MATELECT LTD

SM-HF MODULAR SCANNER SYSTEM

SM1-HF and SM2-HF

INSTRUCTION MANUAL

Revision B (15/08/08)

MATELECT

SM-HF SCANNER SYSTEM
TYPE SM1-HF AND SM2-HF

CONTENTS

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SM-HF SCANNER SYSTEM
TYPE SM1-HF, and SM2-HF

These products have been designed to the highest standard in both electronic and mechanical design, with careful attention to stability, reliability and electrical safety.

The scanner system provides a modular way of monitoring multiple specimens or areas of interest and is designed for use in conjunction with the CGM-7 series of crack growth monitors manufactured by Matelect. For further details on the latter, please see the Matelect CGM-7 instruction manual.

IMPORTANT

Please read these instructions carefully before you use the equipment. For your reference please also read our terms and conditions of sale printed at the rear of this manual.

Please note that there are no user serviceable parts within the scanner system. Never attempt to open an instrument case, unless given express permission to do so by Matelect, as this will void any warranty. Please contact Matelect should you ever experience any difficulties.

MAINS OPERATION

This section applies to all mains operated instruments

PLEASE READ BEFORE OPERATION

The SM-HF system is powered via a standard CGM-7 unit, through its EXT I/O data lead and the built in SC1 module. Ensure that the SM-HF system does not come into contact with fluids or corrosive gases and that the equipment is operated within the temperature range of 0-40 Degrees-C

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OVERVIEW

The SM-HF multiplexing system was developed to permit the extension of the single channel mode of Matelect ACPD crack growth monitors, to multiple channel use. Thus an individual CGM-7 instrument can be used to monitor defect activity in multiple specimen configurations or at multiple sites on a single specimen.

The SM-HF system is modular and can be specified (or expanded) to cover a total of 256 specimen channels. Each module is based on a 4 channel switching unit. Two types of unit exist; the SM1-HF is used for switching the ACPD 0 degree and 90 degree signals, whilst the SM2-HF is used to switch the AC excitation current. Both modules are under the control of a single Scan Controller unit, built into the CGM-7 unit.

The Scan Controller can be operated in one of two modes; **MAN**ual or **AUTO**matic. Commands can be sent to the SC1 by a host computer and hence the scanning sequences can be operated under software control. By employing the computer to also log the resultant ACPD data from the crack growth monitor, a complete scan control and logging system can be constructed. To this end, Matelect produce software, which will run on most PC compatibles.

This manual covers the hardware aspects of the SM-HF series scanners. Additional manuals are available to cover Matelect scanner software and our ACPD crack growth monitor (CGM-7). For further details, please contact Matelect or your local sales representative. Manuals can also be found on our web site in adobe acrobat (.PDF) format for easy download.

Within this manual, text shown in **BOLD CAPITALS** is usually used to indicate lettering that appears on the front/rear panels of the hardware in question.

GENERAL DESCRIPTION

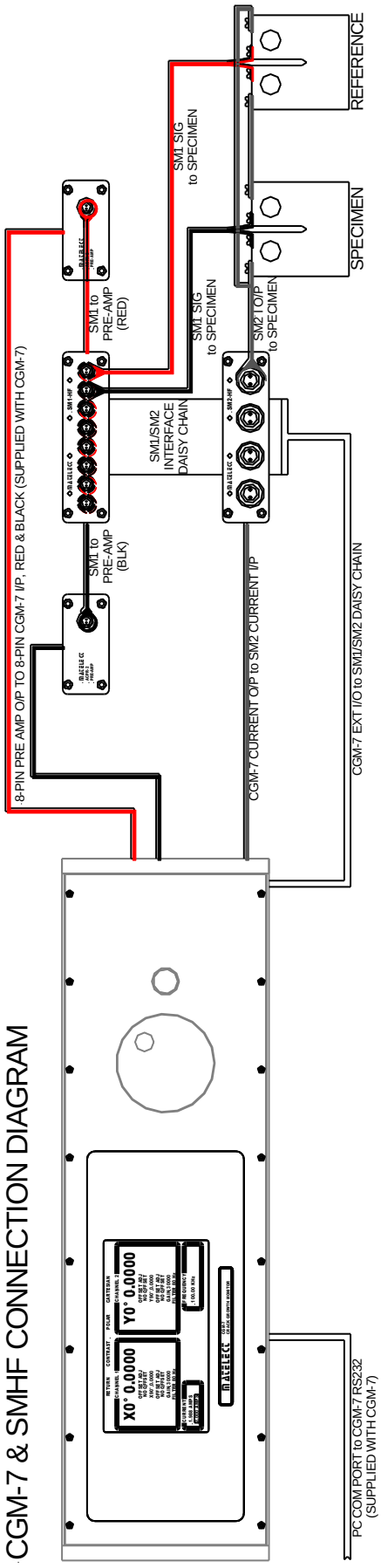
The component parts of the multiplexing system consist of the SM1-HF Signal switching module, SM2-HF Current switching module and the SC1 Scan Controller built into the CGM7. The SM1-HF contains relays to switch the signals and the SM2-HF also contains relays to switch the currents to and from various specimens, this is done using the SC-1 built into the CGM7 under **MAN**ual or **AUTO**matic PC control.

The system should be assembled using figure 1 on the next page as a guide. The various equipment leads are all illustrated in figure 2 on the subsequent page together with their respective functions.

The system illustrated in figure 1 constitutes the basic 4 channel set-up. Further *SM-HF* units (either current or voltage or both) can be added to expand the system (see the subsection on System Expansion).

The *SM-HF* system is usually operated in **AUTO** mode in conjunction with Matelect scanner software. It is also possible for users to write their own coding to operate the scanners and read data from the CGM-7 instrument.

The other mode of operation, **MAN**ual is useful for testing the connections, scanners and signal levels before commencement of the final scanning and logging sequence under AUTO computer control.


CGM-7 & SMHF CONNECTION DIAGRAM
REFERENCE
SPECIMEN
SM1 SIG
to SPECIMEN
SM1 to
PRE-AMP
(RED)
SM1 SIG
to SPECIMEN
SM2 T/P
to SPECIMEN
SM1/SM2
INTERFACE
DAISY CHAIN
SM1 to
PRE-AMP
(BLK)
8-PIN PRE AMP O/P TO 8-PIN CGM-7 I/P, RED & BLACK (SUPPLIED WITH CGM-7)
CGM-7 CURRENT O/P to SM2 CURRENT I/P
CGM-7 EXT I/O to SM1/SM2 DAISY CHAIN
PC COM PORT to CGM-7 RS232
(SUPPLIED WITH CGM-7)

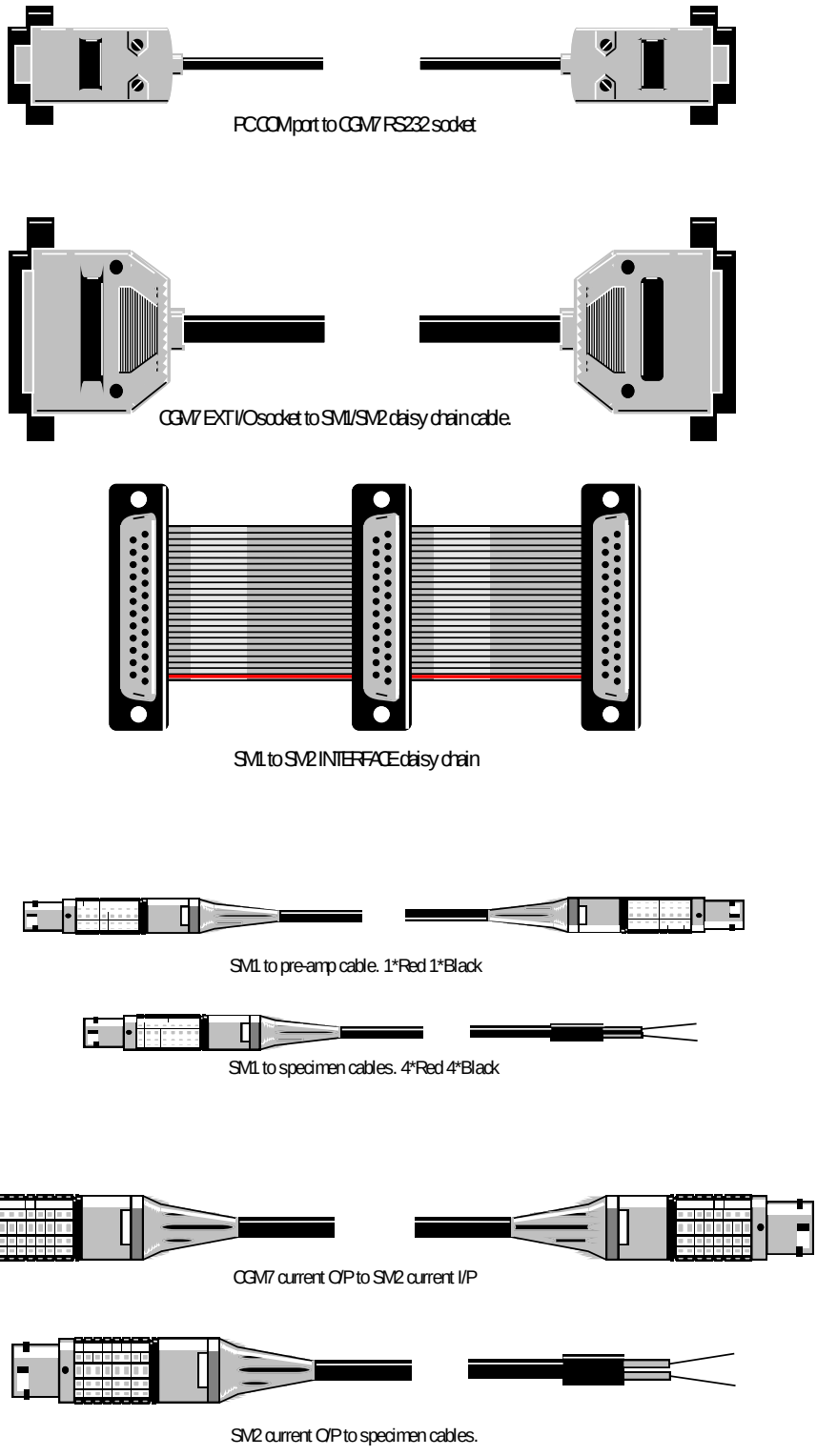


Fig 2. Cables supplied with the SM-HF multiplexing system

FRONT PANEL DESCRIPTIONS

The SM1-HF front panel consist of 8 LEMO type input sockets which act to accept the 0 degree and 90 degree channel input signals from the specimen.
The SM2-HF front panel consist of 4 LEMO type input sockets which act to deliver the excitation current to the specimen.

The signal input sockets are small two pin types. The current output sockets consist of a large two pin connector for the output current. A row of red LEDs (for the SM2-HF) or green LEDs (for the *SM1-HF*) is positioned above the LEMO connector pairs. A lit LED indicates the active channel.

The front panels of the SM1-HF and SM2-HF are shown below in figures 3 and 4.

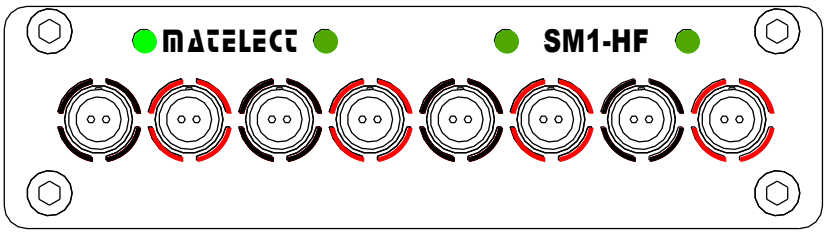


Figure 3. Front panel of SM1-HF

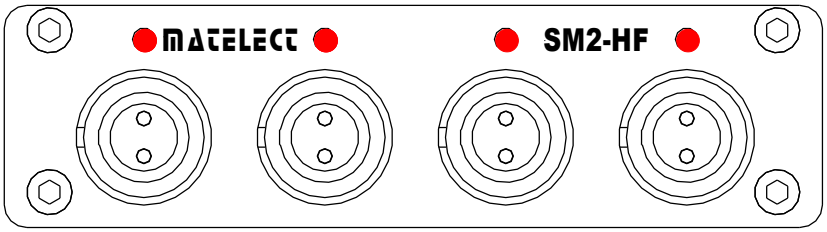


Figure 4. Front panel of SM2-HF

Only the designated LEMO plugs should be used within these input sockets - any other is likely to cause serious damage to these high precision connectors.

Insertion of a plug into a socket is a simple matter of aligning the in-line protrusion on the plug with the corresponding key within the socket. Once this is correctly done, the plug can be pushed home until it locks in place. To remove the plug, the outer knurled collar should be grasped and pulled perpendicularly away from the front panel. This will simultaneously unlock the plug and effect its withdrawal.

Users should note that very little insertion force is required with the LEMO connectors. If they *have* to be forced, then there is either a miss-alignment or a miss-match of the connectors.

REAR PANEL DESCRIPTIONS

1. CGM7 RS232 Connector

Each module is connected to its immediate neighbour by the ribbon cable daisy chain supplied with the system. The chain distributes channel number information, Earth and power lines, and is connected to the EXT I/O connector on the back of the CGM7.

In order that the host PC can communicate with the SC1 built into the CGM7 as well as control the other features of the CGM7 it needs to be connected via the RS232 connector found on the rear panel of the unit, in the top left hand corner. The connector is a 9-way D-type and is connected to the PC via a 9-pin to 9-pin D-type null modem cable provided with the CGM7 see diagram below.

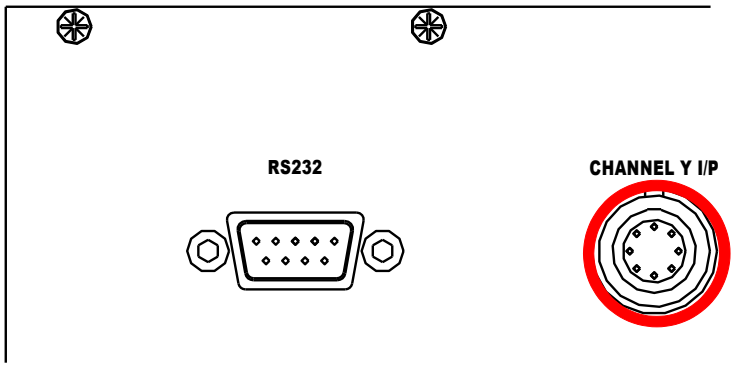


Fig 5. Rear panel view of the CGM-7 RS232 connector

2. SM-HF INTERFACE connector

This is a panel mounted 25-way D-type plug (i.e. with pins) and mates with the corresponding D type socket on the daisy chain connector supplied with the system. It is marked EXT I/O on the rear of the CGM7. See overleaf for pin out details.

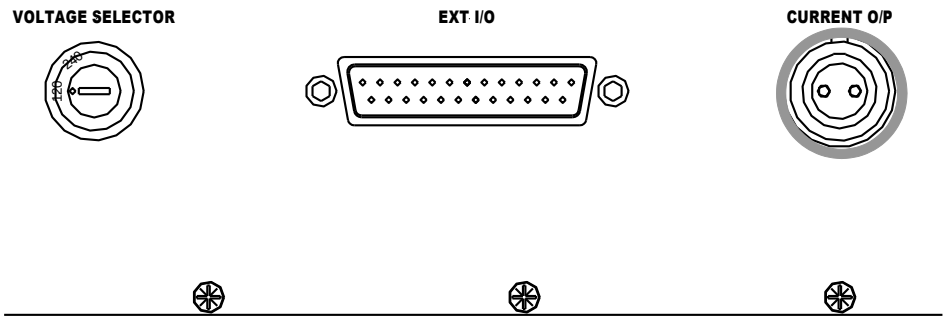
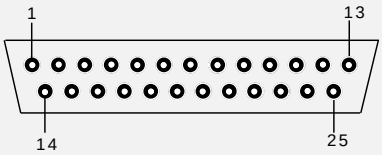


Fig 5. Rear panel view of the CGM-7 EXT I/O connector

The following table gives the pin functions of the **SM-HF INTERFACE**.



PIN No.	Function
1	Voltage address bit 7 (MSB).
14	Voltage address bit 6
2	Voltage address bit 5
15	Voltage address bit 4
3	Voltage address bit 1
16	Voltage address bit 2
4	Voltage address bit 3
17	Voltage address bit 0 (LSB)
5	Current address bit 1
18	Current address bit 3
6	Current address bit 0 (LSB)
19	Current address bit 2
7	+5 Volt system supply
20	Reserved - do not use
8	+5 Volt system supply
1	Reserved - do not use
9	Current address bit 5
22	Current address bit 6
10	Current address bit 4
23	Current address bit 7 (MSB)
11	Reserved - do not use
24	Voltage mux. enable (active high logic)
12	Current mux. enable (active high logic)
25	0 volt
13	0 volt

Notes:
1. All logic is active high
2. Logic high level between +3.5 and +5 volts
3. Logic low level between 0 and +0.8 volts
4. Connect current and voltage enables (pins 12 &13) to system +5 volts for normal operation
5. +5 volt supply must deliver at least 120mA

3. SM1-HF Signal O/P's

These are LEMO type, **two** pin plugs that are used as the outputs for the switched ACPD signals that are routed into the CGM-7 pre-amp unit. The eight signals from the front panel (4 channels, with X and Y values for each) are switched by the relays within the SM1-HF and delivered to the CGM-7 pre-amp unit via the SM1-HF to CGM-7 pre-amp unit cables (see fig 2).

The **O/P** connector of both the X and Y channel mates with the corresponding **two pin** flying sockets on the leads supplied with the system. Insertion of the socket into the plug is a simple matter of aligning the in-line protrusion on the plug with the corresponding key way within the socket. Once this is correctly done, the socket can be easily pushed home until it locks in place. To remove the socket, the outer knurled collar should be grasped and pulled perpendicularly away from the front panel. This will simultaneously unlock the socket and effect its withdrawal. The other ends are connected to their respective sockets on the pre-amp unit.

Users should note that very little insertion force is required with the LEMO connectors. If they have to be forced, then there is either a miss-alignment or a miss-match of the connectors.

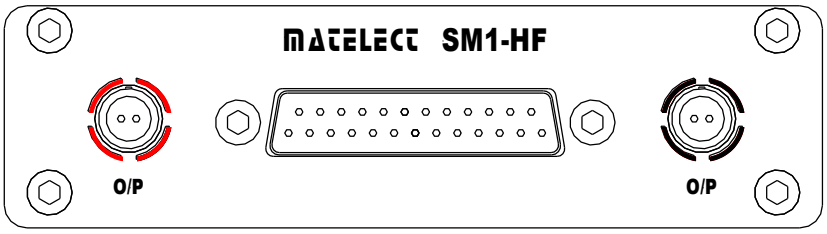


Figure 5b. Rear panel view of the SM1-HF module

4. SM2-HF Current I/P

This consists of two large two pin LEMO plugs that are used as the current output connector current input path. This current is switched by the FETS within the SM2-HF and delivered to the specimen(s) via the SM2-HF front panel connectors.

The two pin LEMO connector mates with the red socket on the CGM-7 via the short high current lead (see fig 2) supplied with the system. Insertion of the socket into the plug is a simple matter of aligning the in-line protrusion on the plug with the corresponding key way within the socket. Once this is correctly done, the socket can be easily pushed home until it locks in place. To remove the socket, the outer knurled collar should be grasped and pulled perpendicularly away from the front panel. This will simultaneously unlock the socket and effect its withdrawal. The CGM-7 end of the cable is simply tightened to the large screw type connector on the back of the CGM-7 unit. Follow the guidelines given above for the three pin LEMO plug.

Users should note that very little insertion force is required with the LEMO connectors. If they have to be forced, then there is either a miss-alignment or a miss-match of the connectors.

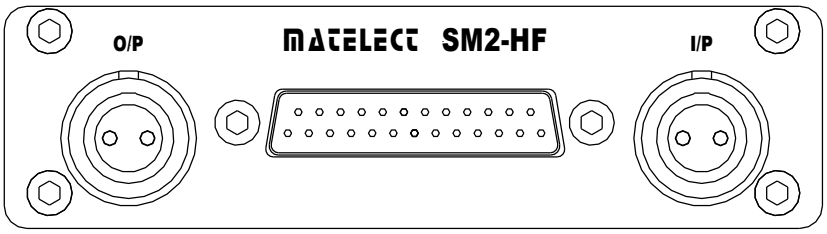


Figure 5a. Rear panel view of the SM2-HF module

GENERAL USAGE ADVICE

SETTING UP THE SYSTEM

The SM-HF system should be configured as shown in Fig 1 using the cable list (Fig 2) as a guide. The scanner modules should first be connected to each other using the cables provided.

The RS232 connections should then be made to the host PC. Finally the current and voltage umbilicals should be used to complete the connections to the CGM-7. The equipment can then be switched on.

Connections to the specimen(s) are made using leads terminated in the appropriate LEMO plugs. Matelect can supply stock cable sets (CABL-1HF and CABL-2HF) or manufacture cables to order.

It is important to remember that, when fabricating cables, attention should be paid to minimising the overall length of the cable. In the case of the voltage leads, this helps to reduce EM pick-up and in the case of the current leads, it maximises the available current to the specimen by minimising its resistance.

Users should note that they should never have to force a connector either into or out of its mating socket - undue force implies a miss-alignment of these components and can lead to degradation of the electrical contacts.

USING THE MODES

Once the system has been set up and the specimen connected in, the signal levels present at the specimen can be checked individually using the **MAN**ual mode of the SC1 to step through each channel in turn. Adjustments to the wiring and the CGM-7 controls can then be made in order to optimise the signal levels before formal testing begins.

SOFTWARE

Dedicated software for the logging of ACPD data and the control of the multiplexing system is available from Matelect.

Virtual CGM7 provides a quick example of what can be done with the CGM7 and SM-HF system via a PC. It allows simple control of the scanner system and full control of the CGM7. Users are strongly advised to purchase CGMSCAN16 or write their own software.

CGMSCAN16 is a 16 channel package that performs the logging and scanning functions whilst simultaneously displaying the activity on each channel as a graph of potential drop against time.

The package is a 32-bit windows based application and can be run on any Microsoft Windows compatible PC.

MODULE ADDRESSES

Each *SM-HF* module has an address with which it is accessed by the SC1 scan controller module. The addresses are factory set before shipment and determine whether the module is designated as containing Channels 0 to 3, 4 to 7 etc.

It is important, therefore, when expanding the system by purchasing further modules to specify the required channel designation. Alternatively this can be changed by adjusting the address which is set by a PCB mounted 6 way binary coded DIL switch located within each module. This is done according to the following table;

Channel designation	DIL setting
0-3	000000*
4-7	000001
8-11	100000

*(*The left most bit is the least significant)*

SYSTEM EXPANSION

The *SM-HF* multiplexing system can easily be expanded to accommodate further signal and current channels. A theoretical maximum of 256 channels can be handled by the SC1 scan controller (256 signal + 256 current).

However, in practice, the method of connection of the modules to each other limits a *practical* system to 24 channels of each type. Therefore, if there is an intention to operate beyond this practical limit, Matelect will recommend a self contained, rather than a modular, approach. Further information can be obtained from our head office.

Expansion of an 4 channel system to 8 channel will require *one* additional module of each type (assuming both current and signal are to be multiplexed) plus a revised daisy chain **INTERFACE** link.

Users who are unsure about their expansion requirements should contact Matelect at our head office for further advice and information.

Electrical Connections:

FURTHER INFORMATION

EARTHING

The SC1 scan controller can be powered the CGM-7. In both cases the SC1 is supplied with low voltage power and therefore no danger from mains voltages can result. To prevent the *SM-HF* system becoming live through contact with external mains sources, the metallic enclosures are held at Earth potential.

The earth line is carried via the power supply connection and distributed to each module through the daisy chain assembly.

SHIELDING & SWITCHING ARRANGEMENTS

Each *SMHC*-1 unit contains eight high quality metal shielded double pole on-off reed relays. These are switched by internal logic circuitry under the direct control of the SC-1 scan module via the daisy chain connector.

Each *SMHC*-2 contains eight high quality metal shielded double pole on-off reed relays. These are switched by internal logic circuitry under the direct control of the SC-1 scan controller via the daisy chain connector.

SPECIFICATIONS

SC1

Type:	Microprocessor based controller unit built into the CGM7
Clock speed:	N/A
Modes:	MANual and AUTOmatic
Capability:	256 channels
Power:	N/A
Comms:	Serial RS232, 300 Baud, 8 data, no parity bits

SM1-HF

Type:	4 channel ACPD voltage signal switching module
Relays:	Pickering type double pole changeover dry reed
Rating:	0.5A max at 20V, 0.05A at 200V max
Contacts:	Rhodium plate
Power:	+/- 5 volts from SC1
Input:	2 pin LEMO type X 8 (mates with FGG0B302CNAD42Z LEMO plug)
Output:	2 pin LEMO to 8 pin CGM-7 input
Case:	Anodised aluminium enclosure

SM2-HF

Type:	4 channel ACPD current switching module
Rating:	5AMPS max at 500KHz
Power:	+/- 5 volts from SC1
Output:	2 pin LEMO
Input:	2 pin LEMO to 2 pin LEMO of CGM-7
Case:	Anodised aluminium enclosure

All modules are built to the CE/IEC 1010 standard for electrical safety CE

WARRANTY AND SERVICE INFORMATION

The following text is an extract from our standard conditions of sale. It covers the terms of warranty and liability only. Please refer to the full text, supplied upon delivery of the goods or contact Matelect Limited.

Extract 6. WARRANTY

Items sold by the company are warranted only as stated below.
Subject to the exceptions and upon the conditions specified below, the company agrees to correct, whether by repair or, at it's election, by replacement, any defect of materials or workmanship which develops within twelve months after delivery of the instrument to it's original purchaser by the company or by any authorised representative provided that investigation and factory inspection by the company discloses that such defect developed under normal and proper use (unless covered by a separate agreement or guarantee written by the company).

The exceptions and conditions mentioned above are the following.

a). The company makes no warranty concerning components and accessories not manufactured by it. however, in the event of the failure of such components or accessory, the company will give reasonable assistance to the purchaser in obtaining from the respective manufacturer whatever adjustment is reasonable in the light of the manufacturer's own warranty.

b). The company shall be released from all obligations under it's warranty in the event of repairs or modifications being made by persons other than it's own or authorised service personnel unless such repairs by others are made with the written consent of the company or unless such repairs are minor or merely the installation of a new Matelect component.

c). The warranty is only valid providing that the terms of payment in clause 4 are strictly adhered to.

d). No product may be returned except with the company's permission in writing. After receiving factory authorisation, goods requiring repair or replacement should be sent prepaid to the factory in the original container properly packed accompanied by a Return Goods Authorisation, purchase order or letter stating as completely as possible the defects and the condition under which it occurred.

Extract 8. CONDITIONS PARAMOUNT

The company expressly disclaims any liability of whatsoever nature and in any circumstances whatsoever, to it's customers, dealers or agents, except as stated in the forgoing terms and conditions.

Extract 9. These terms and conditions of sale may be amended or altered at any time the company feel it necessary to do so.

REPAIR AND RECALIBRATION:

Matelect Limited can repair and/or recalibrate instruments manufactured by it, after the warranty period has expired. If this service is required then please contact Matelect and we will be pleased to provide a quotation for the work necessary.

MATELECT LTD

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