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SBM3000 READOUT

Communication Software

Operating Manual

IS Addendum

Version X1.05

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Communication Software

SBM3000 COMMUNICATION SOFTWARE

Version X1.05

The SBM3000 Communication software is a graphical user interface that enables access to functions of the SBM3000 readout. In addition, it recovers stored data to text files that can be readily imported into a spreadsheet software application for further analysis.

The application is a stand-alone executable created with the National Instruments Corporation LabVIEW® program development system. The installation of this software on any computer will confirm your acceptance of the Software Licence Agreement contained in the **ReadMe.pdf** file accompanying this release kit.

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System Requirements

The SBM3000 interface software utilises the Windows® operating system. The interface screen has been designed for a 1024 x 768 resolution screen using 256 colours and different settings will result in loss of screen detail.

MINIMUM SYSTEM

Windows-based PC
1024 x 768 Monitor using 256 colours
Minimum 8MB of RAM (16MB or more recommended)
USB Drive for software installation
A mouse or other pointing device
A RS232 serial port or USB port

Installing the Software

INSTALLATION

1. The SBM3000 interface software is distributed on a USB memory device or via electronic download. Insert the disc and double-click on the <setup.exe> file to begin
2. Change the path, if necessary, to point to the directory where you require the software to be installed. Click **Finish** to start the installation.
3. The software installer will automatically recognize that an earlier version of the application is installed. Run the <setup.exe> file to upgrade or re-install the application and support files.

INSTALLED FILES

The installer will create the following files in the directory specified by the user:-

SBMx100.exe	The software application
SBMx100.ini	LabVIEW initialisation file
Operating Manual.pdf	A copy of this document
ReadMe.pdf	Warranty, disclaimer and installation information

Getting Started

OPERATING THE SOFTWARE

The SBM3000 software is a graphical user interface designed to configure the SBM3000 readout and recover stored data.

The operator may access the following functions via the interface:

- Recover stored data from any selected site into a single file.
- Recover all stored data from the readout into a single file.
- Update the readout internal clock using the connected computer time and date settings.
- Pre-set and edit up to 20 custom site names to the SBM3000 readout.
- Clear all stored site data from the readout.

Moving the screen pointer over the required screen function and activating the selection by clicking with the left mouse button carries out software operation. On-line HELP is always available by pressing [CTRL-H] and moving the pointer over the screen components. A brief description of the component function will appear in the HELP window.

STRUCTURE

The software is configured to run automatically when loaded. Alternatively, it can be started manually by clicking with the left mouse button on the [RUN] Arrow [⇒] in the toolbar. Once the application is running, it can only be shut down through the [CLOSE] button to ensure that the application completes saving all default values prior to shutting down.

Connecting to the SBM3000 Readout

SERIAL CONNECTION

The SBM3000 readout may be connected to the computer serial port by the custom RS232 cable supplied with the software package. This cable must be connected to a 9-pin serial communication port usually located at the rear of the computer. The plug retaining screws should be fastened. The connection to the readout is via the 4-pin **Data** socket located on the readout panel.

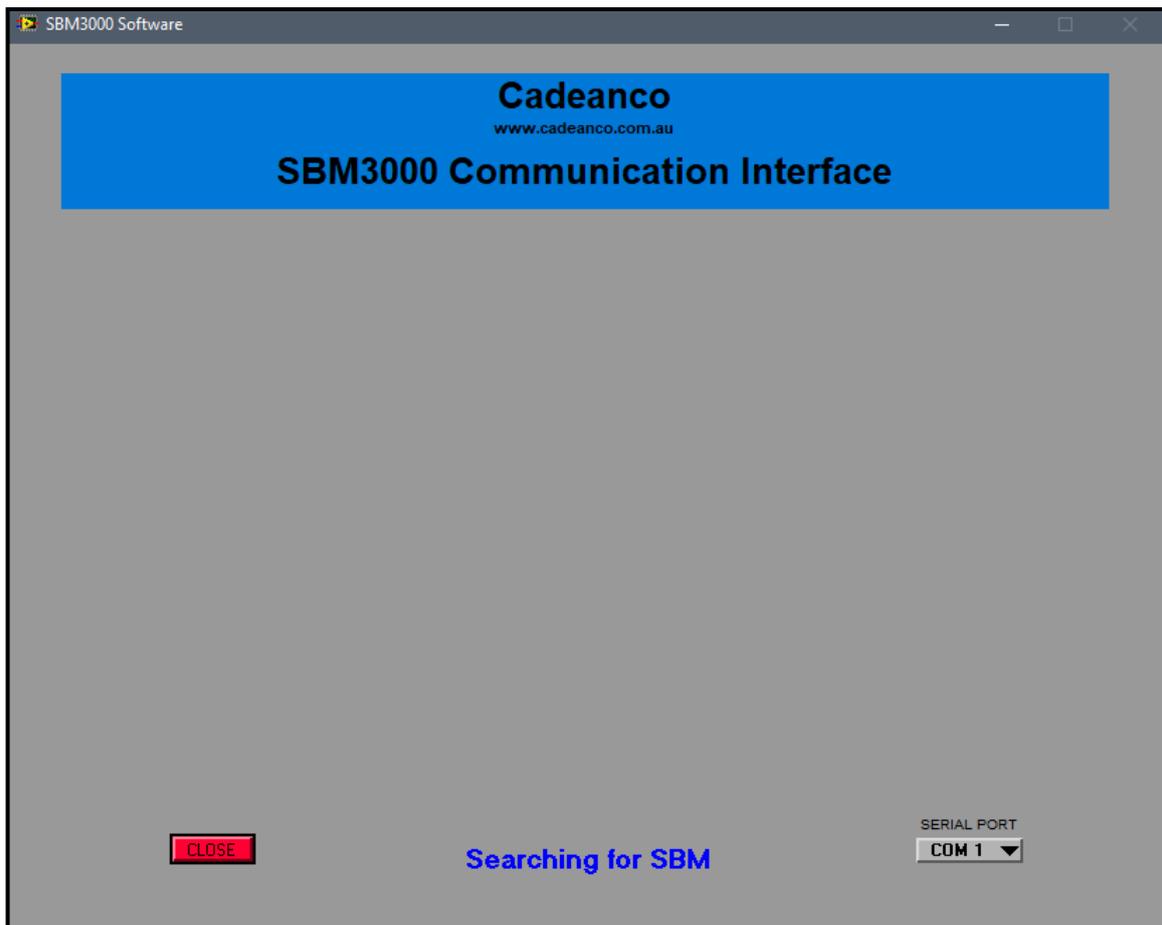
NB. The SBM3000 readout must not be accessed while located in a hazardous area.

When the operator runs the communication interface, an option box appears on the front panel to allow the operator to re-assign the serial port that is to be used to connect to the SBM3000 Readout. Connection is confirmed by a message line and the uploading of the current system configuration parameters to the host computer.

USB-SERIAL ADAPTER

The SBM3000 is supplied with USB-Serial adapter to allow it to connect to laptop computers without a conventional 9-pin serial port. The adapter is supplied with its own installation CD however the adapter should install itself automatically on computers running Windows7[®] or Windows[®]10[®] operating systems.

Communication Interface Functions



[SERIAL PORT] CONTROL

This data box will appear while the application is searching for the serial connection to a SBM3000 readout and disappear once a connection is established. During this time, the operator may change the serial communication port used by the software to reflect the connection used by the computer. The range of this port is 1-20 in line with conventional serial protocol and alternatives may be viewed for selection by clicking on the arrow with the left mouse button. The selected serial port will be saved as the default connection port once a valid connection has been established. The SBM3000 will show 'System under remote control' if awake and connected properly.

NB. If the SBM search phase continues past three repetitions the connection to the readout should be checked.

[CLOSE] BUTTON

Select this option by clicking with the left mouse button to cancel the search for a SBM3000 readout and close the application.

[Edit Site List] BUTTON

Click on this button and confirm the action to edit the existing list of site names stored in the SBM3000 readout. This action will clear all site data but leave the site headings available for editing. Options to edit the site list are shown on the following page.

[Clear Stored Data] BUTTON

Click on this button and confirm the action to clear all stored data from the SBM3000 readout. This action will clear all site data but leave the site headings available for subsequent use. It is not possible to clear data from any individual site.

[CLOSE] BUTTON

Select this option to exit from the application.

[Delete Site from List] BUTTON

Click on this button to delete the selected site from the current list.

[Save to SBM3000] BUTTON

Select this option to clear all stored site names and associated data from the SBM3000 readout. The new site list will be transferred to the SBM3000 readout.

[Cancel Edit] BUTTON

Select this option to exit from the edit screen without making changes to the existing list or clearing stored data.

External Wiring Modes with Option 1 Connector

<p>Configuration 1</p> <p>Configuration 1</p> <p>1/4 Bridge, shared common 20 channels un-compensated Internal Reference Half Bridge Input 3 not used.</p>	<p>Configuration 2</p> <p>Configuration 2</p> <p>2 Wire 1/4 Bridge 20 channels un-compensated Internal Reference Half Bridge Input 3 not used.</p>	<p>Configuration 3</p> <p>Configuration 3</p> <p>9/12 Gauge HI cell Compensating Internal Reference Half Bridge. Thermistor connection available Inputs 2 & 3 not used</p>	<p>Configuration 4</p> <p>Configuration 4</p> <p>Independent 3 Wire 1/4 bridge 16 channels max. Inputs 1 & 2 are for dummy connection. Measurements made on Input 3 Internal Reference Half bridge.</p>
<p>Configuration 5</p> <p>Configuration 5</p> <p>1/2 Bridges, 16 Channels Gauges XX,C connect to P- Gauges XX,T connect to P. where C is compression, & T is Tension. Input 1 not used</p>	<p>Configuration 6</p> <p>Configuration 6</p> <p>Full Bridge, 8 Channels Max. Externally regulated, Common Mode Voltage <math>\leq 2.5</math> Volts Input 1 not used.</p>	<p>Configuration 7</p> <p>Configuration 7</p> <p>Full Bridge, 8 Channels Max. Externally regulated, Common Mode Voltage <math>\leq 2.5</math> Volts Input 1 not used.</p>	<p>Configuration 8</p> <p>Configuration 8</p> <p>Single Ended Potentiometer 16 Channels, Voltage measurement Input 1 not used.</p>

Configuration 1: This configuration allows 20 strain gauges sharing 2 common returns to be connected with compensation as utilized in some instrumentation projects. The additional 8 channels are wired to Input 2 as shown.

Configuration 2: This arrangement has up to 30 strain gauges having only 3 wires between individual inputs and P-. 12 gauges on Input 1 pins 8 on Input 2 are connected to S+ and a 120 ohm dummy resistance internally wired to P-. Note: The internal Reference Return (Pin 14) must be connected to P- (15 or 16) in order to complete the bridge. D & J3 are not wired. Note also that gauge lead wires will cause extra bridge offset because they are wired within the same bridge arm.

Configuration 3: This configuration allows connections for the CUBERO Hollow Inclusion Cell. Gauges 1 to 12 are wired to Input 1 as shown. The 2 commons are the CUBERO commons (pins 13 & 14) and the internal reference return (pin 15). Note: Bridge P- is at junction of 3 commons within the cell itself. D & J3 are not wired. The cell thermistor can be connected to Pin 13 for temperature measurement.

Configuration 4: This scheme enables connection of up to 16 strain gauges in a 1-wire compensating configuration. The 16 channels of input 1 (6 commons) allow the 16 gauges to be terminated with the same leads connecting to Input 1, Pin 15 and/or 16 (P-). The additional 8 channels (8 commons) are terminated to Input 2. The Reference half bridge must be completed by connecting Input 1, pin 14 to Pin 15 (P-).

Configuration 5: This scheme half bridge arrangement is wired to Input 3 which has no internal commons connected to it. The sensor is wired directly to P- (Pin 1) and P+ (Pin 15 or 16) and the common return is wired to the appropriate input on Input 3. As with Options 1, 2, 3 & 4, the Reference Return (14) must be connected to P-. Note: The mechanical sense of the gauges C = Compression, & T = Tension

Configuration 6: This arrangement shows wiring for full bridge sensor. Sensors are connected between P- (Input 2:13) and P+ (Input 2:15,16) with Sensor S+ connected to Input 3, Pin 1 to S- is connected to Input 3, Pin 9 to 16 respectively. Reference Return (14) can be left floating.

Configuration 7: This configuration is similar to 7, in this case, Excitation voltage is regulated externally within the sensor modules (eg. EXM2). Switched and current limited raw voltage is supplied to the sensor modules from Input 2, Pin 11. Measurement connections are made to Input 3 as for configuration F

Configuration 8: This wiring is for single ended devices such as potentiometers. The devices are powered from Input 2:11 (V+) and Input 2:15,16 (V-). Signals are connected to Input 3, 1 to 16. Measurements are made on Input 3, referenced to V-. If the devices are regulated externally, then current limited raw voltage from Input 2:11 can be used instead. Signals on Input 3 should be between zero and 2.048 Volts.

Sundott Pty Ltd tas CADEANCO	External Wiring Options Vers 1
3/4 Royan Place, Baywater, 3153 Ph: +61 3 9761 4235. Fax: +61 3 9761 4260	Revision: SBM3000-WO-1 003
Date: 2/2011	Sheet 8 of 8
File: C:\Users\SBM3000\Documents\Wiring_V1_1_Rev08.dwg	GFC

EXTERNAL CONNECTOR

The SBM3000 readout case is fitted with three 16-way shrouded male headers with mating female plugs. The plug component is fitted with screw terminal terminations to allow easy and reliable termination for connecting sensor conductors in any of the eight available combinations. The SBM3000 firmware is factory configured to recognise this connector option. The application will display the eight available wiring configuration options when adding a new location to the readout site list.

APPLICATION NOTE: Configuration 7 (Full Bridge, 8ch max, External) is not available in the Intrinsically Safe version of the SBM3000

ADDING TO THE SITE LIST

Clicking the [Add Site to List] button in the [Edit Site List] screen will allow the user to create a new site header as shown below. The site name must be a maximum of 15 characters and larger names will be automatically truncated. New sites are always appended to the existing list although the new site can be moved within the site list for convenience. There is a maximum of 20 entries for the site list.

The displayed site list may be edited within the software application as required. No changes will be made until the user downloads the list to the SBM3000 readout. The download process automatically clears all stored data and reallocates the internal memory to suit the new site list configuration. Cancelling the editing process will leave the existing site list and readout configuration in its original state.

New Site Tag

Test Site 7

- ✓ 20ch, Compensated
- 20ch, Uncompensated
- 9 or 12ch HI Cell
- 3-wire 1/4 Bridge, 16ch max
- 1/2 Bridge, 16ch max
- Full Bridge, 8ch max, 2v excit
- Full Bridge, 8ch max, External
- SE Potentiometer, 16ch max

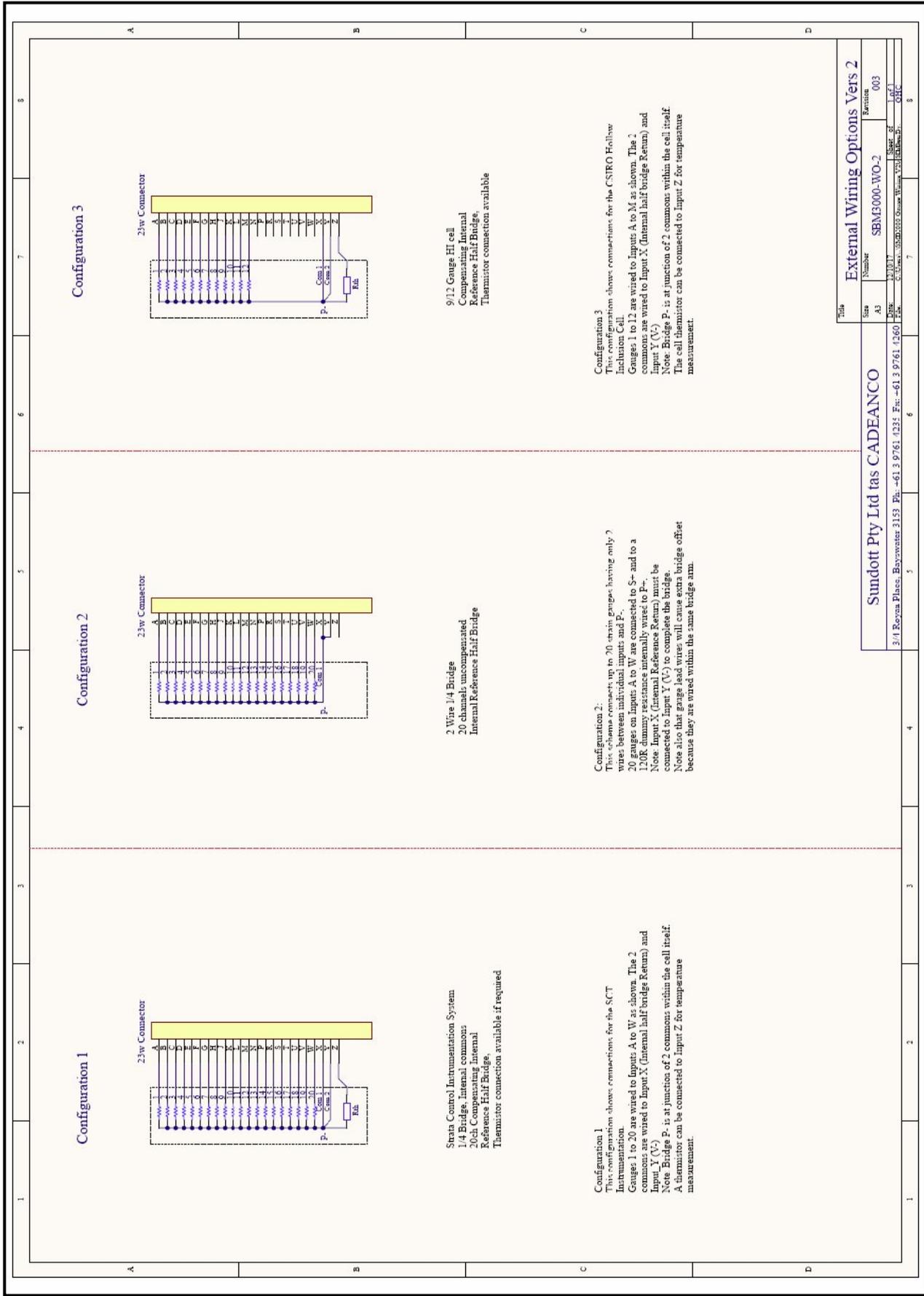
When saved to the SBM3000 menu, the readout will be automatically configured for the selected wiring configuration option when the site is chosen.

Wiring and Measurement with Option 1 Connector

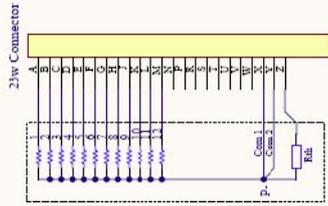
Mode	Description	Max Channels	Temp?	Ref Volts?	Wiring Option
1	This configuration allows 20 strain gauges sharing 2 common returns to be connected with compensation as utilised in some instrumentation projects. The additional 8 channels are wired to Input 2 as shown.	20	Possible	Yes	1 & 2
2	This scheme connects up to 20 strain gauges having only 2 wires between individual inputs and P-. 12 gauges on Input 1 plus 8 on Input 2 are connected to S+ and to a 120R dummy resistance internally wired to P+. Note: J1_14 (Internal Reference Return) must be connected to J1_15 or J1_16 (P-) to complete the bridge. J2 & J3 are not wired. Note also that gauge lead wires will cause extra bridge offset because they are wired within the same bridge arm.	20	No	No	1 & 2
3	This configuration shows connections for the CSIRO Hollow Inclusion Cell. Gauges 1 to 12 are wired to Input 1 as shown. The 2 commons are wired to J1_14 (Internal half bridge Return) and J1_15 (V-). Note: Bridge P- is at junction of 2 commons within the cell itself. J2 & J3 are not wired. The cell thermistor can be connected to J1_13 for temperature measurement.	12	Yes	Yes	1 & 2
4	This scheme enables connection of up to 16 strain gauges in a 3-wire compensating configuration. Input 1 (12 dummies) and Input 2 (4 dummies) allow the 16 gauges to be terminated with the other ends connecting to J1_15 and/or J1_16 (P-). The third wire of each gauge is S+ and is wired to Input 3 where the measurement is made. The Reference half bridge must be completed by connecting J1_14 to J1_15.	16	No	Yes	1 only
5	This active half bridge arrangement is wired to Input 3 which has no internal dummies connected to it. The sensor is wired directly to J2_12 (P+) and J2_15 or J2_16 (P-). The output is connected to the appropriate input on Input 3. As with Options 1, 2, 3 & 4, the Reference Return (14) must be wired to P- to complete the bridge. J1 & J3 are not used. Note: The mechanical sense of the gauges C = Compression and T = Tension	16	No	Yes	1 only
6	This arrangement shows wiring for full bridge sensors. Sensors are connected between J2_13 (P+) and J2_15 or J2_16 (P-) with Sensor S+ connected to J3_1 to J3_8. S- is connected to J3_9 to J3_16 respectively. Reference Return (J2_14) can be left floating.	8	No	Yes	1 only
7	This configuration is similar to Configuration 6. Excitation voltage is regulated externally within the	8	No	No	1 only

	<p>sensor modules (e.g. RWE). Switched and current limited raw voltage is supplied to the sensor modules from J2_11. Measurement connections are made with Sensor S+ connected to J3_1 to J3_8. S- is connected to J3_9 to J3_16 respectively. Reference Return (J2_14) can be left floating.</p> <p>NB This option is not available for the Intrinsically Safe model</p>				
8	<p>This wiring is for single ended devices such as potentiometers. The devices are powered from J2_13 (2.0 V+) and Input J2_15 or J2_16 (V-). Signals are connected to J3_1 to J3_16. Measurements made on Input 3 are referenced to V-.</p> <p>If the devices are regulated externally, then current limited raw voltage from J2_13 can be used instead. Signals on Input 3 should be in the range 0 - 2.048 volts.</p>	16	No	Yes	1 only

External Wiring Modes with Option 2 Connector

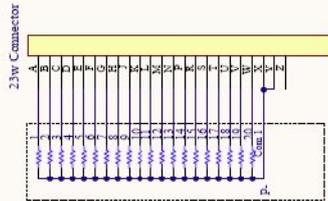


Configuration 3



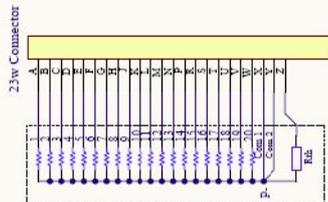
9/12 Gauge HI cell
Compensating Internal
Reference Half Bridge.
Thermistor connection available

Configuration 2



2 Wire 1/4 Bridge
20 channel uncompensated
Internal Reference Half Bridge

Configuration 1



Strain Control Instrumentation System
1/4 Bridge, Internal common
20-ch Compensating Internal
Reference Half Bridge.
Thermistor connection available if required

Configuration 3
This configuration shows connections for the CSIRO Follow Inclusion Cell.
Gauges 1 to 12 are wired to inputs A to M as shown. The 2 commons are wired to input X (Internal Half Bridge Return) and Input Y (V-).
Note: Bridge P- is at junction of 2 commons within the cell itself.
The cell thermistor can be connected to input Z for temperature measurement.

Configuration 2:
This scheme connects up to 20 strain gauges having only 2 wires between individual inputs and P-.
20 gauges on inputs A to W are connected to S- and to a 120K dummy resistance internally wired to P-.
Note: Input X (Internal Reference Return) must be connected to input Y (V-) to complete the bridge.
Note also that gauge lead wires will cause extra bridge offset because they are wired within the same bridge arm.

Configuration 1
This configuration shows connections for the SCT Instrumentation.
Gauges 1 to 20 are wired to inputs A to W as shown. The 2 commons are wired to input X (Internal Half Bridge Return) and Input Y (V-).
Note: Bridge P- is at junction of 2 commons within the cell itself.
A thermistor can be connected to input Z for temperature measurement.

Title		External Wiring Options Vers 2	
Size	Number	Revision	
A3	SBM3000-WO-2	003	
File	131017	Sheet of	1 of 1
Plot	131017	Plot of	01C
3/1 Royon Place, Baywater 3153 Ph: +61 3 9761 4252 Fax: +61 3 9761 4360			
Sundott Pty Ltd tas CADEANCO			

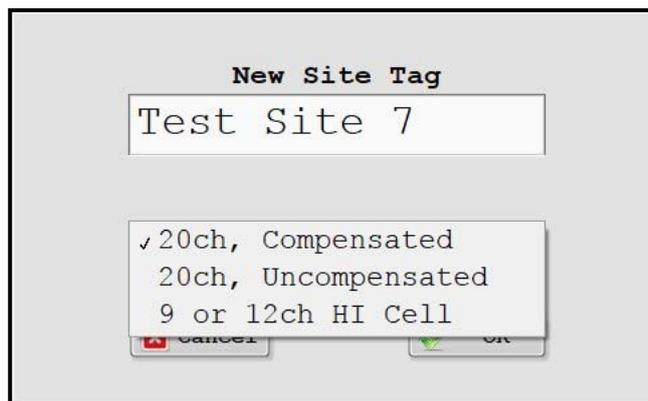
EXTERNAL CONNECTOR

The SBM3000 readout case is fitted with a single 23-way female connector with mating male plug. The plug component has solder terminal terminations to allow permanent termination of sensor conductors in any of the three available combinations. The SBM3000 firmware is factory configured to recognise this connector option. The application will display the three available wiring configuration options when adding a new location to the readout site list.

ADDING TO THE SITE LIST

Clicking the [Add Site to List] button in the [Edit Site List] screen will allow the user to create a new site header as shown below. The site name must be a maximum of 15 characters and larger names will be automatically truncated. New sites are always appended to the existing list although the new site can be moved within the site list for convenience. There is a maximum of 20 entries for the site list.

The displayed site list may be edited within the software application as required. No changes will be made until the user downloads the list to the SBM3000 readout. The download process automatically clears all stored data and reallocates the internal memory to suit the new site list configuration. Cancelling the editing process will leave the existing site list and readout configuration in its original state.



When saved to the SBM3000 menu, the readout will be automatically configured for the selected wiring configuration option when the site is chosen.

Wiring and Measurement with Option 2 Connector

Mode	Description	Max Channels	Temp?	Ref Volts?	Wiring Option
1	<p>This configuration shows connections for the SCT Instrumentation.</p> <p>Gauges 1 to 20 are wired to Inputs A to W as shown. The 2 commons are wired to Input X (Internal half bridge Return) and Input Y (V-)</p> <p>Note: Bridge P- is at junction of 2 commons within the cell itself.</p> <p>A thermistor can be connected to Input Z for temperature measurement.</p>	20	Possible	Yes	1 & 2
2	<p>This scheme connects up to 20 strain gauges having only 2 wires between individual inputs and P-.</p> <p>20 gauges on Inputs A to W are connected to S+ and to a 120R dummy resistance internally wired to P+.</p> <p>Note: Input X (Internal Reference Return) must be connected to Input Y (V-) to complete the bridge.</p> <p>Note also that gauge lead wires will cause extra bridge offset because they are wired within the same bridge arm.</p>	20	No	No	1 & 2
3	<p>This configuration shows connections for the CSIRO Hollow Inclusion Cell.</p> <p>Gauges 1 to 12 are wired to Inputs A to M as shown. The 2 commons are wired to Input X (Internal half bridge Return) and Input Y (V-)</p> <p>Note: Bridge P- is at junction of 2 commons within the cell itself.</p> <p>The cell thermistor can be connected to Input Z for temperature measurement.</p>	12	Yes	Yes	1 & 2

Saved Data File Format

```
File: Saved Data File.txt
```

```
Test Site 1
```

```
27/09/17 13:54:33
```

```
Serial Number: 1234
```

```

Date Time CH 1 CH 2 CH 3 CH 4 CH 5 CH 6 CH 7 CH 8 CH 9 CH10 CH11
CH12 degC Vex1 Vex2
27/09/2017 14:48:12 1030 1388 -685 -2552 1029 1388 -683 -2552 1029
1387 -685 2552 27.5 2.0087 2.0084
27/09/2017 14:49:12 1030 1388 -685 -2552 1029 1388 -683 -2552 1029
1387 -685 2552 27.5 2.0087 2.0084
27/09/2017 14:50:12 1030 1388 -685 -2552 1029 1388 -683 -2552 1029
1387 -685 2552 27.5 2.0087 2.0084
27/09/2017 14:51:12 1030 1388 -685 -2552 1029 1388 -683 -2552 1029
1387 -685 2552 27.5 2.0087 2.0084
27/09/2017 14:52:12 1030 1388 -685 -2552 1029 1388 -683 -2552 1029
1387 -685 2552 27.5 2.0087 2.0084
27/09/2017 14:53:12 1030 1388 -685 -2552 1029 1388 -683 -2552 1029
1387 -685 2552 27.5 2.0087 2.0084
OK

```

The SBM3000 data file header contains the following information:-

- i) The file name for the saved data
- ii) The site name
- ii) The date and time of the data upload
- v) The SBM3000 serial number
- vi) A channel identification header based on the associated site wiring configuration

The data recorded for each scan is recorded as follows:-

- i) The date the scan was recorded according to the SBM3000 internal clock.
- ii) The time the scan was recorded according to the SBM3000 internal clock.
- iii) The data from the instrument for the associated site. The number of channels, data format and precision will depend on the associated wiring code for the site. Further information is available in the relevant section of this manual.
- iv) All data scans use tab separation between columns for easy conversion to spreadsheet applications.

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Readout Operating Manual

CONNECTING SENSORS

Strain gauge sensor arrays may be connected to the SBM3000 readout as shown in the Wiring Options section of this manual.

The SBM3000 is available with three 16-way connectors for general use. Conductors should be stripped and screwed into the supplied plugs before connecting to the rear-mounted sockets. Ensure that the SBM3000 readout is turned off before connecting external instruments. Unused connections may be left open circuit and the SBM3000 will record their value as zero. The thermistor commons should all be returned to the allocated input terminal.

If the SBM3000 readout is supplied with a single 23-way connector, instrument terminations should be made by soldering to the supplied male plug supplied with the readout. Additional plugs are available from the manufacturer.

APPLICATION NOTE: Electrical parameters for sensors used with the intrinsically safe SBM3000 readout must comply with the requirements of the Intrinsic Safety approval.

THE USER MENU

The SBM3000 readout is operated via the front panel keyboard as follows:-

- | | |
|---------------------|--|
| MENU | <ul style="list-style-type: none"> i) Press for 3-secs to apply power when the instrument is OFF. ii) Press at any time to return to the sign-on display. iii) Press for 3-secs to shut down. |
| OK | <ul style="list-style-type: none"> i) Press to activate a selected site. The SBM3000 will automatically match its measurement parameters to the configuration assigned to the site when it was created and downloaded by the interface software. ii) Press to initiate a single scan. Data from the last scan is displayed for review using the UP and DOWN keys at the end of the scan process. iii) Pressing the OK key at any time while the last scan data is displayed will initiate another scan. iv) Pressing the OK key will start/stop the selected auto-scan operation in both Overcoring Mode and the Timed Logging functions |
| LEFT / RIGHT | <ul style="list-style-type: none"> i) Press the RIGHT key to move forwards through the menu options. ii) Press the LEFT key to move backwards through the menu options. iii) Press the LEFT key to access the readout status parameters from the sign-on menu. |
| UP / DOWN | <ul style="list-style-type: none"> i) Press to select remote operating mode when the serial cable is connected ii) Press either key to select Overcoring/Monitoring mode. iii) Press either key to select the Auto-off time. iv) Press either key to select the Timed Logging interval (not available in Overcoring Mode) or after the Site Option is selected. v) Press either key to scroll through the available saved site options. vi) Press either key to review the latest data scan. vii) Press either key to recall saved data scans for the active site. |

READOUT STATUS

1. Turn on the SBM3000 by holding the **MENU** key for 3-secs.
2. Press the **LEFT** key to show the following parameter displays
 - Strain Monitor / Overcoring / Timed Logging – select the required operating mode.
 - Battery State – displays current battery charge state.
 - Memory State – displays the total number of records saved and available
 - Auto-off State - the user can select the auto-shutdown timeout period as 3 minutes, 10 minutes (default), 20 minutes or disabled. The auto-shutdown function is automatically disabled while **Overcoring** or **Timed Logging** functions are active.

CHANGING MODES

The SBM3000 can operate in three modes. Either mode can be selected directly via the instrument **STATUS** menu, allowing versatility for the operator.

Strain Monitor

The instrument can accept a range of wiring configurations based on the installed rear connector. Scans are taken manually and can be reviewed by the operator on the display.

Overcoring

The instrument is pre-configured to connect to a 12-ch HI cell commonly used for overcoring applications. Scans are taken automatically at 30-sec intervals and presented to the operator in an abbreviated format on the display. Scanning can be started and stopped manually by the operator.

1. Turn on the SBM3000 by holding the **MENU** key for 3-secs.
2. Press the **LEFT** key to show the Mode Selection screen.
3. Use the **UP** and **DOWN** key to scroll the available modes of operation.
4. Use the **OK** key to select the mode chosen
5. Press the **MENU** key to return to the main menu.

Timed Logging

With timed logging enabled, the user can select the scan interval immediately after choosing a site. There are ten scan intervals available: 10, 15, 30 seconds, 1, 2, 5, 10, 20 minutes, 1 and 3 hours. This gives the user great flexibility to rapidly capture data when required, or idle along in the background with an eye on remaining memory. The user may change the scan interval at any time during an active measurement cycle without the need to stop and re-start the process.

For logging intervals of 2 minutes or less, the logger remains awake after scanning. For logging intervals of 5 minutes and above, the logger will sleep between scans to save battery life.

The logger can also be woken by pressing the menu key, placing the logger in the paused position. The operator then has the choice of resuming the logging process, changing the scan interval, reviewing previous data using Recall function or exiting to the main menu.

After initiating a scan, data is displayed for observation. The up or down arrows can scroll the available data, and the OK key can pause the process. In sleep mode, data will be displayed for 10 seconds before going to sleep. If an alternative display window is scrolled, the 10 second timeout will be restarted. The user therefore has time to examine readings before shut-down occurs. At the end of the 10 second period, a 'TIMEOUT' message is displayed for 3 seconds, alerting the user in advance of the display going blank.

PREPARING THE READOUT

1. Install the SBM3000 Interface software.
2. Connect the computer to the SBM3000 via the supplied serial cable. Identify the serial port used by the computer system before attempting to establish the data connection to the readout. The 4-pin plug used to connect to the **Data** socket can only be inserted one way.
3. Update the SBM3000 internal clock.
4. Create a custom site list for all instrument sites to be accessed.
5. Confirm the site wiring mode is correct for the instrument to be measured at each site.
6. Download the site list to the SBM3000 readout. Any existing data in the readout will be cleared when the new site list is downloaded.

REMOTE PC ACCESS

1. Connect the computer to the SBM3000 via the supplied serial cable. Identify the serial port used by the computer system before attempting to establish the data connection to the readout. The 4-pin plug used to connect to the **Data** socket can only be inserted one way.
2. When the custom serial cable is plugged into the readout while connected to a PC, the initial sign-on display will include an option to select **PC Remote** mode with the **UP** button.
3. The readout must be in remote control mode to accept and act on commands from the PC application
4. The system will report data to a connected PC at the completion of every scan regardless of operating mode, or if internal memory is filled. Data is formatted according to the selected wiring code, and column headers are included when a new measurement sequence begins.

APPLICATION NOTE: Serial connections to the intrinsically safe SBM3000 readout must take place in a non-hazardous zone to comply with the requirements of the Intrinsic Safety approval.

TAKING DATA SCANS IN MONITORING MODE

1. Turn on the SBM3000 by holding the **MENU** key for 3-secs.
2. Press the **RIGHT** key to access the available site list.
3. Use the **UP** and **DOWN** keys to scroll through the stored site list.

APPLICATION NOTE: The *UNDEFINED SITE* option is always available in the site list. This option should be selected if the user needs to measure an instrument that has not been pre-loaded into the readout site list. The user must select a connection mode based on the input channel to be measured and raw data recorded. The user needs to post-analyze the results as necessary.

4. Press the **OK** key to make the selected site active.
5. The full data list and identification are available by using the **UP** and **DOWN** keys to scroll through the available displays.
6. At this point, the user options will depend on whether **Timed Logging** is enabled
 - If **Timed Logging** is disabled, pressing the **OK** key initiates a single scan of the active site. Data from the latest scan is available for immediate review as soon as the scanning process is completed.
 - If **Timed Logging** is enabled, pressing the **RIGHT** key allows the user to select from the available **Log Interval** options using the **UP** and **DOWN** keys. When the **OK** button is pressed to confirm the **Log Interval**, the user. Data from the latest scan is available for immediate review as soon as the scanning process is completed.
7. Press the **OK** key to start scanning. A second press will stop.
8. Press the **UP** key while data is displayed to review the following
 - Row 1: the current Site ID
 - Row 2: the current battery state
 - Row 3: the sensor excitation voltage
 - Row 4: remaining scan capacityA timed scan will always over-ride the review display.
9. Pressing the **LEFT** key returns to the options list for the active site. The **UP** and **DOWN** keys can be used here to scroll back and forward through saved data.
10. Pressing the **LEFT** key returns to the site list menu.
11. Press the **MENU** key to return to the sign-on display at any time.
12. Holding the **MENU** key for 3-secs turns off the readout.

TAKING DATA SCANS IN OVERCORING MODE

1. Turn on the SBM3000 by holding the **MENU** key for 3-secs.
2. Press the **RIGHT** key to enter overcoring mode. A unique <OVC-yymmdd> site ID will be automatically assigned and added to the stored site list for later upload.

APPLICATION NOTE: Any subsequent overcoring activity will append data scans to the original site data if the date information matches at the start of the activity.

3. Press the **OK** key to select from the available scanning interval options.
4. Press the **OK** key to start scanning. A second press will stop.
5. Data from the latest scan is presented for review in the display as follows
Row 1: Channels 1 - 3
Row 2: Channels 4 - 6
Row 3: Channels 7 - 9
Row 4: Channels 10 - 12
6. Press and hold the **UP** key while data is displayed to review the following
Row 1: the current Site ID
Row 2: the current battery state
Row 3: sensor thermistor data
Row 4: remaining scan capacity
A timed scan will always over-ride the review display.
7. Press the **OK** key to stop scanning. A second press will re-start scanning once more.
8. Press the **MENU** key after stopping scanning to return to the sign-on display.
9. Holding the **MENU** key for 3-secs turns off the readout.

NB - the auto-shutdown function is always disabled when scanning is running in overcoring mode.

UNDEFINED SITES

In normal use, users will preload site ID prior to using the SMB3000 in the field. In the event that this is done incorrectly or forgotten, the user can select the option to record data using the 'Undefined Site' option. This option is always available in the site list however the user must also select an appropriate wiring configuration from the available options so that the connected instrument is scanned correctly.

Data from multiple 'Undefined Sites' can be saved in the readout however scans are stored under a single file. The user must post-process the data after upload, sorting individual 'Undefined Sites' by the embedded time stamp or matching the format of the uploaded data. The 'Undefined Site' site does not appear in the list of user-defined site ID and cannot be uploaded directly. The **UPLOAD ALL SITES** option will always include any 'Undefined Site' data.

MEMORY MANAGEMENT

The SBM3000 readout can store a maximum of 1024 scans. The memory space is pre-formatted and remains constant for all wiring configurations and operating modes.

When the maximum of 1024 scans is reached in monitoring mode, the readout can still be used to scan and display data for the operator however the displayed data will not be saved. The display will indicate that memory is full while scanning is taking place.

POWER MANAGEMENT

The SBM3000 readout will display a warning message when power is applied if the battery level is below 10%. The readout will continue to operate normally but the user should be aware that the battery voltage is low.

If the battery level falls below 10% while in operation, a warning message will appear for 3 secs after each scan. This will continue until the power falls to approximately 5% at which point the readout will automatically switch off to preserve data integrity. The readout must be recharged to resume operation.

A fully charged SBM3000 scanning at the maximum 10-sec rate will fill the available memory before the battery level becomes critical. Battery life is directly proportional to the scanning interval as maximum battery drain occurs when power is applied to connected instrument(s).

CHARGING THE SBM3000 READOUT

The supplied charger is connected via the **Data** socket on the SBM3000 front panel. The readout contains an integrated charging system and only approved DC plug packs should be used to avoid damage to the readout. Please seek advice from the manufacturer before using alternative battery charging systems.

The SBM3000 charger uses a dual-rate system - a fast charge timed rate followed by a continuous trickle charge rate. The fast charger continuously monitors the battery voltage and will terminate when the battery level reaches 100% or after 3 hours.

The readout will recharge from the 5% level in 3 hours. If the unit has been in storage for a prolonged period, the batteries may require a second charge cycle to reach full capacity. Active battery charging is indicated in the display by a dynamic message and a row of [>] symbols representing 10-min time-of-charge intervals. A row of dots at the bottom of the display indicates the progressive battery charge level. In a normal charging cycle, the batteries will reach full charge before the maximum charge time of 3 hours is reached. The display will clear when the fast-charging cycle is complete.

The integrated charging system will prevent damage to the battery cells due to over-charging. The case and front panel may become warm during the charging process however this is normal and not be a cause for concern. Charging may take place during scanning however this is not recommended due to potential interference from the external charging power on the measurement system. The charging display will not activate while the unit is actively scanning

APPLICATION NOTE 2: Battery charging for the intrinsically safe SBM3000 readout must take place in accordance with the requirements of the Intrinsic Safety approval.

SBM3000 Readout Specifications

PHYSICAL SPECIFICATIONS:

Size:	240mm high x 198mm wide x 109mm deep	
Weight:	1.6kg	
Material:	Black polypropylene case	
Sealing:	Rated to IP64 with lid closed or open	
Temperature:	Operating temperature	-20°C to +40°C
	Storage temperature	-25°C to +70°C

INTRINSIC SAFETY APPROVAL: (for readout Serial Nos <3000I***> only)

International Standards: IEC 60079-0, Ed 6.0 (2011)
IEC 60079-11, Ed. 6.0 (2011)
IEC 60079-11 , Ed. 6.0 (2011)/Cor.1 (2012)

Australia/New Zealand Standards: AS/NZS 60079.0:2012
AS/NZS 60079.11:2011

Certification: A full copy of the IECEx Certification is available from:
<https://www.iecex-certs.com/#/deliverables/CERT/57714/view>

ELECTRICAL SPECIFICATIONS:

Power:	Internal Battery:	6 x AA cells, NiMH technology, 7.2V, 2.55Ah
	Charger:	240V Plug-pack Charger Module, 15v DC output Integrated intelligent charger
	Charge Time:	Approximately 3 hours from flat
	Auto-off:	3-min, 10-min, 20-min or Disabled (user selectable)
Data Logging:	Input Channels:	Dependant on wiring options, max of 20 channels
	Storage Capacity:	All configurations can store a maximum of 1024 scans
	Data Storage Backup:	10 years without primary power
	Internal clock:	Real-time clock, non-volatile operation 10-year count without primary power
	Scanning Intervals:	Manual trigger (all modes) 10, 15, 30 seconds (all modes, selectable while scanning) 1, 2, 5, 10, 20 mins (all modes, selectable while scanning) 1, 3 hours (all modes, selectable while scanning)
Communications:	Baud Rate:	9600 baud, 8 data, 1 start, 1 stop, no parity
	Data Format:	Date, Time, Data dependant on configuration
	Data Separator:	Tab separated columns, text format
	Data Recovery:	Custom WINDOWS Interface software

Cadeanco is continually improving its products and processes and as such, information contained in this document is subject to change without notice.

Intrinsic Safety Addendum

IDENTIFICATION LABEL

The intrinsic safety version of the SBM3000 readout has been approved for use in explosive atmospheric environments under IEC 60079-0:2011 and IEC 60079-11:2011. The approved version may be readily identified as follows:

- The serial no will include a Capital 'I' in the sequence e.g.3000I***
- There will be a label inside the lid in the following format:

<p>CADEANCO Strain Bridge Monitor Model SBM3000 Ex ia I/IIB T3 Ma Ga IP64 Serial No: 3000I*** IECEX SIM 21.0006X Warning – DO NOT CHARGE THE BATTERY IN A HAZARDOUS LOCATION Front Panel Socket: Charge Um: 15v; Data Um: 5.0v Rear Connector: Out 1, 2, 3 or 4</p>

SAFE OPERATION OF THE SBM3000 READOUT

- The SBM3000 readout is a precision instrument capable of resolving extremely small voltages. It requires the operator to have a full understanding of strain measurement techniques and wiring configurations. The operator should review the attached operating manual and software notes before attempting to use the device.
- Charging and data downloads must not be undertaken in hazardous locations as defined in the relevant Standards.
- The SBM3000 does not require any maintenance apart from recharging via the front panel socket. The unit performs an internal self-calibration prior to each reading cycle and does not require any factory recalibration under regular operation.
- The readout contains an integrated charging system and only approved DC plug packs should be used to avoid damage to the readout. Please seek advice from the manufacturer before using alternative battery charging systems.
- Under no circumstances should the instrument be disassembled in explosive atmospheric conditions. Any maintenance issues should be discussed with the manufacturer to maintain its intrinsic safety accreditation. (email: SBM@cadeanco.com.au)
- The readout should be connected to external instruments before activating to take readings.

READOUT OPERATION

The attached operating manual and software notes detail all aspects of the unit including possible wiring configurations of attached instruments. The manual readout must be configured to match the selected wiring configuration of each site. Measurement sites must be configured and stored via the SBM3000 configuration software before they are available to take measurements. The software will allow up to 20 individual sites to be saved for later use. Configuration of the SBM3000 must not be made in hazardous locations as per the conditions of the IS Approval.

APPROVAL FOR USE

The SBM3000 readout has been certified for use in explosive atmospheric environments under IEC 60079-0:2011 and IEC 60079-11:2011. Final approval for use of the readout should be sought from the relevant site authority before the readout is transported to any hazardous area.

ENVIRONMENTAL

The SBM3000 is certified to IP64 however its use in areas of dripping or spraying water should be avoided. The front panel should be thoroughly wiped dry and surface moisture should be allowed to evaporate before storing the readout with the lid sealed closed for extended periods.

The readout should not be stored or operated outside of the following temperature ranges:

Operating temperature	-20°C to +40°C
Storage temperature	-25°C to +70°C

APPROVAL STANDARDS

The SBM3000 has been approved under the following International Standards:

- **IEC 60079-0:2011 Ed 6.0**
- **IEC 60079-11:2011 Ed 6.0**

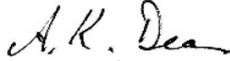
DATA TRANSFERS and CHARGING THE SBM3000 READOUT

The Type SBM3000 must be connected for charging and data transfer only in a safe area

EXTERNAL CONNECTION PARAMETERS

- Charging Um: 15v
- Data Um: 5.0v
- The following entity parameters are applicable:

SBM3000 (Outputs 1, 2, 3 and 4)	Uo (V)	Io (A)	Po (W)	Co (uF)	Lo (mH)	Lo/Ro
Group I	5.9	0.52	0.644	999	2.2	375
Group IIA				999	0.8	228
Group IIB				999	0.525	114

SBM3000 Readout IS Addendum	Approved By:  Managing Director	Document: SBM3000-ISA Rev 1	Date: 10-11-21
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