

# SYSTEM 4101 CONCRETE MATURITY METER OPERATIONS MANUAL

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# SYSTEM 4101 CONCRETE MATURITY METER

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## **IMPORTANT NOTICE**

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## ***Sec.1 Introduction***

The System 4101 Concrete Maturity Meter provides accurate, predictable concrete strength determination by monitoring the concrete temperature via disposable wires. Some of the benefits of using this meter on the construction site include:

- Form and shoring removal time estimation
- Loading and post-tensioning time estimation
- Control of winter heating and insulation requirements
- Accelerated construction scheduling

Years of experience using data logging electronics in construction environments are behind the System 4101 Maturity Meters design.

The use of thermocouple wires for temperature sensing enables long or short cable runs and allows flexibility in the placement of the temperature sensors. As well, low cost type "T" thermocouple wire is used with the connections made via quick-connect thermocouple jacks.

The computerized nature of this meter provides features previously unavailable in concrete maturity meters:

- Complete conformance to ASTM C1074-93 specification for estimating concrete strength
- Simultaneous calculation of 2 different maturity factors
- Programming of equation constants, meter ID #, date and time , serial port parameters , and phone #
- Meter to meter data transfer
- Data output to a computer, modem or printer

Despite the flexibility designed into this meter, it's operation is easily understood through the use of a 32 character display and well designed keyboard layout. In addition, there is an extensive on-screen help menu available.

Please familiarize yourself with this manual before using the meter. There are some helpful hints that could save you time and money.

## ***Sec.2 Meter Operation***

### 2.1 Introduction

The System 4101 Concrete Maturity Meter is capable of performing many functions relating to concrete strength estimation and quality control. Although it is quite complex in design, learning to use it effectively is quite straightforward.

The meter is designed to be as user friendly as possible.

A "HELP" facility is provided, that gives general information about the meter and its' use. The various features and functions are easily accessed through the use of the simple keyboard layout. The best way to become familiar with this meter is to follow the tutorial presented here and then to read through the rest of the manual.

If you wish to know more about applying the maturity concept to concrete strength estimation, please refer to ASTM C1074-93, "Estimating Concrete Strength by the Maturity Method".

### 2.2 Turning the Meter On and Off

To manually turn on the meter press the <ENTER> key (power on). The time and date will be displayed on the top line of the display and the meter ID number will be displayed on the lower line. After 2 seconds, the "Present Values" menu is displayed. This is the menu that is used to display the current channel temperatures and calculated maturity factors.

The meter may be manually turned off by pressing the <EXIT> key (power off), anywhere in the in the Present Values menu.

**The meter will automatically turn off 30 seconds after the last key press.**

### 2.3 Viewing Present Values

After turning the meter on, the Present Value Menu will be displayed automatically. It may be accessed from all other main menus (Set Up, Record, View, Communications, Help) by depressing the <Exit> key.

Channel temperatures, temperature-time factors and equivalent age factors can be viewed in the Present Values menu. To change the selected channel, press the <UP> and <DOWN> keys. To change the temperature-time values or equivalent age values, press the <ENTER> key.

Over and under temperature indication as well as "off" status (open circuit) will appear as an alarm or warning, rather than the temperature values.

Refer to the ALARMS section for information on channel alarms indicators (OFF, LTA, HTA).

### 2.4 Accessing the Menus

There are 6 menus available on the meter that may be called up on the display:

1. Present Values
2. Help Information
3. Recording Control
4. Viewing Recorded Data/Meter Status
5. Parameter Setup
6. Recorded data Output (Communications)

Press the <REC> key to get to the **Recording Control menu**. Press the same key a second time to get to the **Parameter Setup Menu**. Press the <EXIT> key to return to the Present Values menu.

Press <VIEW> key once to get the **Viewing Data/Status Menu**. Press the same key a second time to get to the **Communications Menu**. Press the <EXIT> key to return to the Present Values menu.

Use the <UP> and <DOWN> arrow keys to change the function selected within each menu. Use the <ENTER> key to activate the desired function. Use the <EXIT> key to "back out" of functions and menus.

## 2.5 Help Information

If you do not have the System 4101 manual with you, assistance may still be available through the Help menu.

The Help Information menu may be activated anywhere in the **Present Values menu**. It contains more than 200 lines of information in 8 sub-menus. Press the <UP> and <DOWN> arrow keys together to activate this menu and then follow the instructions displayed. There are 8 separate sub-menus to choose from. To cancel the help menu, just press the <EXIT> key.

## **Sec.3 Using the Menus**

### 3.1 Recording Control

There are 3 items in the recording menu:

1. Start Recording
2. Stop Recording
3. Erase

After the meter is placed in the **Record** mode, it automatically powers itself off and "wakes up" when it's time to take temperature measurements. Temperature measurements are taken every half hour for the first 48 hours and then once an hour after that. The temperature-time factors may be reviewed in the Present Values menu at any time during recording.

The **erase function** clears out all recorded values and resets the memory pointers. Although it is not necessary to clear the memory before starting a new recording, we recommend it to avoid redundant printouts of the previous data. Separate records are kept of each recording and the data can be output to a computer or printer for viewing at a later date via the COM PORT.

The **current** recording data can be reviewed in the **Data Viewing** menu but previous recordings can only be output via the COM PORT. This also applies to any recording data transfer from another meter.

There are 327 days of recording capacity (x4 channels) when the memory is erased. Each time a new recording is started, the number of days available for recording will be displayed. If the battery voltage becomes too low, the recording will automatically stop. The battery can be replaced during recording if so desired, without loss of memory.

Rechargeable models require recharge only.

Constants (datum, temperature, Etc.) may not be altered during recording.

### 3.2 Viewing Recorded Data

When reviewing recorded data and calculations, the channel number is selected and then the following information is displayed:

- Channel number
- Hour number (Hr)
- Temperature (T)
- Temperature-time factor (TTF)
- Equivalent age factor (Age)

The <UP> and <DOWN> arrow keys are used to scan back and forth in the recorded data. Holding down either key causes auto scrolling. Only the current data being recorded may be viewed. Data that has been previously recorded but not erased cannot be viewed. This also applies to data transfers from other meters. This 'hidden' data may only be output to a printer, computer or modem. It may also be transferred to another meter.

### 3.3 Viewing Meter Status

This function displays the following:

- Available memory (in days)
- Memory used (in days)
- Battery voltage (minimum 5.5 V)
- Memory and clock backup circuit integrity

***This function should be selected each time the meter is used to determine condition of the battery and the available memory.***

### 3.4 Parameter Setup

The following items may have their values or settings altered in this menu:

- |                                     |              |
|-------------------------------------|--------------|
| 1. Datum Temperature                | (0)          |
| 2. Activation Energy Constant       | (5000)       |
| 3. Equivalent Age Temperature       | (20)         |
| 4. Date and Time                    | (PST)        |
| 5. Meter ID Number                  | (0)          |
| 6. Temperature Sensing Calibration  | (calibrated) |
| 7. Memory Initialization            | (erased)     |
| 8. Phone Number (for modem dialing) | (blank)      |

The default values for these parameters when shipped from the factory are indicated in square brackets. Before using the meter, always check for proper parameter settings.

The required settings will depend on the type of concrete being used, as well as the expected temperature range. To gain familiarity with the subject of selecting parameters refer to ASTM C1074-93.

#### **WARNING !**

**Do not perform a memory initialization or calibration unless you are able to calibrate the temperature sensing circuitry. These functions are only to be used after the replacement of the clock/memory backup battery, or if there has been a corruption of memory.**

To properly calibrate the temperature sensing circuitry, two baths -an ice bath (0°C) and a hot bath (30°C to 40°C) must be prepared. There should be four thermocouple cables available for insertion into the baths. A thermometer accurate to 0.5°C should be used to determine the temperature of the hot bath. Follow the prompts on the display. Consult your local representative or Standard Scientific Inc.

The phone # can only be entered through the use of a computer or data terminal. Do not try to enter a telephone # unless the appropriate equipment is available. When the prompt appears on the computer terminal display, enter the phone number without any spaces. Be sure to include all the required digits, i.e. the phone number (905) 890-1090 should be entered as “9058901090”

The <UP> and <Down> arrow keys are used to change the values/settings (the scrolling feature can be activated by holding down the keys) in most of the parameter setup functions.

See section 4.5 for detailed explanation of entering a Phone Number.

### 3.5 Recorded Data Output (COM PORT)

There are three different ways to output recorded data from the meter.

They are:

- Formatted output to a serial printer or computer
- Transfer meter-to-meter
- Formatted output via modem

The ***formatted output*** is clearly labeled and can be included directly in reports using the ***Data Output Function***. This formatted information may be sent directly to a serial printer or to a computer first, then to a printer or it may be imported. It also has the capacity to be imported into a spreadsheet program like Lotus 1-2-3™ for graph presentation of the data. ***Be sure to set the baud rate to match the printer/computer specifications.***

There are times when a modem must be used to transmit the data over phone lines. The modem transfer function auto-dials the phone number stored in memory and waits for a proper connection before transmitting the formatted output. The transmitting modem should use the "AT" command set. The computer being used at the other end should have an auto answer modem attached to it that is operating at the same baud rate as the maturity meter.

Almost any communications program may be used to record the transmitted data. Programs such as Perfect Link™ should be set to log data to a file before the phone call is placed. As soon as the phone call is auto-answered, the transmitted information will start to appear on the computer screen. When the call is completed, the data logging can be turned off and the file may then be edited with a standard ASCII file editor, or it may be printed or imported into spreadsheets like Lotus 1-2-3™.

The meter-to-meter transfer function allows one meter to be used for data collection from all the meters on construction site. The data is then output from the collection meter to a printer, computer, modem, etc.

To activate this feature, connect the collection meter to the unit from which you wish to transfer the data. On the collection meter, select the transfer in function and then press <ENTER>. With the instrument you are retrieving with, select the transfer out function and then press the <ENTER>. Transfer complete will be displayed upon completion.

The cables required for various equipment interconnections are described in the Communications Port Requirements section. They may be ordered from your local representative or Standard Scientific Inc.

### 3.6 Alarm Conditions

The meter monitors both the battery voltage and the memory and clock back-up circuitry continuously during meter operation. A warning message will be displayed if there are any problems. The 9-volt Lithium battery should be replaced if the voltage drops below 5.5 volts.

The temperature sensing alarms include:

- Low temperature, below -10°C (LTA)
- High temperature, above +90°C (HTA)
- Channel off (unplugged, open circuit) (OFF)

These alarms are displayed in the following menus:

- Present Values
- View Recorded Data
- Output Data
- Modem Output

Read the section on battery maintenance and check the battery voltage before the meter is used. Make sure that the meter lid has been fastened down securely so that the O-ring forms a watertight seal.

## ***Sec.4 Communications Port Requirements***

### 4.1 Introduction

The communications port uses standard RS-232-C interface signals. This is the same standard used by IBM PC serial printers. The handshaking protocol is XON/XOFF which eliminates the need for complex cables. If a serial printer is being purchased for use with the System 4101 maturity meter, make sure the XON/XOFF feature is included. Handshaking with an IBM PC is not as important because computers can accept data as quickly as the maturity meter can send it. Most communications programs do allow for XON/XOFF handshaking if required.

### 4.2 Modem Implementation

Before a modem can be used with the System 4101 maturity meter to transmit data remotely to another computer, some modem requirements must be fulfilled. Check the modem manual to set up the transmitting modem for:

- "AT" command set
- DTR forced "on"
- Asynchronous operation
- Proper BAUD rate (300/1200/2400)
- Data format:
  - 8 data bits
  - 1 start bit
  - 2 stop bits
  - No parity
- DCD under modem control (not forced "ON")

The receiving modem must be configured for auto answering. Modems vary from manufacturer to manufacturer and in a few cases DCD (data carrier detect) cannot be placed under modem control if DTR is forced "ON". DCD must become active when a communication link has become established with the answering modem. One way to get around this problem is to provide a positive voltage signal loop back from a modem output or test signal pin to the DTR pin. Then there is no longer any requirement to force DTR "ON" and DCD should be able to provide the required signaling to the System 4101 maturity meter.

### 4.3 Cables

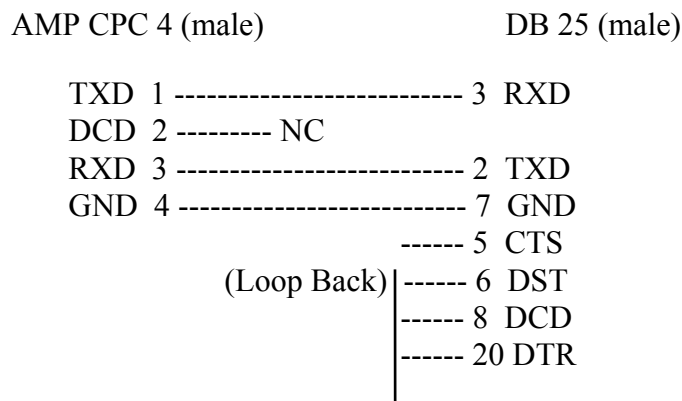
There are 5 cables available for the System 4101 maturity meter:

1. 25 pin D shell serial cable for IBM PC
2. 25 pin D shell to 9 pin D shell serial adapter for IBM PC
3. 25 pin D shell serial cable for modem
4. 25 pin D shell serial cable for serial printer
5. Meter to meter transfer cable

Cable #2 is required for IBM PC's with the smaller 9-pin D shell serial connector. It converts cable #1's 25-pin connector to a 9-pin connector.

If the serial printer in use requires a female connector, use a gender change adapter. This and other cable supplies are available at local computer supplies stores. Alternately, cables may be obtained through distributors of this meter. Use the Connectors Pinouts section of this manual to assemble cables for custom requirements.

#### 1. Maturity Meter to IBM PC Cables



2. 9 Pin Female to 25 Pin Male D Shell Adapter Cable:

Pin # (DB 9 female)	Pin # (DB 25 male)
1 -----	NC
2 -----	3
3 -----	2
4 -----	20
5 -----	1,7
6 -----	6
7 -----	4
8 -----	5
9 -----	NC

All signals match except  
DCD and RI which are NC

3. Maturity Meter to Modem Cable:

AMP CPC 4 (male)	DB 25 (male)
TXD 1 -----	2 TXD
DCD 2 -----	8 DCD
RXD 3 -----	3 RXD
GND 4 -----	7 GND

4. Maturity Meter to Printer Cable:

AMP CPC 4 (male)	DB 25 (male)
TXC 1 -----	3 RXD
DCD 2 -----	NC
RXD 3 -----	2 TXD
GND 4 -----	7 GND

5. Maturity Meter to Maturity Meter Transfer Cable:

AMP CPC 4 (male)	AMP CPC 4 (male)
TXD 1 -----	3 RXD
DCD 2 -----	NC NC ----- 2 DCD
RXD 3 -----	1 TXD
GND 4 -----	4 GND

#### 4.4 Connector Pinouts

The following information may be helpful in assembling custom cables for non-standard applications:

System 4101 Communications Port Connector:

1 - TXD  
3 - RXD            2 - DCD  
4 - GND

#### ***4.5 Entering a Phone Number:***

First complete the first five steps of section ten or eight steps of section eleven as required (depending on your computer system) to activate Hyper Terminal correctly.

When the hookup of the Maturity Meter is complete and Hyper Terminal is running, turn on the Maturity Meter.

Press the "SETUP" key twice for the "Setup" menu then the down arrow key once for the "Phone #" menu. The meter should display "9 Phone #".

Press "ENTER" on the keypad once to view any previously entered Phone Number .

Press "ENTER" again to change the Phone Number and the meter will respond with a confirmation message.

Press "ENTER" one last time if changing the Phone Number is really desired.

The Hyper Terminal screen will display "Ph #:".

Using the computer's keypad type in the Phone Number desired then the "Return or Enter key" .

Be sure to include all the required digits, i.e. the phone number (905) 890-1090 should be entered as "9058901090".

The Phone Number will be displayed on the Maturity Meter's screen.

On the Maturity Meter's keypad Press, "EXIT" to quit or "ENTER" to change the Phone Number again.

#### ***Removal of a Phone Number:***

To remove a Phone Number from a Maturity Meter follow the above steps but when prompted for the Phone Number input enter an equivalent number of spaces that the original Phone Number took or just press the computer's "ENTER" key.

The Maturity Meter will display a blank Phone Number.

IBM PC Serial Port 25 Pin D shell, male type connector:

Pin #	Description		Direction
1	Frame Ground	GND	
2	Transmit Data	TXD	Output
3	Receive Data	RXD	Input
4	Request to Send	RTS	Output
5	Clear to Send	CTS	Input
6	Data Set Ready	DSR	Input
7	Ground	GND	
8	Carrier Detect	DCD	Input
20	Terminal Ready	DTR	Output
22	Ring Indicator	RI	Input

IBM PC Serial Port 9 Pin D shell, male type connector:

Pin #	Description		Direction
1	Carrier Detect	DCD	Input
2	Receive Data	RXD	Input
3	Transmit Data	TXD	Output
4	Terminal Ready	DTR	Output
5	Ground	GND	
6	Data Set Ready	DSR	Input
7	Request to Send	RTS	Output
8	Clear to Send	CTS	Input
9	Ring Indicator	RI	Input

Standard Loop Back for XON/XOFF Handshaking:

- Connect inputs DCD, DSR and CTS to output DTR

Modem 25 Pin D shell, female type connector:

Pin #	Description		Direction
1	Frame Ground	GND	
2	Transmitted Data	TXD	Input
3	Received Data	RXD	Output
4	Request to Send	RTS	Input
5	Clear to Send	CTS	Output
6	Data Set Ready	DSR	Output
7	Ground	GND	
8	Carrier Detect	DCD	Output
20	Terminal Ready	DTR	Input
22	Ring Indicator	RI	Output

## ***Sec.5 Field Preparation***

### 5.1 Thermocouples

Thermocouple temperature sensors are used because they are economical and rugged. They are ideally suited to maturity meter applications as different length cables, deep sensor placement and complex form work are easily accommodated.

"T" type thermocouples made of copper-constantan are used. They are available in a wide range of wire sizes and insulation types.

Thermocouple wire can be purchased from most wire companies and is available (along with standard connectors) from distributors of the meter.

### 5.2 Sensor Preparation

To prepare a thermocouple temperature transducer you will need a length of 24 gauge or larger, "T" thermocouple wire and a standard "T" type thermocouple plug. These plugs are included with the meter and they are available through your local representative or Standard Scientific Inc.

For long cable runs use heavier gauge wire and if the situation warrants, consider the use of armored cable.

The thermocouple wire has a polarity to it. The copper being the positive (+) side and the constantan (silver in color) being the negative (-) side. Disassemble the plug, separate the wire pair approximately 1 inch and strip 1/2 inch off each lead. Making sure that the polarity is correct, connect the wires to the plug and reassemble.

To form the temperature transducer at the other end of the wire, strip the wire end as instructed in the previous paragraph, with the following change. Twist the two leads together, using a pair of pliers to ensure that the connection is solid. The point where the wires are twisted together forms the temperature transducer. To make a permanent connection, soldering the wires is recommended.

To prevent damage or corrosion to the sensor point, plastic dipping using a product such as "PLASTI-DIP" is also recommended.

Thermocouple cables may be prepared at the office so that site installation is accomplished in as efficient a manner as possible. Cables may be reused by cutting off old cables at the concrete interface and following the same procedure for a new cable.

### 5.3 Meter and Thermocouple Placement

When using the meter on the construction site, you should keep the following points in mind.

- The most common cause of maturity meter failure is from accidental damage. Secure the meter away from high traffic areas or material that may be moved. Take care when transporting.
- Long cable runs may be a problem if routed through high traffic areas and again around material that may be moved. Try to keep the cable lengths as short as possible.
- Concrete is very dense and while being poured can rip thermocouple wires. When vibrators are being used, mesh and reinforcing bars will shake violently. In order to reduce transducer failure, carefully place the wires around the reinforcing bars before the forms are completed. For critical areas, wire more than one thermocouple so that you have backup if a transducer "Open Circuit" indicator under temperature values.
- Contact with wet cement should be avoided. The exterior surface of the meter can be kept clean by protecting it in its case.
- To avoid over estimating the concrete strength, try to place the temperature sensor in a section of the concrete placement where the concrete will be cooler.

## ***Sec.6 Maintaining the System 4101***

### 6.1 Battery Maintenance (9V Lithium Battery)

The Maturity Meter uses a Kodak Lithium 9V Battery. It is an excellent battery, which will stand up to rough operating conditions like low and high temperature extremes. Under normal conditions the battery life expectancy will be more than 2 years.

Using the meter continuously for long periods ( eg. reviewing recorded data on the display ) will reduce the battery life. The battery life will be reduced to 30 hours if left on continuously. If the meter is left on only for short periods of time, the battery life will be extended for up to 3 years of recording operation. Replace the battery if the voltage is less than 5.5 volts. Use the Meter Status menu to read the battery voltage.

- 6.1a To Change Battery: Using a Slot Screwdriver unscrew the top faceplate from the meter. Raise the faceplate gently from the meter keeping the membrane cable in full view and attached to the meter. Using thumb and forefinger pull the lithium battery directly up and out of the meter. Replace with a new lithium battery. Close the meter and test all functions.

For Battery Removal : Insert a thin-edged tool between the holder and the rear of the battery and pull battery up with fingers. For battery insertions - line up battery contacts with holder contacts, then push down battery while pulling holder catch away from rear of battery.

Use of Standard 9V Alkaline batteries is acceptable when the meter is not operating below 10 °C. The capacity is 40% of the lithium battery under these conditions. Do not use these batteries in low temperatures because of their poor performance.

**WARNING !**

To avoid backup battery drain during storage, always stop recording before removing the 9V Battery. If a dead battery was removed, first install a new battery and then execute " Stop Recording ". (Non-rechargeable units only)

### 6.1b Battery Maintenance (Rechargeable Model)

If you are using a rechargeable Model 4101, battery replacement should be performed at the factory. Recharging through the recharging port should be done using the Factory Authorized Charger. Charging should only be done when battery is low. The Battery Pack should be charged for 15 hours continuously to replenish the battery pack fully. The Red LED (charge) will remain on as charging commences. When the battery has attained full charge, the red light will start blinking. The Green LED (power) stays on during the charging period and indicates power presence and proper charger Polarity.

**WARNING !**

**Use of an Unauthorized Charger is not recommended and Voids your Warranty.**

Do not remove cover if the meter is cooler than the ambient air (i.e. by bringing the meter inside on a cold day). Doing so will cause condensation on the internal electronic parts. Let the meter warm up before removing cover.

### 6.2 Meter Care and Attention

The Maturity Meter is housed in a polycarbonate enclosure, which is an extremely strong material. It resists scratching, retains its flexibility over a wide range of temperatures and is impervious to most solvents. With occasional washing, the meter will retain its original appearance for a considerable time.

Cement is hygroscopic in nature and contact with the enclosure will eventually cause the lid machine screws to become devoid of lubrication. a drop of oil will make the screws easier to loosen. The thermocouple jacks should be kept free of any dirt or concrete dust. Electrical contact cleaner is not recommended but alcohol and a small wire brush could clean out stubborn dirt.

**WARNING !**

Meter is water resistant but not water proof so care should be taken not to immerse the meter in water. If the meter is to be used in damp conditions secure it in a clear plastic bag and seal the opening around the wires with water proof tape.

**NOTE: WATER DAMAGE VOIDS WARRANTY.**

### ***Sec.7 Maturity Concept Theory:***

In the last few years, there has been a good deal of investigative work done in the area of concrete strength determination through electronic temperature measurement. This work is based on the findings of J.M. Plowman, who first advanced the non-linear, time - temperature, or "Maturity Concept" of rate of gain of strength in portland cement in 1947.

There are various methods of relating the concrete *time-temperature* data to strength, but most methods employ the integrated value of temperature with time. The "Maturity Value" is given by the following equation:

$$M = \text{SUM} [ t ( T + 10 ) ]$$

Where      M = Maturity (°C \* hours)  
               T = Average concrete temperature (°C)  
               t = Duration of Curing ( hours )

Interpolation of integrated temperature values on pre-determined strength versus time-temperature graphs enables instant strength calculations. Because concrete continues to gain strength down to about -10 °C, this value is usually used as an integration " datum temperature ".

An alternative way to determine concrete strength is via the "*equivalent age*" calculation. This calculation enables strength comparisons between a laboratory cured concrete cylinder at temperature " X " and the concrete being monitored at the job site. The calculation uses the lab temperature " X " (" equivalent age temperature ") and the concrete " activation energy " constant to compare the relative curing time of construction concrete to the laboratory concrete.

$$t_e = \sum e^{-q \left( \frac{1}{T_a} - \frac{1}{T_s} \right) \Delta t}$$

$t_e$	=	Equivalent age at specified temperature $T_s$ (days or hours)
$T_a$	=	Average temperature of concrete during time interval $\Delta t$ , (°K)
$q$	=	Activation energy divided by the gas constant, (°K)
$T_s$	=	Specified temperature, (°K)
$\Delta t$	=	Time interval, days or hours

Although different concrete mix designs exhibit similar curing characteristics, each should be tested to determine it's exact strength/maturity relationship.

Maturity values are converted to strength estimates through the use of prediction equations. The subject. Of converting maturity values to concrete strength estimates is dealt with extensively in ASTM C1074-93 Anyone using maturity meters should obtain a copy of this standard, either through your local library or ASTM directory. This standard also provides instructions on how to select maturity function constants (parameters) for different types o concrete and gives clear example calculations.

**Sec.8 Specifications:**

## Temperature Measurement:

- Sensor measurement range -10 °C to 90 °C
- Accuracy -+/- 1 °C
- Thermocouple Wire - Type "T"

## Data Record :

- Memory Capacity - 32K bytes
- Data Capacity - 10 months x 4 Channels
- Recording Interval - Every 1/2 hour up to 48 hrs., then every hour.

## Communications:

- I/O Port - Serial RS 232C
- Handshaking - XON/XOFF
- Data Format - ASCII
- Baud Rates - 300, 1200, 2400,4800, 9600 (selectable)

## Power :

- \* 9V Kodak Ultralife Lithium ( U9VL ) battery
- 1.0 Amp hour capacity
- Up to 2 years of service life at 20 °C
- \* 3.6V Lithium, 1/2AA Cell Memory/Clock
- 0.750 Amp Hour Capacity
- 10 year service life at 20 °C.

Note: Use of a standard 9 volt alkaline battery may reduce capacity up to 60%.

\* Rechargeable Models employ a 9.6 Volt Battery Pack.

## Mechanical :

- Dimensions 7.8" x 4.7" x 2.9"
- Case Material Polycarbonate
- Weight 1.75 lbs.
- Thermocouple Connectors Omega "Flat Pin" Miniature
- I/O Connector AMP "CPC" Series 4

## Environmental :

- Operating Temperature - 20 °C to 50 °C.
- Enclosure Watertight, Impact resistant

## Maturity Value Calculations:

- Constant Programmable Range  
Datum Temperature  
(Temperature integration Base) -20 °C to 40 °C.
- Equivalent Age  
Temperature : 0°C to -40°C.
- Activation Energy  
Constant 0 °K to 20,000 °K.
- Maximum Maturity Values Displayed:  
Degrees Temperature Time Factor : 99999 °C hours  
Degrees Equivalent Age Factor : 9999 Hours

### ***Sec.9 Using MS Windows for Data Downloading***

1. From Windows " Program Manager" choose "Accessories"
2. In " Accessories:" go to" Terminal".
3. In " Terminal " open " Settings" section, and choose " Communications".

#### Step One :

- a) Connector - COM1-4 ( Varies with computer. Must be done in this order ) .
- b) Data Bits - 8
- c) Stop Bits - 1
- d) Parity - None
- e) Flow Control - XON/XOFF
- f) Baud rate - 9600 Set the same baud rate on your Maturity Meter.  
Baud rates must match exactly.
- G) Choose OK

#### Step Two:

Choose " Text Transfer "  
Mark " Standard Flow "  
Choose OK

4. From " File Menu" : choose " Save As "  
In " File Name " Type the name of the file, which contain setting setups for communication with Maturity Meter 4101, for example " 4101.TRM".  
Choose OK
5. To start receiving data open the " Transfers" section.  
Mark " Receive Text File". In the " File Name " box type the name of the file in which data will already be stored, for example 4101.TXT.  
Choose OK.  
The terminal is now ready to receive data.
6. On Maturity Meter 4101 choose " Output Data " then press " Enter " You should be able to see the text data on the computer screen now.

### ***Sec.10 Using MS Win 95, Win98, Win2000 & Win XP for Data Downloading***

1. Click in Windows on " START" button and choose "PROGRAMS".
2. In " PROGRAMS " go to {“ ACCESSORIES “ in Win95} or {“ ACCESSORIES” then Communications” in Win98, Win2000 & Win XP} and choose " HYPER TERMINAL".
3. In " HYPER TERMINAL " double click on "HYPRTERM.EXE" icon .
4. If application ask for modem installation deny installation. ( If modem is installed chose at this point the direct connection and appropriate Communication Port ) .
5. Type in name for new connection and choose icon for it ( i.e. “ 4101 TERMINAL ” ).
6. Select appropriate Communication Port for Direct Connection ( i.e. “ DIRECT TO COM2 “ ).
7. Select port configuration :
 

a.	Bits per second	-	9600	set the same baud rate on your Maturity Meter. Baud rates must match exactly.
b.	Data bits	-	8	
c.	Parity	-	None	
d.	Stop Bits	-	1	
e.	Flow Control	-	XON/XOFF	

Choose OK
8. Connect serial cable between Maturity Meter and Computer’s Serial port.
9. Start receiving data from Maturity Meter 4101 ( i.e. On Maturity Meter 4101 choose “ Output Data” then press “Enter”. You should be able to see the text data on the computer screen now).
10. When completed from “File Menu” choose "SAVE" and “EXIT”.

**Note:** Any data saved in Hyper terminal under name specified can retrieved later and processed accordingly .

### ***Sec.11 Warranty Policy***

STANDARD SCIENTIFIC INC. warrants its Maturity Meter, Model 4101 against defective materials and workmanship for a period of one (1) year from the date of purchase.

Proof of Purchase is required for all Warranty Claims. The Warranty applies only to the original purchaser.

This Warranty Does Not Apply to any unit which has been subject to accident, neglect, negligence, abuse, misuse, improper operation, nor does it apply to any unit that has been repaired or altered by any other than an authorized factory representative.

There are no other warranties, expressed or implied, which extend beyond those herein specifically claimed.

STANDARD SCIENTIFIC INC. expressly disclaims any and all liability arising from the use and / or operation of this unit in any and all applications, and shall not be liable for any consequential, incidental or collateral damages or injury to persons or property .

All Warranty Claims must be made in writing and accompany the goods returned for repair.

STANDARD SCIENTIFIC INC. reserves the right to make changes from time to time in the content hereof without the obligation of Standard Scientific Inc. to notify any person of such revision or changes.