

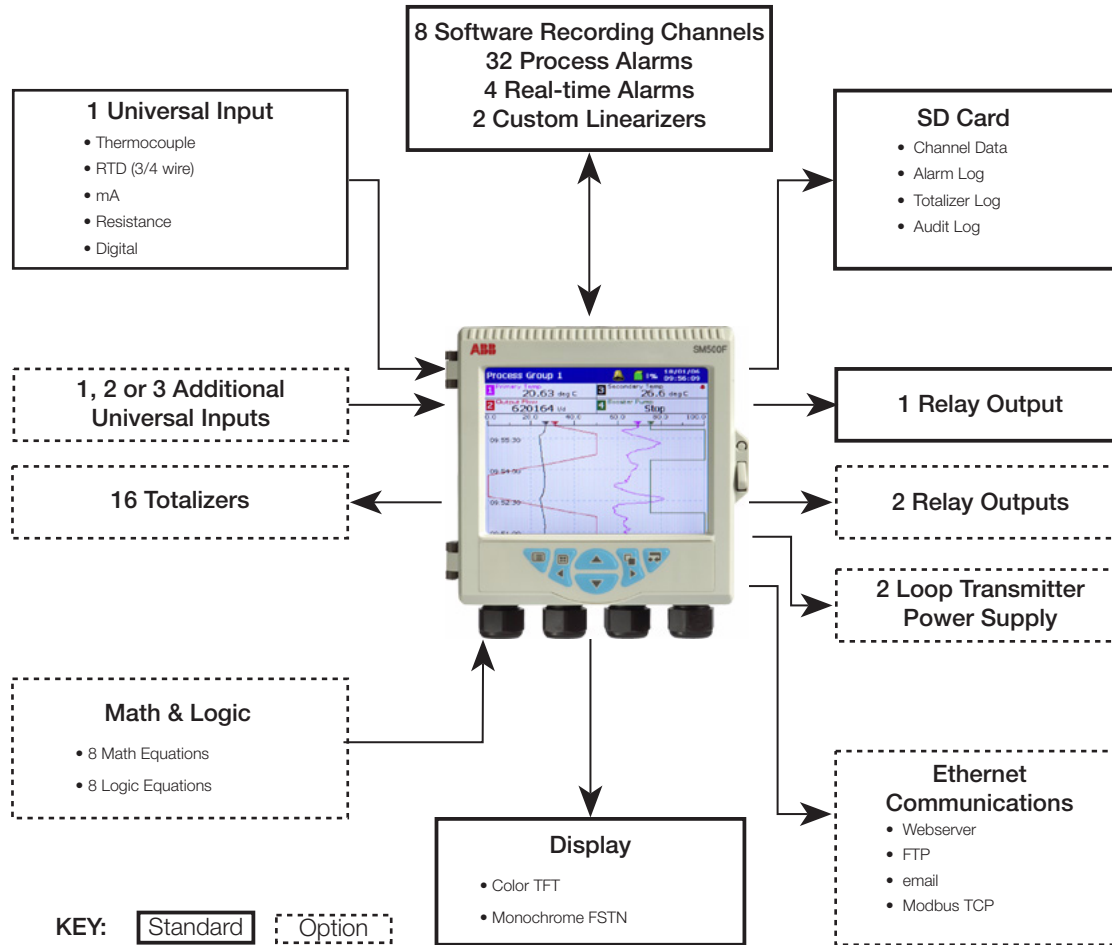
- **Unique universal mounting capability**
 - wall-, pipe- or panel-mount
 - ultra-slim design, ≤90mm (3.5 in.) deep
- **Secure data recording**
 - large internal Flash memory
 - archiving to SD memory card
- **21 CFR Part 11 compliant data security**
 - extensive physical and electronic security features
- **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

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.

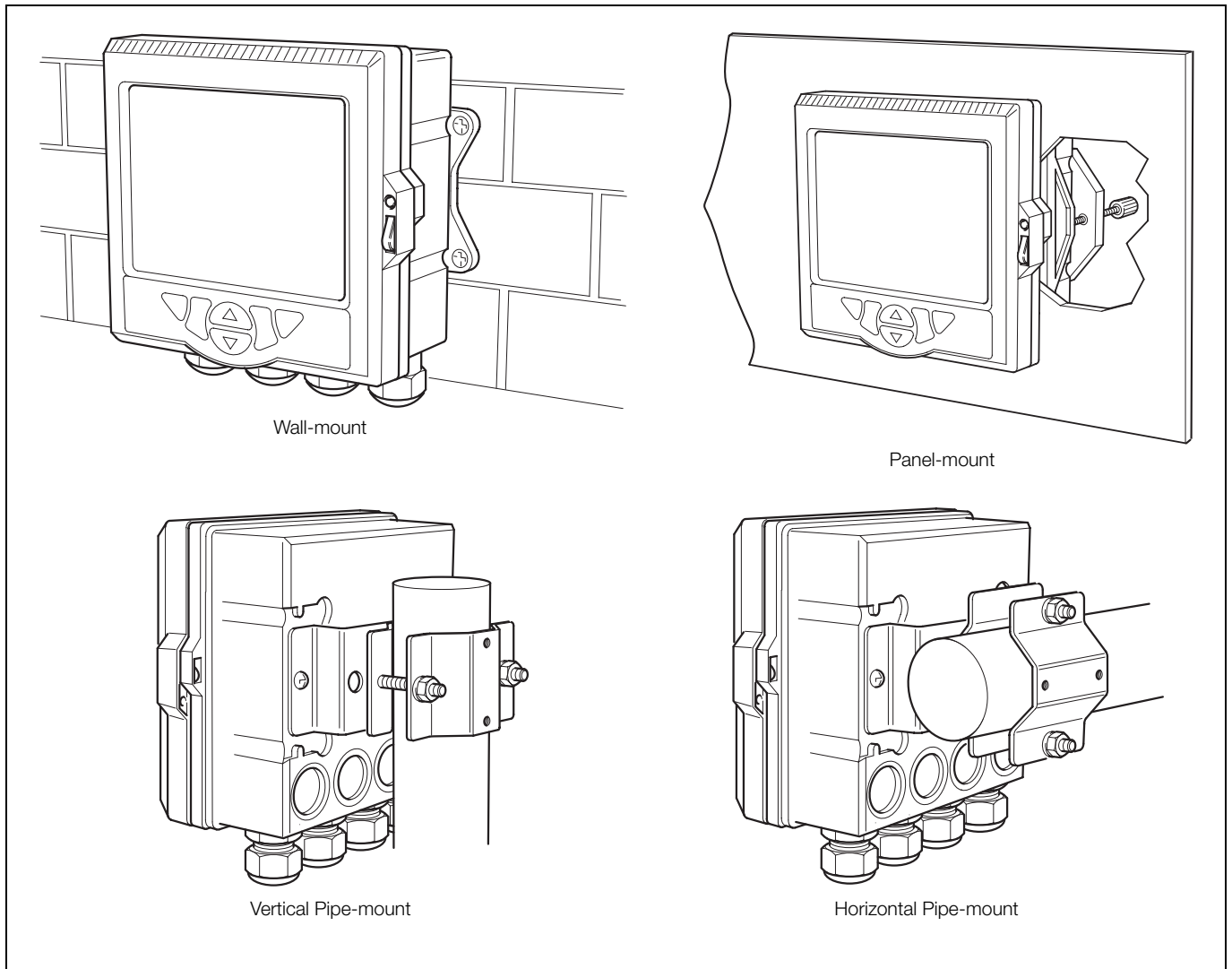


Unique Enclosure

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.



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.

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.

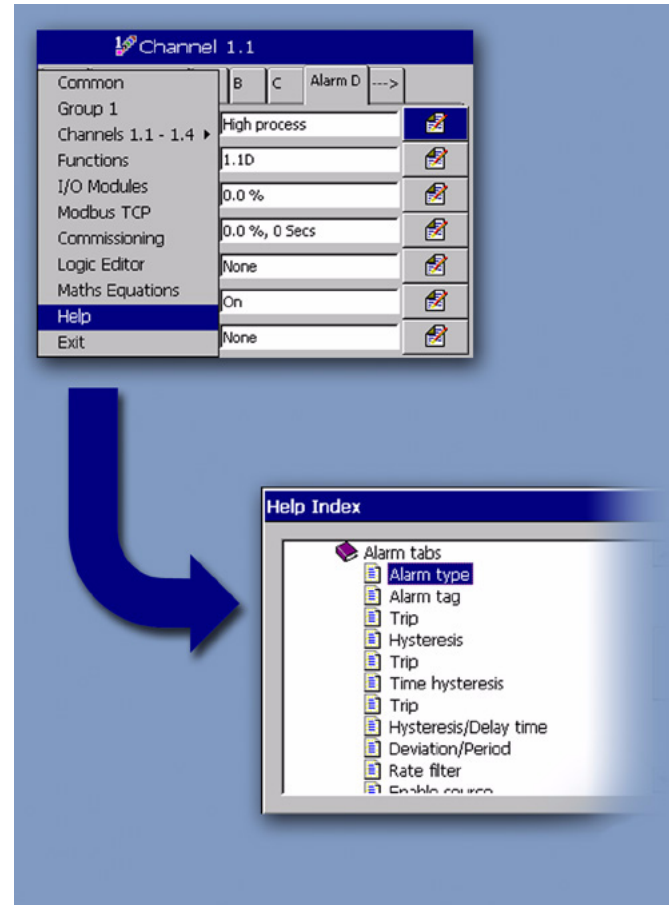
Included as standard is a relay output that can be driven from process alarms, memory card capacity warning or many other events. Two additional relays can be added if required.

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.

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

Extensive Security Features

The SM500F has extensive physical and electronic security features which ensure the integrity of the recorder's configuration and archived data. These features ensure the SM500F meets the requirements of 21 CFR Part 11.

- An optional door lock can be specified. When locked the recorder's SD card is protected from unauthorized access.
- The recorder's configuration can be password protected. Up to 12 users with individual passwords and access levels can be configured.
- To meet the requirements of regulatory bodies the configuration mode of the recorder can be locked by an internal security switch. This switch can then be protected by a tamper-evident seal providing physical evidence of the integrity of the recorder's configuration.
- Security of all process data archived to the SD card is always assured. Files stored in comma-separated variable format are attributed with an Encrypted Digital Signature and files stored in binary format are encoded securely with inbuilt integrity checks. Both data storage formats are compliant with FDA standard 21 CFR Part 11.

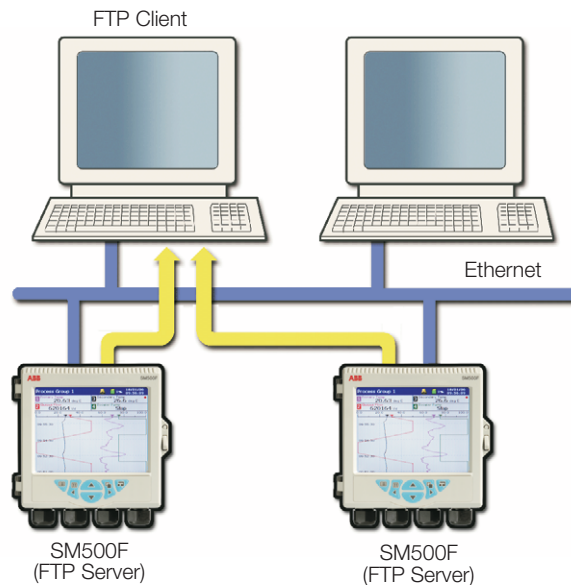
Ethernet Communications

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. The FTP server in the recorder is used to access its file system from a remote station on a network. This requires an FTP client on the host PC. Both MS-DOS® and Microsoft® Internet Explorer version 5.5 or later can be used as an FTP client.

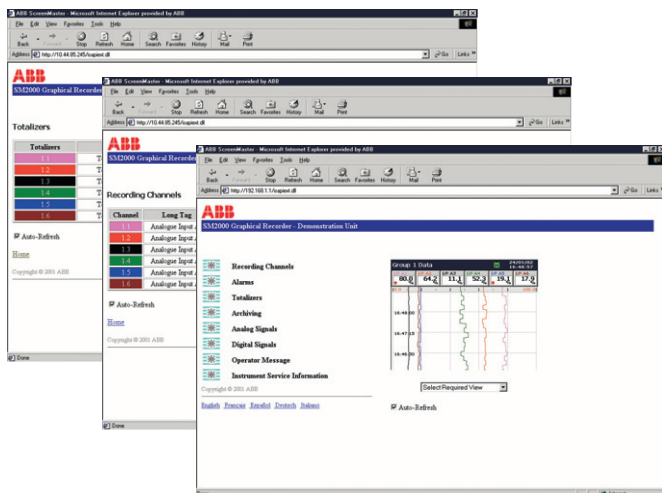
- Using a standard web-browser or other FTP client, data files contained within the SM500F's memory card can be accessed remotely and transferred to a PC or network drive.
- Four individual FTP users can be programmed into the SM500F. An access level can be configured for each user.
- All FTP log-on 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 web server. Alternatively, the clocks of multiple recorders can be synchronized using FTS (File Transfer Scheduler).



On-line Demonstration

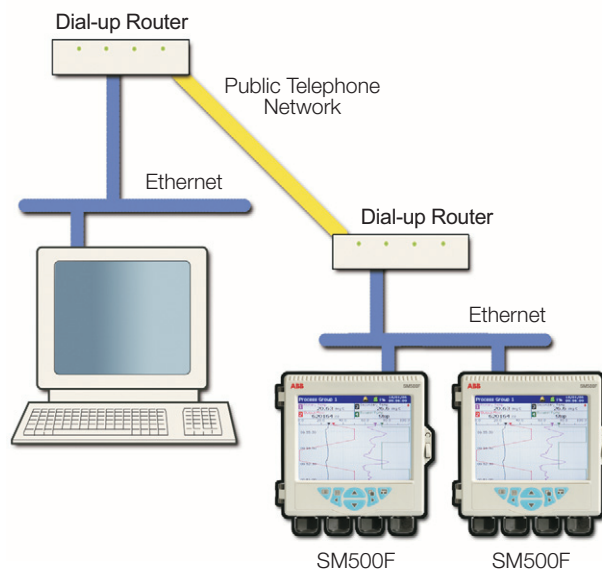
A demonstration of these features is available from an on-line recorder accessible via the internet. In the address bar of your web browser enter '<http://217.33.207.105>'.

Email Notification

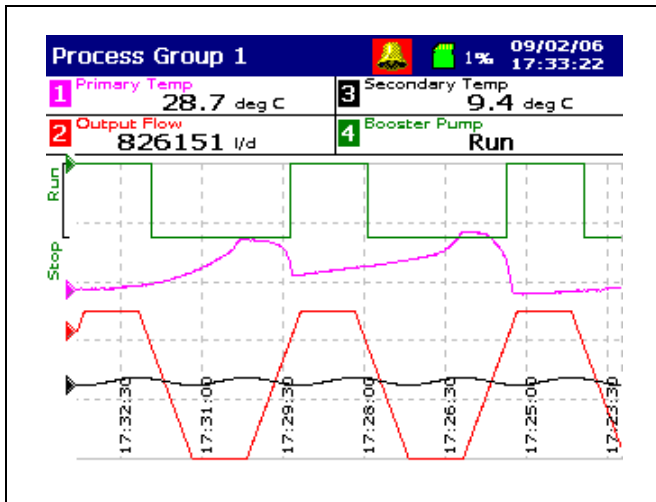
Via the SM500F's inbuilt SMTP client the recorder is able to email notification of important events. Emails triggered from process alarms or other critical process events can be sent to multiple recipients. The recorder can also be programmed to email reports of the current process status at specific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

Remote Access and Monitoring

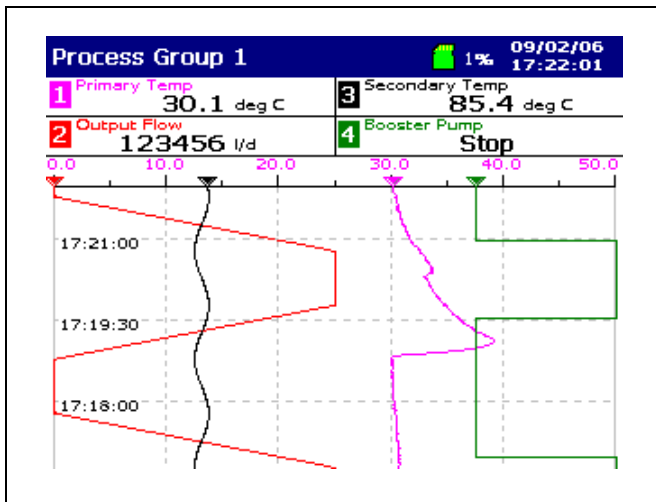
Ethernet communications can provide a link to recorders installed in remote locations. Via the use of a dial-up router an SM500F can be installed in a remote location and accessed via a public telephone network when required.



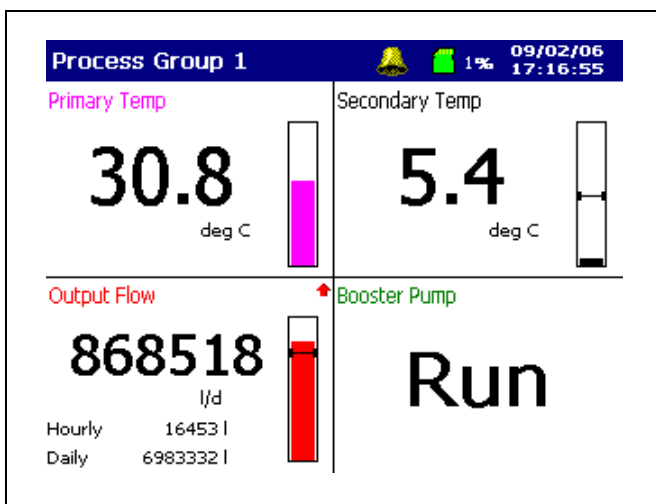
Powerful Operator Displays



Horizontal Chart Display



Vertical Chart Display



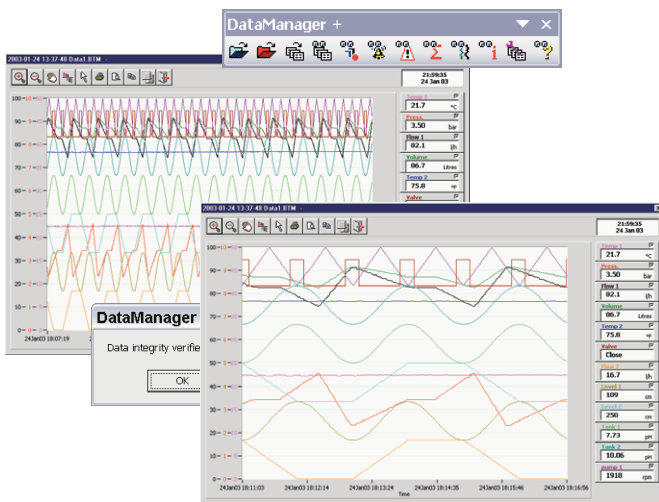
Digital Display

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 enable resettable and cumulative totals to be displayed simultaneously.

Math & 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 F0 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 limit | 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 |

Custom Linearization

Number

- 2

Number of breakpoints

- 20 per linearizer

Operator Messages

Number

- 24

Trigger

- Via front panel or digital signals

Recording in alarm/event log

- Can be enabled or disabled on configuration

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

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

Real-time Alarms

Number

4

Programmable

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

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

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

Card Compatibility

ABB recorders comply with approved industry standards for memory cards and ABB has fully tested and recommend the use of SanDisk Standard Grade memory cards. Other brands may not be fully compatible with this device and therefore may not function correctly.

Card Size

Cards up to 2Gb capacity may be used

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

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

Log Type Log Entry Events	Alarm/Event Log		Totalizer Log		Audit Log	
	Alarm state changes Operator messages		User-defined logging intervals Totalizer stop/start, reset, wrap Power up/down		Configuration/calibration changes System events Errors, operator actions	
	In Log	On Screen	In Log	On Screen	In Log	On Screen
Information Recorded in Log						
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 is enabled and selected

Analog/Digital Inputs

General

Number of inputs

4 (1 as standard, 3 optional)

Input types

mA, mV, voltage, resistance, THC, 3-wire RTD, 4-wire RTD, volt-free digital, 24V DC digital

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

Standard Analog Input Modules

Common mode noise rejection

>120dB at 50/60Hz with 300 Ω imbalance resistance

Normal (series) mode noise rejection

>60dB at 50/60Hz

C/JC rejection ratio

0.05 $^{\circ}$ C/ $^{\circ}$ C

Sensor break protection

Programmable as upscale or downscale

Temperature stability

0.02%/ $^{\circ}$ C or 2 μ V/ $^{\circ}$ C

Long term drift

<0.2% of reading of 20 μ V annually

Input impedance

>10M Ω (millivolts inputs)

>10M Ω (voltage inputs)

44 Ω (mA inputs)

Linear Inputs	Standard Analog Input	Accuracy (% of reading)
Millivolts	0 to 150mV	0.1% or \pm 20 μ V
Milliamps	0 to 50mA	0.2% or \pm 4 μ A
Volts	0 to 25V	0.2% or \pm 1mV
Resistance Ω (low)	0 to 550 Ω	0.1% or \pm 0.1 Ω
Resistance Ω (high)	0 to 10k Ω	0.1% or \pm 0.5 Ω
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 $^{\circ}$ C	Maximum Range $^{\circ}$ F	Accuracy (% of reading)
B	-18 to 1800	0 to 3270	0.1% or \pm 2 $^{\circ}$ C (3.6 $^{\circ}$ F) (above 200 $^{\circ}$ C [392 $^{\circ}$ F]) *
E	-100 to 900	-140 to 1650	0.1% or \pm 0.5 $^{\circ}$ C (0.9 $^{\circ}$ F)
J	-100 to 900	-140 to 1650	0.1% or \pm 0.5 $^{\circ}$ C (0.9 $^{\circ}$ F)
K	-100 to 1300	-140 to 2350	0.1% or \pm 0.5 $^{\circ}$ C (0.9 $^{\circ}$ F)
L	-100 to 900	-140 to 1650	0.1% or \pm 1.5 $^{\circ}$ C (2.7 $^{\circ}$ F)
N	-200 to 1300	-325 to 2350	0.1% or \pm 0.5 $^{\circ}$ C (0.9 $^{\circ}$ F)
R	-18 to 1700	0 to 3000	0.1% or \pm 1 $^{\circ}$ C (1.8 $^{\circ}$ F) (above 300 $^{\circ}$ C [540 $^{\circ}$ F]) *
S	-18 to 1700	0 to 3000	0.1% or \pm 1 $^{\circ}$ C (1.8 $^{\circ}$ F) (above 200 $^{\circ}$ C [392 $^{\circ}$ F]) *
T	-250 to 300	-400 to 550	0.1% or \pm 0.5 $^{\circ}$ C (0.9 $^{\circ}$ F) (above -150 $^{\circ}$ C [-238 $^{\circ}$ F]) *

* For B, R, S and T thermocouples, accuracy is not guaranteed below the value stated.

RTD	Maximum Range $^{\circ}$ C	Maximum Range $^{\circ}$ F	Accuracy (% of reading)
PT100	-200 to 600	-325 to 1100	0.1% or \pm 0.5 $^{\circ}$ C (0.9 $^{\circ}$ 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 (optional)

Number

2 isolated supplies

Voltage

24V DC nominal

Drive

22mA (each supply)

Ethernet Module (optional)

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)

Advanced Math (optional)

Type

8 equations provide ability to perform general arithmetic calculations including F0, mass flow, relative humidity and emissions calculations

Size

40-character equation

Functions

+, -, /, log, Ln., Exp, X^n , $\sqrt{\quad}$, Sin, Cos, Tan, mean, rolling average, standard deviation, high/median/low select, multiplexer, absolute, relative humidity

Tags

8- and 20-character tags for each block

Update rate

1 enabled Math block is updated every 100ms

Logic Equations (optional)

Number

8

Size

11 elements each

Functions

AND, OR, NAND, NOR, XOR, NOT

Tags

20-character tag for each equation

Update rate

300ms

EMC

Emissions & immunity

Meets requirements of IEC61326 for an Industrial Environment

Electrical

Supply ranges

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

10V to 36V DC (optional)

Power consumption

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 (pending)

UL 1010 (pending)

Isolation

500V 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

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

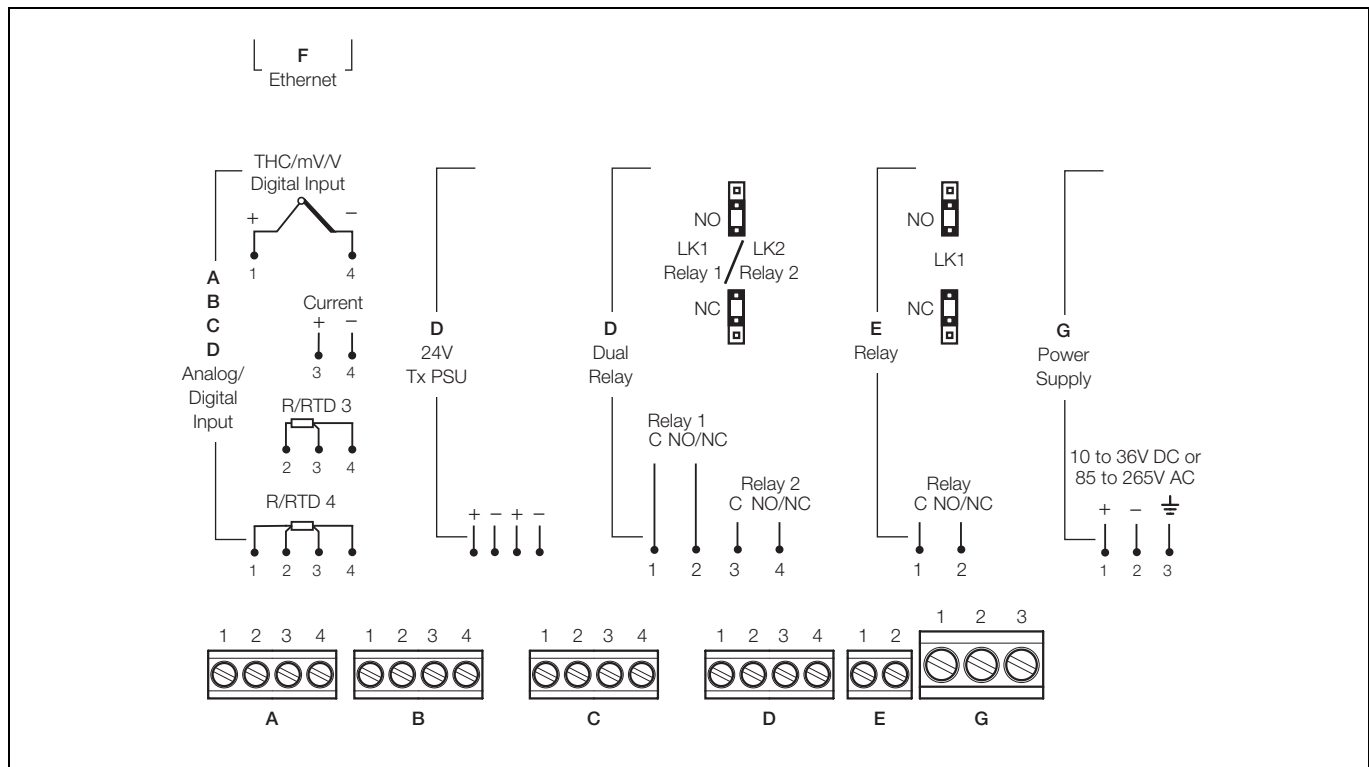
Operator keypad

Tactile membrane keys

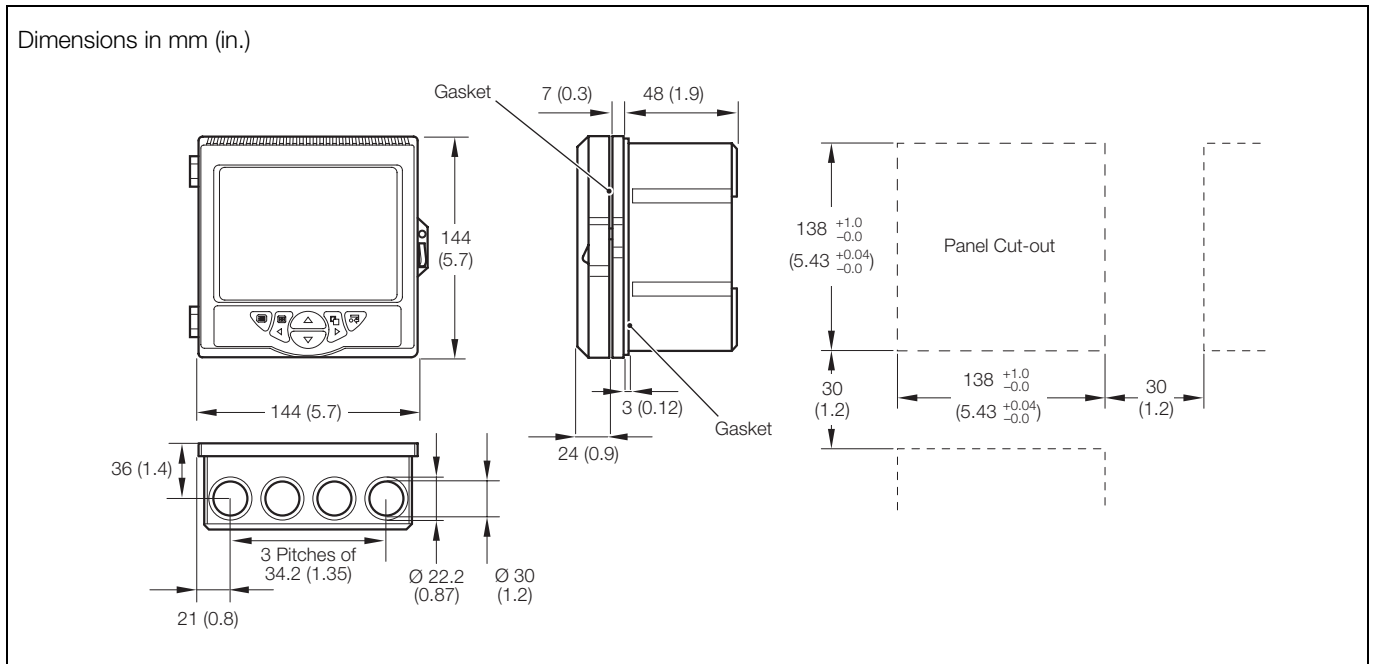
No. of keys

6

Electrical Connections



Overall Dimensions



Optional Accessories

256Mb SD Card	B12466
512Mb SD Card	B12467
1Gb SD Card	B12468
USB SD Memory Card Reader	B12028
DataManager Software	SW/DATMGR
Pipe-mounting Kit	SM500/0703

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 ⁽¹⁾								T					
Power Supply													
85 to 265V AC									0				
10 to 36V DC									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												G	
French												F	
Italian												I	
Spanish												S	
Special Features													
Standard													STD
Custom programming													CUS
Special													SPXX

⁽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.

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