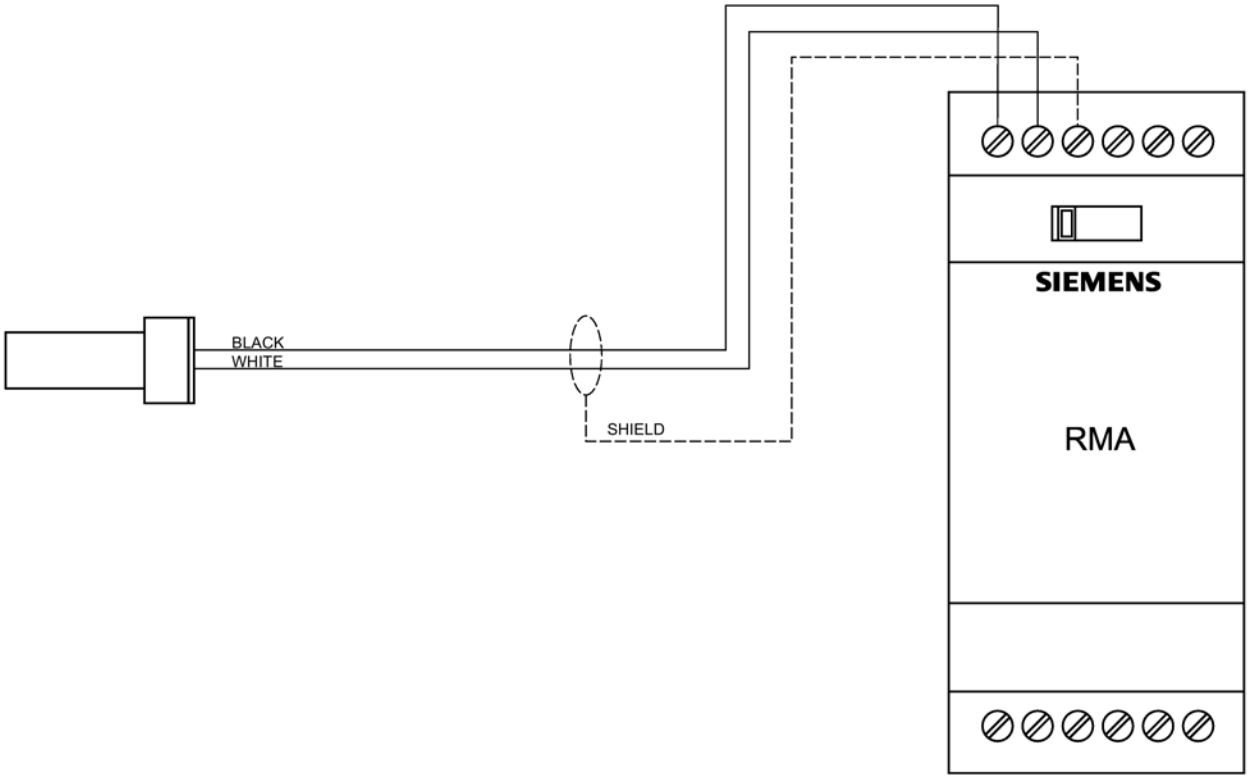
4.1.1 MSP-3 or MSP-9 Probe with RMA (remote mounted amplifier)



- RMA selector switch to the right
- Maximum cable length from probe to RMA is 30 m/100 ft of shielded cable, 18 ga. wire.
- 1.5 m (5 ft) Belden 83321 Teflon[1)] cable potted in probe
  See Cable length from RMA or IMA to WM300 MFA (Page 23) for cable lengths from RMA to main group.

[1)] Teflon is a registered trademark of E.I. du Pont de Nemours and Company

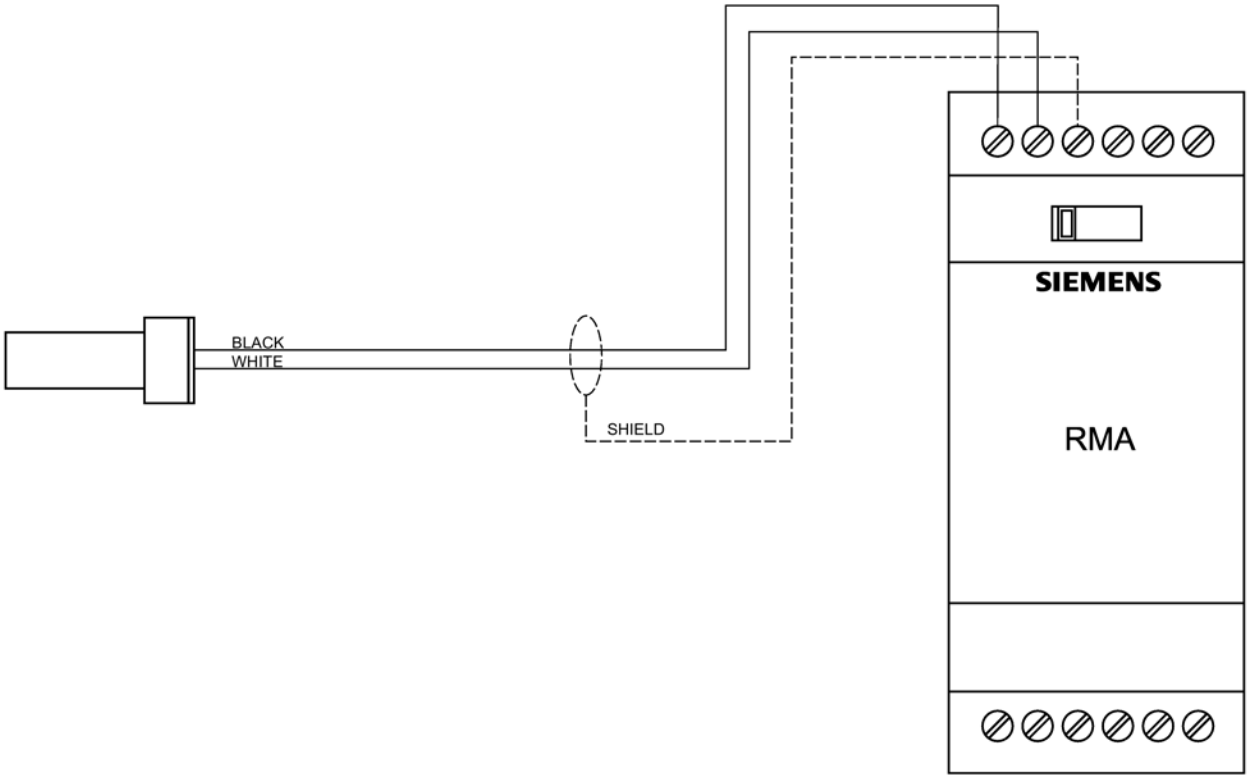
4.1.2 MSP-12 Probe with RMA (internally mounted pre-amplifier)



- RMA selector switch to the left.
- Wire can be run in conduit common to motor supply or control wiring. Connection to probe terminals can be made under probe cap.

See cable lengths (Page 23)for maximum separation from probe to RMA.

4.1.3 XPP-5 with RMA (internally mounted pre-amplifier)



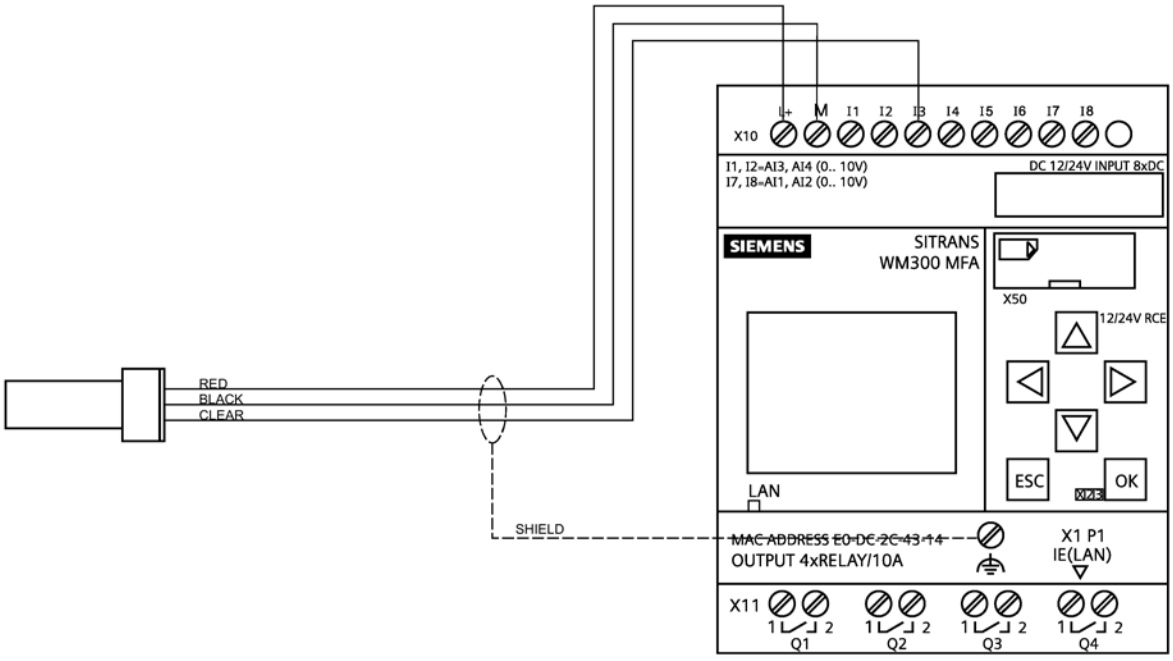
- RMA selector switch to the left.
- XPP-5 cable must be run in dedicated, approved metal conduit, boxes and fittings and to procedures in accordance with all governing regulations. See Cable length from RMA or IMA to WM300 MFA (Page 23) for cable lengths from probe at SITRANS WM300 MFA.

See cable lengths for maximum separation from probe to RMA.

Note

Refer to Interconnection Diagram for XPP-5 (Page 24)

4.1.4 MSP-7 with IMA (internally mounted pre-amplifier)



Wire can be run in conduit. Connection to probe terminals can be made under probe cap.

See cable lengths (Page 23) for maximum separation from probe to SITRANS WM300 MFA.

WARNING

Unsuitable cables, cable glands and/or plugs

Risk of explosion in hazardous areas.

- Use only cable glands/plugs that comply with the requirements for the relevant type of protection.
- Tighten the cable glands in accordance with the torques specified in Cable length from RMA or IMA to WM300 MFA (Page 23).
- Close unused cable inlets for the electrical connections.
- When replacing cable glands, only use cable glands of the same type.
- After installation, check that the cables are seated firmly.

WARNING

Incorrect conduit system

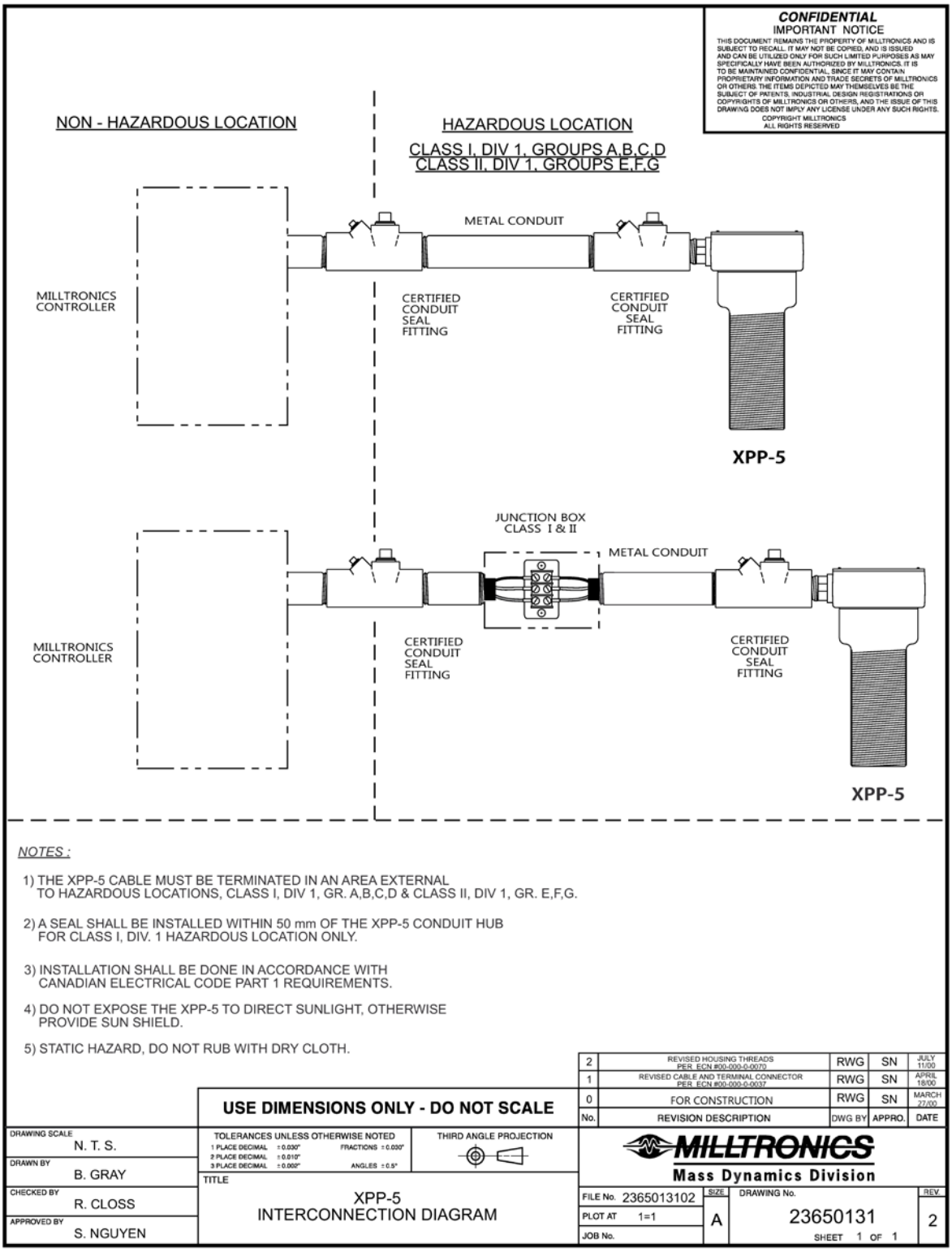
Risk of explosion in hazardous areas as result of open cable inlet or incorrect conduit system.

- In the case of a conduit system, mount a spark barrier at a defined distance from the device input. Observe national regulations and the requirements stated in the relevant approvals.

4.1.5 Cable length from RMA or IMA to WM300 MFA

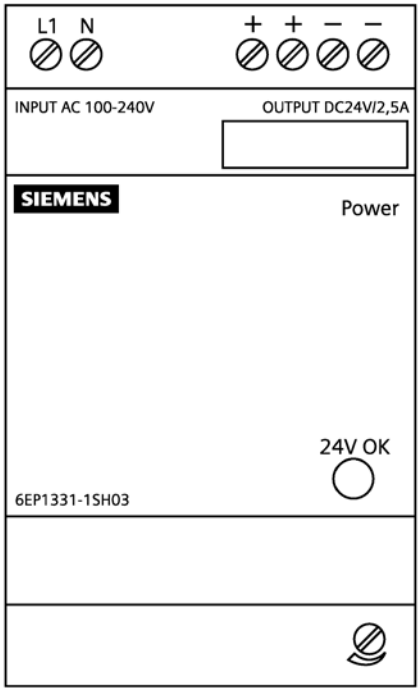
Wire gauge	Length in feet	Length in meters
22 AWG (0.34 mm^2)	2 500	760
18 AWG (0.75 mm^2)	5 000	1 520
12 AWG (4 mm^2)	25 000	7 600

4.1.6 Interconnection Diagram for XPP-5

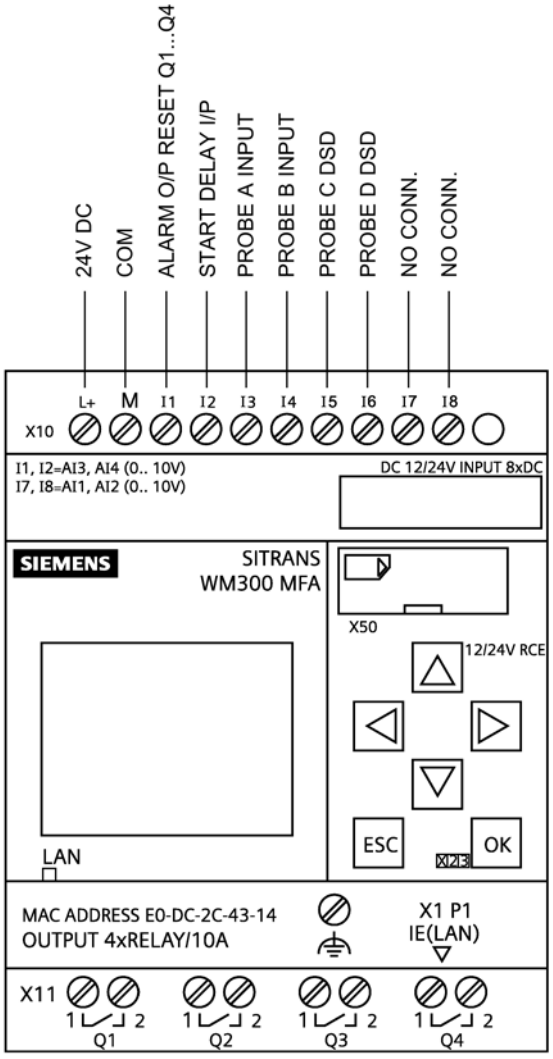


4.2 Connection to Power

A standard LOGO! power module can be used to convert AC to DC power. If 24VDC power is already available in the installation cabinet, connect it directly to the SITRANS WM300 MFA.



Typical LOGO! power module



- 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 should be 250 V.

Service and maintenance 5

5.1 Setup

Introduction display:

Note

Cursor keys duplicate function keys; however, the “Esc” key must also be pressed to activate the cursor keys.

Function keys		
F1	◀	Navigate display backward
F2	▲	Increment count values or enable/disable functions
F3	▼	Decrement count values
F4	▶	Navigate display forward

5.1.1 Calibration

The probe and pre-amplifier require no calibration.

Connect the probe, pre-amp (if required), and SITRANS WM300 MFA as shown in the Interconnection (Page 19) chapter. Connect the SITRANS WM300 MFA to power as shown in the Connection to Power (Page 25) diagram.

5.2 Maintenance

The device is maintenance-free. However, a periodic inspection according to pertinent directives and regulations must be carried out.

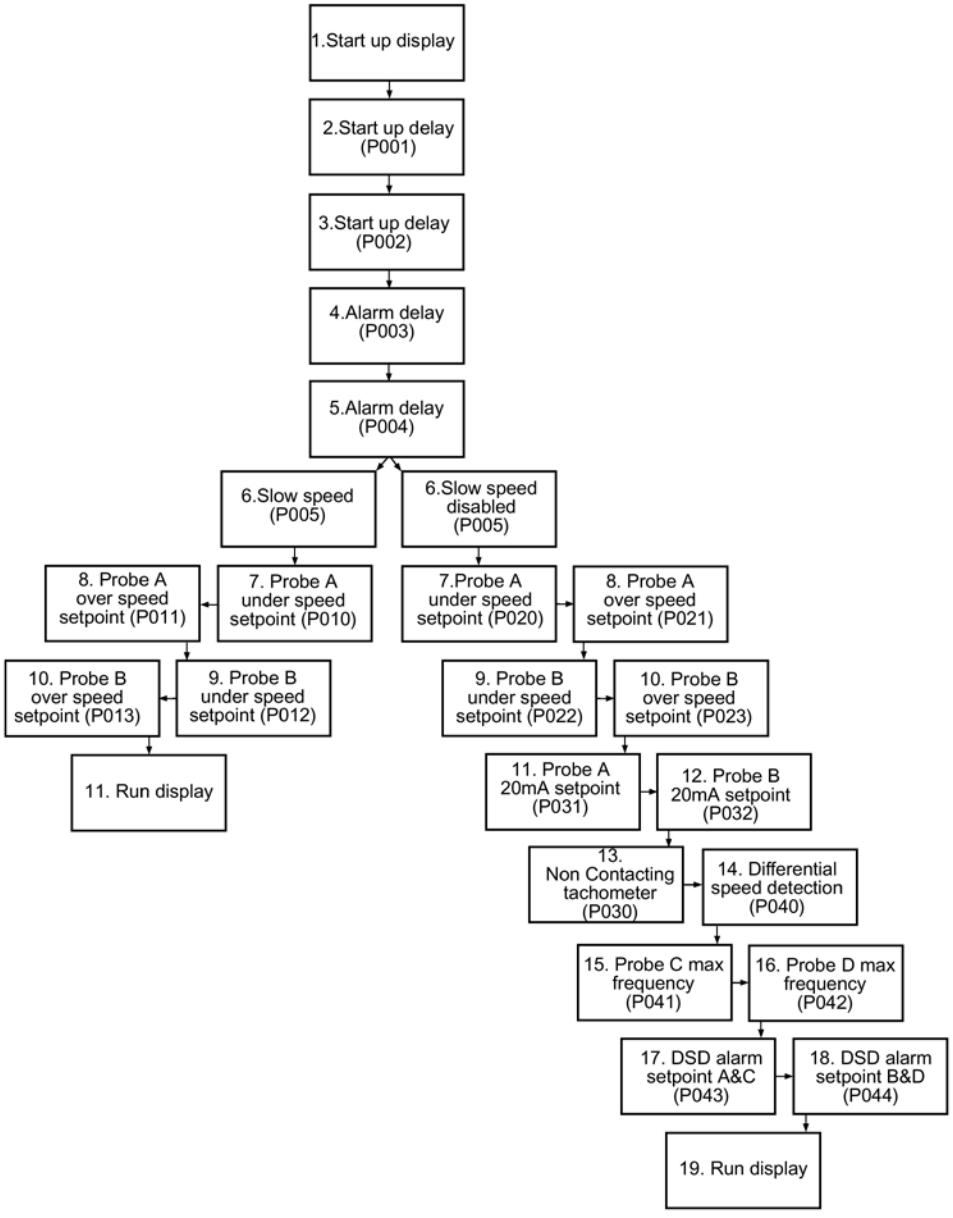
An inspection can include check of:

- Ambient conditions
- Reliability of power supply, lightning protection, and grounds

Parameter assignment

6

6.1 Menu structure

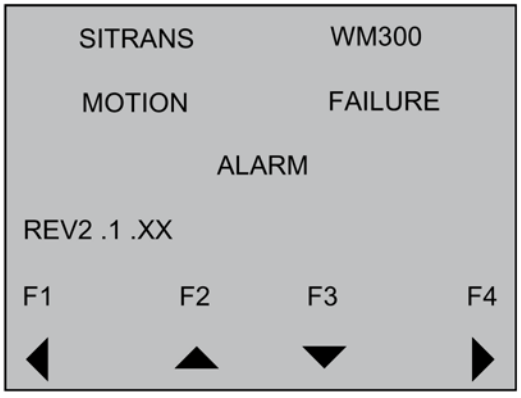


6.2 Motion failure alarm

The table below is a detailed chart of the inputs on the SITRANS WM300 MFA for all functions. Details include the slow speed and standard speed applications with their corresponding outputs.

Input	Probe			Start DLY Timer		Outputs		Alarm Delay
I1		O/P Reset				Q1 - Q4	Q1 - Q4	-----
I2		Start Delay				Q1 & Q3	Q1 & Q3	A1
						Q2 & Q4	Q2 & Q4	A2
Motion Failure Alarm - Slow Speed Version								
I3	A	0 - 399 Sec	----	T1	Q1	----	I3 OVR/SPD	A1
I5		Not Used	----		Q3	----	I3 UND/SPD	A1
I4	B	0 - 399 Sec	----	T2	Q2	----	I4 OVR/SPD	A2
I6		Not Used	----		Q4	----	I4 UND/SPD	A2
Motion Failure Alarm - Standard Version								
I3	A	0 - 5 kHz	----	T1	Q1	OVR/UNDER	----	A1
I4	B	0 - 5 kHz	----	T2	Q2	OVR/UNDER	----	A2
I5	C	Differential	----	T1	Q3	DIFFERENTIAL	----	A1
I6	D	Differential	----	T2	Q4	DIFFERENTIAL	----	A2

Setup of the SITRANS WM300 MFA using the HMI of the device and four button keys.



Input Requirements

Input I1 – activates a "Reset" of all outputs after an alarm.

Input I1 can be used in the two applications listed below:

- Automatic Reset of any or all output(s) when a process variable is within defined upper and lower limits as programmed for an input.

Note

Input I1 is set Active Hi and maintained at all times.

- Manual Reset of any or all output(s) when a defined upper or lower limit is observed and the Alarm flag set. The physical output, once activated (failsafe operation, set to Lo) will set the output relay to "Off" or "Low" and maintain this state until the operator physically resets "Alarm On" by switching input I1 from Lo to Hi state using a "Momentary Make Contact".

Note

Input I1 must transition momentarily from a Lo to a Hi to initiate the Reset function.

Input I2 – initiates a Start Up time delay when activated (Momentary transition from Lo - Hi - Lo).

Gives operator the ability to program a time delay to allow a slow running process to achieve the normal operating speed (typically for Slow Speed applications) before standard process monitoring takes over.

6.3 Start up delay

6.3.1 Start up delay (P001)

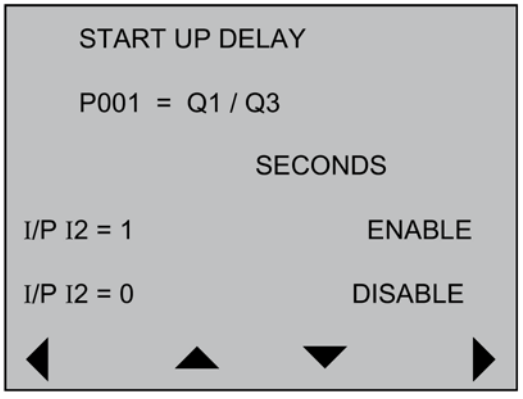
For relay outputs Q1 and Q3 from probe A input, Input 2 must have an enable function.

Note

Typically used for a slow speed process, but also compatible with standard operating functions.

Enable to have a start up delay in seconds (0 to 399), delay allows process to get to operational speed before a relay output will be generated.

When value = > 0 then output relays are maintained (Hi) for the set time period to allow system to achieve process speed.



Values	Start up delay = ON
	I2 = Hi (active Hi transition from Lo – Hi)
	Input I2 = 1 Enable (momentary transition from Lo - Hi – Lo)
	Input I2 = 0 Disabled

6.3.2 Start up delay (P002)

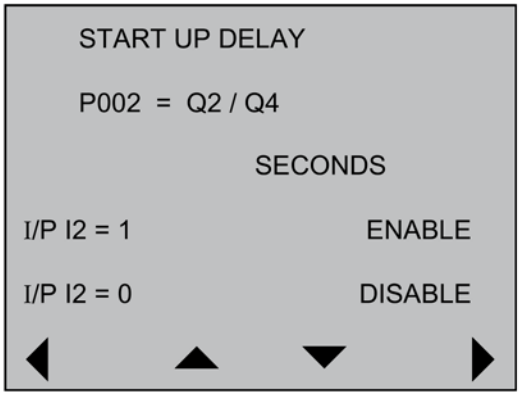
For relay outputs Q2 and Q4 from probe B input, input 2 must have an enable function

Note

Typically used for a slow speed process, but also compatible with standard operating functions.

Enable to have a start up delay in seconds (0 to 399), delay allows process to get to operational speed before a relay output will be generated.

When value = > 0 then output relays are maintained (Hi) for the set time period to allow system to achieve process speed.



Values	Startup Delay = ON
	I2 = Hi (Active Hi transition from Lo – Hi)
	Input I2 = 1 Enable (Momentary transition from Lo - Hi – Lo)
	Input I2 = 0 Disabled

6.4 Alarm delay

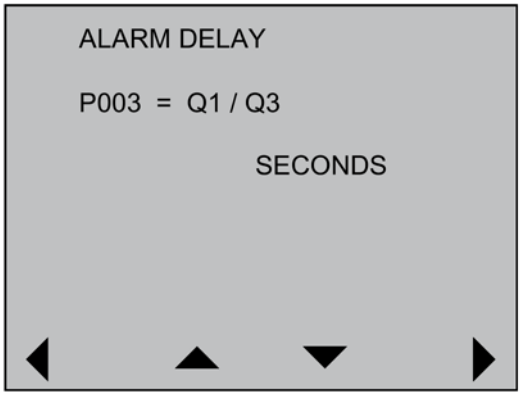
6.4.1 Alarm delay (P003)

For relay alarm delay (P003) outputs Q1 and Q3 from probe A input.

Note

Once an alarm delay is programmed, no input is required to activate.

Enter a relay output delay in seconds (0-399). The delay avoids false alarms in conditions which can go in and out of desired range setpoint frequently.



When value = > 0 then output relays are held maintained (Hi) for the set time period to allow system to achieve process speed.

Values	Alarm Delay = ON
	P003 ≥ 1 **(1 = 1.00 Seconds)**

Note

Typically used for a slow speed process, but compatible with standard operating functions.

6.4.2 Alarm delay (P004)

For relay, alarm delay (P004) outputs Q2 and Q4 from probe B input.

Note

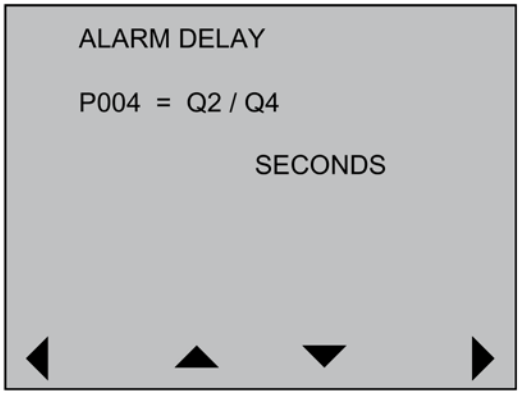
Once an alarm delay is programmed, no input is required to activate.

Enter a relay output delay in seconds (0-399). The delay avoids false alarms in conditions which can go in and out of desired range setpoint frequently.

When value = > 0 then output relays are held maintained (Hi) for the set time period to allow system to achieve process speed

Note

Typically used for a Slow Speed process, but will work with standard operating functions as well.



Values	Alarm Delay = ON
	P004 ≥ 1 **(1 = 1.00 Seconds)**

6.5 Slow speed

6.5.1 Slow speed (P005)

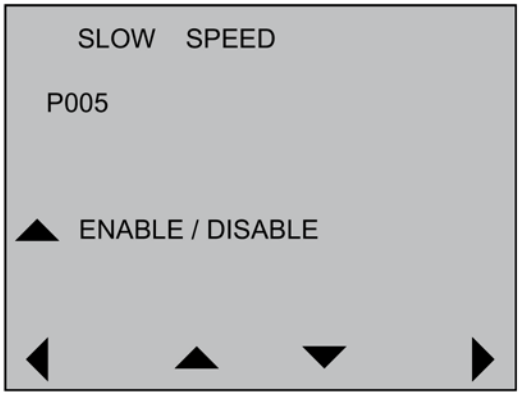
Note

Slow speed monitoring function, does not allow NCT or DSD functionality.

Enable for slow speed process monitoring. Disable for standard speed monitoring.

Functionality can be enabled from this screen. Pressing the F2 or Esc key and ▲ cursor key together will enable or disable this feature set.

- P005: ENABLED or DISABLED



The setpoints are programmed in seconds and not frequency (Hz). When enabled, the displays access only the slow speed version setup parameters. Slow speed version only allows two independent sensors wired to inputs Q1 and Q2. Over speed and under speed setpoints are programmed independently.

Note

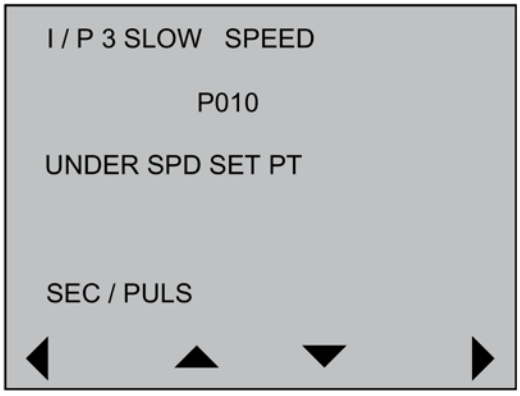
Typically used for a slow speed process, but compatible with standard operating functions.

6.5.2 Slow speed (P010)

For relay output Q3.

Under speed setpoint indicates when the process speed of the target device has decreased below a safe working speed/rotation. Enter the number of seconds between pulses in an under speed situation.

- P010: xxx seconds



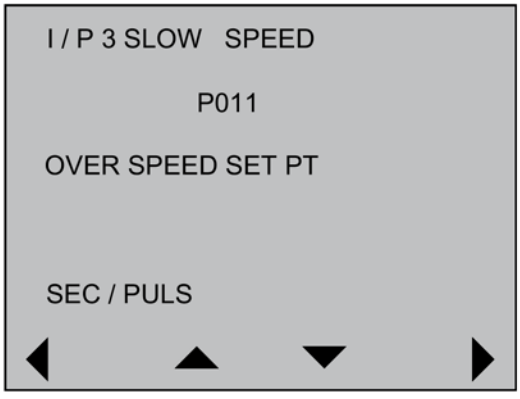
Values	Setpoint 00:00:xx (HH:MM:SS) range 0 ... 399s then resets back to 0
	Input I3 – Under speed alarm output relay Q3

6.5.3 Slow speed (P011)

For relay output Q1

Over speed setpoint indicates when the process speed of the target device has increased past a safe working speed/rotation within the process. Enter the number of seconds between pulses in an over speed situation.

- P011: xxx seconds



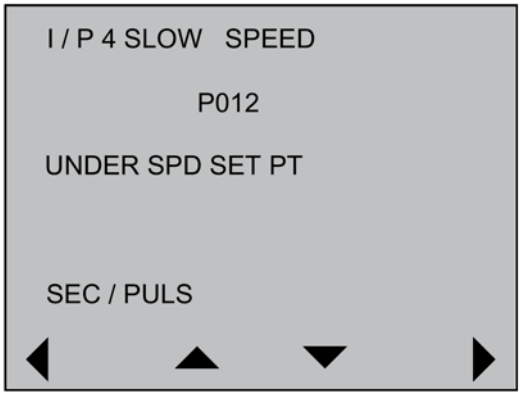
Values	Setpoint 00:00:xx (HH:MM:SS) range 0 ... 399s then resets back to 0
	Input I3 – Over Speed alarm output relay Q1

6.5.4 Slow speed (P012)

For relay output Q4

Under speed setpoint indicates when the process speed of the target device has decreased below a safe working speed/rotation. Enter the number of seconds between pulses in an under speed situation.

- P012 = xxx seconds



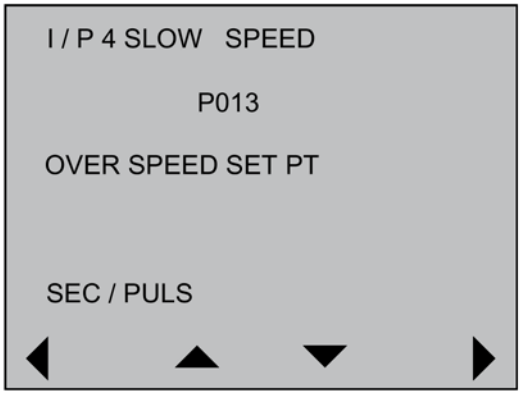
Values	Setpoint 00:00:xx (HH:MM:SS) range 0 ... 399s then resets back to 0
	Input I4 – Under Speed alarm output relay Q4

6.5.5 Slow speed (P013)

For relay output Q2

Over speed setpoint shall indicate when the process speed of the target device has increased past a safe working speed/rotation within the process. Enter the number of seconds between pulses in an under speed situation.

- P013: xxx Seconds



Values	Setpoint 00:00:xx (HH:MM:SS) range 0 ... 399s then resets back to 0
	Input I4 – Over speed alarm output relay Q2

Run display features seconds between pulses for probe A and B and relay output status.

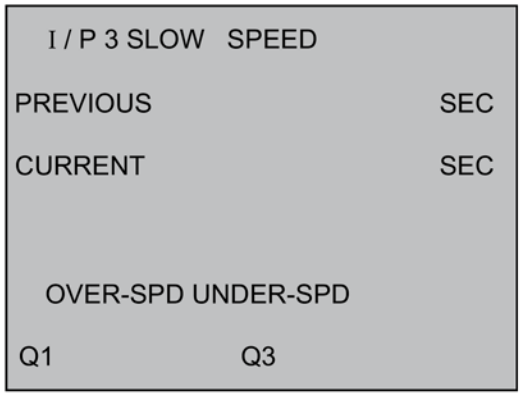
6.5.6 Process variable overview display

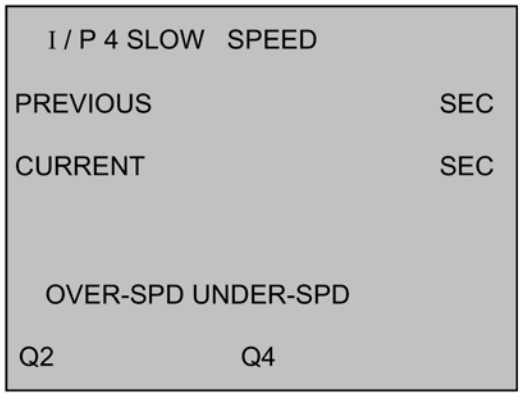
Note

Overview display alternates between input I3 and input I4 configured in programming and cannot be changed to a display - only one channel.

Previous time period in seconds between the last pulse and the previous pulse. This can be used as a guide to understand timing between pulses at any time in the process.

Current time is since the last pulse and will continue to increase until the next consecutive pulse is observed on the input.





Probe Input I3 – Output Q1 & Q3	
Q1	Alarm Off = maintained HI output.
Q1	Alarm On = maintained LO output
Q3	Alarm Off = maintained HI output.
Q3	Alarm On = maintained LO output.
Probe Input I4 – Output Q2 & Q4	
Q2	Alarm Off = maintained HI output.
Q2	Alarm On = maintained LO output.
Q4	Alarm Off = maintained HI output.
Q4	Alarm On = maintained LO output.

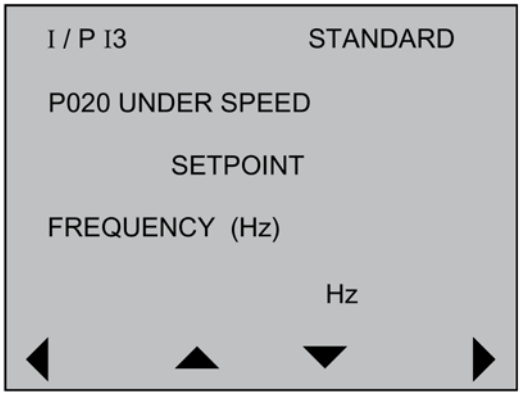
6.5.7 Standard version motion failure alarm

6.5.7.1 Standard speed (P020 - P021)

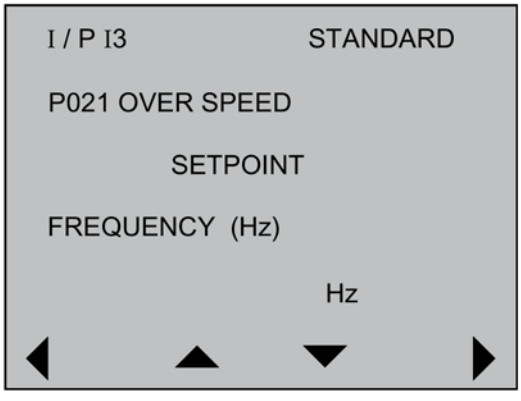
For relay output Q1.

Probe A under speed setpoint (P020) for relay output Q1. Enter the frequency between pulses in an under speed situation. Probe A over speed setpoint (P021). Enter the frequency between pulses in an over speed situation. The setpoint value (Max Hz) for input I3 represents the 20 mA analog output AQ1. Only set the value if the non-contact tachometer function will be used.

- P020: xxx Seconds



- P021: xxx Seconds

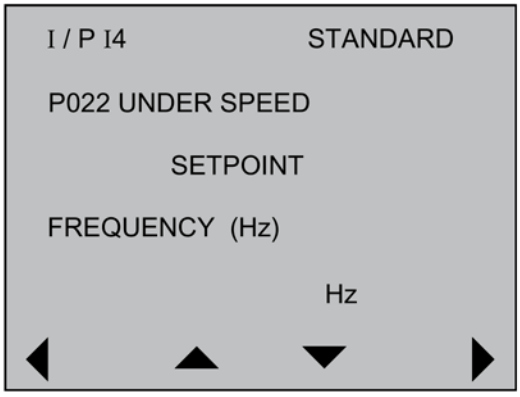


6.5.7.2 Standard speed (P022 - P023)

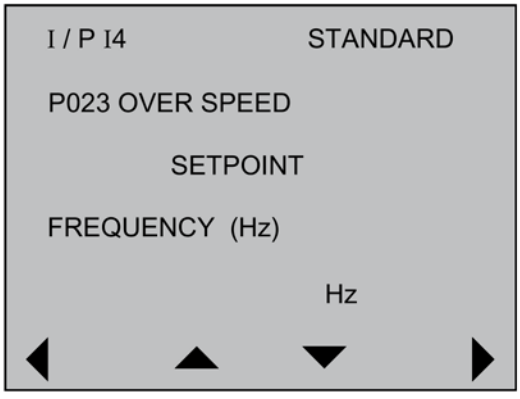
For relay output Q2

Probe B under speed setpoint (P022) for relay output Q2. Enter the frequency between pulses in an under speed situation. Probe B over speed setpoint (P023) for relay output Q2. Enter the frequency between pulses in an over speed situation. The setpoint value (Max Hz) for input I4 represents the 20 mA analog output AQ2. Only set the value if the non-contact tachometer function will be used.

- P022: xxx Seconds



- P023: xxx Seconds



6.6 Tachometer Function

6.6.1 Tachometer Function (P031 - P032)

Note

Only set this value if the Non-Contact Tachometer Function will be enabled.

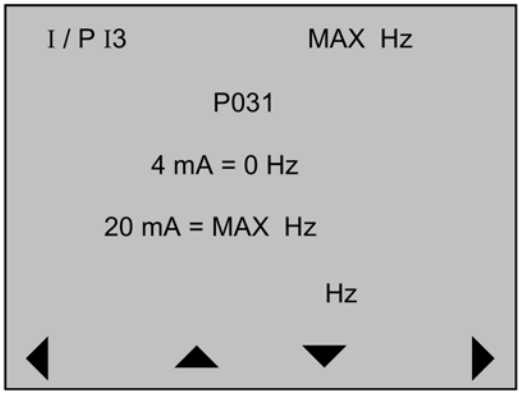
The non-contact tachometer (analog output AQ1 and AQ2) function is for the standard operating mode of the SITRANS WM300 MFA only. The setpoint default for non-contact tachometer is set to a minimum of 16 Hz (4 to 20 mA); therefore, 1 Hz is equal to 1 mA.

Probe A 20 mA setpoint (P031) for analog output AQ1 when an NCT application is in use. Probe B 20mA setpoint (P032) for analog output AQ2 when an NCT application is in use. Enter the frequency representing maximum speed for analog output (20mA).

Note

P031 and P032 (Maximum Frequency = 20 mA) must be programmed prior to enabling the Tachometer function. Failure to do so could result in the output set to maximum analog output value.

- P031: xxx Hz
- P032: xxx Hz



Note

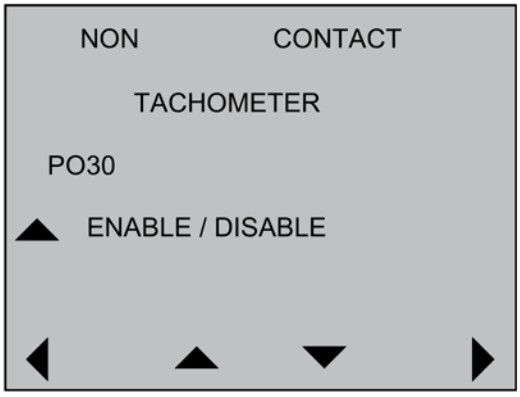
Value must be entered before enabling NCT function to properly manage analog outputs to control functions.

6.6.2 Non-contacting tachometer (P030)

NCT function, provides a mA output based on speed for probe A and B. Enable for NCT use, disable for standard speed monitoring. The non-contact tachometer functionality can be enabled or disabled from this display.

Pressing the F2 or Esc Key & ▲ cursor key together will enable or disable this feature set.

- P030: ENABLED or DISABLED



6.7 Differential speed detection

6.7.1 Differential speed detection (P040)

Differential Speed Detection (DSD) function, provides a relay output based on differential comparison between probes A and C, B and D. Enable for DSD use, disable for standard speed monitoring. The DSD can be enabled from this display. Pressing the F2 or Esc Key & ▲ cursor key together will enable or disable this feature set.

Note

Standard operating setpoints must be programmed between 1 to 10% only. A setpoint of 0% (which can be set by user interface) will result in an alarm condition, Q3 or Q4 set to failsafe (Lo level)

DSD Calibration

The DSD must be calibrated so that each input has a full scale reading that is proportional to the maximum operating speed of the machinery. The maximum input frequency for each input is 5000 Hz. In DSD mode, the two calibrated inputs are compared to each other and if the differential is greater than the set point, it will go into alarm.

For example:

1 Hz on a 1000 Hz full scale is equal to 0.1% speed change.

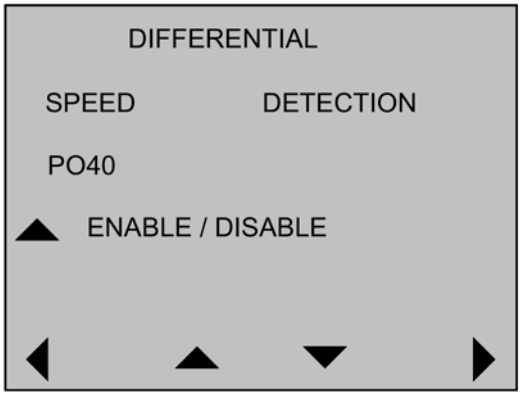
1 Hz on a 100 Hz full scale is equal to 1% speed change.

1 Hz on a 10 Hz full scale is equal to a 10% speed change.

Note

The input resolution is 1 Hz. Depending on the Input frequency calibration, this 1 Hz value will represent a different percentage of speed change.

- P040: Enabled or Disabled



6.7.2 Maximum frequency setpoint (P041 - P042)

Probe C maximum frequency (P041) for comparison to probe A. Enter the maximum frequency between pulses for probe C. Input I5 is the second frequency input (motion failure sensor) with respect to Input I3, applied to the same mechanical equipment being monitored.

Probe D maximum frequency (P042) for comparison to probe B. Enter the maximum frequency between pulses for probe D. Input I6 is the second frequency input (motion failure sensor) with respect to Input I4, applied to the same mechanical equipment being monitored.

- For example:

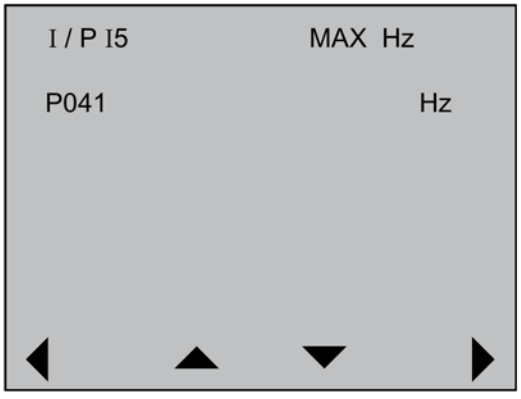
  I3 maximum Hz = 60 Hz

  I5 maximum Hz = 30 Hz

  Alarm setpoint = 10 %

Therefore, a differential of 6 Hz (10%) on channel A or 3 Hz on channel C will cause a differential alarm to be activated.

- P041: xxx Hz

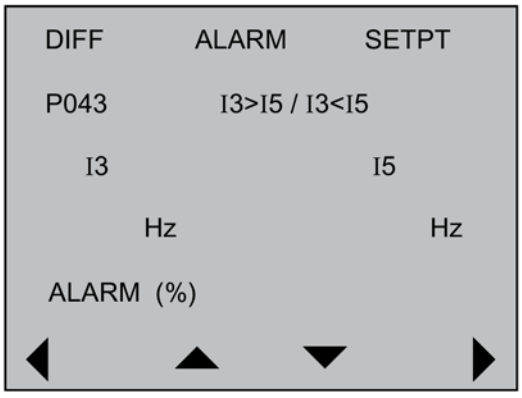
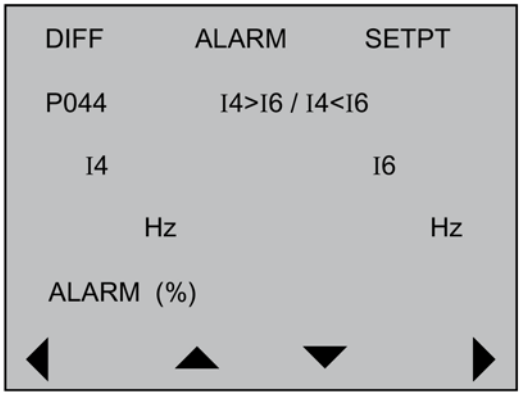


- P042: xxx Hz

Note

In the event both sensors do not monitor the same frequency, the maximum frequency setpoints can be different. The programming calculates the setpoint difference in percentage (%).

6.7.3 Differential alarm setpoints (P043 - P044)

Differential alarm setpoint displays (Inputs I3 and I5)	**DSD alarm setpoint A and C (P043)**
	For relay output Q3. Enter the percentage difference between frequency of probe A and probe C for relay output. When enabled, output Q3 will alarm on set-point differential programmed. When inputting the setpoint value in percentage, the operator observes the frequency of both setpoints for comparison using this parameter. • **Alarm = 1 to 10%** • When function is enabled, output Q3 is used to alarm the pro-grammed differential percentage setpoint. • When inputting the setpoint value percentage, the operator can observe the current frequency of both setpoints for comparison in this display.
Differential alarm setpoint displays (Inputs I4 and I6)	**DSD alarm setpoint B and D (P044)**
	For relay output Q4. Enter the percentage difference between frequency of probe B and probe D for relay output. When enabled, output Q4 will alarm on set-point differential programmed. When inputting the setpoint value in percentage, the operator observes the frequency of both setpoints for comparison using this parameter. • **Alarm = 1 to 10%** • When function is enabled, output Q4 is used to alarm the pro-grammed differential percentage setpoint. • When inputting the setpoint value percentage, the operator can observe the current frequency of both setpoints for comparison in this display.

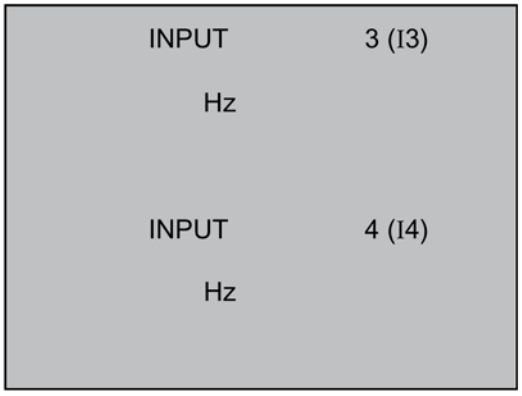
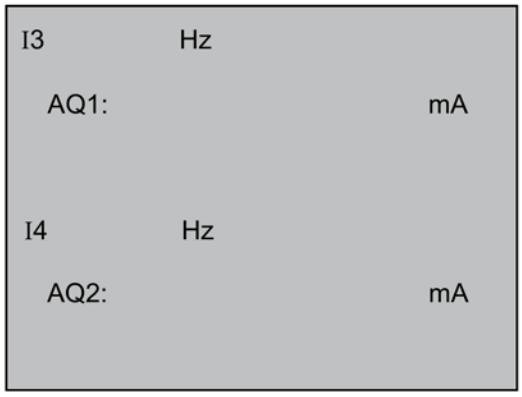
Note

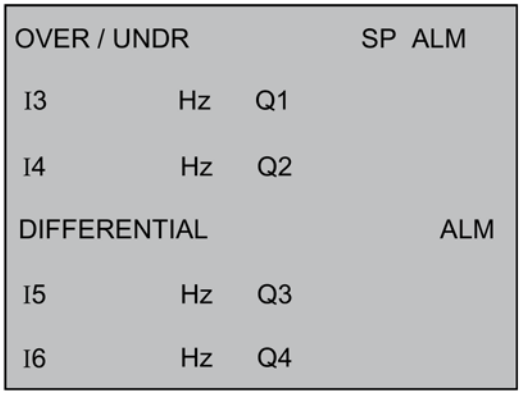
Each channel is programmed independently due to variation in frequency based on a target RPM or the number of targets on two different rotating shafts.

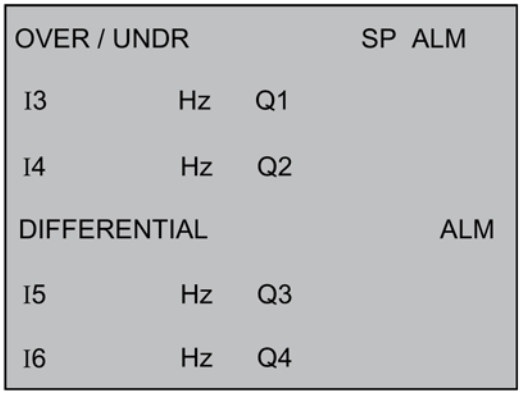
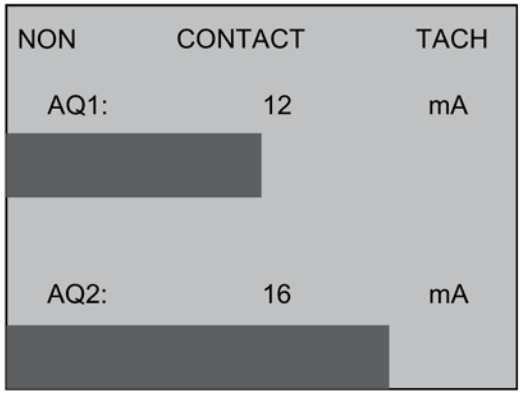
6.7.4 Operator display

Note

Only one of these displays will be active, each display selected is based on which functions have been Enabled.

Tachometer function disabled differential speed disabled	Tachometer function enabled differential speed disabled
	

Tachometer function enabled differential speed display	
	

Tachometer function enabled differential speed enabled	
	

Note

When the non-contact tachometer and the differential speed functions enabled, the display alternates between the over/under speed alarm and non-contact tachometer screens.

Troubleshooting 7

7.1 Troubleshooting

Operator display screen after power failure or power cycle

Following the commissioning of the SITRANS WM300 MFA, the final display is the overview of the relay status and process variables. The F4 key or equivalent is pressed, the device will reset back to the initial start-up display. If the F4 key is pressed, the operator can sequentially scroll though the setup to return to the run display.

In the event of a power loss or power cycle, the remote display will repower to the last valid display screen. If the on-board display does not reload to the setup screen, press the "ESC" key on the base module to return to the last valid display screen.

Notes:

- If diagnosis does not solve the malfunction, the probe, pre-amp or SITRANS WM300 MFA may be defective.
  - 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.

Technical data

8

Note

Device specifications

Siemens makes every attempt to ensure the accuracy of these specifications but reserves the right to change them at any time.

8.1 Safety Note

Note

Always use product in accordance with specifications.

8.2 Power

- 10.8 ... 28.8 V DC, 25 ... 165 mA
- Power supply: 100 ... 240 V AC, 50/60 Hz, 0.7 ... 0.35A per LOGO! power module

8.3 Outputs

- 4 relays

Resistive rating

- 10 A @ 24 V DC
- 10 A @ 240 V AC

8.4 Inputs

Input voltage:	L+
Signal 0:	< 5VDC
Signal 1:	> 12 VDC
Input Current	
Signal 0:	< 0.9mA (I3 ... I6)
	< 0.07 mA [I1, I2, I7 (n/a), I8 n/a)]
Signal 1:	> 2.1 mA (I3 ... I6)
	> 0.18 mA [I1, I2, I7 (n/a), I8 (n/a)]

Note

High speed inputs I3, I4, I5 and I6 maximum 5 kHz. Normal inputs I1, I2, I7 and I8 maximum 4 Hz.

8.5 Performance

Repeatability

- ± 1 %

Temperature coefficient (setpoint variance)

- 0.018 %/°C (0.01 %/°F)

Setpoint adjustment range

- Standard mode: 2 ... 5 000 Hz (120 ... 300 000 ppm)
- Slow speed mode: 2 ... 400 seconds (30 ... 0.15 ppm)

SITRANS WM300 standard mode

- MSP-3, MSP-7, MSP-9, MSP-12, XPP-5
- 2 Hz ...120 Hz (120 ppm ... 7 200 ppm)

SITRANS WM300 slow speed mode

- MSP-3, MSP-7, MSP-9, MSP-12, XPP-5
- 30 ... 0.15 ppm (between pulses: 2 ... 400 seconds)

Customer supplied sensor voltage range

- 5 ... 32 VDC

Note

Please see input specifications for voltage range details.

MSP and XPP dynamic range

- 0 ... 7 200 ppm

8.6 Design

- Polycarbonate construction: 0.2 kg (0.44 lb)

Note

For use in outdoor applications, device must be installed in a suitable NEMA/IP rated enclosure.

8.7 Approvals

- CE, CSA/UL(C/US), FM, EAC, RCM, KCC
- EMC performance available on request

8.8 Operating Conditions

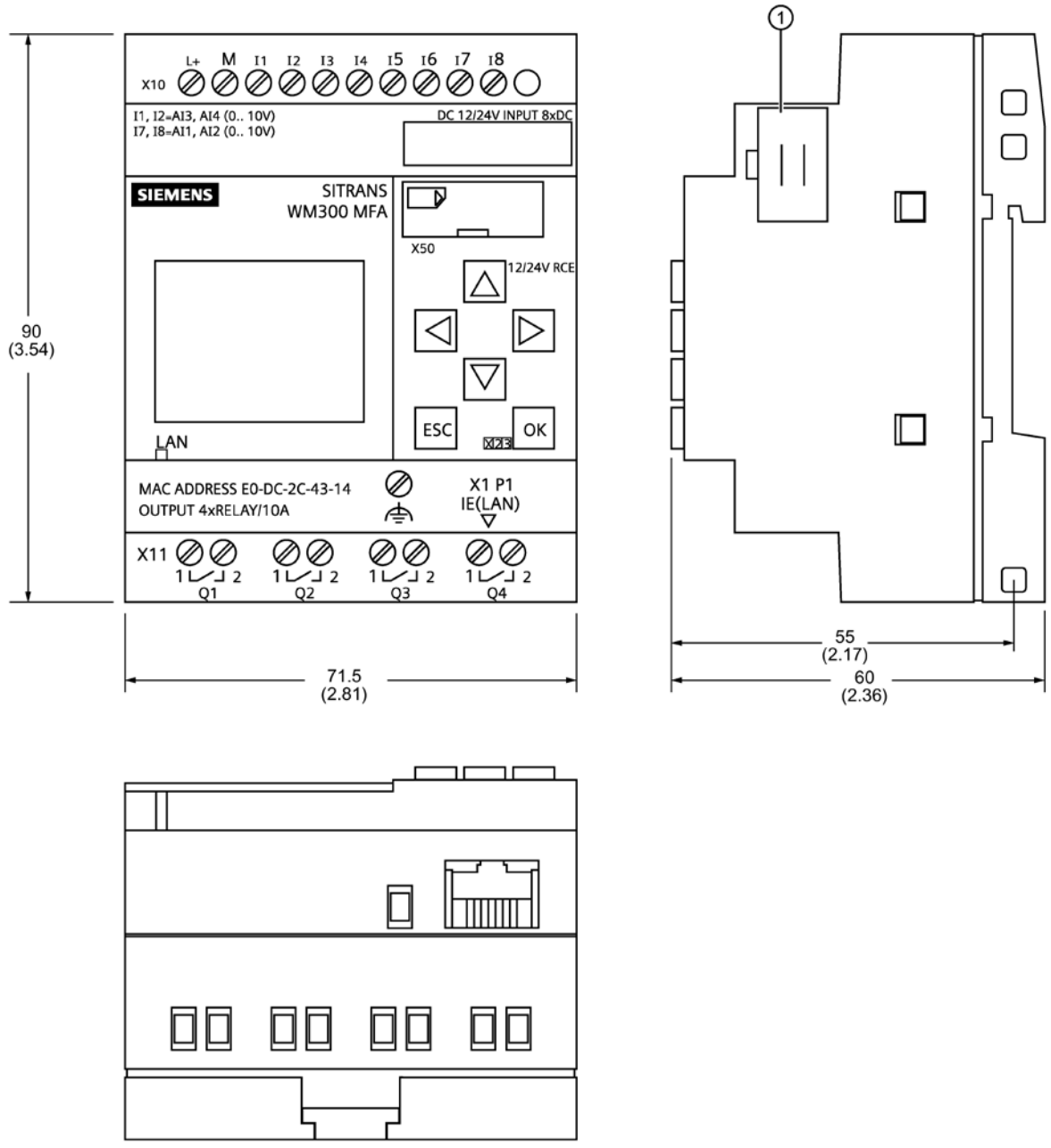
Location	Indoor/outdoor
Altitude	2 000 m max.
Ambient temperature	-20 ... 55 °C (-4 ... 131 °F)
Relative humidity	Suitable for outdoor
Installation category	II
Pollution degree	2

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)
MSP-7	-40 ... 60 °C (-40 ... 140 °F)	1.4 kg (3 lb)

Dimension drawings

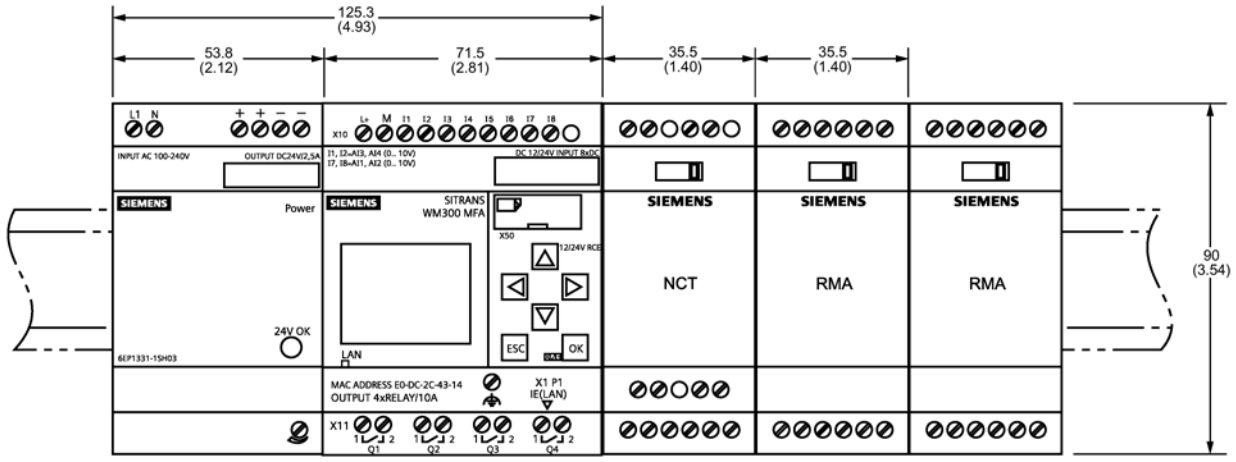
9

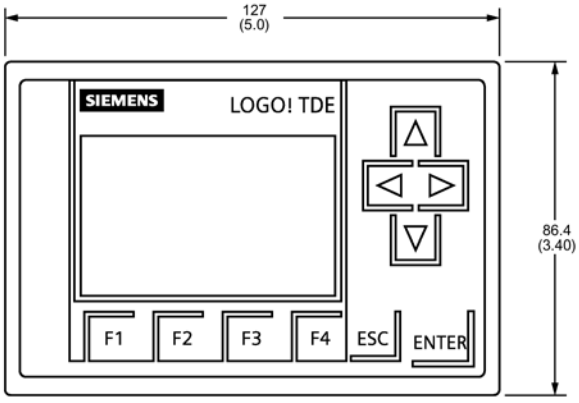
9.1 SITRANS WM300 MFA dimensions



Dimensions in mm (inch)

① Bus port cover (remove for NCT module integration)



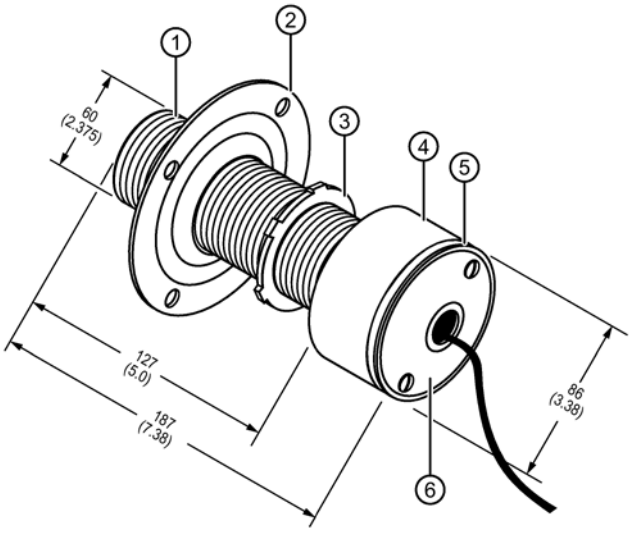


Dimensions in mm (inch)

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.

9.2 High Temperature Probe MSP-3

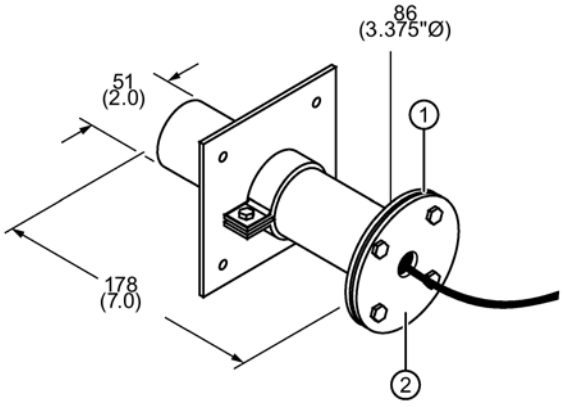


Dimensions in mm (inch)

① 2" NPSL
② Mounting flange
③ Locknut
④ Probe body
⑤ Gasket
⑥ Cap c/w 1/2" NPT conduit entrance

- Cast aluminum body comes with cast aluminum cap and zinc flange, zinc plated locknut, and silicone rubber gasket.
- See Mounting Details (Page 13)

9.3 Stainless Steel Probe MSP-9



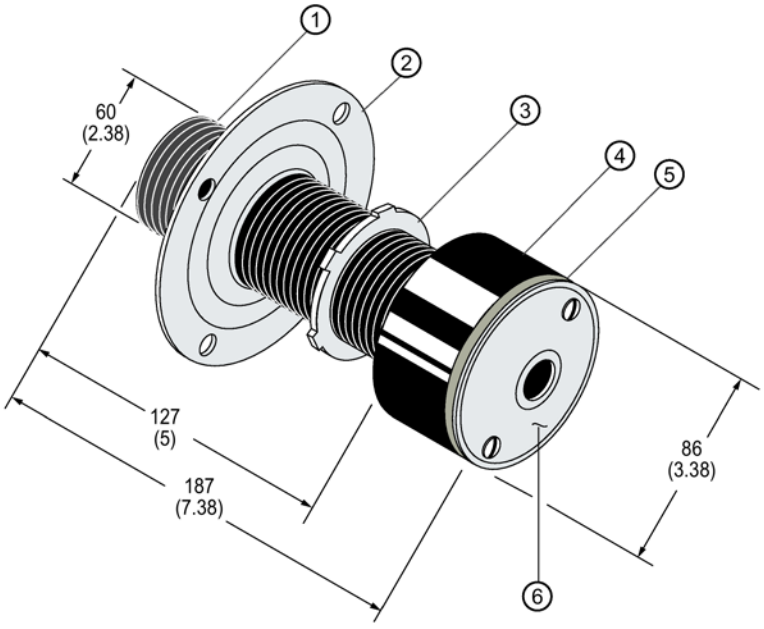
Dimensions in mm (inch)

① Gasket

② Cap c/w 0.875∅ holes (22 mm)

- Stainless steel body and mounting flange

9.4 Standard Probe MSP-12 and MSP-7

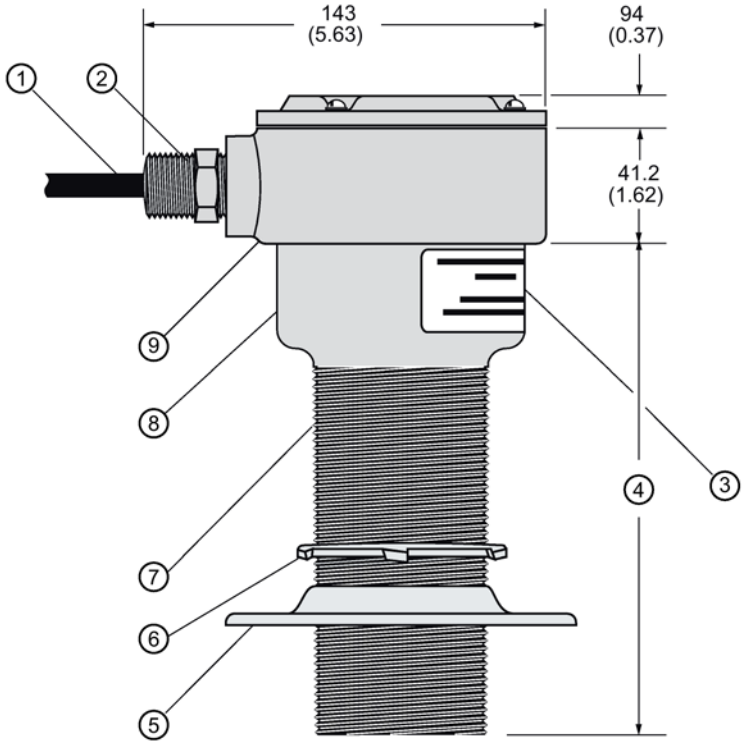


Dimensions in mm (inch)

① 2" NPSL
② Mounting flange
③ Locknut
④ Probe body
⑤ Gasket
⑥ Cap c/w ½" NPT conduit entrance

- Aluminum body comes with die-cast aluminum cap and zinc flange, zinc plated locknut, and neoprene gasket.
- See Mounting Details (Page 13)

9.5 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.

Technical Reference

A

A.1 Principles of Operation

SITRANS WM300 MFA

SITRANS WM300 MFA is a highly sensitive, dual 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 SITRANS WM300 MFA. The SITRANS WM300 MFA 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.

Probe

The Milltronics probes work on the principle of Faraday's Laws of Electromagnetic Induction. When a ferromagnetic object enters the probe's permanent magnetic field, it distorts the flux causing it to cut the coil windings and generate a voltage. This voltage is proportional to the strength of the magnet and the number of wire turns in the coil (constant in the Milltronics probes) and the speed at which the ferrous target passes through the flux. The generated voltage is also inversely proportional to the square of the distance between the target and the probe.

The relationship between speed and gap of a standard probe

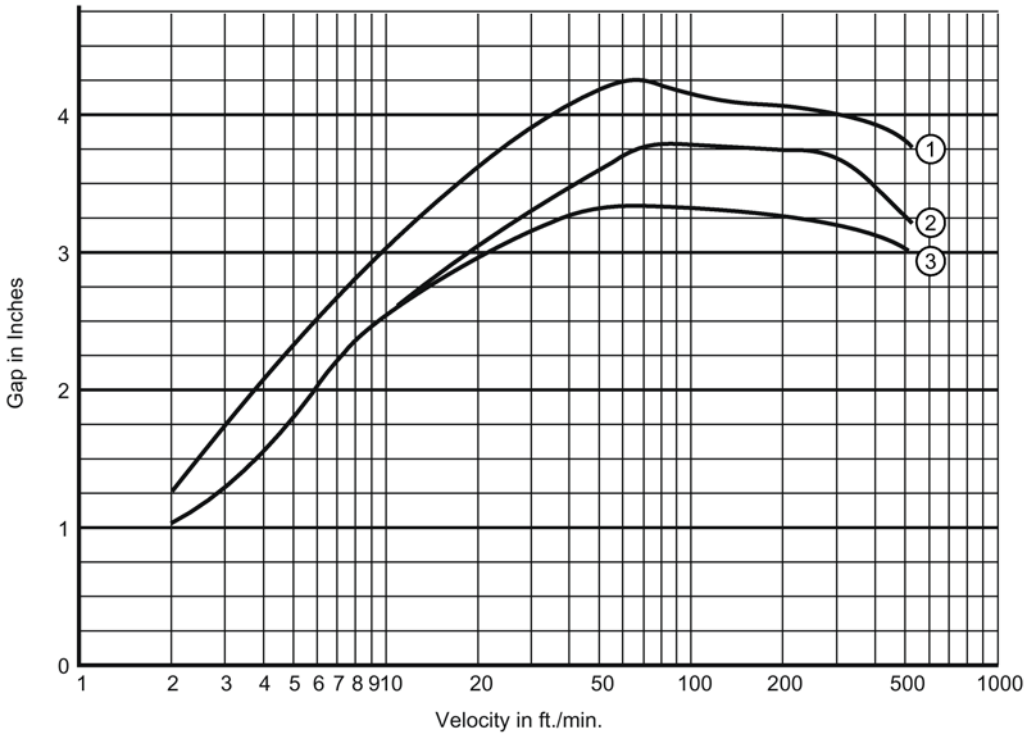


Fig. a
50 x 25 x 50 mm
(2 x 1 x 2 inch)
ferrous block

Fig. b
50 x 50 x 25 mm
(2 x 2 x 1 inch)
ferrous block

Fig. c
50 x 25 x 25 mm
(2 x 1 x 1 inch)
ferrous block

① Fig. a

② Fig. b

③ Fig. c

The resultant line indicates the threshold tolerance of the accompanying SITRANS WM300 MFA electronics. For example, in **Fig. a**, a 100 mm (4 inch) gap requires a minimum velocity of about 10 m/minute (35 ft/minute): with a velocity of 0.61 m/minute (2 ft/minute), a maximum gap of 31 mm (1.25 inch) is possible.

Note

25.4 mm = 1 inch and 0.305 m = 1 ft

The graph was plotted from tests using four ferrous blocks set equidistantly on a 406 mm (16 inch) diameter circle on a non-ferrous disc.

The physical shape of the ferrous target generally becomes important at low velocities or large gaps. At these points, tests indicate that a cubic shape gives the best results due to the sudden change it causes in the magnetic field.

An increase in block size beyond 50 x 50 x 25 mm (2 x 2 x 1 inch) is generally not as effective as minimizing the gap, except at very low velocities.

Milltronics manufactures probes to suit a wide variety of environments: low temperature, high temperature, corrosive, and Class I, II, and III applications.

Pre-Amplifier (IMA and RMA)

The pre-amplifier accepts the voltage pulses generated by the probe and converts them into NPN open collector outputs. The preamplifier comes internally mounted in the probe, or in a module enclosure for remote mounting.

Internally mounted pre-amplifiers are called IMAs. Remote mounted pre-amplifiers are called RMAs.

SITRANS WM300 MFA Operation

The SITRANS WM300 MFA provides a short circuit protected, +24 V DC unregulated supply to the preamp.

The rate at which the pulses are received by the SITRANS WM300 MFA is compared to a setpoint reference signal from the setpoint programmed.

The alarm relays will de-energize (failsafe operation) if the process variable (incoming pulses) exceeds the upper setpoint or the lower setpoint. Once the process variable (incoming pulses) is within the defined upper and lower limits, the Alarm Relay will reset automatically or requires a reset manually depending on the state of Input I1 -Alarm O/P Reset.

- Automatic reset: Input I1 is maintained Active Hi at all times. See Automatic Reset (Page 32).
- Manual reset: Input I1 must transition from a Lo to Hi state. This method will maintain an Active Lo input state. See Manual Reset (Page 32).

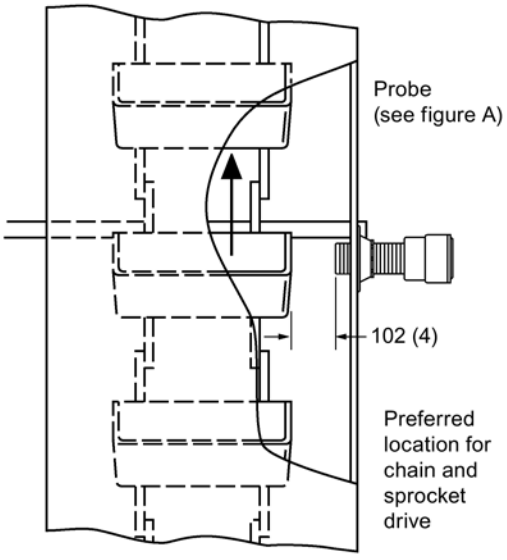
The WM300 MFA has a 0 to 399 second time delay feature, allowing the monitored device to accelerate to normal running speed before monitoring begins.

The time delay feature is activated with the use of input I2. When in use, time delay will energize the relay outputs and be maintained in a closed state for the duration of the programmed timer. This feature will prevent a false alarm indication during equipment startup in slow speed applications.

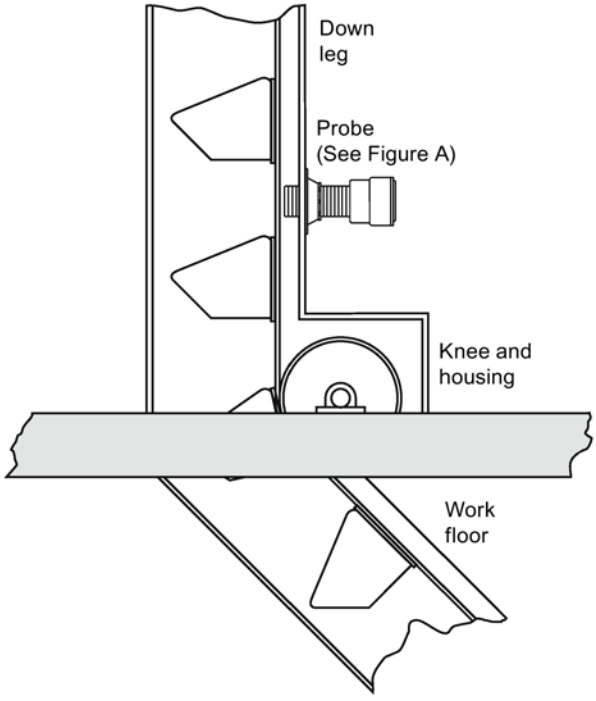
Input I2 must realize a transition from "Lo - Hi - Lo" in order to initiate the internal timer used to maintain the output relay closed. If the monitored equipment does not reach normal operating speed within the set time period, the relays will de-energize creating a failsafe alarm condition.

Applications

B.1 Bucket Elevators



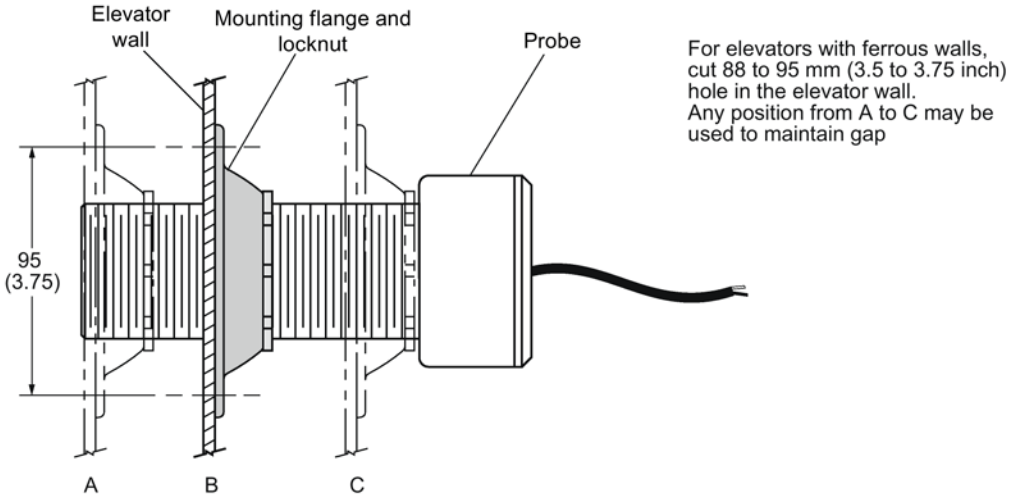
For chain and sprocket drive elevators, place the probe so that the gap between the bucket and the probe does not exceed 102 mm (4 inch). To prevent damage to the probe from eccentric bucket motion, ensure that the gap is not less than 12.5 mm (0.5 inch) in the worst condition



Preferred location for belt-driven elevators with ferrous bucket spacing greater than 76 mm (3 inch), and non-ferrous buckets with ferrous bolts.
For ferrous buckets with spacings less than 76 mm (3 inch) locate probe on the front of the leg.

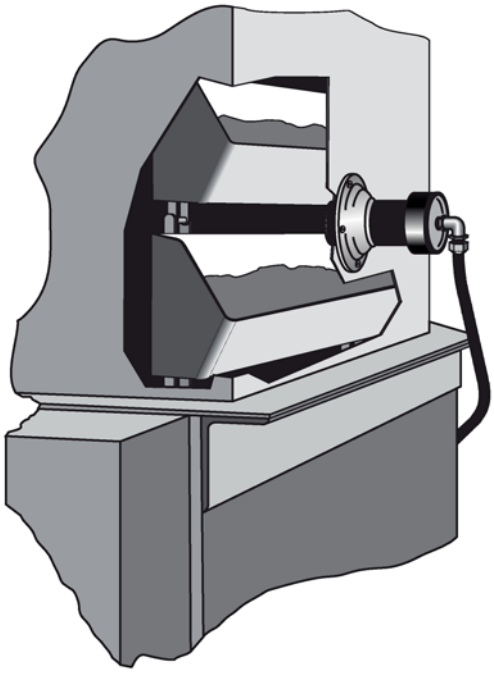
Dimensions in mm (inch)

Figure A

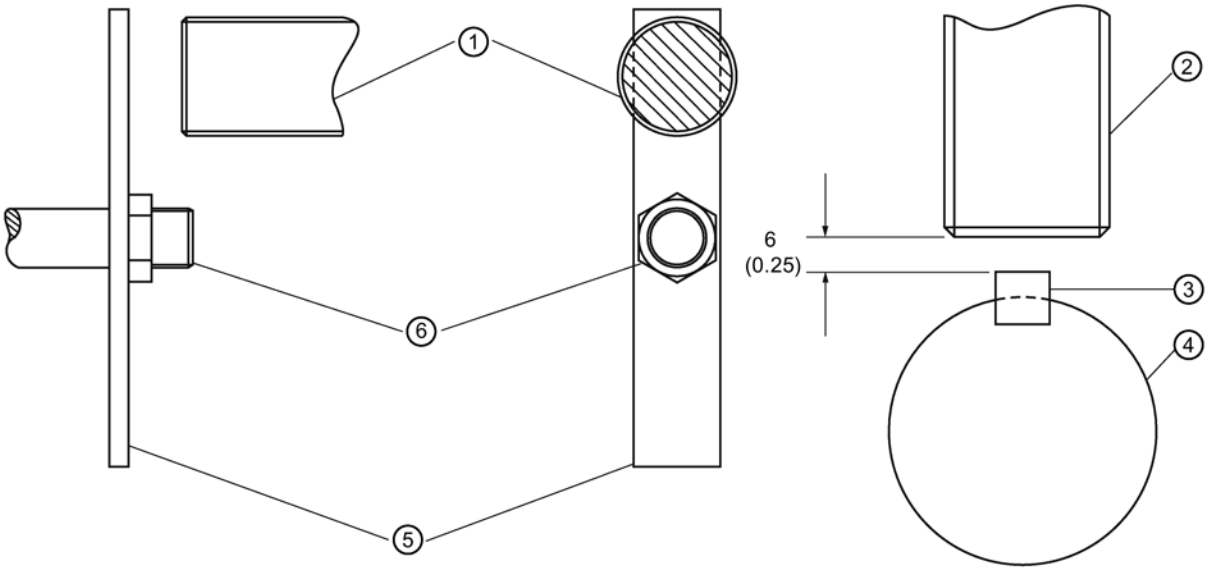


Dimensions in mm (inch)

B.2 Bucket Elevator



B.3 Shafts



Safety shield not shown

Dimensions in mm (inch)

① Probe

② Probe

③ Key and keyway

④ Shaft 102 (4) ∅ min.

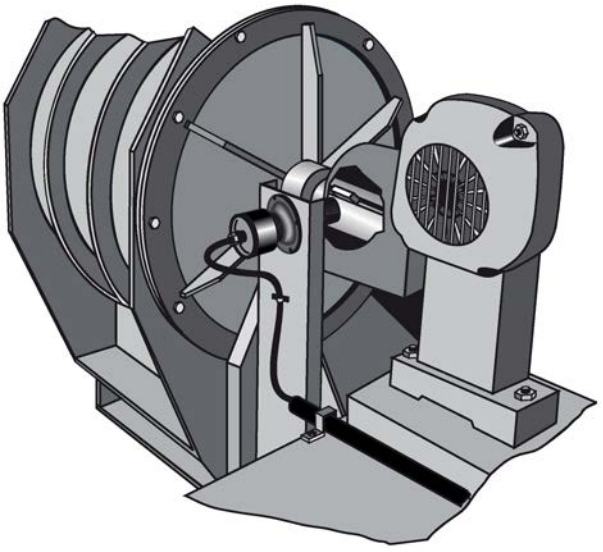
⑤ Added paddle

⑥ Shaft

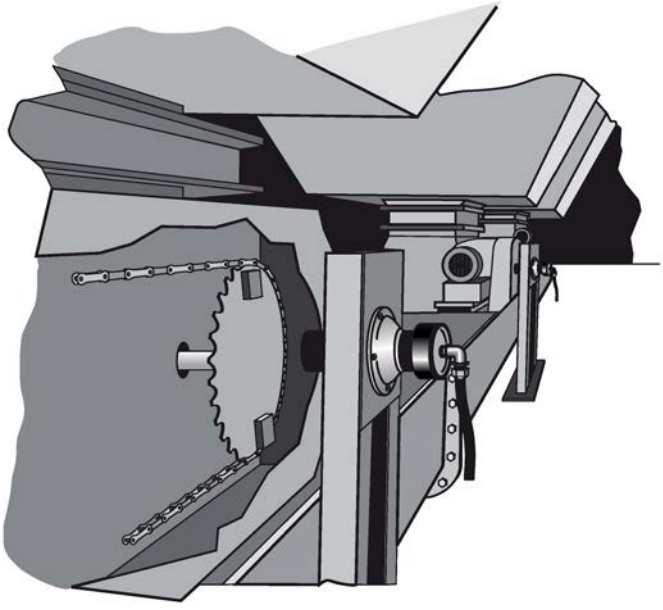
These methods are viable if the speed is such that the blades or key will provide the number of pulses required at a minimum velocity of 1.5 m/minute (5 ft/minute). In applications where exposed moving parts are required, safety shields and precautions should be applied.

Where conditions prevent the sensing of buckets, a belt pulley or paddle mounted on an exposed shaft end, preferably the tail pulley, may be used.

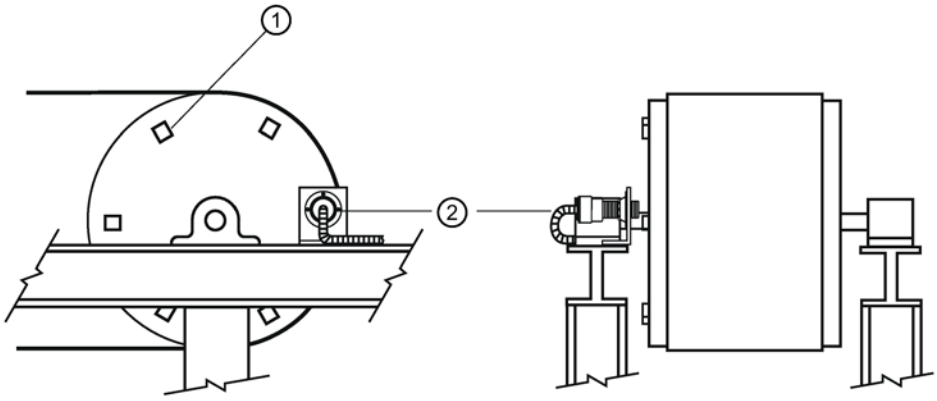
B.4 Rotating Shaft of Rotary Feeder



B.5 Drive Sprocket on Rotary Feeder



B.6 Belt Conveyors



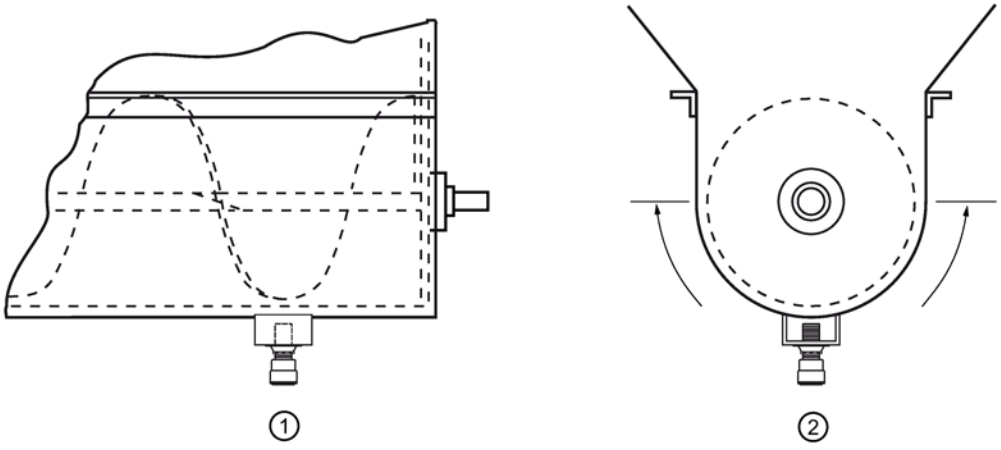
Dimensions in mm (inch)

① 50 x 50 x 25 (2 x 2 x 1) ferrous blocks or spoked wheel

② Probe

Potential for damage in each application governs the minimum gap allowable. Maximum gap for operation is 102 mm (4 inch), optimum 25 to 50 mm (1 to 2 inch).

B.7 Screw Conveyors

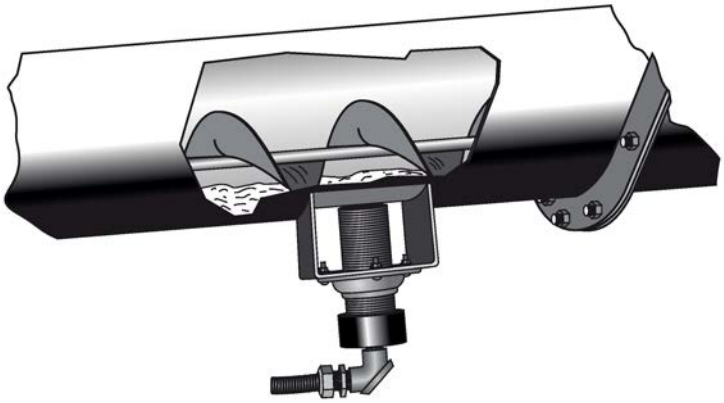


① The probe should be located at the idler end (usually feed end)

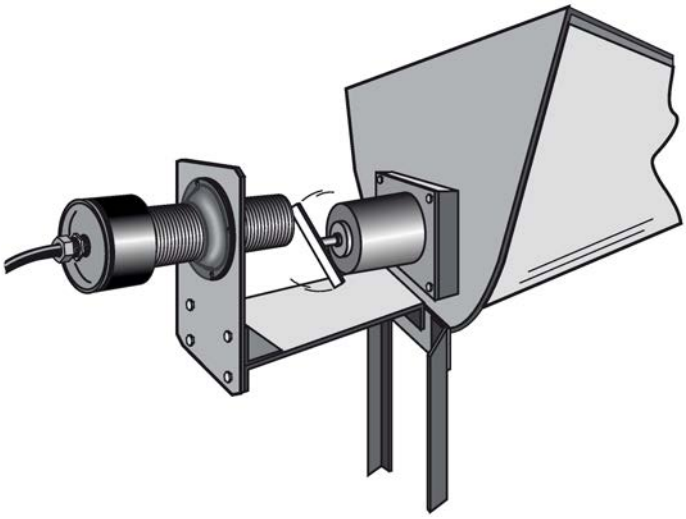
② Arrows indicate permissible placement range of the probe

A ferrous mass added behind the flight of a screw conveyor, where it passes the probe aids Borderline Operation. This mass must be added for all non-ferrous screws.

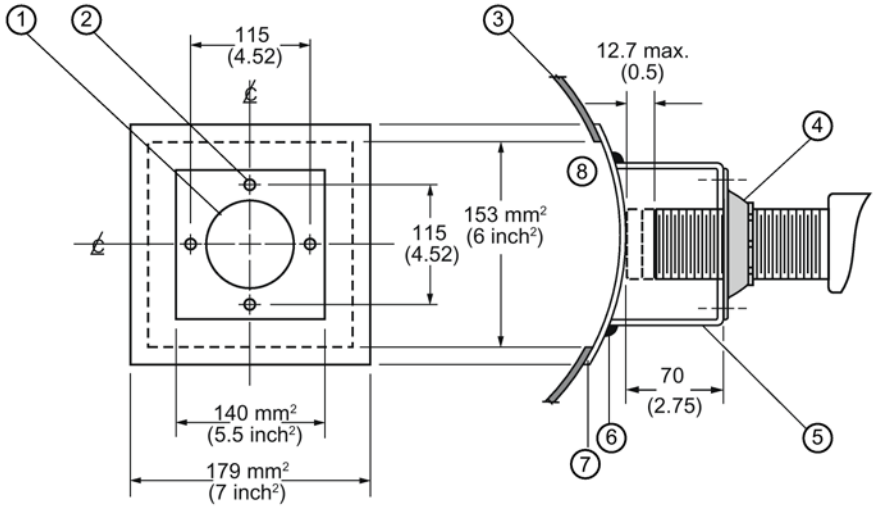
B.8 Screw Conveyor Flights



B.9 End Bearing on Screw Conveyor



B.10 Non-ferrous Window



Minimum recommended dimensions shown

Dimensions in mm (inch)

① 64 (3.5) ∅ clearance hole

② 6 (0.25) ∅ clearance, 4 holes

③ Conveyor housing

④ Probe and mounting flange

⑤ Bracket

⑥ Weld

⑦ Base plate

⑧ Window

For screw conveyor with trough over 3.1 mm (0.125 inch) thick or for high temperature applications. The dimensions shown for the base, window, and bracket are the minimum recommended with tolerances of ± 0.8 mm (0.031 inch). Use 305, 310, or 316 stainless steel, brass, or aluminum.

The probe may not touch the window if temperatures are in excess of 60 °C (140 °F) when using the low temperature probes or 260 °C (500 °F) when using the high temperature probes.

Support

C

C.1 Technical support

Technical support

If this documentation does not provide complete answers to any technical questions you may have, contact Technical Support at:

- Instructions and manuals (http://www.siemens.com/processinstrumentation/documentation)
- More information about our Technical Support is available at Technical Support (http://www.siemens.com/automation/csi/service)

Internet Service & Support

In addition to our documentation, Siemens provides a comprehensive support solution at:

- Partner (http://www.automation.siemens.com/partner)

Personal contact

If you have additional questions about the device, please contact your Siemens personal contact at:

- Support request (http://www.siemens.com/automation/support-request)

To find the personal contact for your product, go to "All Products and Branches" and select "Products & Services > Industrial Automation > Process Instrumentation".

Documentation

You can find documentation on various products and systems at:

- Services and Support (http://www.siemens.com/automation/service&support)

C.2 Certificates

You can find certificates on the Internet at Certificates (http://www.siemens.com/processinstrumentation/certificates) or on an included DVD.

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