SM1000 Videographic recorder

Simplicity without compromise

Clear display of process information
— bright TFT display

Robust and convenient archive storage
— low cost, high reliability, Compact Flash option
— high capacity

Secure data recording
— internal Flash memory for 12 recording channels and logs
— no battery back-up required

21 CFR Part II compliant data security
— extensive physical and electronic security features

Intuitive user interface
— dedicated tactile operator keys and Microsoft® Windows-style menus

Unsurpassed environmental protection
— hosedown to IP66 and NEMA4X standards

10BaseT Ethernet communications
— remote monitoring/access
— email notification of alarms and status report

GAMP validation package
— 21 CFR part 11 compliant
SM1000
Videographic recorder

SM1000

The SM1000 is a state-of-the-art solution to recording and data storage. It provides 12 recording channels and up to 12 universal analog inputs which can be viewed in a variety of display formats: chart, bargraph, digital indicator and process summary. Historical logs are provided for recording alarms, operator and system events and totalizer values.

The SM1000 has onboard Flash memory for secure storage of process data. Process data can also be logged to a Compact Flash card, then transferred to a PC for storage and analysis.

Application areas include:
- Water treatment plants
- Cold storage
- Stack gas monitoring
- Environmental monitoring
- Autoclaves
- Food, Dairy and Beverage processing
- Furnaces
- Heat treatment
- Pulp & Paper
- Life sciences
Simplicity of Use

- Six dedicated tactile keys are used for all aspects of operation and configuration of the SM1000.
- During everyday operation each key has a specific function ensuring simplicity of use.
- The use of a Windows-style pop-up menu and configuration screens ensures that the operation of the SM1000 is exceptionally easy and instantly familiar.

Guaranteed Data Integrity

- The use of Flash memory technology ensures that the SM1000 is not reliant on batteries to preserve stored data during a power failure.
- In the internal memory, data is stored in small blocks with each block containing a checksum to ensure the integrity of that data.
- Internal flash memory is provided for buffering of process data. At any time the complete memory can be reviewed in the Chart View of the SM1000. Once this memory is full it automatically wraps-around and overwrites the oldest data, ensuring that the latest process data is always captured.
- 12 recording channels are provided, as standard, which can be used to record any analog, digital or communications (via Modbus™) signal. Two sample rates can be preset in the configuration of the SM1000; a primary and a secondary (fast or slow). Automatic switching between these two sample rates allows detailed information to be stored under specific process conditions, for example, critical process states or alarm conditions. Through the use of pre-storage filters it is possible to record the average, max./min. or instantaneous value of any analog data.

Industrial Standard, Robust, Archive Storage

- Compact Flash memory cards can be used for archiving purposes. The solid state nature of these cards ensures that the SM1000 can truly operate in ambient temperatures up to 50 °C (122 °F).
- Every write to the archive storage media is verified to ensure the integrity of the data.
- Process data can be archived to the removable media in either of two configurable formats, comma separated variable or binary encoded. In addition to the analog/digital recording channels, the alarm event, totalizer (if fitted) and audit logs can also be archived to the removable media.
- Security of all process data stored to the memory card is always ensured. Files stored in comma separated variable format are attributed with an Encrypted Digital Signature and files stored in binary format are securely encoded with built-in integrity checks. Both formats of data storage are compliant with FDA standard 21 CFR Part II.
- A Media door lock is fitted as standard to prevent unauthorized access to the removable media.
21 CFR part 11 Compliance and GAMP Validation Package

With its comprehensive audit trail, secure archiving format and extensive physical and configuration security features, the SM1000 is ideally suited to applications where compliance to 21CFR part 11 (the FDA’s regulations regarding electronic record keeping) is required (for further information refer to INF02/70).

In keeping with this, a template for validating the SM1000 videographic recorder is available. Following GAMP 5 (a risk-based approach to compliant GxP computerized systems), the template is designed to make the validation process as simple as possible and provides an IQ and OQ that is completed at the customer site, before and after installation. Once completed, the template is then packaged together with other documentation relating to the system as a whole, ready to be presented to the governing regulatory body for inspection.

Low Cost of Ownership

The large capacity of the storage media used on the SM1000 ensures that the requirement for operator intervention to transfer the data to a PC on a regular basis is greatly reduced.

See below for an example of how memory storage times vary depending on the media device. The example shows the recording duration for a 6-channel recorder with a sample time of 10 s configured to use binary archiving. Also included in the example is how these storage times compare with a traditional paper recorder.
Unsurpassed Environmental Protection

Unique to this type of product, the SM1000 has unrivalled protection ratings of IP66 and NEMA4X and includes a fully-sealed, lockable media door. This enables the SM1000 to be installed, without additional protection, in applications that require frequent hosedown. With industrial standard noise emission and immunity protection, the SM1000 operates effectively in high electrical-noise environments.

Intuitive User Interface

![Diagram of SM1000 user interface with process group 1 data, including temperature, pressure, flow rate, volume, and status icons for alarm, chart trace, and alarm event. The interface also includes time stamps for relevant events such as high temperature and batch start.]
Operator Views

In addition to the standard chart view, a number of other operator views are available:

- **Process View**
  Provides an at-a-glance summary of each channel including alarm, totalizer and statistical (max./min.) information.

- **Digital Indicator View**
  Process value, engineering units, channel tag, associated totalizer (if fitted), and alarm status are all shown. Auto-sizing always ensures the clearest possible display.

- **Bargraph View**
  Horizontal or vertical format which includes min./max. and alarm trip point markers.

Historical Logs

Providing functions unavailable in paper-based recorders, three historical logs ensure complete validity of the recorder and its data. Any or all of these logs can be exported to the removable media:

- **Alarm Event Log**
  Complete display of all acknowledged and unacknowledged alarms, alarm state changes and operator messages.

- **Audit Log**
  Displays time, date and ID stamped system data including configuration, calibration changes, system errors and operation actions. This provides comprehensive evidence of the integrity, validity and traceability of the SM1000 and its measured data in accordance with FDA guidelines 21 CFR part 11.

- **Totalizer Log**
  Independent log intervals for each channel, enabling total, average, maximum and minimum readings to be time and date stamped.

Configuration

A simple Windows-style structure provides an exceptionally simple approach to the set up of the recorder. Text and numerical information is very quickly entered via an on-screen keyboard. Navigation of the configuration menus is performed via the cursor keys and the pop-up menu.

The configuration mode is protected via a user-specific password system. All configuration changes are logged in the Audit log complete with operator ID’s.

It is also possible to configure the SM1000 with a Windows-based PC configuration package.
On-line Data Review

The SM1000 provides a number of unique features to provide a clear view of your process:

- The screen interval can be altered to display between 18s and 7 days of information, without it affecting the sample rate. This gives you the ability to 'zoom in' to a close-up view of the most current data or 'zoom out' and get the big picture.
- Individual traces can be removed temporarily from the screen to enable clear comparison of two or more channels.
- The instrument can easily review all historical data in the internal buffer memory at the touch of a button. During this time, recording of the process data to the internal memory remains unaffected.

Off-Line Review and Analysis

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

- Database management of data files provided by DataManager Pro ensures simple, secure long-term storage and retrieval of historical data.
- The graphing capabilities provided by DataManager Pro ensure easy interrogation of process data.
- The validity of all data files is always checked by DataManager Pro during the storage and retrieval process, ensuring maximum data integrity.

For further information on the capabilities of DataManager Pro, refer to data sheet DS/RDM500–EN.

Batch Recording

A batch recording option enables simple recording and reviewing of batch processes. When a batch is started it is tagged with a unique batch number, operator identification and three user-definable description fields. All information is entered on-screen with a history function allowing quick entry of commonly repeated descriptions.

Using DataManager Pro software batches can be simply and quickly traced for review using the unique batch number and description information entered at the time of recording. Additional functionality provides the ability to search and sort batch records for an entire production facility in many ways, including by product type, operator and time and date of processing.
Math and Logic
Available as an option are advanced math and logic capabilities. 12 multi-element math and 12 multi-element logic equations can be programmed via the touch screen of the recorder. 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/mid signal selection and multiplexing functions.
- Predefined equations are provided for relative humidity and F0 calculations.
- AND, NAND, OR, NOR, XOR and NOT operators are available within the logic equations.

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

Ethernet Communications
The SM1000 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 SM1000 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 SM1000’s internal memory and memory card can be accessed remotely and transferred to a PC or network drive.
- Four individual FTP users can be programmed into the SM1000. Access rights can be configured for each user specifying their access level.
- All FTP log-on activity is recorded in the audit log of the SM1000.
- Using ABB’s data file transfer scheduler program, data files from multiple recorders can be automatically backed-up 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 SM1000 is an embedded web-server allowing access to web pages created within the recorder. The use of HTTP (Hyper Text Transfer Protocol) enables standard web browsers to view these pages.

- Detailed with 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 SM1000’s internal buffer memory can be displayed in full from 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 regularly refreshed enabling them to be used as a process supervision tool.

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://217.46.239.73".

Remote Access/Monitoring

Ethernet communications can provide a link to recorders installed in remote locations. Via the use of a dial-up router an SM1000 can be installed in a remote location and accessed via a public telephone network when required.

Email Notification

Via the SM1000’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.
Specification

Operation and Configuration

Configuration

Via tactile membrane switches 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)

Configuration ports

3.5 mm jack socket for connection to RS232 port on a PC via an adapter

Display

Color, TFT, liquid crystal display (LCD) with built-in backlight and contrast adjustment

125 mm (5 in.) diagonal display area, 76800 pixel display*

*Note. 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 18 s 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

Security

Physical

Standard door lock

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 username 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

Operator Views

<table>
<thead>
<tr>
<th>Contents</th>
<th>Chart</th>
<th>Bargraph</th>
<th>Digital Indicator</th>
<th>Process*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instantaneous values/states</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Units of measure</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Short tags</td>
<td>✔</td>
<td></td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Long tags</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alarm status</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Alarm trip markers</td>
<td>—</td>
<td>✔</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alarm trip values</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Max./Min. markers</td>
<td>—</td>
<td>✔</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Analog bargraphs</td>
<td>—</td>
<td>✔</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Totalizer values &amp; units of measure</td>
<td>—</td>
<td>—</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Totalizer tags</td>
<td>—</td>
<td>—</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Max., min. and average batch values</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>✔</td>
</tr>
<tr>
<td>Graphical view of historical data</td>
<td>✔</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* If Totalizer option is fitted and selected
SM1000
Videographic recorder

Standard Functionality
Operator Messages
Number
6
Trigger
Via front panel or digital signals
Recording in alarm/event log
Can be enabled or disabled on configuration

Process Alarms
Number
24 (2 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 9999 s)
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 or digital signals

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
1 Mb Flash memory provides storage for 512 k samples
Oldest data is automatically overwritten 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
12 (6 per group)
Sources
Analog inputs, Modbus™ inputs, any digital signal
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 0.1 s 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 6 channels of analog data (for 12 channels divide by 2, for 3 channels multiply by 2 etc.).

<table>
<thead>
<tr>
<th>Sample Rate</th>
<th>1 s</th>
<th>10 s</th>
<th>40 s</th>
<th>60 s</th>
<th>120 s</th>
<th>480 s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Mb Internal Flash buffer memory</td>
<td>23 hours</td>
<td>9 days</td>
<td>38 days</td>
<td>57 days</td>
<td>4 months</td>
<td>1 year</td>
</tr>
</tbody>
</table>
SM1000
Videographic recorder

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 automatically overwritten by new data when log is full

Historical Logs

<table>
<thead>
<tr>
<th>Log Type</th>
<th>Alarm/Event Log</th>
<th>Totalizer Log</th>
<th>Audit Log</th>
</tr>
</thead>
</table>
| Log Entry Events | • 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 |

Information Recorded in Log

<table>
<thead>
<tr>
<th></th>
<th>In Log</th>
<th>On Screen</th>
<th>In Log</th>
<th>On Screen</th>
<th>In Log</th>
<th>On Screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date &amp; time of event</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Type of event</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tag</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Source tag</td>
<td>✓</td>
<td>—</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alarm trip value &amp; units of measure</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alarm state</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Alarm acknowledgement state</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Operator ID</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Description</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Batch total and units of measurement*</td>
<td>—</td>
<td>—</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Max., Min. and average values plus units*</td>
<td>—</td>
<td>—</td>
<td>✓</td>
<td>✓</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Secure total</td>
<td>—</td>
<td>—</td>
<td>✓</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* If Totalizer option fitted and selected

Archiving to Removable Media

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

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 or Ultra II memory cards. Other brands may not be fully compatible with this device and therefore may not function correctly.

Card size
Cards up to 4 Gb capacity may be used

File Structure

<table>
<thead>
<tr>
<th></th>
<th>Binary</th>
<th>Comma-separated</th>
</tr>
</thead>
<tbody>
<tr>
<td>File protection</td>
<td>Secure binary format with data integrity checks</td>
<td>Encrypted digital signature</td>
</tr>
<tr>
<td>New file generation interval</td>
<td>Automatic</td>
<td>Programmable for automatic file generation every hour, day or month</td>
</tr>
<tr>
<td>Archive sample rates</td>
<td>Programmable from 0.1 s to 12 hours for each process group*</td>
<td>Programmable from 1 s to 12 hours for each process group*</td>
</tr>
</tbody>
</table>

* For sample rates faster than 1 s the performance of the analog input card must be considered. For further information refer to page 14 of this data sheet. Further information is also available from your local ABB representative.
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Videographic recorder

Recording Duration
Approximate duration calculated for continuous recording of 6 channels of analog data (for 12 channels divide by 2, for 3 channels multiply by 2 etc.).

Binary Encoded File

<table>
<thead>
<tr>
<th>Sample Rate</th>
<th>1 s</th>
<th>10 s</th>
<th>40 s</th>
<th>60 s</th>
<th>120 s</th>
<th>480 s</th>
</tr>
</thead>
<tbody>
<tr>
<td>512 Mb Compact Flash</td>
<td>16 months</td>
<td>13 years</td>
<td>53 years</td>
<td>79 years</td>
<td>159 years</td>
<td>635 years</td>
</tr>
<tr>
<td>1 Gb Compact Flash</td>
<td>31 months</td>
<td>26 years</td>
<td>103 years</td>
<td>155 years</td>
<td>311 years</td>
<td>1246 years</td>
</tr>
</tbody>
</table>

Comma-separated File

<table>
<thead>
<tr>
<th>Sample Rate</th>
<th>1 s</th>
<th>10 s</th>
<th>40 s</th>
<th>60 s</th>
<th>120 s</th>
<th>480 s</th>
</tr>
</thead>
<tbody>
<tr>
<td>512 Mb Compact Flash</td>
<td>4 months</td>
<td>35 months</td>
<td>11 years</td>
<td>17 years</td>
<td>35 years</td>
<td>140 years</td>
</tr>
<tr>
<td>1 Gb Compact Flash</td>
<td>7 months</td>
<td>5 years</td>
<td>22 years</td>
<td>34 years</td>
<td>68 years</td>
<td>275 years</td>
</tr>
</tbody>
</table>
Analog Input Modules

General

Number of inputs
6 per board, max. of 12 inputs

Input types
mA, mV, voltage, resistance, THC, RTD

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

Resistance thermometer
PT100

Other linearizations
$\sqrt{x}$, $\sqrt[3]{x}$, $\sqrt[5]{x}$, custom linearization

Digital filter
Programmable 0 to 60 s

Display range
$-999$ to $9999$

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

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

CJC rejection ratio
0.05 °C/ºC

Sensor break protection
Programmable as upscale or downside

Temperature stability
0.02 %/ºC or 2 µV/ºC

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

Input impedance
> 10 MΩ (millivolts inputs)
500 kΩ (voltage inputs) externally mounted divider
10 Ω (mA inputs) externally mounted on terminals*

* Hart transmitters require a minimum 250 Ω loop impedance. A 250 Ω shunt resistor can be used together with the voltage divider board (GR2000/0375) to meet this requirement. In such cases the input should be programmed for 1...5 V.

Analog to digital converter resolution
16 bit

Standard/High Specification Analog Input Modules

<table>
<thead>
<tr>
<th>Linear Inputs</th>
<th>Standard Analog Input</th>
<th>High Specification Analog Input</th>
<th>Accuracy (% of reading)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millivolts</td>
<td>0 to 2000 mV</td>
<td>−1000 to +1000 mV</td>
<td>0.1 % or ± 10 µV</td>
</tr>
<tr>
<td>Milliamps</td>
<td>0 to 50 mA</td>
<td>−100 to +100 mA</td>
<td>0.2 % or ± 2 µA</td>
</tr>
<tr>
<td>Volts</td>
<td>0 to +20 V*</td>
<td>−50 to +50 V*</td>
<td>0.2 % or ± 10 mV</td>
</tr>
<tr>
<td>Resistance Ω</td>
<td>0 to 5000 Ω</td>
<td>0 to 2000 Ω</td>
<td>0.2 % or ± 0.08 Ω</td>
</tr>
</tbody>
</table>

Sample Interval
100 ms per sample (2 modules are processed in parallel) gives worst case update times as follows:
600 ms for 6 or 12 channels — mV, mA, voltage
800 ms for 6 or 12 channels — THC
1100 ms for 6 or 12 channels — resistance, RTD

Input Isolation
35 V DC channel-to-channel

Isolation from Rest of Instrument
Galvanically isolated to 500 V DC

Thermocouple

<table>
<thead>
<tr>
<th>Maximum Range °C</th>
<th>Maximum Range °F</th>
<th>Accuracy (% of reading)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>−18 to 1800</td>
<td>0 to 3270</td>
</tr>
<tr>
<td>E</td>
<td>−100 to 900</td>
<td>−140 to 1650</td>
</tr>
<tr>
<td>J</td>
<td>−100 to 900</td>
<td>−140 to 1650</td>
</tr>
<tr>
<td>K</td>
<td>−100 to 1300</td>
<td>−140 to 2350</td>
</tr>
<tr>
<td>L</td>
<td>−100 to 900</td>
<td>−140 to 1650</td>
</tr>
<tr>
<td>N</td>
<td>−200 to 1300</td>
<td>−325 to 2350</td>
</tr>
<tr>
<td>R</td>
<td>−18 to 1700</td>
<td>0 to 3000</td>
</tr>
<tr>
<td>S</td>
<td>−18 to 1700</td>
<td>0 to 3000</td>
</tr>
<tr>
<td>T</td>
<td>−250 to 300</td>
<td>−400 to 550</td>
</tr>
</tbody>
</table>

RTD

<table>
<thead>
<tr>
<th>Maximum Range °C</th>
<th>Maximum Range °F</th>
<th>Accuracy (% of reading)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT100</td>
<td>−200 to 600</td>
<td>−325 to 1100</td>
</tr>
</tbody>
</table>
Advanced Math

Math Blocks

Type
12 equations provide ability to perform general arithmetic calculations including $F_0$, mass flow (of ideal gases), relative humidity and emissions calculations

Size
40-character equation

Functions
+, -, /, log, Ln, Exp, $X^2$, 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 100 ms

Logic Equations

Number
12

Size
11 elements each

Functions
AND, OR, NAND, NOR, XOR, NOT

Tags
20-character tag for each equation

Update rate
300 ms

Hybrid Module

Digital I/O

Number
6 inputs and 6 outputs per card

Type
Volt-free switching inputs

Polarity
Negative, i.e. closed switch contact or 0 V = active signal

Digital input min. pulse
100 ms

Digital output voltage
5 V

Isolation
500 V DC from any other I/O

Analog output

Number
2 isolated

Configurable current range
0 to 20 mA

Max. load
750 Ω

Isolation
500 V DC from any other I/O

Accuracy
0.25 %

2-Wire Transmitter Power Supply Module

Number
2 isolated supplies per module

Voltage
24 V DC nominal

Drive
45 mA per supply, i.e. each module can drive $2 \times 2 = 4$ loops

Ethernet Module

Physical medium
10BaseT

Protocols
TCP/IP, ARP, ICMP, FTP (server), HTTP, MODBUS TCP (client, server)

FTP server functions
Directory selection & listing
File upload/download
Four, 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

SMTP client compatibility
Compatible with MS Exchange versions up to and including MS Exchange 2003

Note. The total load for all relays within the instrument must not exceed 36 A.
SM1000
Videographic recorder

**RS485 Serial Communications Module**

<table>
<thead>
<tr>
<th><strong>Number of ports</strong></th>
<th>1 as option</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connections</strong></td>
<td>RS485, 2- or 4-wire</td>
</tr>
<tr>
<td><strong>Protocol</strong></td>
<td>Modbus™ RTU slave + master</td>
</tr>
</tbody>
</table>

**Totalizer (optional)**

<table>
<thead>
<tr>
<th><strong>Number</strong></th>
<th>12 (1 per recording channel) 10-digit totals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Analog or digital, batch and secure totals</td>
</tr>
</tbody>
</table>

**Statistical calculations**

- Average, maximum, minimum (for analog signals)

**EMC**

**Emissions & Immunity**

- Meets requirements of:
  - EN50081-2
  - EN50082-2
  - EN61326 for an industrial environment

**Electrical**

<table>
<thead>
<tr>
<th><strong>Power supply</strong></th>
<th>100 to 240 V AC ±10 % (90 min. to 264 V max.) 50/60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24 V DC ± 4 V (optional)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Power consumption</strong></th>
<th>35 VA max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power interruption protection</strong></td>
<td>No effect for interruptions of up to 20 ms</td>
</tr>
</tbody>
</table>

**Safety**

**General safety**

- EN61010-1
- cULus
- cCSAus

- Overvoltage Class III on mains, Class II on inputs and outputs
- Pollution category 2

**Isolation**

- 500 V DC to earth (ground)

**Environmental**

<table>
<thead>
<tr>
<th><strong>Operating temperature range</strong></th>
<th>0 to 50 °C (32 to 122 °F) with Compact Flash</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating humidity range</strong></td>
<td>5 to 95 % RH (non-condensing)</td>
</tr>
<tr>
<td><strong>Storage temperature range</strong></td>
<td>—10 to 60 °C (14 to 140 °F)</td>
</tr>
<tr>
<td><strong>Front panel sealing</strong></td>
<td>IP66 and NEMA4X</td>
</tr>
<tr>
<td><strong>Rear panel sealing</strong></td>
<td>IP40 (with rear cover)</td>
</tr>
<tr>
<td></td>
<td>IP20 (without rear cover)</td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td>Conforms to EM60068-2</td>
</tr>
</tbody>
</table>

**Physical**

<table>
<thead>
<tr>
<th><strong>Size</strong></th>
<th>144 mm (5.67 in.) x 144 mm (5.7 in.) x 195 mm (7.68 in.) depth behind panel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight</strong></td>
<td>2.6 kg (5.6 lb) approx. (unpacked)</td>
</tr>
<tr>
<td><strong>Panel cutout</strong></td>
<td>138 mm (5.43 in.) x 138 mm (5.43 in.)</td>
</tr>
<tr>
<td><strong>Case material</strong></td>
<td>10 % glass-filled polycarbonate</td>
</tr>
<tr>
<td><strong>Display housing material</strong></td>
<td>40 % glass-filled polycarbonate</td>
</tr>
<tr>
<td><strong>Membrane switch</strong></td>
<td>Polyester, metal dome, tactile feel</td>
</tr>
</tbody>
</table>
Electrical Connections

*Note. 24 V DC instrument power supply must be specified when ordering.

Overall Dimensions
## Ordering Information

### SM1000 Videographic Recorder

<table>
<thead>
<tr>
<th>Universal Analog Inputs</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
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</thead>
<tbody>
<tr>
<td>None</td>
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<td></td>
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<tr>
<td>6 – standard specification</td>
<td>00S</td>
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</tr>
<tr>
<td>12 – standard specification</td>
<td>06S</td>
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<tr>
<td>6 – high specification</td>
<td>12S</td>
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<tr>
<td>12 – high specification</td>
<td>06H</td>
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</table>

### Build Option

<table>
<thead>
<tr>
<th>Build Option</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
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<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
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</thead>
<tbody>
<tr>
<td>Standard</td>
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<tr>
<td>cCSAus*</td>
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<tr>
<td>UL*</td>
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</tbody>
</table>

### Archive Media

<table>
<thead>
<tr>
<th>Archive Media</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
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</thead>
<tbody>
<tr>
<td>None (internal flash memory only)</td>
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<tr>
<td>Compact Flash drive</td>
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</tbody>
</table>

### Software Option

<table>
<thead>
<tr>
<th>Software Option</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
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<th>XXX</th>
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<tbody>
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</tr>
<tr>
<td>Advanced Math &amp; Logic</td>
<td></td>
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</tr>
<tr>
<td>Totalizers</td>
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</tr>
<tr>
<td>Advanced Math &amp; Logic &amp; Totalizers</td>
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</tr>
<tr>
<td>Batch Recording</td>
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<td>Batch Recording &amp; Totalizers</td>
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</tr>
<tr>
<td>Batch Recording &amp; Advanced Math &amp; Logic</td>
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</tr>
<tr>
<td>Advanced Math &amp; Logic, Totalizers &amp; Batch Recording</td>
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</tbody>
</table>

### Option Modules

#### Position A

<table>
<thead>
<tr>
<th>Option Modules</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserved for analog inputs</td>
<td></td>
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</tbody>
</table>

#### Position B

<table>
<thead>
<tr>
<th>Option Modules</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserved for analog inputs if 12 inputs are specified</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3 relays</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6 relays</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid – 6 digital inputs, 6 digital outputs, 2 analog outputs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-wire transmitter power supply</td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

#### Position C

<table>
<thead>
<tr>
<th>Option Modules</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet (10BaseT) communications</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RS485 Modbus serial communications</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid – 6 digital inputs, 6 digital outputs, 2 analog outputs</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>2-wire transmitter power supply</td>
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</tbody>
</table>

#### Position D

<table>
<thead>
<tr>
<th>Option Modules</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
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</thead>
<tbody>
<tr>
<td>None</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>3 relays</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>6 relays</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hybrid – 6 digital inputs, 6 digital outputs, 2 analog outputs</td>
<td></td>
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</tr>
<tr>
<td>2-wire transmitter power supply</td>
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<td></td>
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</tbody>
</table>

### Case

<table>
<thead>
<tr>
<th>Case</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without terminal compartment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With terminal compartment</td>
<td></td>
<td></td>
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</tbody>
</table>

### Power Supply

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 to 240 V AC ±10 % (90 min. to 264 V max.) 50/60 Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>24 V DC</td>
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<td></td>
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</tbody>
</table>

### Special Features

<table>
<thead>
<tr>
<th>Special Features</th>
<th>SM10</th>
<th>XXX/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>X</th>
<th>X/</th>
<th>X</th>
<th>XXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custom configuration (customer to complete and supply SM1000 custom configuration sheet – INF08/034)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>GAMP validation compatible instrument**</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineered configuration (customer to supply configuration details required)</td>
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* Not available in conjunction with 24 V DC power supply

** Instrument supplied preconfigured to customer’s requirements, together with calibration and conformity certificates. Configuration must be supplied using custom configuration sheet – INF08/034
SM1000
Videographic recorder

Standard Accessories
Included with each recorder:
Panel-mounting Clamps
Media-door Lock keys
Shunt Resistors (1 per analog input)
Compact Flash Card (only with Compact Flash Memory Card option)

Optional Accessories

Compact Flash Cards
B12158 Compact Flash Card (2 Gb)

Card Reader
B12028 Compact Flash Reader (USB Interface)

Other
GR2000/0375 Voltage divider board (2 to 20 V) – per voltage input channel
GR2000/0375 Voltage divider board fitted with a 250 Ω shunt resistor
RDM500–CD DataManager Pro software
RDM500L DataManager Pro single user license
RDM500ML DataManager Pro multi-user license
CD/VALSM1000 SM1000 validation package template
ENG/REC After-sales engineered configuration service

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