

# SM500F

## Field-mountable paperless recorder



Innovative, simple, reliable recording

Measurement made easy

SM500F  
field-mountable  
paperless recorder

### Introduction

This publication provides the following commissioning instructions for the SM500F field-mountable paperless recorder:

- ① **Location**  
location requirements
- ② **Mounting**  
installation requirements to achieve IP66/NEMA 4X hose-down rating
- ③ **Electrical connections**  
AC and DC min./max. values and fuse requirements
- ④ **Navigation**  
navigating the user-interface quickly and effectively
- ⑤ **Menus overview**  
menu familiarization
- ⑥ **Basic setup**  
steps required for first-time use
- ⑦ **Symbols and icons**  
a schedule of icons/warning symbols that may be displayed during operation

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SM500F  
Field-mountable paperless recorder

[IM/SM500F-EN](#)

Data Sheet  
SM500F  
Field-mountable paperless recorder

[DS/SM500F-EN](#)

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# Health & Safety

## Safety conventions

Symbols that appear in this document are explained below:



**WARNING – Bodily injury** This symbol in conjunction with the signal word 'WARNING' indicates a potential electrical hazard. Failure to observe this safety information will result in death or severe injury.



**CAUTION – Minor injuries** A caution is used to indicate a condition which, if not met, could cause minor or moderate personal injury and / or damage to the equipment. Do not proceed beyond a caution until all conditions have been met.



**IMPORTANT (NOTE)** A note is used to indicate important information or instructions that should be considered before operating the equipment.

## Safety precautions

Be sure to read, understand and follow the instructions contained within this manual before and during use of the equipment. Failure to do so could result in bodily harm or damage to the equipment.



**WARNING – Bodily injury** Installation and maintenance of this product must only be conducted by personnel authorized to work on electrical installations and in accordance with relevant local regulations.

## Potential safety hazards

### Electrical



**WARNING – Bodily injury** To ensure safe use when operating this equipment, the following points must be observed:

- Up to 240 V AC may be present. Be sure to isolate the supply before removing the terminal cover.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and / or temperature.

Safety advice concerning the use of the equipment described in this manual or any relevant Material Safety Data Sheets (where applicable) can be obtained from the Company, together with servicing and spares information.

## Safety standards

This product has been designed to satisfy the requirements of IEC61010-1:2010 3<sup>rd</sup> edition 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use' and complies with US NEC 500, NIST and OSHA.

## EC Directive 89/336/EEC

**Electrical** – In order to meet the requirements of the EC Directive 89/336/EEC for EMC regulations, this product must be used in an industrial environment.

## End-of-life disposal



The recorder contains a small lithium battery that must be removed and disposed of responsibly in accordance with local environmental regulations.

The remainder of the recorder does not contain any substance that causes undue harm to the environment and must be disposed of in accordance with the Directive on Waste Electrical and Electronic Equipment (WEEE). It must not be disposed of in Municipal Waste Collection.



ABB is committed to ensuring that the risk of any environmental damage or pollution caused by any of its products is minimized as far as possible. The European Waste Electrical and Electronic Equipment (WEEE) Directive that initially came into force on 13 August 2005 aims to reduce the waste arising from electrical and electronic equipment; and improve the environmental performance of all those involved in the life cycle of electrical and electronic equipment.

In conformity with European local and national regulations, electrical equipment marked with the above symbol may not be disposed of in European public disposal systems after 12th August 2005

## Cleaning

The complete recorder can be hosed down if it has been installed to IP66 / NEMA 4X standards – see Section 2 on page 5.

Warm water and a mild detergent can be used.

## Symbols

Symbols that appear on this product are shown below:

	Protective earth (ground) terminal.
	Both direct and alternating current supply.
	This symbol, when noted on a product, indicates a potential hazard which could cause serious personal injury and / or death. The user should reference this instruction manual for operation and / or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and / or electrocution exists and indicates that only individuals qualified to work with hazardous voltages should open the enclosure or remove the barrier.
	Recycle separately from general waste under the WEEE directive.

## Restriction of Hazardous Substances (RoHS)

	The European Union RoHS Directive and subsequent regulations introduced in member states and other countries limits the use of six hazardous substances used in the manufacturing of electrical and electronic equipment. Currently, monitoring and control instruments do not fall within the scope of the RoHS Directive, however ABB has taken the decision to adopt the recommendations in the Directive as the target for all future product design and component purchasing.
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## Specification

### EMC

#### Emissions & immunity

Meets requirements of IEC61326 for an Industrial Environment

### Electrical

#### Supply ranges

100 V to 240 V AC  $\pm$  10% (90 V min to 264 V max) or

105 V DC min. to 115 V DC max.

10 V to 36 V DC (optional)

#### Power consumption

10 W max. 15 VA max.

#### Power interruption protection

No effect for interrupts of up to 20 ms

### Safety

#### General safety

EN61010-1

Overvoltage Class III on mains, Class II on inputs and outputs

Pollution category 2

CSA 61010-1

UL 61010-1

#### Isolation

500 V DC to earth (ground)

### Environmental

#### Operating temperature range

-10 to 50 °C (14 to 122 °F)

#### Operating humidity range

5 to 95 %RH (non-condensing)

#### Storage temperature range

-20 to 70 °C (-4 to 174 °F)

#### Enclosure sealing

IP66 and NEMA4X (the enclosure meets the requirements of the NEMA 4X hosedown test)

#### Vibration

Conforms to EN60068-2-6

# 1 Location

Locate the recorder in a position where its temperature and humidity specification will not be exceeded, and ensure that it is suitably protected from direct sunlight, rain, snow and hail.

Select a location away from strong electrical and magnetic fields. If this is not possible, particularly in applications where mobile communications equipment is expected to be used, screened cables within flexible, earthed metal conduit must be used.

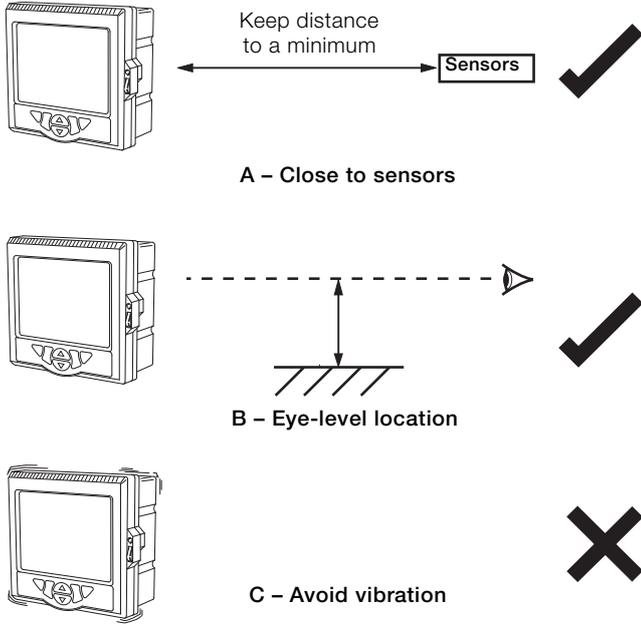


Fig. 1 Siting

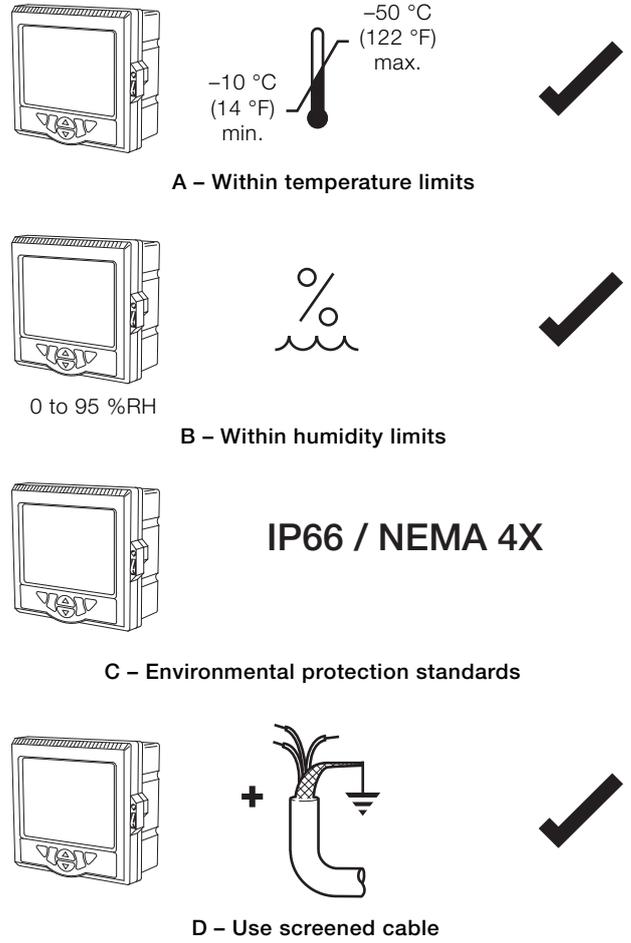


Fig. 2 Environmental requirements

## 2 Mounting

**i IMPORTANT (NOTE)** If removal of knockouts is required, refer to Cable entries on page 8.

### Panel-mounting

Referring to Fig. 3:

1. Cut the correct sized hole in panel (A).
2. Insert the recorder (B) into the panel cut-out.
3. Screw one clamping screw (C) into left-hand bracket (D) until 10 to 15 mm of the thread protrudes from the other side of the bracket and position one clamp (E) over the end of the thread.
4. Holding the assembly together, position the bracket into the left-hand recess on the rear of the recorder case and secure with bracket securing screw (F). Ensure that the plastic washer remains in the position fitted.
5. Repeat steps 3 and 4 for the right-hand panel clamp assembly.
6. Tighten clamping screws (C) evenly and securely by hand.

**i IMPORTANT (NOTE)** Tightening the clamping screws correctly is critical to ensuring proper compression of the panel seal and to achieving the IP66/NEMA 4X hosedown rating.

Dimensions in mm (in.)

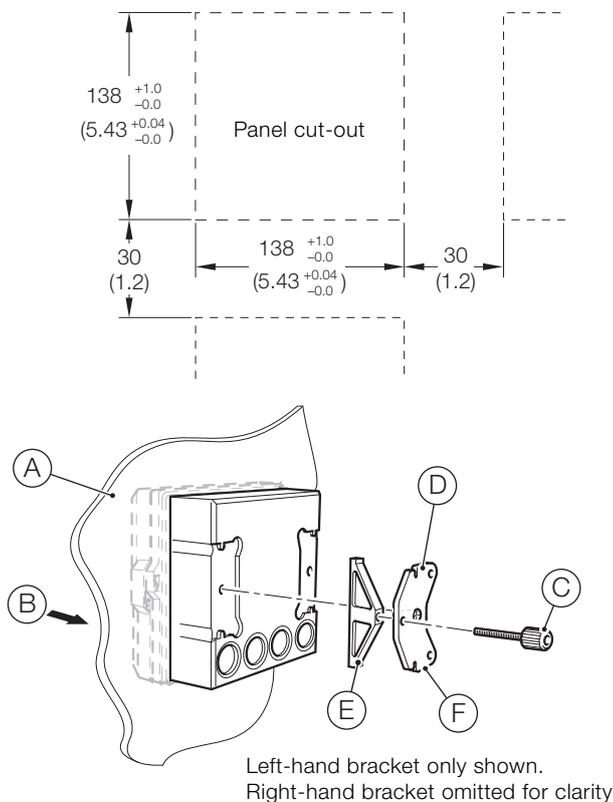


Fig. 3 Panel-mounting

### Wall-mounting

Referring to Fig. 4:

1. Position left- and right-hand mounting brackets (A) into the recesses on the rear of the recorder as shown and secure with bracket securing screws (B). Ensure the plastic washers remain in the positions fitted.
2. Mark fixing centers and drill suitable holes in the wall.
3. Secure the recorder to the wall using 2 screws (C) in each mounting bracket.

Dimensions in mm (in.)

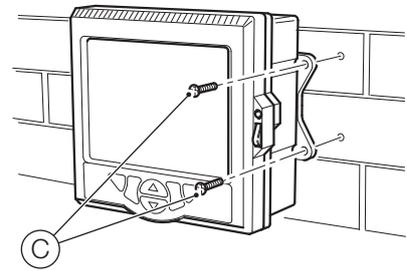
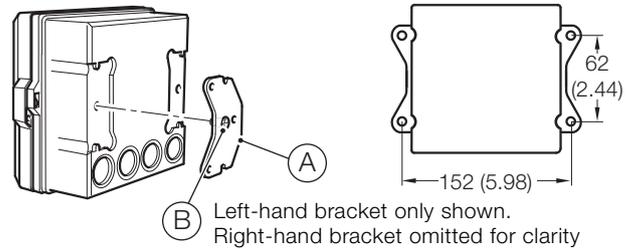


Fig. 4 Wall-mounting

### Pipe-mounting (optional)

Referring to Fig. 5:

1. Fit two M6 x 50 mm long hexagon-head screws (A) through one clamp plate as shown.
2. Using the appropriate holes to suit vertical or horizontal pipe, secure the clamp plate to the pipe-mounting bracket using two M6 x 8 mm long hexagon-head screws (B) and two spring lock washers (C).
3. Position the pipe mounting bracket into the recesses on the rear of the recorder as shown and secure with two bracket securing screws (D). Ensure the plastic washers remain in the positions fitted.
4. Secure the recorder to the pipe using the remaining clamp plate, spring lock washers and nuts (E).

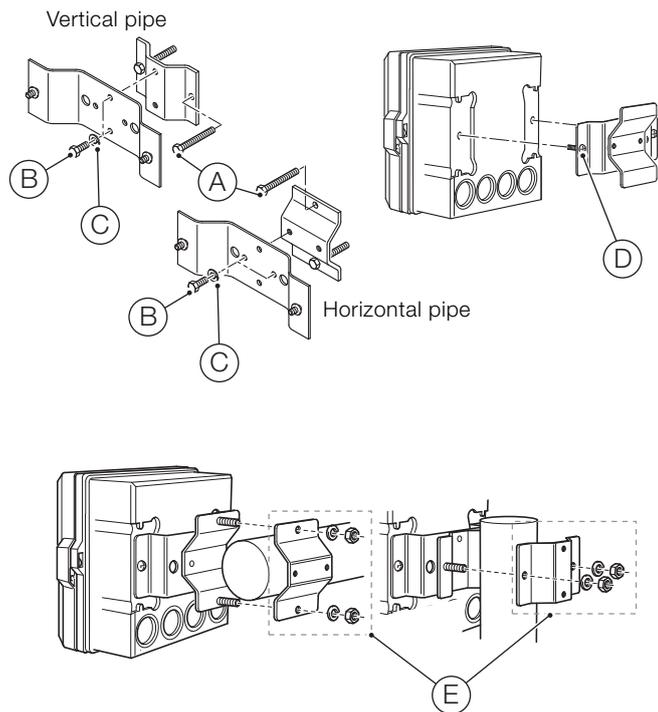


Fig. 5 Pipe-mounting

## 3 Electrical connections

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### **WARNING – Bodily injury**

- The recorder is not fitted with a switch therefore a disconnecting device such as a switch or circuit breaker conforming to local safety standards must be fitted to the final installation. It must be fitted in close proximity to the recorder within easy reach of the operator and must be marked clearly as the disconnection device for the recorder. A fuse must be fitted in accordance with Fig. 10.
  - Remove all power from supply, relay and any powered control circuits and high common mode voltages before accessing or making any connections.
  - Use cable appropriate for the load currents: 3-core cable rated 3 A and 90 °C (194 °F) minimum, that conform to either IEC 60227 or IEC 60245. The terminals accept cables from 0.8 to 2.5 mm<sup>2</sup> (18 to 14 AWG).
  - The recorder conforms to Installation Category II of IEC 61010.
  - All connections to secondary circuits must have basic insulation.
  - After installation, there must be no access to live parts, for example, terminals.
  - Terminals for external circuits are for use only with equipment with no accessible live parts.
  - If the recorder is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
  - All equipment connected to the recorder's terminals must comply with local safety standards (IEC 60950, EN601010-1).
- 



### **IMPORTANT (NOTE)**

- Always route signal leads and power cables separately, preferably in earthed (grounded) metal conduit.
- Use screened cable for signal inputs and relay connections.
- Replacement of the internal battery (type Varta CR2025 3V lithium cell) must be carried out by an approved technician only.

### **USA and Canada only**

- The supplied cable glands are provided for the connection of signal input and ethernet communication wiring only.
  - The supplied cable glands and use of cable/flexible cord for connection of the mains power source to the mains input and relay contact output terminals is not permitted in the USA or Canada.
  - For connection to mains input and relay contact outputs), use only suitably rated field wiring insulated copper conductors rated min. 300 V, 14 AWG, 90C. Route wires through suitably rated flexible conduits and fittings.
-

**i** IMPORTANT (NOTE)

- For wall- or pipe-mounting to IP66/NEMA4X standard, fit suitable cable glands. Blank off any unused holes with the blanking plugs and retaining clips supplied with the recorder.
- Optional cable glands are available and are suitable for use with cables  $\varnothing$  5 to 9 mm (0.20 to 0.35 in.). The alternative 2-hole cable gland inserts are suitable for use with cables  $\varnothing$  5 mm (0.20 in.). The Ethernet cable gland is suitable for use with cable  $\varnothing$  4.8 to 6.3 mm (0.19 to 0.25 in.).

Referring to Fig. 6:

1. Route cables through four holes (A) provided on the bottom of the case.
2. Knockouts (B) are provided on the rear of the recorder case as an alternative means of cable entry. To remove a knockout, place the back of the recorder on a firm, flat surface, open the door and inner cover and carefully remove the knockout by placing the blade of a small, flat-bladed screwdriver into the knockout groove and tapping the screwdriver smartly with a hammer.
3. Use cable entry hole or knockout (C) if the optional Ethernet module is fitted.
4. Connect Ethernet cable (D), ensuring that if optional input modules are fitted in positions B and C, the cable is routed between their terminal blocks as shown.
5. Connect cable screens only to terminals (E).

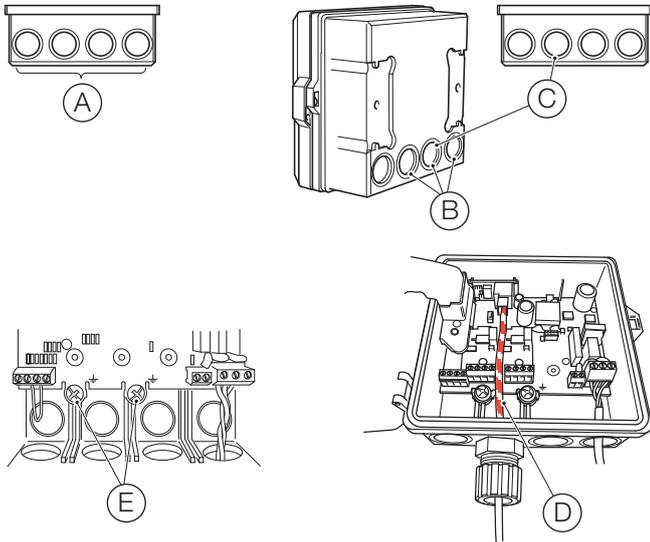
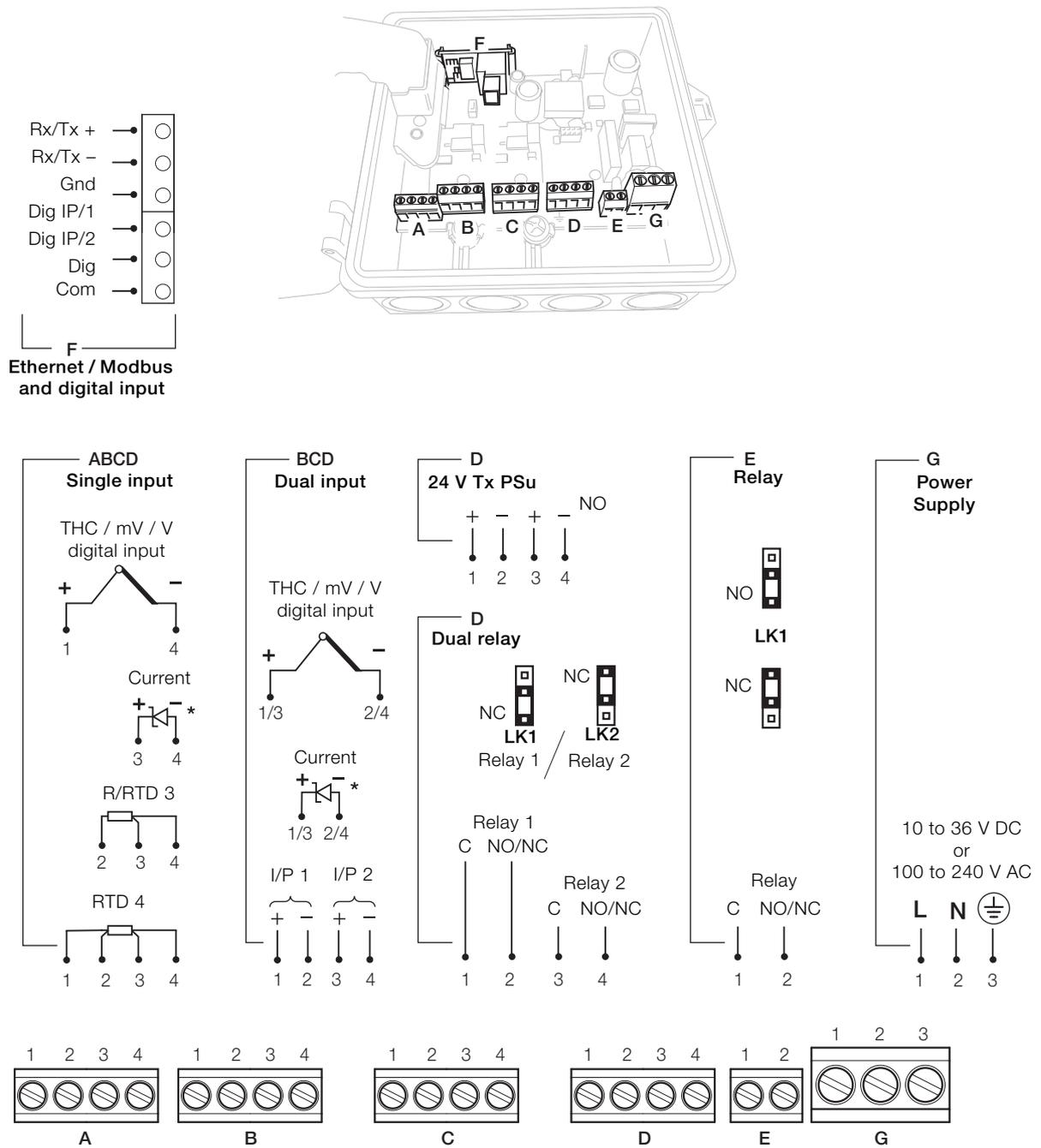


Fig. 6 Cable knockouts, ethernet cable routing and cable screening connections

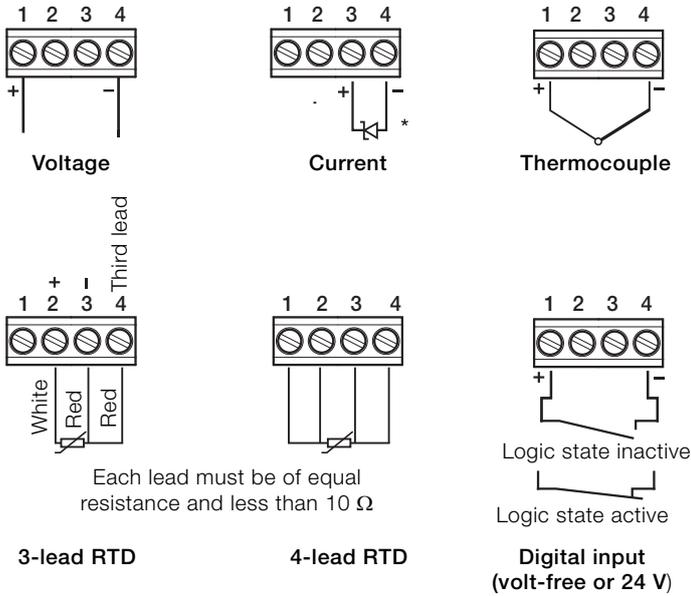
## Connections



\*In the powered-down condition the current input is open circuit. In order to maintain a current loop when the recorder is powered down, fit a zener diode (BZX79 - B/C2V4) to the input as shown.

Fig. 7 Electrical connections

**i IMPORTANT (NOTE)** Tighten power supply terminal screws to a torque of 0.8 Nm (7 lbf.in). Tighten all other terminal screws to a torque of 0.5 Nm (4.5 lbf.in).



\*In the powered-down condition the current input is open circuit. In order to maintain a current loop when the recorder is powered down, fit a zener diode (BZX79 – B/C2V4) to the input as shown.

Fig. 8 Single analog / digital input connections

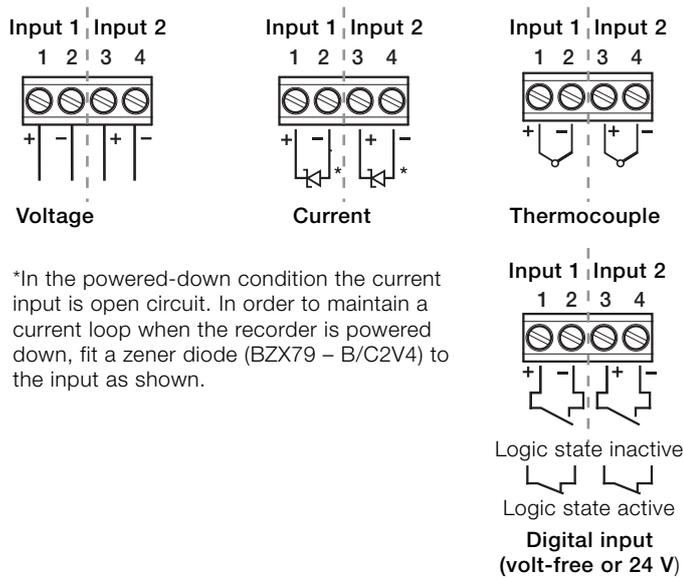
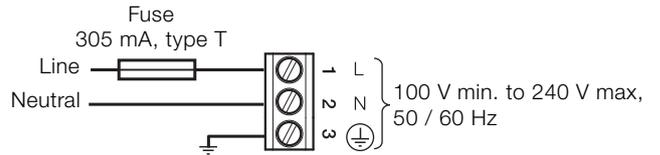


Fig. 9 Dual analog / digital input connections

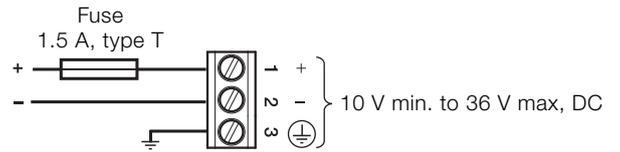
**i IMPORTANT (NOTE)** Tighten all analog / digital input terminal screws to a torque of 0.5 Nm (4.5 lbf.in).

### Power supply connections



**Warning.** Use fuse rating 315 mA (max.) type T

#### A – AC supply



**Warning.** Use fuse rating 1.5 A (max.) type T

#### B – DC supply

Fig. 10 Power supply connections

**i IMPORTANT (NOTE)** Tighten power supply terminal screws to a torque of 0.8 Nm (7 lbf.in).

### Transmitter power supply module

One transmitter power supply module can be fitted in position D to provide a nominal 24 V supply capable of driving two, 2-wire transmitters.

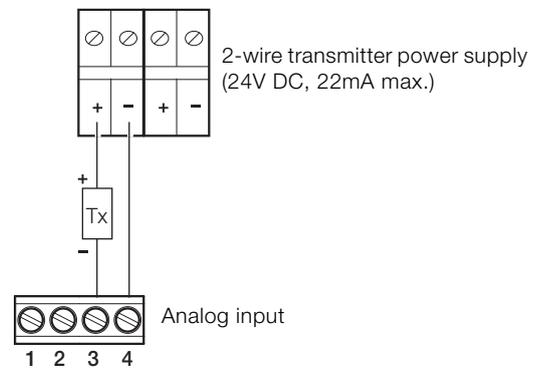


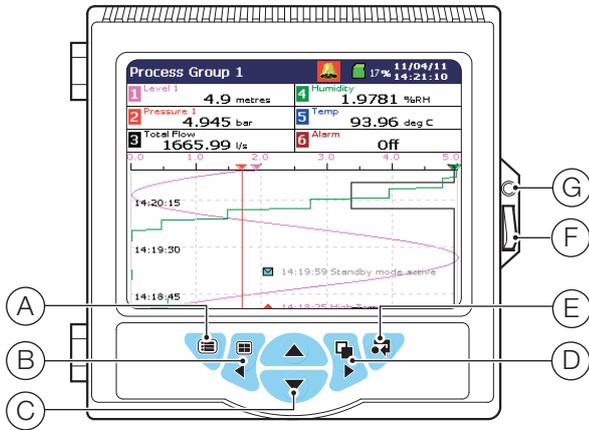
Fig. 11 Power supply connections

# 4 Navigation

## Operator keys and door features

The recorder is operated via the Operator Keys located below the screen.

Referring to Table 1, operator keys and door features are located as follows:



Key	Function
(A)	<b>Menu key</b> – displays or hides the context-sensitive operator menu associated with each view. Also cancels the menu without making a change or returns to the previous menu level
(B)	<b>Group key</b> – selects a different process group.
or (F)	<b>Left key</b> – scrolls left.
(C)	<b>Up / Down keys</b> – highlights menu items and scrolls through previously recorded data.
(D)	<b>View key</b> – selects a different process view or log.
or (D)	<b>Right key</b> – scrolls right.
(E)	<b>Enter key</b> – selects the highlighted menu item. If 'Screen Capture' is set to 'Enabled' during configuration <b>and</b> a Secure Digital (SD) archive media card is inserted in the recorder, the operator can save a snapshot of any an image of any Chart, Indicator, Audit Log, Alarm Log or Totalizer Log view to the SD card if  is pressed when an operator menu is not displayed.
(F)	<b>Door release.</b>
(G)	<b>Door lock (optional).</b>

Table 1 Operator keys and door features

# 5 Menus overview

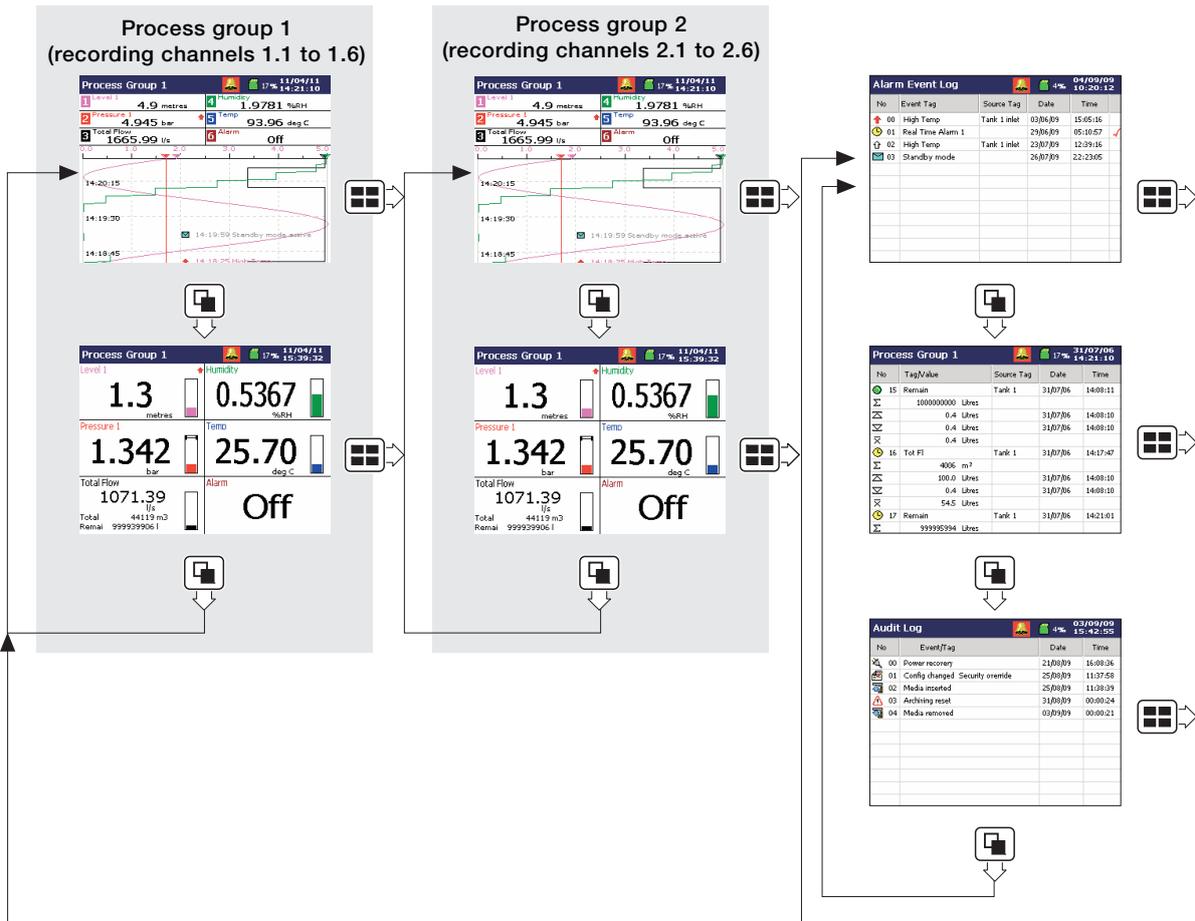
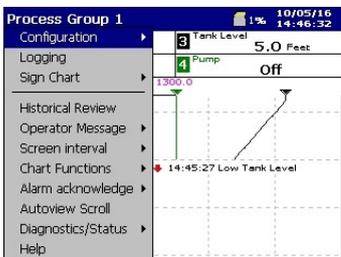


Fig. 12 Overview of operator displays

**IMPORTANT (NOTE)** Only process groups and views that are enabled are displayed.

### Operator menu

Press from any operator or log view to display the Operator menu. Recorder functions are then accessed by using the and keys to highlight the required option within the displayed menu and pressing to select the highlighted option.



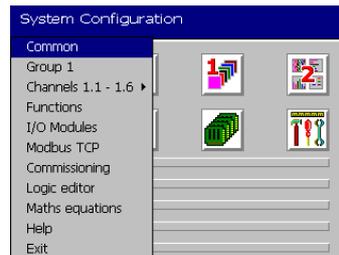
### Configuration level menus

To access the configuration menus:

1. Highlight **Configuration** in the operator menu.
2. Press and highlight the operator to log on as.
3. Press and enter the operator password (if configured).

**IMPORTANT (NOTE)** If the recorder is being used for the first time, a password is not set.

4. Select the configuration entry mode:
  - a. Edit Current Configuration
  - b. Open a Configuration
  - c. New Configuration



Configuration menu options comprise:

	<b>Common</b>
Setup	Number of groups
	Language
	Global alarm ack source
	Instrument tag
	Options enabled
	Chart View Timer
Screen	Screen saver wait time
	Screen Capture
	Brightness
Time	Date and time
	Daylight Saving - Enable
Security (Basic)	Security type
	Logging security
User	User 1(to 4)
Op. Messages (1 to 24)	Message 1 (to 24)

	<b>Group 1 (2)</b>
Recording	Tag
	Recording enable source
	Primary sample rate
	Secondary sample rate
	Sample rate select source
Chart	Chart view enable
	Chart annotation
	Chart divisions
	Pointers/Indicators
	Screen interval
	Trace width
	Menu enables
Indicator	Indicator
	Totalizer / statistics
	Bar graph display
	Alarm Trip Points
	Menu enables
Archive	Archive file format
	Archive file enables
	Wrap
Batch (If option enabled)	Enable Batch Recording
	Start/Stop, Abort
	Operator Login
	Batch Number
	Field 1(to 3) Title

	<b>Channels 1.1 (to 6) and 2.1 (to 6)</b>
Setup	Source ID
	Trace color / Zone
	Filter type
Analog I/P	Scale Type
	Input type
	Engineering range
	Tag
	Filter time constant
Alarm A (to D)	Fault detect level
	Broken sensor direction
	Alarm type
	Alarm tag
	Trip
	Hysteresis
	Enable source
Log Enable/Ack Timeout	
Totalizer A (B)	Alarm group
	Enable
	Tag
	Units
	Stop/Go/Reset
	Count range
	Log update
Count rate/Cut off	

	<b>Functions</b>
Linearizer	Adjust custom linearizer 1 (2)
RTA 1 (to 4)	Alarm tag
	Daily enables
	1st of the month enable
	On time
	Duration
	Log enable

	<b>I/O Modules</b>
Analog Input A (D2)	Mains rejection frequency Operator Calibrate
Relay Relay E1	Source Polarity
Ethernet	IP-address Subnet mask Default gateway FTP User 1 (4)
Email	Auto Address Sender Address
Email 1(2)	SMTP Server IP address Recipient 1 (to 3) Options enabled Trigger 1-5 Trigger 6-10

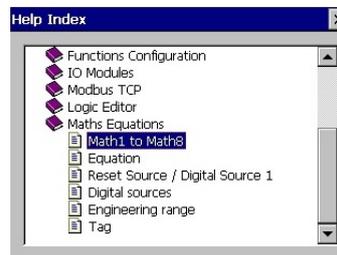
	<b>Modbus TCP</b>
Implementation – Server (Slave)	Connections Allowed Modbus TCP Port Reverse IEEE data
Implementation – Client (Master)	Connections Allowed Modbus TCP Port Poll Rate (ms) Poll fail limit Response Timeout (ms)
Comms analog I/P	Comms analog I/P Protocol
Comms digital I/P	Comms digital I/P Protocol

	<b>Logic editor</b>
Eqtn 1 (8)	Operand / Operator 1 (to 6) Eqtn tag & log enable

	<b>Maths equations</b>
Math1 (to 8)	Equation Rst srce/Dgtl srce1 Digital source 2/3 Engineering range Tag

### Help index

Select help from anywhere in the configuration menu to display full online help instructions, for assistance without paper manual.



## 6 Basic setup

Perform the following steps in sequence to set up the recorder for the first time. For detailed configuration instructions refer to the User guide – IM/SM500F-EN.

### Start up

1. Locate and mount the recorder as described in Sections 1 and 2.
2. Make electrical and signal connections as described in Section 3.
3. Power up the recorder.
4. Proceed to the next step to set the date and time.

### Set the date and time

1. Press the  key from any operator or log view to display the operator menu.
2. Use the  /  keys to select *Operator 1* and press the  key.
3. Use the  /  keys to select the 'OK' button at the Operator 1 – Password (0...9999) page and press the  key (passwords are not set at first-time use). The *Operator 1 Edit / Open / New Configuration* dialog is displayed with the *Edit Current Configuration* button () highlighted.
4. Press the  key to display the system configuration screen.
5. Press the  key to display the configuration menu, use the  /  keys to highlight the *Common* menu option and press  to display the common configuration page.
6. Use the  key to select the *Time* tab and press the  key to edit the *Date and Time* field. The following warning is displayed:



press the  key.

7. Use the  /  and  /  keys to select the first field to edit.
8. Enter the required information in each field pressing  before using the  /  and  /  keys to move to the next field.
9. When all fields have been set, use the  /  and  /  keys to highlight  and press  to return to the *Time* tab.
10. Proceed to the next step to set the sample rate.

### Configure the process group(s)

1. Press the  key to display the configuration menu, use the  /  keys to select *Group 1* and press the  key to display the group's *Recording* tab.
2. Use the  /  keys to highlight the edit button () next to each field and press the  key to configure each parameter as required.
3. Use the  key to select the *Chart* tab.
4. Use the  /  keys to highlight the edit button () next to each field and press the  key to configure each parameter as required.
5. If Indicator View is required, use the  key to select the *Indicator* tab.
6. Use the  /  keys to highlight the edit button () next to each field and press the  key to configure each parameter as required.
7. Use the  key to select the *Archive* tab.
8. Use the  /  keys to highlight the edit button () next to each field and press the  key to configure each parameter as required.
9. Repeat steps 1 to 8 for *Group 2* recording parameters (if required).

### Configure the recording channels

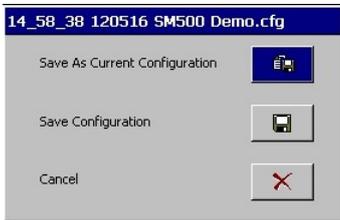
1. Press the  key to display the configuration menu, use the  /  keys to select *Channels 1.1 - 1.6*, press the  key and use the  /  keys to highlight the first channel to configure and press the  key to display the channel's *Setup* tab.
2. Use the  /  keys to highlight the edit button () next to each field and press the  key to configure each parameter as required.
3. Use the  key to select the *Analog I/P XX* tab.
4. Use the  /  keys to highlight the edit button () next to each field and press the  key to configure each parameter as required.
5. Repeat steps 3 and 4 for each of the *Alarm* and *Totalizer* (if enabled) tabs as required.
6. Press the  key to display the configuration menu, use the  /  keys to select *Channels 1.1 - 1.6*, press the  key and use the  /  keys to highlight the next channel to configure and press the  key to display the channel's *Setup* tab.
7. Repeat steps 2 to 5 to configure the channel as required.
8. Repeat steps 6 and 7 for each of the remaining channels as required.
9. Repeat steps 1 to 8 for *Channels 2.1 - 2.6* (if required).

**i IMPORTANT (NOTE)** The recorder detects the type of module fitted in each position automatically.

1. Press the key to display the configuration menu, use the / keys to select *I/O Modules* and press the key.
2. Use the / keys to select the tab for the first module to configure and press the key.
3. Use the / keys to highlight the edit button () next to each field and press the key to configure each parameter as required.
4. Repeat steps 2 and 3 for each of the remaining modules as required.

**Save the configuration and exit**

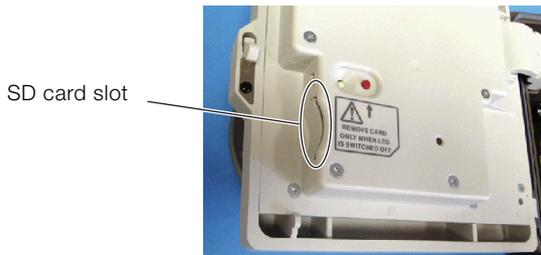
1. Press the key to display the configuration menu, use the / keys to select *Exit* and press the key. The save configuration dialog is displayed:



2. Press the key.
3. Use the / keys to select either *Internal Storage* or *External Storage* and press the key to save the configuration and start recording.

**Archiving**

To start archiving, open the recorder's door, insert an SD card and close the door. Archiving is initiated automatically.



7 Symbols and icons

**Archiving icons**

**Display type**

**Color      Monochrome**



External archive media on-line with % used indication  
 External archive media off-line with % used indication  
 External archive media not inserted (flashing exclamation mark)  
 Media update in progress.  
**Do not remove media while this symbol is displayed**  
 External media 100% full, archiving stopped (flashing cross)  
 Warning! Too many files (left-hand icon – media online, right-hand icon – media offline)  
 Too many files, archiving stopped (flashing cross)

**Status icons**

- Historical review active
- Alarm(s) active, red flashing border indicates unacknowledged alarm(s) active
- AutoView scroll active
- Clock battery failure

**Alarm event icons**

**Inactive    Active**

- High process alarm
- Low process alarm
- Delayed high process alarm
- Delayed low process alarm
- High latch alarm
- Low latch alarm
- Fast rate alarm
- Slow rate alarm
- High annunciate alarm
- Low annunciate alarm
- Real-time alarm
- Alarm acknowledged
- Operator message
- Daylight saving start / end changed
- Electronic signature

## Totalizer icons

-  Totalizer started
-  Totalizer stopped
-  Totalizer wrapped
-  Totalizer reset
-  Intermediate value reached
-  Timed event
-  Triggered event
-  Power failed
-  Power restored
-  Batch total
-  Maximum value
-  Minimum value
-  Average value
-  Daylight saving start / end changed

## Audit log icons

-  Power failed
-  Power restored
-  Calibration change
-  Configuration change
-  File deleted
-  Archive media inserted
-  Archive media removed
-  Archive media offline
-  Archive media online
-  Archive media full
-  System error / reset archiving
-  Daylight saving start / end changed
-  FTP Logon

# Notes

Sales



Service



Software



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