

# SM3000

## Multipoint videographic recorder

Raising the standards  
of data storage



### Large clear display

- 31 cm (12.1 in.) thin film transistor (TFT) color screen

### Unsurpassed environmental protection

- hosedown to IP66 and NEMA4X standards

### Multiple point recording

- up to 36 universal analog inputs

### Robust and convenient archive storage

- solid-state high-reliability
- Compact Flash Memory Card option

### Intuitive user interface

- clear and simple Microsoft® Windows-style operation and configuration menus

### 10BaseT Ethernet communications as standard

- easy integration into PC networks
- remote monitoring/access
- email notification of alarms and status reports.

### 21 CFR Part 11 compliant data security

- extensive physical and electronics security features

### GAMP validation package

- 21 CFR part 11 compliant

## SM3000

Multipoint videographic recorder

## SM3000

The SM3000 Multipoint Videographic Recorder features state-of-the-art data storage and security technologies. Up to 36 universal analog inputs, communicated inputs or math results can be recorded and displayed in a variety of operator views.

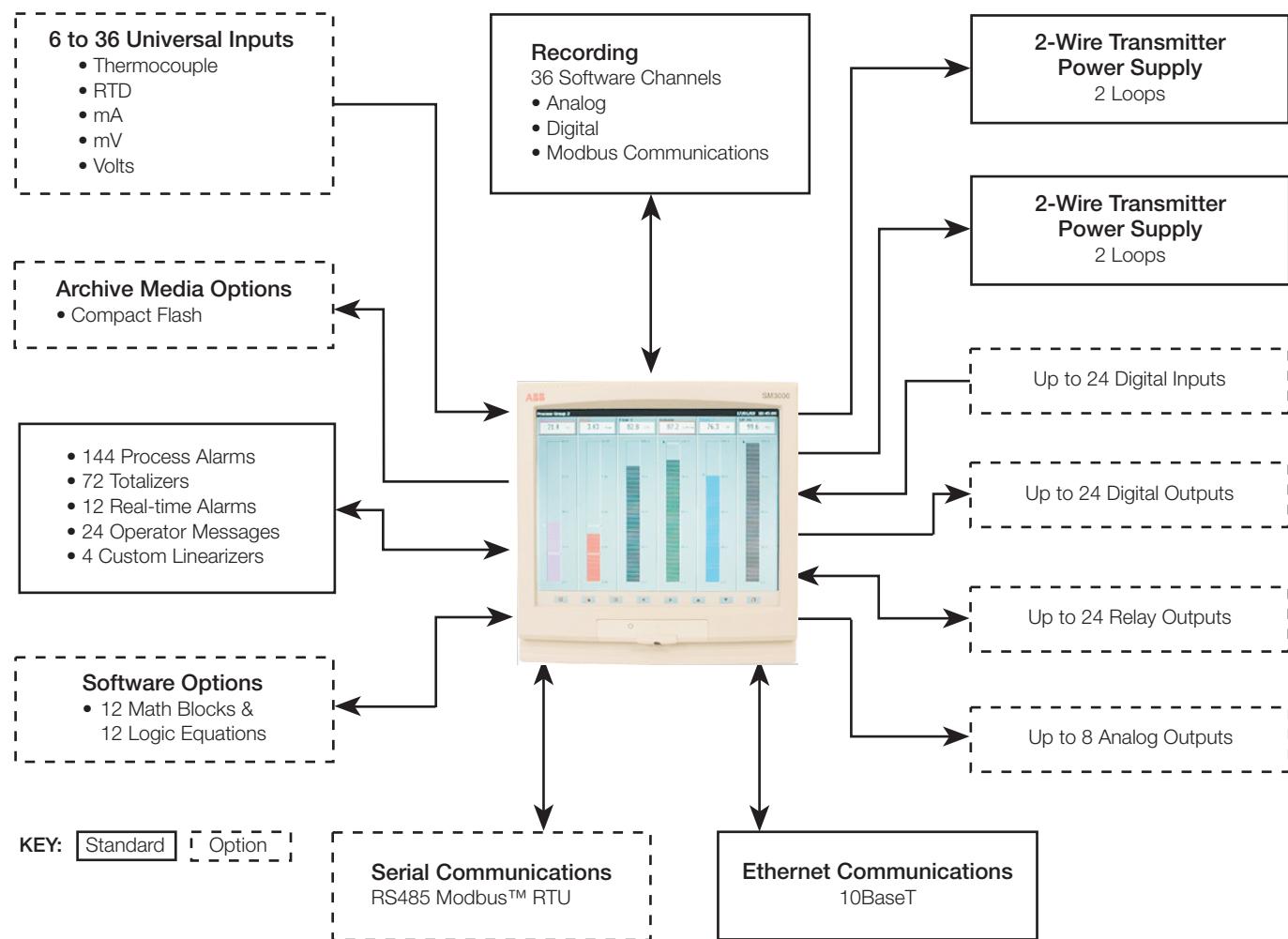
Standard 10KBaseT Ethernet communications ensure full integration into PC networks for remote process monitoring and secure access to archived process data.

8 Mb of onboard flash memory, capable of storing 2.8 million samples of data and the option of Compact Flash removable memory cards, provide extensive data storage capability.

A bright, clear high-contrast 31 cm (12.1 in.) TFT display, Windows-style operation and configuration menus ensure clear and simple operator interface.

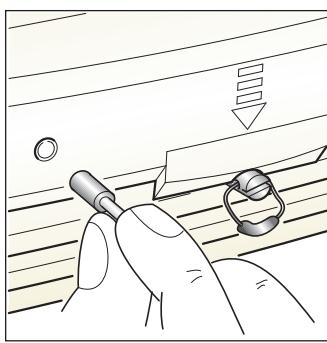
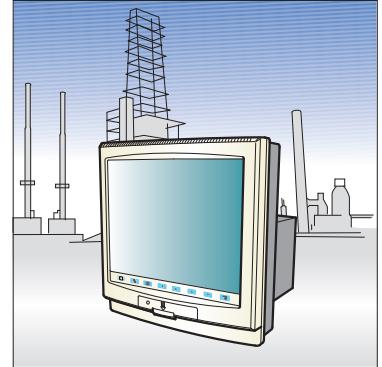
### Application areas include:

- Environmental monitoring
- Water treatment plants
- Heat treatment
- Autoclaves
- Food, Dairy and Beverage processing
- Power stations
- Cold storage
- Emission monitoring
- Life sciences



## Advanced Process Recording

- 36 recording channels are provided as standard which can be used to record any analog, digital or communications (via Modbus) signal.
- Each group can be stored at its own primary or secondary sample rate. This allows detailed information to be stored under specific process conditions, e.g. critical process states or alarm conditions. Alternatively, for simple applications one sample rate can be applied to all channels.
- Through the use of pre-storage filters it is possible to record the average, max./min. or instantaneous values of any recording channel.
- 8 Mb of internal memory is provided for buffering of process data. Once this memory is full it wraps-around automatically and overwrites the oldest data, ensuring that the latest process data is always captured.
- All data recorded by the SM3000 is available to archive to the removable storage media. During periods when a card is not present or is full, data is still recorded into the SM3000's internal memory. When a card is inserted or space becomes available on the card unarchived data can be transferred to the card.

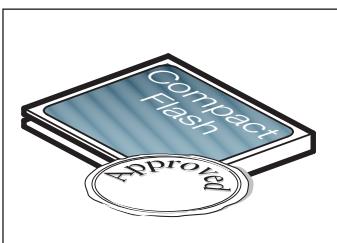
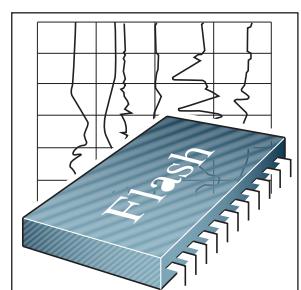


## Security

- High specification data security compliant with 21 CFR Part II.
- A media door lock is fitted as standard to prevent unauthorized access to the memory card.
- Multiple users can be configured, each with an individual user name and password. Comprehensive security options, including password expiry and configurable access levels, ensure the exceptional security of the SM3000.
- Operator actions, data archiving events, configuration changes and other system occurrences are all saved to the audit log of the SM3000. Each entry is time, date and, where appropriate, stamped with a user ID, providing a comprehensive audit trail to accompany any data recorded by the SM3000.
- All data files contained within the SM3000's 8 Mb of internal buffer memory, or created on memory cards, are encoded in a secure binary format ensuring that recorded data cannot be altered.
- Two security modes are available for protection of the instrument's configuration. Multiple users can be configured, each with individual passwords and access levels or, as an alternative, a tamper-evident seal can be fitted to the front of the recorder. In this mode the configuration of the recorder can only be altered by first changing the position of an internal switch. To accomplish this the recorder must be removed from its case, breaking the seal.

## Guaranteed Data Integrity

- The use of Flash memory technology ensures that the SM3000 is not reliant on batteries to preserve stored data during a power failure.
- Data stored in the internal memory and on removable media is stored in small blocks with each block containing a checksum to ensure the integrity of that data.
- An advanced error detection/correction code is built into the internal Flash memory, ensuring safe storage of your process data.



## Industrial Standard, Robust, Archive Storage

- A Compact Flash memory card option can be fitted to the SM3000 for archive purposes. The solid-state nature of these cards ensures that the SM3000 can truly operate in ambient temperatures up to 50 °C (122 °F), whereas traditional electromagnetic floppy disk drives can operate only in temperatures up to 40 °C (104 °F).
- Every write to the archive storage media is verified to ensure the integrity of the data.

## 21 CFR part 11 Compliance and GAMP Validation Package

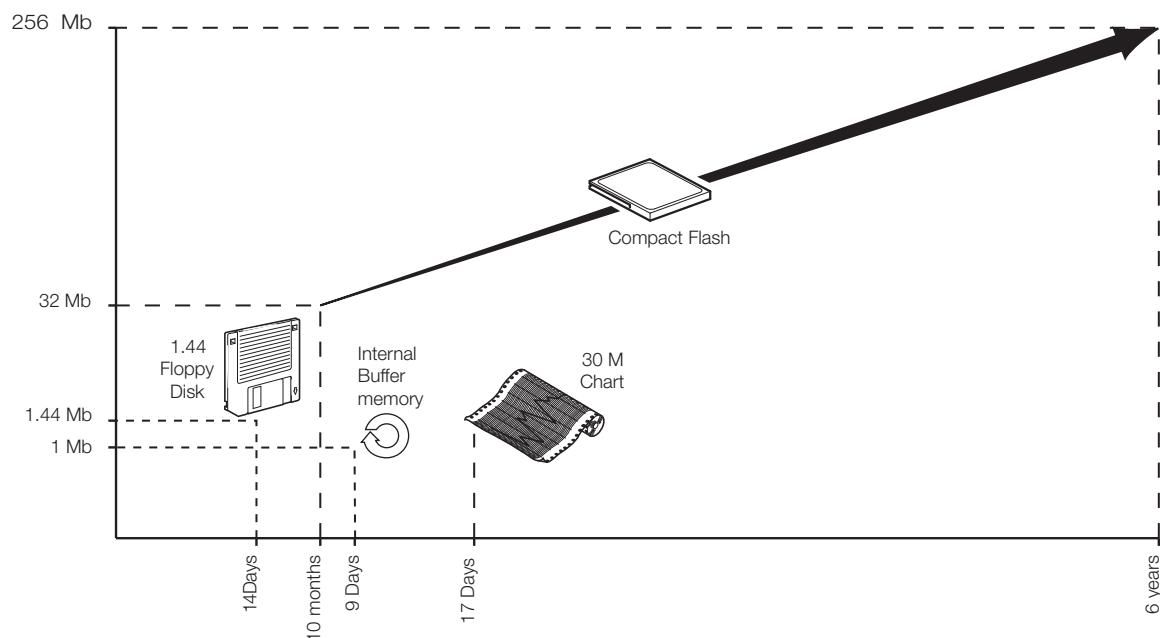
With its comprehensive audit trail, secure archiving format and extensive physical and configuration security features, the SM3000 is ideally suited to applications where compliance to 21CFR part 11 (the FDA's regulations regarding electronic record keeping) is required (for further information refer to [INFO2/70A](#)).

In keeping with this, a template for validating the SM3000 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 Compact Flash memory cards used by the SM3000 ensures that the requirement for operator intervention to transfer process data to a PC on a regular basis is greatly reduced. Older floppy disk technology, used by many other manufacturers of graphical recorders, limits storage capability significantly; sometimes to levels below the ability of a traditional paper recorder.

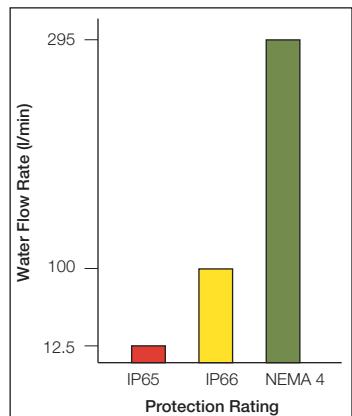
See below for an example of how memory storage times vary depending on the type of media device. The example shows the recording durations for a 6-channel recorder with a sample rate of 10 s. Also included in the example is how these storage times compare with a traditional paper recorder.



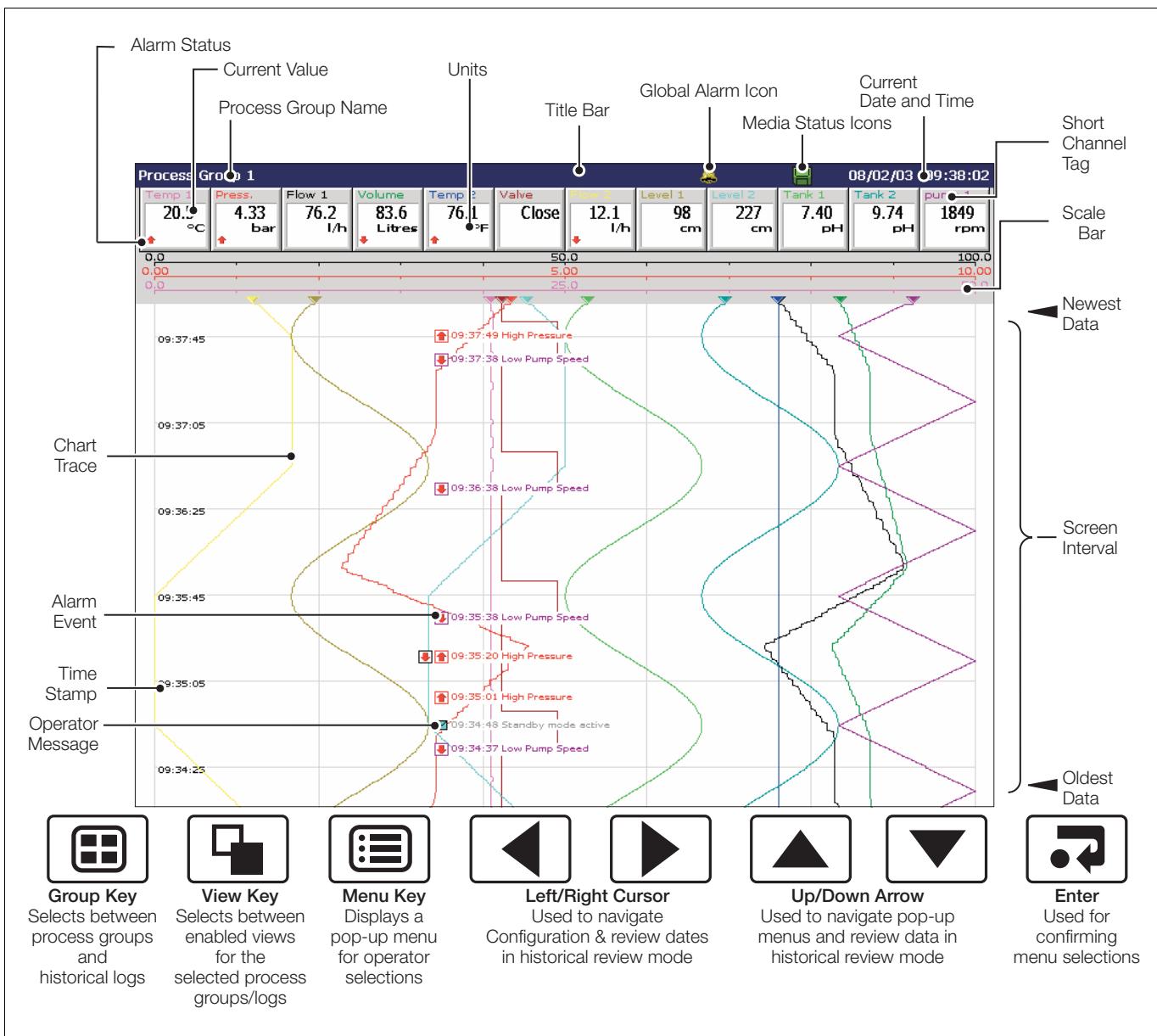


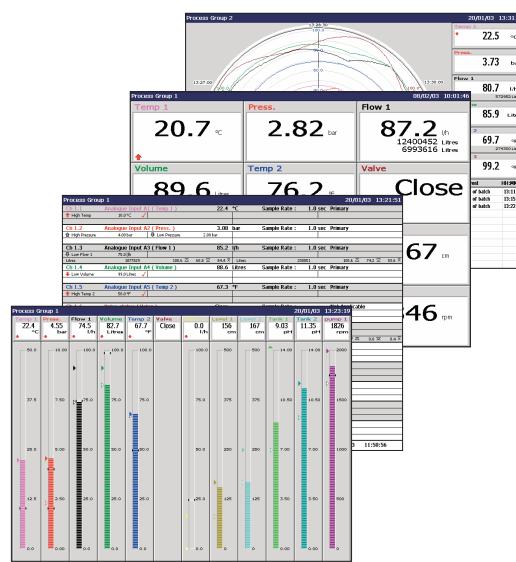
## Unsurpassed Environmental Protection

Unique to this type of product, the SM3000 has unrivalled protection ratings of IP66 and NEMA4X and includes a fully-sealed, lockable media door. This enables the SM3000 to be installed, without additional protection, in applications that require frequent hosedown. With industrial standard noise emission and immunity protection, the SM3000 also operates effectively in high electrical-noise environments.



## Intuitive User Interface





## Operator Views

The 36 recording channels of the SM3000 can be freely distributed between 6 process groups and displayed using a number of different operator views. In addition to the standard strip chart views, the following views are available:

### ■ Circular Chart View

Up to six trends can be plotted on a circular chart. In addition to digital indicators, including alarm status and totalizer values, a log is constantly in view showing a list of recent alarm activity.

### ■ Digital Indicator View

Process value, engineering units, channel tag, totalizers and alarm status are all displayed clearly. An overview screen provides an at-a-glance view of all 36 recording channels.

### ■ Process View

Provides an at-a-glance summary of each channel, including detailed alarm, totalizer and statistical (min., max. & average) information.

### ■ Bargraph View

Horizontal or vertical formats, including min./max. and alarm trip point markers.

## Historical Logs

Providing functions unavailable in paper-based recorders, three full-time and date-stamped historical logs ensure complete validity of the recorder and its data. Any or all of these logs can be archived to the removable memory card.

### ■ Totalizer Log

All totalizer activity, e.g. starts, stops and resets, are recorded by the totalizer log. In addition individual log intervals can be configured for each totalizer, allowing total values to be logged regularly.

### ■ Alarm Event Log

A detailed history of all alarm occurrences, including active and inactive transitions plus acknowledgement details.

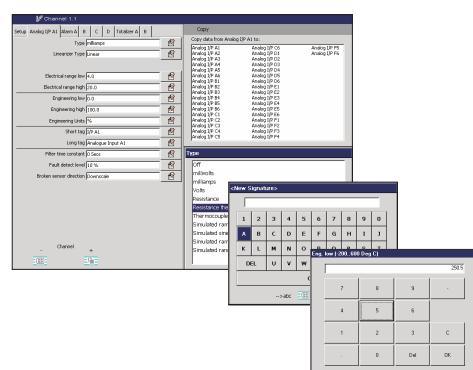
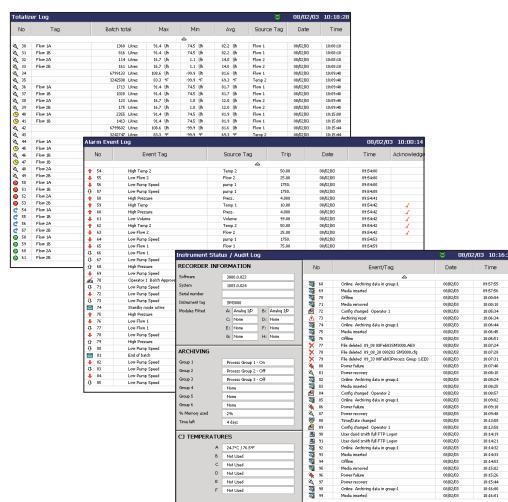
### ■ Audit Log

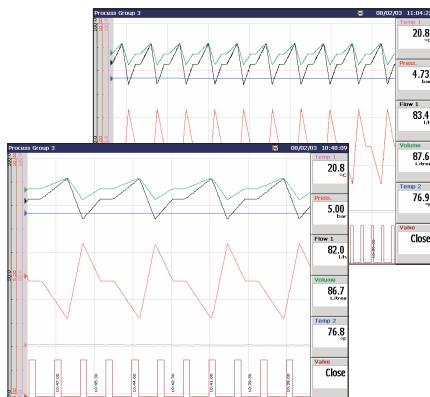
The highly-detailed secure log of all system events gathered by the Audit Log provides comprehensive evidence of the integrity, validity and traceability of data recorded by the SM3000. Included in the log are configuration changes, data archiving events, calibration adjustments, details of remote accesses and many more key events, all marked with operator IDs where applicable.

## Configuration

A simple Windows-style structure provides an exceptionally easy approach to the setup of the SM3000. Text and numerical information is entered very quickly via an on-screen keyboard. Navigation of configuration menus is performed via the cursor keys and the pop-up menu.

It is also possible to configure the SM3000 via a Windows-based PC configuration package.

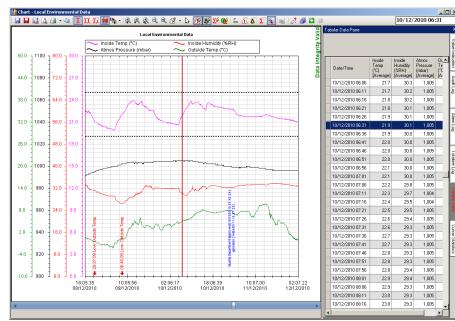




## On-line Data Review

The SM3000 provides a number of unique features to provide a clear view of your process

- The screen interval can be altered to display between 48 s and 14 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' to get the big picture.
- Individual traces can be temporarily removed from the screen to enable clear comparison of two or more trends.
- The SM3000 can easily review all historical data in the 8 Mb 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 reviewed easily.

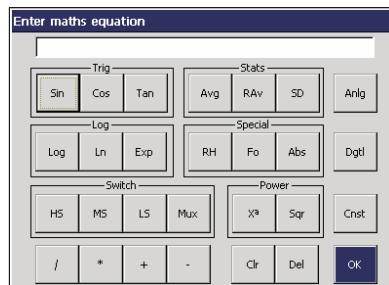
- Database management of data files provided by DataManager Pro ensures simple, secure long-term storage and retrieval of historical data.
- The graphing capabilities provided by DataManager Pro ensure easy interrogation of process data.
- The validity of all data files is always checked by DataManager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

## 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 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/mid 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.

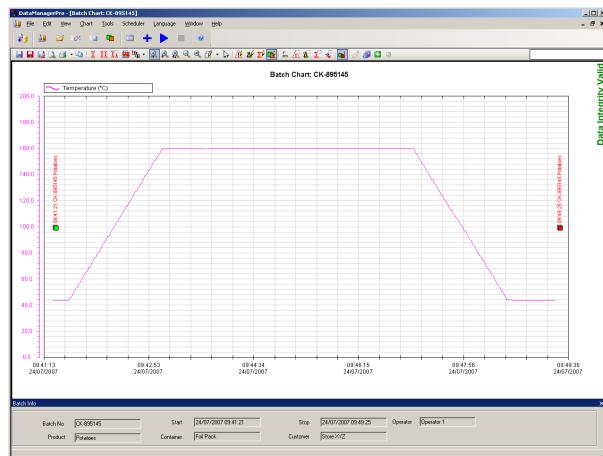


All math and logic equation results can be recorded on the display of the SM3000 and archived to the removable media. Detailed diagnostic functions are provided for both the math and logic equations.

## 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.



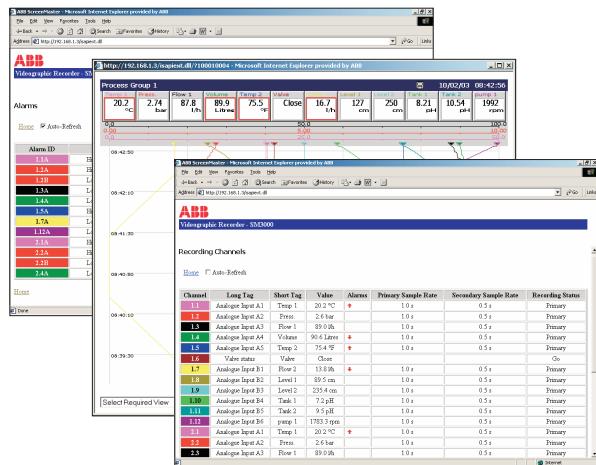
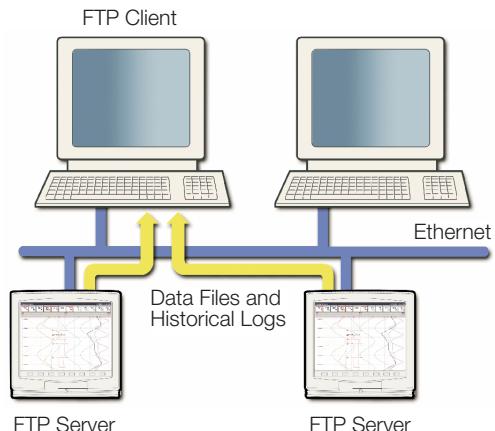
## Ethernet Communications

The SM3000 provides 10BaseT Ethernet communications as standard via a standard RJ45 connector. The SM3000 uses industry-standard protocols TCP/IP, FTP and HTTP enabling easy integration into existing PC networks.

### Data File Access via FTP (File Transfer Protocol)

The SM3000 features FTP server functionality that provides high-speed access via Ethernet to data archived by the recorder.

- Using a standard web-browser or other similar FTP client, data files contained within the recorder's internal memory and removable memory card can be accessed remotely and transferred to a PC or network drive.
- 8 individual FTP users can be programmed into the SM3000. 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 SM3000.
- Using the SM series complementary FTS (File Transfer Scheduler) software, 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 operator intervention.



### Embedded Web Server

Contained within the SM3000 is an embedded web-server, enabling access to web pages created within the recorder. The use of HTTP (Hyper Text Transfer Protocol) enables standard web browsers to view these pages.

- The web pages show the current display of the recorder, detailed information on process signals, alarm conditions, totalizer values, an overview screen showing the status of all 36 recording channels and other key process information.
- The historical logs stored in the SM3000'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

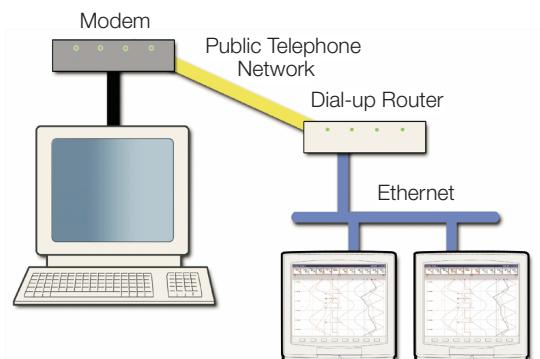
A demonstration of these features is available from an on-line recorder accessible via the internet. In the address bar of your web browser enter '<http://217.46.239.73>'.

### Remote Access/Monitoring

Ethernet communications can provide a link to recorders installed in remote locations. By using a dial-up router, multiple SM3000 recorders can be installed in remote locations and accessed via a public telephone network when required.

### Email Notification

Using its inbuilt SMTP client the SM3000 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 status at specific times during the day. Status report content can be tailored to suit your specific process needs.



## Specification

### Operation and Configuration

#### Configuration

Via tactile membrane keys on front panel or  
PC Configuration using removable media card

Multiple configuration files can be stored in internal (up to 5 files) or  
external memory (with removable media option fitted)

#### Display

Thin film transistor (TFT), active-matrix, color, liquid crystal display  
(LCD) with built-in backlight

Low-reflective, 31 cm (12.1 in.) diagonal display area,  
480,000 pixel display\*

Viewing angle — Horizontal 55 ° typ. (left side, right side)

Vertical 50 ° from below, 40 ° from above

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

#### Screensaver

Can be programmed to dim the backlight if operator keys are not  
pressed for a selected period of time

#### Languages

English, German, French, Italian and Spanish

#### Dedicated operator keys

- Group select
- View select
- Menu key
- Left cursor
- Right cursor
- Up/Increment key
- Down/Decrement key
- Enter key

#### Vertical chart screen intervals

Selectable from 48 s to 14 days

#### Horizontal chart screen intervals

Selectable from 70 s to 20 days

#### Circular chart duration

Selectable from 9 minutes to 32 days

#### Chart scales

Independent primary and secondary ranges for each channel

#### Vertical/horizontal chart divisions

Programmable for up to 10 major and 10 minor divisions

#### Circular chart divisions

Programmable up to 10 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

Contents	Views Available			
	Chart	Bargraph	Digital Indicator	Process
Instantaneous values/states	✓	✓	✓	✓
Units of measure	✓	✓	✓	✓
Short tags	✓	✓	✓	✓
Long tags	—	—	—	✓
Alarm status	✓	✓	✓	✓
Alarm trip markers	—	✓	—	—
Alarm trip values	—	—	—	✓
Max./Min. markers	—	✓	—	—
Analog bargraphs	—	✓	—	—
Totalizer values & units of measure	—	—	✓	✓
Totalizer tags	—	—	—	✓
Max., min. and average batch values	—	—	—	✓
Graphical view of historical data	✓	—	—	—

## Security

### 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

### Setup security

Configuration	Can be configured for password protection or free access to setup levels
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### Users

Number of users	Up to 15
Usernames	Up to 20 characters, Usernames are unique, i.e. names cannot be repeated
Access privileges	<p>Setup access — Yes/No</p> <p>Electronic signature access — Yes/No</p> <p>Configuration access — None/load file only/limited/full</p>
Passwords	<p>Up to 20 characters</p> <p>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</p>
Password failure limit	<p>Configurable for 1 to 10 consecutive occasions or 'infinite'</p> <p>A user is deactivated if a wrong password is entered repeatedly</p>
Deactivation of inactive users	<p>Can be disabled or configured for 7, 14, 30, 60, 90, 180 or 360 days of inactivity</p> <p>Users are deactivated (by removal of access privileges) after a period of inactivity</p>

### Electronic signature

Protection	<p>Only accessible to users with electronic signature access privileges</p> <p>Access requires a valid username and password</p>
Function	<p>Provides an electronic equivalent to the signing of a conventional paper chart</p> <p>Enables operator to securely approve recorded data</p>
Content	<p>Date/Time, operator ID and operator defined 20-character message are stored in the alarm/event log and can be displayed on the chart</p>

## Standard Functionality

### Operator Messages

Number	24 configurable messages of up to 20 characters each
	1 operator defined message of up to 20 characters

### Trigger

Via front panel or digital signals

### Recording in alarm/event log

Can be enabled or disabled on configuration

## Process Alarms

### Number

144 (4 per recording channel)

### Update rate

Up to 12 alarms processed every 100 ms, e.g. with 36 alarms enabled each alarm is updated once every 300 ms.

### Types

High/low: process, latch & annunciator, delayed process

Rate: fast/slow

### Tag

20-characters 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

12

### Programmable

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

## SM3000

Multipoint videographic recorder

### Totalizer

#### Number

72 (2 per recording channel) 10-digit totals

#### Type

Analog or digital, batch and secure totals

#### Statistical calculations

Average, maximum, minimum (for analog signals)

Date and time of max. and min. values

#### Update rate

Up to 4 totalizers processed every 100 ms, e.g. with 12 totalizers enabled each total is updated once every 300 ms.

### Custom Linearization

#### Number

4

#### Number of breakpoints

20 per linearizer

### Number of Channels v. Number of Groups

Groups	Channels per Group
1, 2, 3	Up to 12
4	Up to 9
5	Up to 7
6	Up to 6

### Recording Duration

Approximate duration calculated for continuous recording of 12 channels of analog data (for 24 channels divide by 2, for 6 channels multiply by 2 etc.)

Sample Rate	1 s	10 s	40 s	60 s	120 s	480 s
Internal Flash buffer memory	1½ days	27½ days	3½ months	5½ months	11 months	3½ years

Sample Rate	1 s	10 s	40 s	60 s	120 s	480 s
512 Mb Compact Flash	8 months	6 years	26 years	40 years	79 years	319 years
1 Gb Compact Flash	1 year	13 years	52 years	77 years	155 years	623 years

### Recording — to Internal Memory

#### Data Channels

##### Internal buffer memory

8 Mb Flash memory provides storage for 2.9 million samples

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

##### Data integrity checks

Checksum for each block of data samples

48-bit code for error detection/correction built-in

#### Independent process groups

6

#### No. of recording channels

36

#### Sources

Analog inputs, Modbus input, 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

## 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

Log Type	Alarm/Event Log		Totalizer Log		Audit Log	
Information Recorded in Logs	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 trip	✓	✓	—	—	—	—
Alarm acknowledgement state	✓	✓	—	—	—	—
Operator ID	✓	—	—	—	✓	✓
Description	—	—	—	—	✓	✓
Batch total and units of measurement	—	—	✓	✓	—	—
Max., Min. and average values plus units	—	—	✓	✓	—	—
Secure total	—	—	✓	—	—	—
Time & date of min./max. values	—	—	✓	✓	—	—

## Archiving – To Memory Card

### File types that can be saved to removable media

Recorded data for each channel

Alarm event log for each group

Totalizer log for each group

Audit log

Configuration

### File Structure

Binary encoded with built-in data integrity checks

### Automatic updating of archive files

At regular time intervals according to the sample rate

When a media card is inserted

### 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

## Analog Input Modules

### General

#### Number of inputs

6 per board, max. of 36 inputs

#### Input types

Millamps, millivolts, voltage, resistance, THC, RTD, digital input

#### Digital input types

Type Volt-free contact

Minimum pulse duration 1 s

#### 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 60 s

#### Display range

–999 to 9999

#### Common mode noise rejection

> 120 dB at 50/60 Hz with 300  $\Omega$  imbalance resistance

#### Normal (series) mode noise rejection

> 60 dB at 50/60 Hz

#### CJC rejection ratio

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

#### Sensor break protection

Programmable as upscale or downscale

#### Temperature stability

0.02  $^{\circ}\text{C}/^{\circ}\text{C}$  or 2  $\mu\text{V}/^{\circ}\text{C}$

#### Long term drift

< 0.2 % of reading or 20  $\mu\text{V}$  annually

#### Input impedance

> 10 M $\Omega$  (millivolts inputs)

500 k $\Omega$  (voltage inputs) externally mounted divider

10  $\Omega$  (mA inputs) externally mounted on terminals\*

\* Hart transmitters require a minimum 250  $\Omega$  loop impedance. A 250  $\Omega$  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 to 5 V.

## Standard/High Specification Analog Input Modules

Linear Inputs	Standard Analog Input	High Specification Analog Input	Accuracy (% of reading)
<b>Millivolts</b>	0 to 2000 mV	–1000 to +1000 mV	0.1 % or $\pm 10 \mu\text{V}$
<b>Millamps</b>	0 to 50 mA	–100 to +100 mA	0.2 % or $\pm 2 \mu\text{A}$
<b>Volts</b>	0 to +20 V*	–50 to +50 V*	0.2 % or $\pm 10 \text{ mV}$
<b>Resistance <math>\Omega</math></b>	0 to 5000 $\Omega$	0 to 2000 $\Omega$	0.2 % or $\pm 0.08 \Omega$
<b>Sample Interval</b>	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	100 ms per sample (2 modules are processed in parallel) gives worst case update times as follows: 100 ms for 6 or 12 channels — all input types	
<b>Input Isolation</b>	35 V DC channel-to-channel	500 V DC channel-to-channel	
<b>Isolation from Rest of Instrument</b>	Galvanically isolated to 500 V DC	Galvanically isolated to 500 V DC	

\*Requires external voltage divider board Part No. GR2000/0375

## Analog Input Types

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

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

## 2-wire Transmitter Power Supply

### Number

1 fitted as standard

### Voltage

24 V DC

### Drive

Up to 45 mA, i.e. can drive 2 loops

## Ethernet

### Physical medium

10BaseT

### Protocols

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

### FTP server functions

Directory selection and listing

File upload/download

12 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

## 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,  $X^n$ ,  $\sqrt{ }$ , 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 block 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

## SM3000

Multipoint videographic recorder

### Modules

#### 3- or 6-Relay Output Modules (max. of 4 Modules)

##### Number of relays

3 or 6 per module, max. of 4 modules (24 relays)

##### Type and rating

Relay type single-pole changeover

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

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

#### Hybrid Module (max. of 4 Modules)

##### 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	125 ms
Digital output voltage	5 V
Isolation	500 V from any other I/O

##### Analog output

Number	2 isolated
Configurable current range	0 to 20 mA
Max. load	750 $\Omega$
Isolation	500 V DC from any other I/O
Accuracy	0.25 %

#### 2-Wire Transmitter Power Supply Module (max. of 2 Modules)

##### Number

2 isolated supplies per module

##### Voltage

24 V DC nominal

##### Drive

45 mA per supply, i.e. each module can drive 2 x 2 = 4 loops

#### RS485 Serial Communications Module (Max. of 1 Module)

##### Number of ports

1

##### Connections

RS485, 2- or 4-wire

##### Protocol

Modbus RTU slave + master

### EMC

#### Emissions & Immunity

Meets requirements of:

EN50081-2

EN50082-2

EN61326 for an industrial environment

### Electrical

#### Power supply

100 to 240 V AC  $\pm 10\%$  (90 min. to 264 V max.) 50/60 Hz

24 V DC  $\pm 2.4\%$  (optional)

#### Power consumption

35 VA max.

#### Power interruption protection

No effect for interruptions of up to 20 ms

#### Maximum accepted cable size

Instrument terminal block 14 AWG (1.63 mm OD)

GR2000/0375, GR2000/0377 15 AWG (1.45 mm OD)

### 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

#### Operating temperature range

0 to 50 °C (32 to 122 °F) with SmartMedia/Compact Flash

#### Operating humidity range

5 to 95 % RH (non-condensing)

#### Storage temperature range

-20 to 60 °C (-4 to 140 °F)

#### Front panel sealing

IP66 and NEMA4X

#### Rear panel sealing

(with rear cover) IP40

(without rear cover) IP20

### Physical

#### Size

288 mm (11.34 in.) x 288 mm (11.34 in.) x 195 mm (7.68 in.) (depth behind panel)

#### Weight

8 kg (17.4 lb) approx. (unpacked)

#### Panel cutout

281 mm (11.06 in.) x 281 mm (11.06 in.)

#### Case material

20 % glass-filled polyester/stainless steel (grade 304)

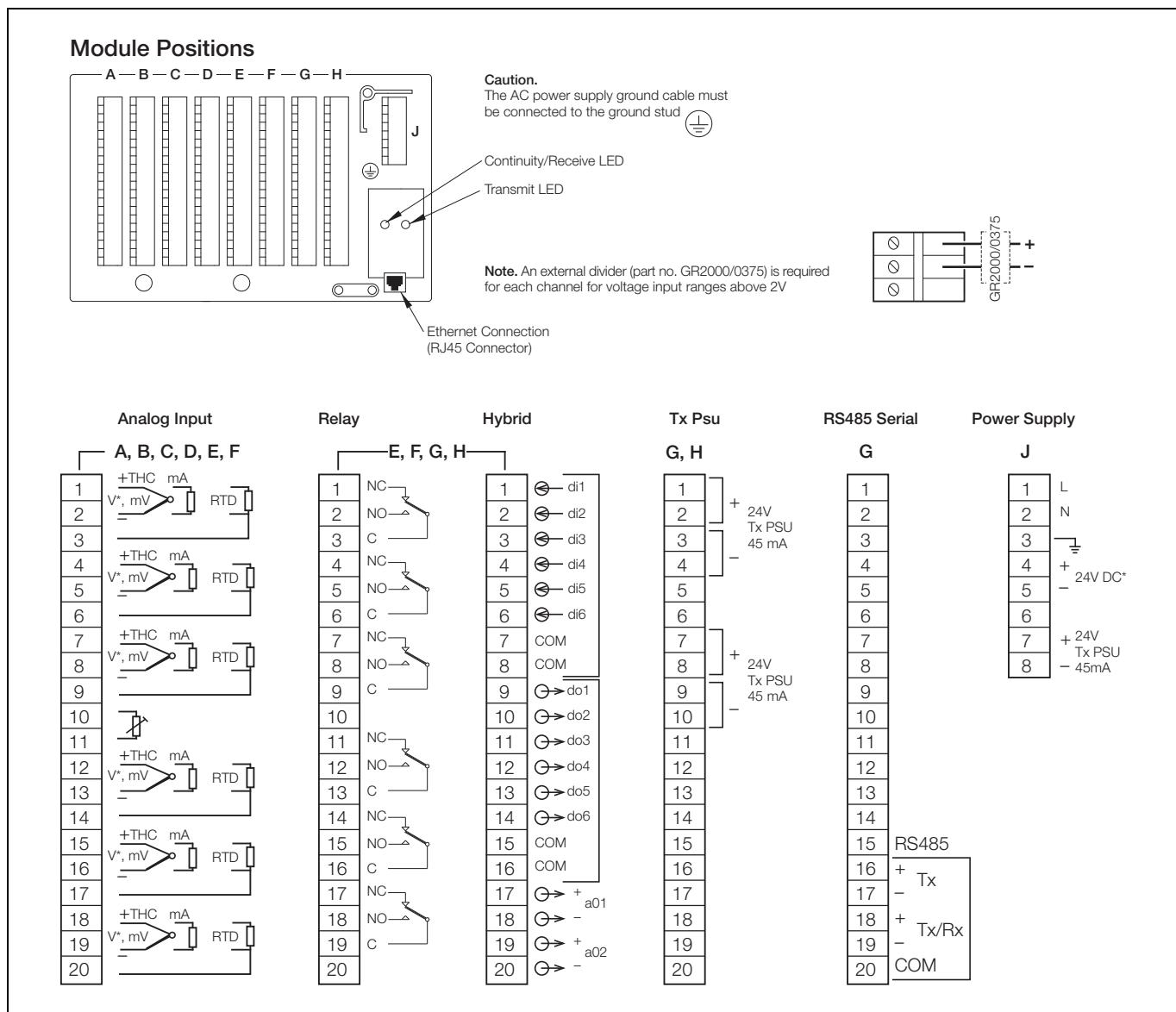
#### Display housing material

25 % glass-filled polyester

#### Screen

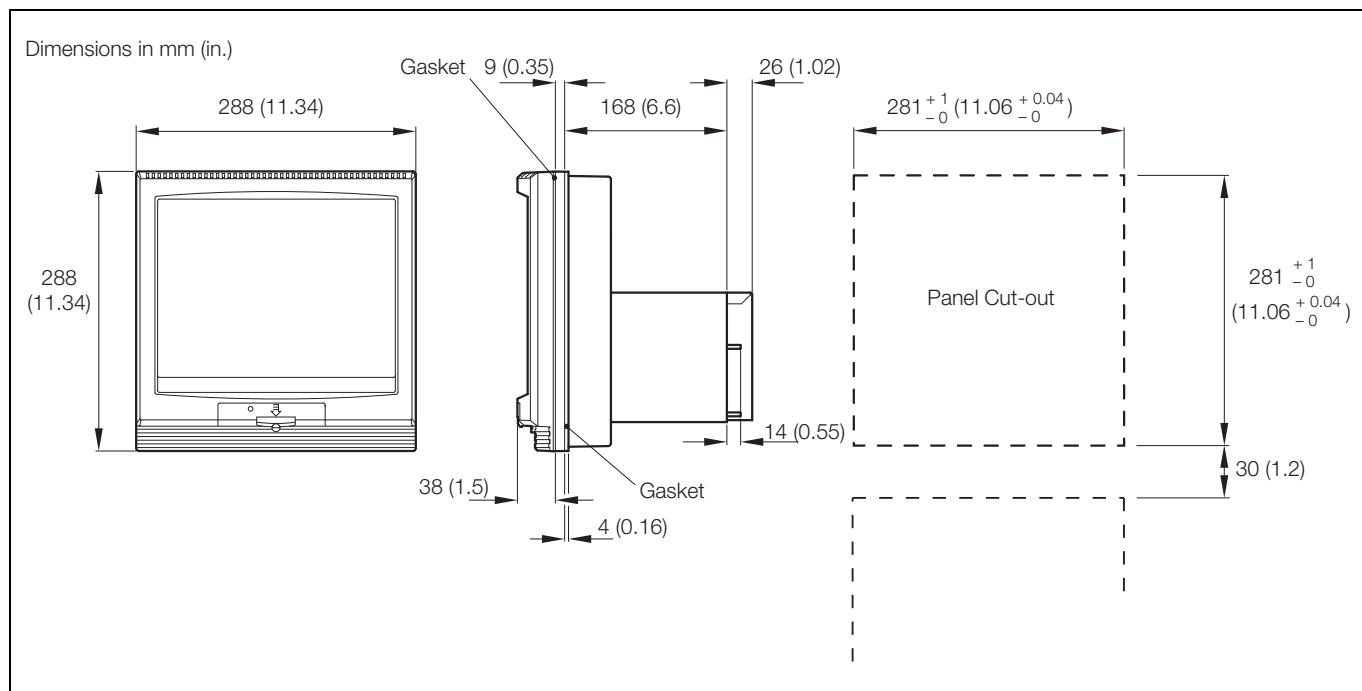
Double layer polyester coated toughened glass

## Electrical Connections



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

## Overall Dimensions



## 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 $\Omega$ shunt resistor
RDM500-CD	DataManager Pro software
RDM500L	DataManager Pro single user license
RDM500ML	DataManager Pro multi-user license
CD/VALSM3000	SM3000 validation package template
ENG/REC	After-sales engineered configuration service

## Acknowledgements and Trademarks

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