MATELECT 2 CHANNEL DIVIDING COMPENSATION SYSTEM & SOFTWARE

For SM3, D2M-1, SM3.exe and D2Msoft

INSTRUCTION MANUAL

MATELECT LIMITED

Copyright 2004 Ver 11

DIVIDING TWO CHANNEL MULTIPLEXING SYSTEM

TYPE SM3/D2M-1 & D2Msoft

Thank you for your interest in our product, we hope that it will serve your needs and prove a reliable tool.

This product has been designed to the highest standard in both electronic and mechanical design, with careful attention to stability, reliability and electrical safety. Our software has been extensively tested for compatibility on most major and many minor manufacturer's PCs.

IMPORTANT

Please read these instructions carefully before you use the instrument. For your reference please also read our terms and conditions of sale printed at the rear of this manual. All our software products are protected by copyright law.

Please note that there are no user serviceable parts within the D2M-1 system. Never attempt to open the instrument case as this will void any warranty. Please contact Matelect should you ever experience any difficulties.

If software has been supplied, please ensure that you read any "README" files that reside on the disk

MATELECT LIMITED

Telephone **+44 (0)1895 823 334**
Facsimile **+44 (0)1895 824 300**
E-mail **info@matelect.com**

GENERAL DESCRIPTION

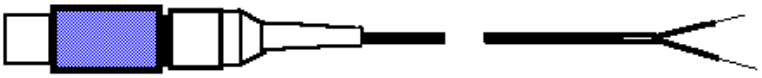
The component parts of the D2M-1 system consist of the unit itself, the connection cables and the optional software package, D2Msoft.

The system is used in ACPD studies to reduce the influence of specimen temperature on the voltage measurements. The basic principle of operation is described in the applications note given at the end of this manual. The principle relies upon the use of a reference point on a specimen that is not subject to cracking but is subject to the same thermal conditions as the crack site.

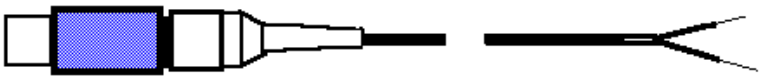
The D2M-1 unit has been designed to multiplex between two signal channels representing the actual specimen signal and that from a non cracked reference. The signals are switched and routed in sequence to a crack growth monitor (CGM), where they are conventionally processed, and fed back to the compensation unit. There they are further processed by performing a normalisation subtraction and division. The results of this electronic calculation are available as an analogue voltage at the rear of the SM3/D2M-1 unit.

The system should be assembled using the diagram on page 3 as a guide. The various equipment leads are all illustrated overleaf together with their respective functions.

Please contact Matelect should you experience any difficulty in setting up or operating the system.



D2M-1 input socket to specimen (A signal)



D2M-1 input socket to Reference point (B signal) (✳)

CGM-5 current output to specimen (✳)

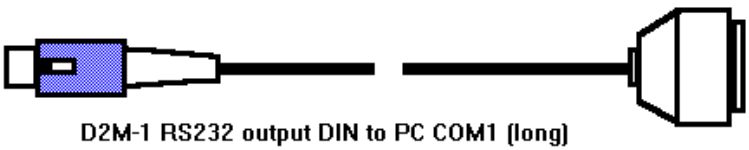
D2M-1 DIN recorder output to chart recorder

CGM-5 voltage input to D2M-1 Signal output

CGM-5 Recorder output to D2M-1 recorder IN

CGM-5 Aux power output to D2M-1 Power input (DIN)

CGM-5 RS232 output to D2M-1 RS232 input DIN (short)



D2M-1 RS232 output DIN to PC COM1 (long)

(✳) AS SUPPLIED WITH CGM-5

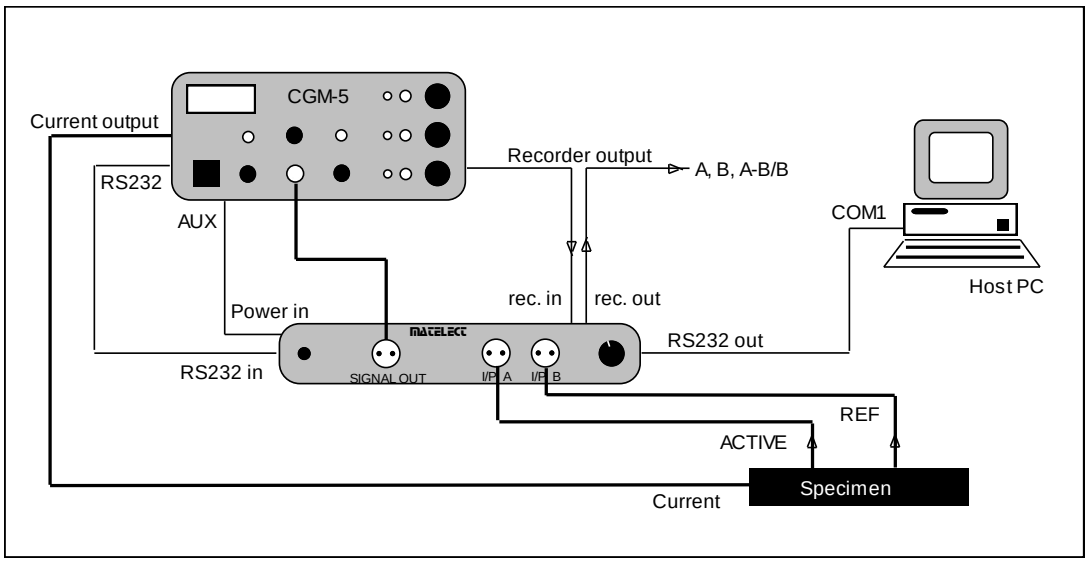
HARDWARE DESCRIPTION

The D2M-1 (formerly known as the SM3) contains relays to switch the ACPD signals, sample and hold circuitry and an analogue divider. The D2M-1 accepts raw signals, designated A & B from the specimen under test and provides analogue outputs of A, B and (A-B)/B. It can thus be used as a stand alone unit to perform thermal compensation of ACPD measurements. The normalisation calculation can also be performed on the raw data using a personal computer. The data for this process is transferred via an RS232 serial communications link between the D2M-1 and the host PC. Software for this purpose (D2Msoft) is available from Matelect.

The analogue outputs are available via a 6 way DIN socket. The pin functions are shown in Fig 5. The lead supplied with the D2M-1 for connection between this socket and a chart recorder is configured to give (A-B)/B output. Alternative lead configurations can be supplied by Matelect upon request.

The switching between channel A and channel B is carried out continuously at a rate which is set within the unit at the factory. Three standard rates of 3.2, 8 and 16 seconds are provided. These are selected using the front panel rotary switch. The delays and their respective switch positions are marked on the underside of the D2M-1 unit. Other delay period can be factory set upon request.

An overview of the hardware set-up is shown in fig 1 below.



The analogue output cable for the D2M-1 is terminated in 4mm "Banana" type plugs for connection to a data recorder. It provides analogue valves of A, B and (A-B/B).

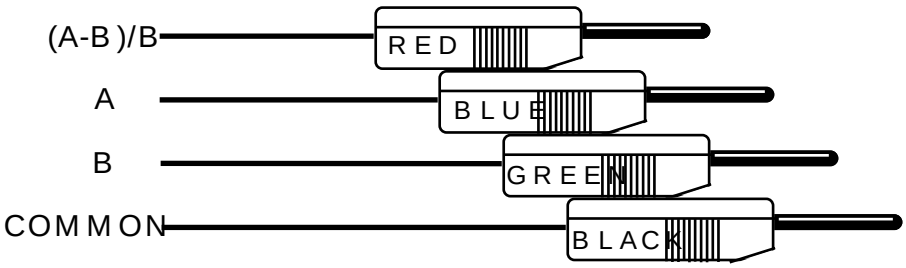


Fig 2. Colour code for the output cable.

PRECAUTIONS FOR USE OF THE SM3/D2M-1 TWO CHANNEL TEMPERATURE COMPENSATION UNIT

For optimum results, the following precautions should be observed by users of the compensation unit.

1. The unit will only function correctly if the reference signal is lower than the specimen signal. This may not be the case if the spacing between the reference probes is greater than that between signal probes. The remedy in such circumstances is to reduce the spacing of the reference probes. Ideally both sets of probes should exhibit equal spacing.

2. The most accurate results are obtained when the reference signal level is not less than 10% of the specimen signal. Smaller reference levels lead to inaccuracies in the compensated output. This is because the reference signal is used as a denominator in the compensation calculation. Change the separation of the reference pins if the above ratio is below 10%.

3. Electronic noise considerations limit the minimum absolute signal levels that should be tolerated for both signal and reference channels. All signals should therefore be maintained above 0.1V. Alter the settings on the CGM (Current, gain or frequency) to obtain higher signal levels if you encounter this problem.

4. Ensure that the CGM unit has its signal filter switched to the MIN position when using it in conjunction with the compensation unit.

5. Inconsistent readings can be obtained from the division unit if insufficient time has elapsed for the CGM to adequately lock-in to the maximum ACPD signal. This can be confirmed by observing the lock-in LED on the CGM front panel together with the signal level on the front panel DVM. If the signal level changes, (i.e. the displayed value changes) before the LED has stopped flashing, lock-in has not been achieved. The main reason for observing this problem is that the phase difference between signal and reference channels is large. The CGM can require up to 10 seconds to lock-in to wide phase angle variations.

The solution is to reduce the magnitude of the phase difference by altering the relative position of the current and signal leads. In most cases this is most easily achieved by reversing the probe connections on any one channel so that the lead polarity is reversed. Alternatively, the CGM unit can be switched into the manual mode. In this case, no lock-in is required but the user pays a small penalty in that signal levels may be reduced as a result. This is not a great disadvantage in ferrous materials.

A further solution is to increase the multiplexing delay between channels so that sufficient time is allowed for lock-in to occur. The variable control on the front panel of the D2M-1 should be used to set the appropriate delay. The factory configured delays are detailed on the underside of the instrument. These should provide the user with sufficient variation in measurement frequency. Other delays can be provided upon request