Field Mountable Videographic Recorder

SM500F

■ **Unique universal mounting capability**
 – wall-, pipe- or panel-mount
 – ultra-slim design, ≤90mm (3.5 in.) deep

■ **Secure data recording**
 – large internal Flash memory
 – archiving to SD memory card

■ **8 software recording channels for recording of:**
 – up to 4 analog/digital inputs
 – math function results
 – Modbus TCP signals

■ **Remote access and data retrieval**
 – Ethernet connectivity

■ **Install into the harshest of process environments**
 – protection to NEMA4X and IP66 standards

■ **Choice of displays**
 – color TFT or monochrome options

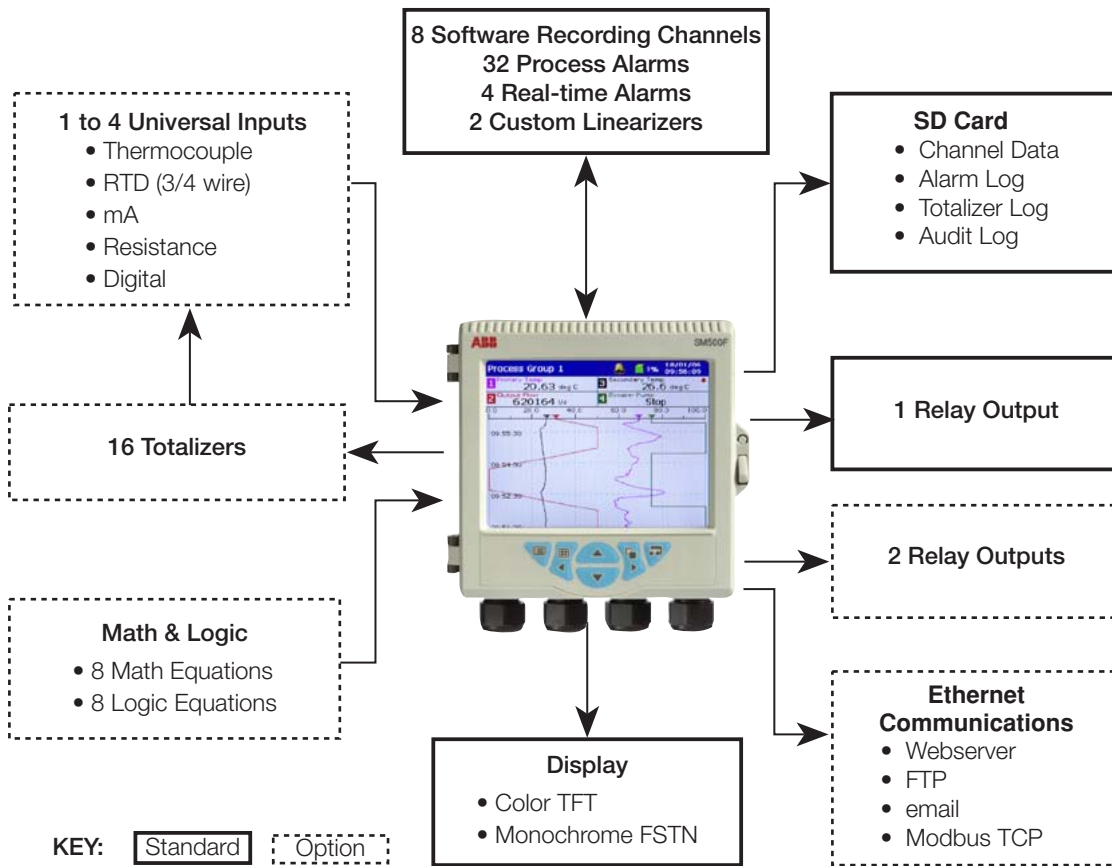■ **Quick and easy setup**
 – on-line help and Windows™-style menus

Innovative, simple, reliable recording

ABB

SM500F

The SM500F is a field-mountable videographic recorder. Its unique enclosure design enables wall-, pipe- or panel-mounting of the unit. Process data is displayed clearly to the local operator through a variety of display formats, including chart, bargraph and digital indicator displays. Additionally, process data is logged securely to the removable memory card. Ethernet communications provide convenient remote monitoring of the process and access to logged data.
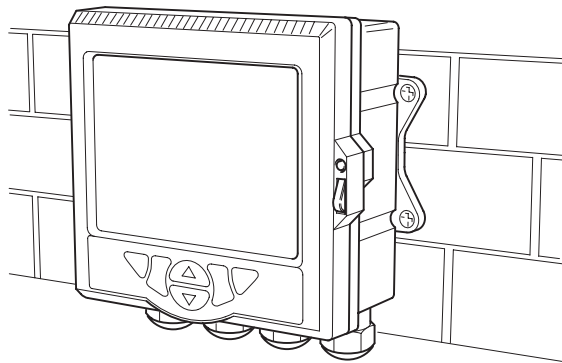
1 to 4 Universal Inputs
- Thermocouple
- RTD (3/4 wire)
- mA
- Resistance
- Digital

8 Software Recording Channels
32 Process Alarms
4 Real-time Alarms
2 Custom Linearizers

SD Card
- Channel Data
- Alarm Log
- Totalizer Log
- Audit Log

16 Totalizers

1 Relay Output

2 Relay Outputs

Math & Logic
- 8 Math Equations
- 8 Logic Equations

Ethernet Communications
- Webserver
- FTP
- email
- Modbus TCP

Display
- Color TFT
- Monochrome FSTN

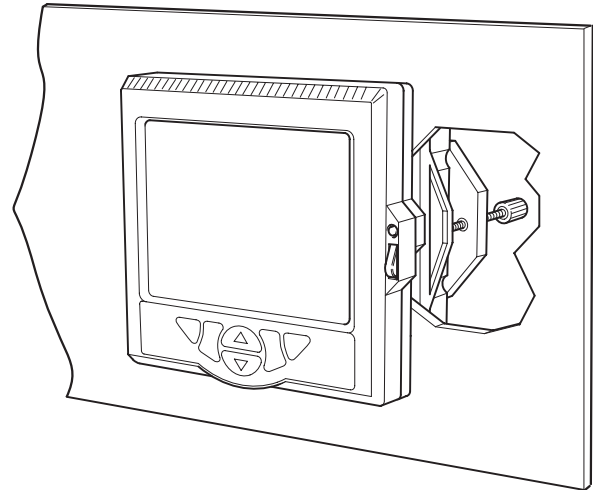**KEY:** Standard | Option

Unique Enclosure

The SM500F is housed in a unique enclosure for a videographic recorder. 'Out of the box' it is possible to either wall- or panel-mount the device. The SM500F can also be pipe-mounted using the optional kit.

In any type of installation the SM500F's enclosure meets both IP66 and NEMA 4X hose-down standards. This means that the unit requires no costly additional enclosures or protection when mounted in applications that require frequent hose-down.
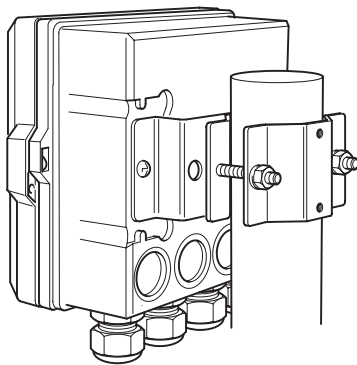
When panel-mounted the SM500F's ultra slim profile requires a panel depth of only 67mm (2.7 in.). This ensures that there are no problems when replacing existing recording devices and enables the SM500F to be installed into existing panels where required.
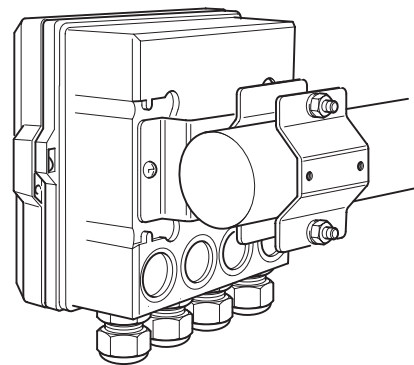

Wall-mount

Panel-mount

Vertical Pipe-mount

Horizontal Pipe-mount

Innovative design enables multiple mounting options

Save Time and Money

The unique enclosure design of the SM500F enables it to be wall-mounted without the need for additional costly enclosures. To wall-mount a traditional videographic recorder, an additional enclosure must be sourced and a cut-out made to suit the recorder, glanded cable entries made and any internal wiring required for safety regulations installed and tested.

The work involved in producing such an enclosure increases costs and installation times significantly.
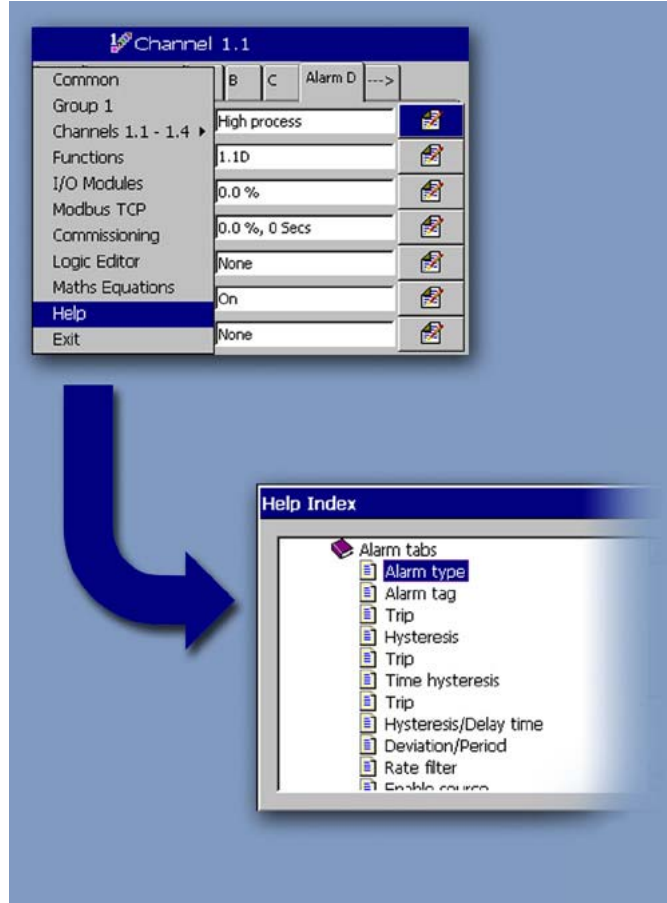
Flexible Recording

8 software recording channels are featured in the SM500F as standard. Up to 4 physical analog/digital inputs can be fitted to the SM500F and assigned to a software recording channel. The remaining software recording channels can be used to record math block results, alarm status, signals communicated via Modbus TCP or any other analog or digital signal available within the recorder. Each software recording channel features 4 process alarms and 2 optional totalizers.

Ease of Use

Operation of the SM500F is performed via dedicated operator keys on the front panel. All operation and configuration is performed via intuitive Windows-style menus.

The SM500F includes context-sensitive online help that quickly assists the operator when required. This enables the SM500F to be installed quickly and configured without the use of the instruction manual.

Comprehensive and intuitive on-line help system

Display Options

The SM500F is available with a choice of displays. Depending on the application requirements, either a 144mm (5.7 in.) color TFT or 120mm (4.7 in.) monochrome FSTN display can be specified.

High definition color display

Cost-effective monochrome display option

High Specification I/O

The SM500F features up to 4 fully universal inputs. Each input can be configured to accept a variety of process signals directly – including mA, mV, RTD (3- or 4-wire), thermocouple, voltage, resistance or digital signal. Process data can be logged at the high speed of 100mS. All analog/digital inputs have 500V channel-to-channel isolation.

Included as standard is a relay output that can be driven from process alarms, memory card capacity warning or many other events. Two additional relays can be added if required.

The SM500F can be upgraded easily with additional I/O due to its modular design. When inserted, additional inputs or relay modules are recognized by the recorder and can then be configured ready for use.
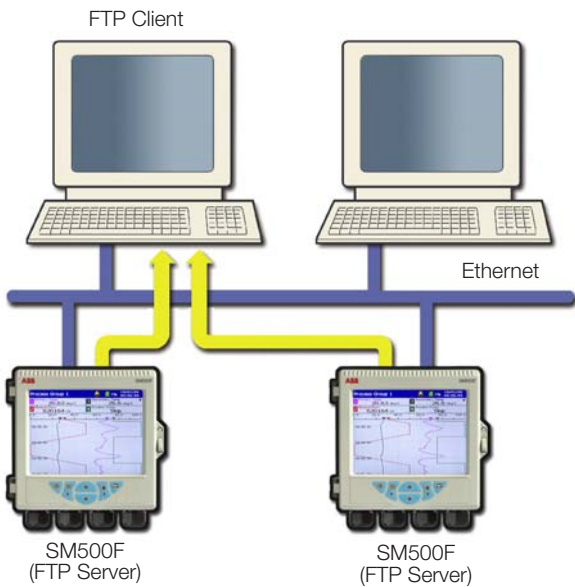
Ethernet Communications

The SM500F can provide 10BaseT Ethernet communications via a standard RJ45 connector and uses industry-standard protocols TCP/IP, FTP and HTTP. The use of standard protocols enables easy connection into existing PC networks.

Data File Access via FTP (File Transfer Protocol)

The SM500F features FTP server functionality. This functionality provides high-speed access via Ethernet to data archived by the recorder.
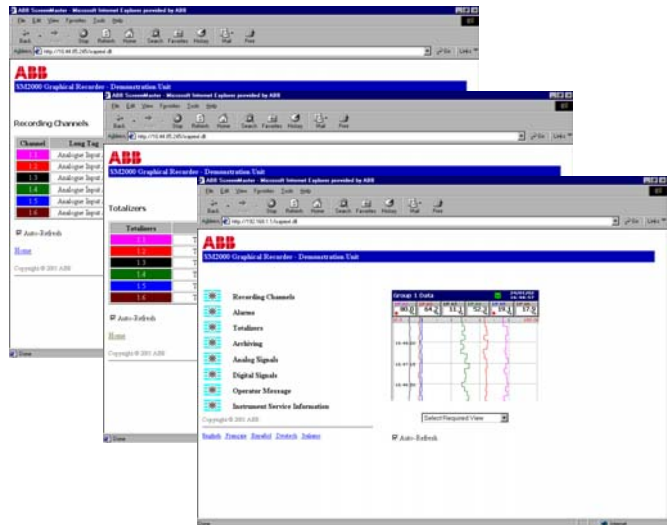
- Using a standard web-browser or other FTP clients, data files contained within the SM500F's memory card can be accessed remotely and transferred to a PC or network drive.

- Four individual FTP users can be programmed into the SM500F. An access level can be configured for each user.

- All FTP log-on activity is recorded in the audit log of the SM500F.

- Using ABB's data file transfer scheduler program, data files from multiple recorders can be backed-up automatically to a PC or network drive for long-term storage, ensuring the security of valuable process data and minimizing the operator intervention required.

Embedded Web Server

Contained within the SM500F is an embedded web-server that provides access to web pages created within the recorder. The use of HTTP (Hyper Text Transfer Protocol) enables standard web browsers to view these pages.

- Presented within the web pages is the current display of the recorder, detailed information on process signals, alarm conditions, totalizer values and other key process information.

- The historical logs stored in the SM500F's internal buffer memory can be displayed in full form within the web pages.

- Operator messages can be entered via the web server enabling comments to be logged to the recorder.

- All of the information displayed on the web pages is refreshed regularly enabling them to be used as a process supervision tool.

- The recorder's configuration can be switched to a different configuration. This can be an existing configuration in the internal memory or a new configuration file transferred to the recorder via FTP.

- The recorder's real-time clock can be set via the webserver. Alternatively, the clocks of multiple recorders can be sychronized using FTS (File Transfer Scheduler).

FTP Client

Ethernet

SM500F
(FTP Server)

SM500F
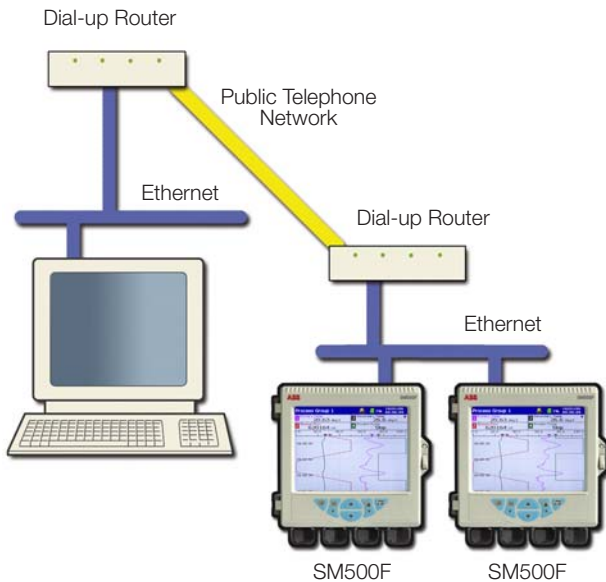(FTP Server)

On-line Demonstration

A demonstration of these features is available from an on-line recorder accessible via the internet. In the address bar of your web browser enter 'http://217.33.207.105'.
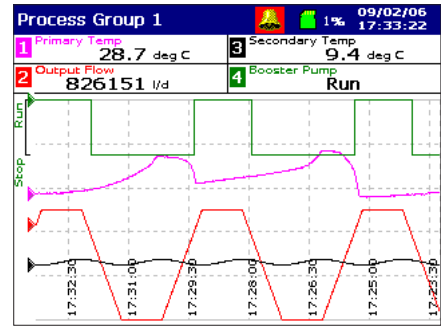
Email Notification

Via the SM500F's inbuilt SMTP client the recorder is able to email notification of important events. Emails triggered from process alarms or other critical process events can be sent to multiple recipients. The recorder can also be programmed to email reports of the current process status at specific times during the day, the content of which can be tailored to suit your specific process needs.
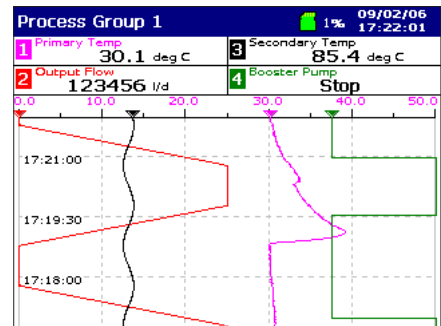
Remote Access and Monitoring

Ethernet communications can provide a link to recorders installed in remote locations. Via the use of a dial-up router an SM500F can be installed in a remote location and accessed via a public telephone network when required.
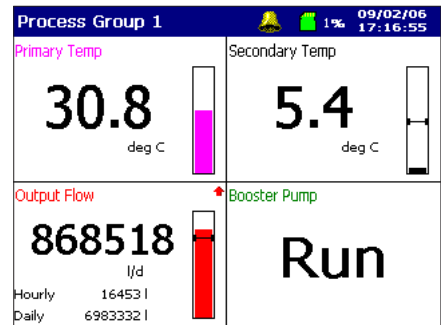
Powerful Operator Displays

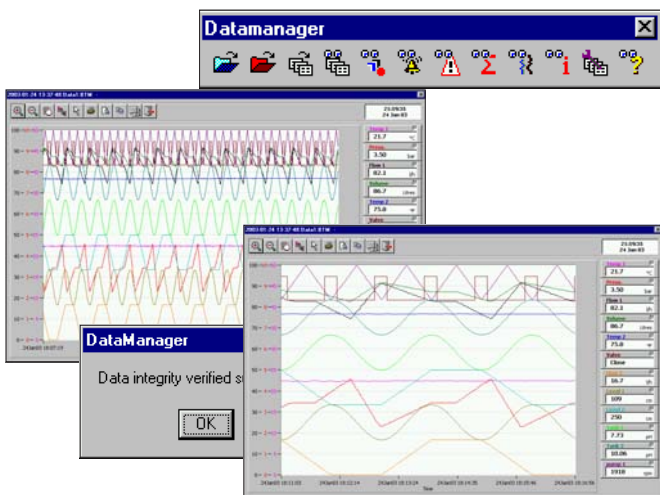*Horizontal Chart Display*

Vertical Chart Display

Digital Display

DataManager Off-Line Review and Analysis

Using ABB's DataManager software, archived process data and historical logs recorded to a removable media card can be reviewed easily.

- Database management of data files provided by DataManager ensures simple, secure, long-term storage and retrieval of historical data.

- The graphing capabilities provided by DataManager ensure easy interrogation of process data.

- The validity of all data files is always checked by DataManager during the storage and retrieval process, ensuring maximum data integrity.

For further information on the capabilities of DataManager, refer to data sheet SS/DATMGR.

Software Options

Totalizers

Flow totalizers are available as an option. Each software recording channel has 2 totalizers that enables resetable and cumulative totals to be displayed simultaneously.

Maths & Logic

Advanced math and logic capabilities are available as an option. 8 multi-element math and 8 multi-element logic equations can be configured. Equations can be nested into each other to provide extensive capabilities.

- Mean, standard deviation and rolling averaging functions are provided.

- Standard addition, subtraction, multiplication and division are complemented with Log, Ln, Square root, power, Sin, Cos, Tan and absolute functions.

- Switching of process signals can be achieved via the high/low/middle signal selection and multiplexing functions.

- Predefined equations are provided for relative humidity and F_0 measurements.

- AND, NAND, OR, NOR, XOR and NOT operators are available within the logic equations.

All math and logic equation results can be shown on the display of the SM500F and archived to the removable media. Detailed diagnostic functions are provided for both the math and logic equations.

Specification

Operation and Configuration

Configuration

Via tactile membrane keys on front panel or
PC Configuration

Multiple configuration files can be stored in internal (up to 16 files)
or external memory (with removable media option fitted)

Security

Physical

Optional lock on door

Configuration security

Password protection	Access to configuration is allowed only after the user has entered a password
Internal switch protection	Access to configuration is allowed only after a hardware switch has been set. This switch is situated behind a tamper-evident seal

Logging security

Configuration	Can be configured for password protection or free access to logging levels

Basic type security

4 individual users with unique usernames and passwords

Advanced type security

Number of users	Up to 12
Usernames	Up to 20 characters. Usernames are unique (names cannot be repeated)
Access privileges	Logging access – Yes/No Configuration access None/Load file only/Limited/Full
Passwords	Up to 20 characters A minimum required password length of 4 to 20 characters can be configured and a password expiry time can be applied to eliminate password ageing
Password failure lmit	Configurable for 1 to 10 consecutive occasions or 'infinite' A user is deactivated if a wrong password is entered repeatedly
Deactivation of inactive users	Can be disabled or configured for 7, 14, 30, 60, 90, 180 or 360 days of inactivity Users are deactivated (by removal of access privileges) after a period of inactivity

Display

Monochrome FSTN or Color TFT, passive matrix, liquid crystal
display (LCD) with built-in backlight and contrast adjustment

Diagonal display area	color 144mm (5.7 in.) monochrome 120mm (4.7 in.)

76800 pixel display*

* A small percentage of the display pixels may be either constantly active
or inactive. Max. percentage of inoperative pixels <0.01%.

Language

English, German, French, Italian and Spanish

Dedicated operator keys

– Group select/Left cursor

– View select/Right cursor

– Menu key

– Up/Increment key

– Down/Decrement key

– Enter key

Chart screen intervals

Selectable from 18s to 7 days

Chart divisions

Programmable for up to 10 major and 10 minor divisions

Chart annotation

Alarm and operator messages may be annotated on the chart

Icons to identify the type of event, time of occurrence and tag are
displayed

Operator Views

Standard Functionality

Operator Messages

Number

24

Trigger

Via front panel or digital signals

Recording in alarm/event log

Can be enabled or disabled on configuration

Process Alarms

Number

16 (4 per recording channel)

Types

High/Low	process, latch & annunciator
Rate	fast/slow

Tag

20-character tag for each alarm

Hysteresis

Programmable value and time hysteresis (1 to 9999s)

Alarm enable

Allows alarm to be enabled/disabled via a digital input

Alarm log enable

Recording of alarm state changes in the alarm/event log can be
enabled/disabled for each alarm

Acknowledgement

Via front panel keys or digital signals

...Specification

Real-time Alarms

Number

4

Programmable

Day of the week, 1st of month, start and duration times

Custom Linearization

Number

2

Number of breakpoints

20 per linearizer

Recording to Internal Memory

Data Channels

Internal buffer memory

8Mb Flash memory provides storage for 2 million samples

Oldest data is overwritten automatically by new data when memory is full

Data integrity checks

Checksum for each block of data samples

Independent process groups

2

No. of recording channels

4 per group

Sources

Analog inputs, Modbus™ inputs, any digital signal, math block

Filters

Programmable for each channel to allow recording of: instantaneous values, average, max., min. and max. & min. value over sample time

Primary/Secondary sample rates

Programmable from 0.1s to 12 hours for each process group

Primary/Secondary sample rate selection

Via any digital signal or from password protected menu

Recording start/stop control

Via any digital signal or from password-protected menu

Recording Duration

Approximate duration calculated for continuous recording of 4 channels of analog data (for 8 channels divide by 2, for 2 channels multiply by 2 etc.)

Sample Rate	1s	10s	40s	60s	120s	480s
8Mb Internal Flash Buffer Memory	6 days	2 months	7.5 months	1 year	2 years	7 years

Historical logs

Types

Alarm/Event, Totalizer and Audit logs

No. of records in each historical log

Up to 200 in internal memory

Oldest data is overwritten automatically by new data when log is full

Historical logs

Log Type / Information Recorded in Log	Alarm/Event Log • Alarm state changes • Operator messages		Totalizer Log* • User defined logging intervals • Totalizer stop/start, reset, wrap • Power up/down		Audit Log • Configuration/calibration changes • System events • Errors, operator actions	
Log Entry Events	In Log	On Screen	In Log	On Screen	In Log	On Screen
Date & time of event	✔	✔	✔	✔	✔	✔
Type of event	✔	✔	✔	✔	✔	✔
Tag	✔	✔	✔	✔	–	–
Source tag	✔	–	✔	–	–	–
Alarm trip value & units of measure	✔	–	–	–	–	–
Alarm state	✔	✔	–	–	–	–
Alarm acknowledgement state	✔	✔	–	–	–	–
Operator ID	✔	–	–	–	✔	✔
Description	–	–	–	–	✔	✔
Batch total and units of measurement*	–	–	✔	✔	–	–
Max., min. and average values plus units*	–	–	✔	✔	–	–
Secure total	–	–	✔	–	–	–

*If Totalizer option fitted and selected

Archiving to Removable Media

Removable storage media options

– SD Card

Data that can be saved to removable media

– Recorded data for group 1 & 2 channels

– Alarm event log data

– Totalizer log data

– Audit log data

– Configuration

– Screen capture images

File structure

Configurable as either binary-encoded or comma-separated

Filename

20-character tag, prefixed with date/time

Data verification

Carried out automatically on all writes to removable-media files

Recording Duration

Approximate duration calculated for continuous recording of 4 channels of analog data
(for 8 channels divide by 2, for 2 channels multiply by 2 etc.)

Binary Encoded File

Sample Rate	1s	10s
128Mb SD	3 months	2.5 years
256Mb SD	6 months	5 years
512Mb SD	12 months	10 years
1Gb SD	2 years	20 years

Comma-separated File

Sample Rate	1s	10s
128Mb SD	20 days	6 months
256Mb SD	40 days	12 months
512Mb SD	2.5 months	2 years
1Gb SD	5 months	4 years

...Specification

Analog Inputs

General

Number of inputs
4 (1 as standard, 3 optional)

Input types
mA, mV, voltage, resistance, THC, 3-wire RTD, 4-wire RTD

Thermocouple types
B, E, J, K, L, N, R, S, T

Resistance thermometer
PT100

Other linearizations
$\sqrt{x}$, $x^{3/2}$, $x^{5/2}$, custom linearization

Digital filter
Programmable 0 to 60s

Display range
–99999 to +999999

Common mode noise rejection
>120dB at 50/60Hz with 300Ω imbalance resistance

Normal (series) mode noise rejection
>60dB at 50/60Hz

CJC rejection ratio
0.05°C/°C

Sensor break protection
Programmable as upscale or downscale

Temperature stability
0.02%/°C or 2µV/°C

Long term drift
<0.2% of reading of 20µV annually

Input impedance
>10MΩ (millivolts inputs)

500kΩ (voltage inputs)

10Ω (mA inputs)

Standard Analog Input Modules

Linear Inputs	Standard Analog Input	Accuracy (% of reading)
Millivolts	0 to 150mV	0.1% or ±20µV
Milliamps	0 to 50mA	0.2% or ±4µA
Volts	0 to 25V	0.2% or ±1mV
Resistance Ω (low)	0 to 550Ω	0.1% or ±0.1Ω
Resistance Ω (high)	0 to 10kΩ	0.1% or ±0.5Ω
Sample Interval	100ms per sample	
Input Isolation	500V DC channel-to-channel	
Isolation from Rest of Instrument	Galvanically isolated to 500V DC	

Analog Input Types

Thermocouple	Maximum Range °C	Maximum Range °F	Accuracy (% of reading)
B	–18 to 1800	0 to 3270	0.1% or ±2°C (3.6°F) (above 200°C [392°F])
E	–100 to 900	–140 to 1650	0.1% or ±0.5°C (0.9°F)
J	–100 to 900	–140 to 1650	0.1% or ±0.5°C (0.9°F)
K	–100 to 1300	–140 to 2350	0.1% or ±0.5°C (0.9°F)
L	–100 to 900	–140 to 1650	0.1% or ±1.5°C (2.7°F)
N	–1200 to 1300	–325 to 2350	0.1% or ±0.5°C (0.9°F)
R	–18 to 1700	0 to 3000	0.1% or ±1°C (1.8°F) (above 300°C [540°F])
S	–18 to 1700	0 to 3000	0.1% or ±1°C (1.8°F) (above 200°C [392°F])
T	–250 to 300	–400 to 550	0.1% or ±0.5°C (0.9°F)

RTD	Maximum Range °C	Maximum Range °F	Accuracy (% of reading)
PT100	–200 to 600	–325 to 1100	0.1% or ±0.5°C (0.9°F)

Relays

Number of relays

1 as standard, 2 optional, (1 Module)

Type and rating

Relay type selectable NO/NC

Voltage	250V AC	30V DC
Current	5A AC	5A DC
Loading (non-inductive)	1250VA	150W

2-Wire transmitter power supply

Number

2 isolated supplies

Voltage

24V DC nominal

Drive

22mA (each supply)

Ethernet Module

Physical medium

10BaseT

Protocols

TCP/IP, FTP (server), HTTP, SMTP, Modbus TCP (Client + Server)

FTP server functions

Directory selection & listing

File upload/download

4 independently configurable users with full or read-only access

Web server functions

Operator screen monitoring/selection. Remote monitoring of recording channels, analog/digital signals, alarms, totalizers and archiving.

Totalizer (optional)

Number

2 per recording channel, 10-digit totals

Type

Analog or digital

Statistical calculations

Average, maximum, minimum (for analog signals)

EMC

Emissions & immunity

Meets requirements of IEC61326 for an Industrial Environment

Electrical

Power supply type

Universal AC/DC

Supply ranges

85V min. to 265V max. AC 50/60Hz

9V to 36V DC (optional)

Power consumption

35VA max., 10W max.

Power interruption protection

No effect for interrupts of up to 20ms

Safety

General safety

EN61010-1

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

Pollution category 2

CSA 1010

UL 1010

Isolation

500V DC to earth (ground)

Environmental

Operating temperature range

0 to 50°C (32 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

Physical

Size

144mm (5.7in.) x 144mm (5.7in.) x 84mm (3.3 in.)

Weight

1.0kg (2.2 lb) approx. (unpacked)

Panel cutout

138mm (5.43 in.) x 138mm (5.43 in.) x 67mm (2.7 in.) behind panel

Case material

Glass-filled polycarbonate

Operator keypad

Tactile membrane keys

No. of keys

6

Electrical Connections

Overall Dimensions

Optional Accessories

256Mb SD Card	B12466
512Mb SD Card	B12467
1Gb SD Card	B12468
2Gb SD Card	B12469
USB SD Memory Card Reader	B12028
DataManager Software	SW/DATMGR
Pipe-mounting Kit	SM500F/0703

Licensing, Trademarks and Copyrights

Modbus™ is a trademark of Modicon, Inc.
Windows™ is a trademark of the Microsoft Corp.

Ordering Information

Field-mountable Videographic Recorder	SM50	X	X	X/	X	X	X	X	X	X	X	X/	XXX
Channels													
One analog/digital input		1											
Two analog/digital inputs		2											
Three analog/digital inputs		3											
Four analog/digital inputs		4											
Mounting													
Field/Panel			F										
Display Type													
Monochrome				B									
Color				C									
Electrical Code													
Standard					B								
UL (pending)					U								
CSA (pending)					C								
Software Option													
None						0							
Math & Logic						1							
Totalizer						2							
Math, Logic & Totalizer						3							
Communications													
None							0						
Ethernet 10BaseT							E						
Optional Output Module													
None								0					
2 Relays [1]								R					
2-wire transmitter power supply (pending)								T					
Power Supply													
85 to 265V AC									0				
9 to 36V DC (pending)									1				
Gland Entry Type													
None – 4 x blanking plug supplied										0			
4 x standard supplied [2]										1			
3 x standard and 1 x Ethernet supplied [3]										2			
Door Lock													
None											0		
Fitted											1		
Language													
English												E	
German (pending)												G	
French (pending)												F	
Italian (pending)												I	
Spanish (pending)												S	
Special Features													
Standard													STD
Custom programming													CUS
Special													SPx-x

[1] This option is not available if four inputs are fitted.
[2] Available only if Ethernet communication is not specified.
[3] Available only if Ethernet communication is specified.

ABB