

**The Following Manual gives the basic setup procedure together with the calibration and data download instructions**

## **SETTING UP**

The MINCARB thermal analysis and temperature instrument should be securely mounted via the four fittings on the cabinet. The unit should be set to the required supply voltage via the internal link and connected to a fused power supply. The lance input should be connected via the round reynolds plug/socket (+ve to L and -ve to N) and the cup input connected to the 2 pin compensated socket observing the cable colour code for polarity. A standard text ASCII printer can be connected to the 25 pin "D" type socket. The instrument has been calibrated and pre-set to standard default settings which will accommodate the majority of applications. However the unit has been designed to be custom configured to optimise operation, and can be set to correlate with chemical analysis, calculate required additions, and record heat/part number. Adjustment and interrogation of the settings can be carried out via the integral keypad and LCD screen on the front panel.

## **OPERATION**

### **Bath Temperature**

To take a bath temperature measurement, simply connect a thermocouple to the dip lance and the "green" lamp above the temperature display will light. Immerse the unit into the metal and observe the display, the amber lamp will light and the actual temperature will be indicated on the temperature display. As the Mincarb determines an acceptable plateau the red lamp will light and the display will show the plateau temperature (this would be immediately printed out with date and time should the option be selected). The temperature would be held on the display until the next measurement is taken (the green lamp indicating that the thermocouple is serviceable).

### **Thermal Analysis TA (Carbon Cup)**

To make a measurement of CE, C, and Si simply connect a "carbon cup" to the stand, the green lamp above the C display will light. Pouring metal into the cup will cause the green lamp to flash indicating measurement in progress, and the LCD display will begin to show the actual cooling curve (the real time temperature is displayed in the right hand corner of this screen). As the Mincarb analyses the curve and mathematically determines the optimum arrest point for the liquidus, the CE value will be shown in the large L.E.D. display. The system will continue to monitor the cooling rate and determine the solidus/eutectic using the same exacting methods. When satisfied the C and Si are displayed on the L.E.D.s and the arrest points marked on the curve to offer the operator an opportunity to verify the result. The red lamp is then lit to indicate end of measurement (the result, date and time would be sent to the printer should this option be selected). The displays would show the result of this cup until a further cup was poured.

## **FUNCTIONS AND CONFIGURATION**

A number of standard and advanced features are available on the Mincarb which are accessible via the membrane keyboard. The functions are displayed on the screen as a reminder and prompts are given to assist operation.

### **Function 1 (F1)**

#### **Heat / Part No input**

The operator can enter a "Heat" or "Part" number related to the cast simply by pressing the **F1** Key prior to pouring the cup. The Heat I.D. screen appears and invites you to enter up to 8 characters (Using the Alpha key to select between letters and numbers). This I.D. is then entered onto the display and printout.

## Function 2 (F2)

### Configuring the Mincarb

A **menu** function is accessed via the **F2** Key , this allows a large menu with several sub-menus to be selected. The first menu offers the following options .

MENU	FUNCTION	SUB-MENU	OPERATION
1.	Print Report	1	TA: Sends a report to the printer of the cup results for the selected date ( holds up to 1000 measurements)
		2	Temperature Lance: As above but for temperature lance
		3	(Reserved for future developments)
		4	Change date of print out
2.	Recall measurement	1	TA: Displays past results on the LCD screen with date and time for quick reference
		2	Temperature: as above for Lance
3.	Calibrate Cup	1	Cup: Allows a set temperature to be injected from an external calibrated source to automatically adjust any offset errors , this should be carried out by an engineer experienced in the calibration of thermal analysis instruments.(see below)
		2	Lance: as above for lance input
4.	Diagnosis	Engineers mode for analysis of input signal	
5.	Configuration	This setting has a number of sub-menus to allow for a wide range of user selectable options and is protected by password. The default password is 1597.	

Configuration Sub-Menus			Operation	
1.	Thermal Analysis	1-8 Metal Types	1	Parameter: Graph scale , duration , no of readings, Liq detection, Eut detection, Min rec, Silicon calculation type ½, Display RM/BH, Name of Metal Type (Use Alpha key for letters)
			2	Chemistry Correction: CE, C, Si , P offsets (changed to match known offsets)
			3	Equation: CE , C, Si, P equation (changed in correlation with laboratory analysis)
			4	Ranges: CE Min-Max , C Min-Max , Si Min-Max (used to calculate additions)
			5	Additions: C and FeSi Valance (% C / Si in trimming material) and C and FeSi Recovery (% trimming material recovered in melt from experience)
			6-8	Reserved for future developments
			9	Restore Factory settings: (for this metal type)
			9	TA General: Applies to all metal types for Calibration temperature, correction, Display SC (saturated carbon) and engineers diagnostics mode .
		2	Lance Parameters	Calibration temperature, Correction, Min temp, Plateau Tol +/- C, Readings within Tol, Lance fail after (sec.), T/C Type R, S, B.
3	Oxygen Parameters	If option installed.		
4	Printer	Auto printing after TA measurement 0=off / 1= on Auto printing after Lance measurement 0=off / 1= on		
5	Communication	If option installed		
6	Change password	Replace factory set password with selection of 4 numbers.		
7.	Time / Date	Set current date separated by . Set current time separated by :		

**NOTE: All Changes to parameter are accepted by pressing "Enter" and menu is exited by pressing "ESC" .**

## **Function 3 (F3)**

### **Metal type**

Pressing **F3** when in the operate mode will select the next metal type. Each press will increment the metal type by one, the Metal type name is shown at the top of the screen and the corresponding configuration will be set automatically to all parameters. (alternatively, pressing the number of the metal type on the numeric keyboard will select a particular metal type)

## **Function 4 (F4)**

### **Additions**

If the ranges and additions data input has been completed (see Function 2.) the Mincarb will automatically indicate if the Metal is outside specification for the metal type selected. This will be indicated by a “^” (over range) or “v” (under range) beside the result shown on the LCD screen. To calculate the additions required to bring the metal into range simply press the **F4** key, the Mincarb will request an input of the metal weight and display the ranges set in the configuration. Input the metal weight and press enter, the required additions will be calculated based and displayed in the same unit as the metal weight input. Pressing esc. will return the instrument to operate mode.

## **Special Recovery Mode**

Should the user password be lost, a master password of 0815 can be used to access the configuration menu allowing a new user password to be input.

The Measurement data stored in the Mincarb can be erased by pressing “shift” & “F3” whilst in Configuration menu ( a request is made to re-enter the password before erase complete ).

The complete configuration can be reset to factory settings and measured data erased by pressing “shift” & “F4” whilst in configuration menu ( a request is made to re-enter the password before erase complete).

## **Varification and Calibration**

**The Mincarb incorporates high quality Analogue – Digital converters with software temperature conversion and calibration. Temperature measurement is very stable and drift is unlikely. Avoid adjusting the instruments calibration unless a genuine reason exists.**

**Calibration should only be carried out by an engineer experienced in the operation of temperature measurement and thermal analysis instrumentation, as any small offset could have dramatic implications in the calculation of results.**

### **Verification of Thermal Analysis (TA) instrument accuracy**

Connect a “Mincal” cup simulator or calibrated thermocouple source with automatic cold junction compensation directly to the cup stand and allow the system to equalise in temperature for at least 10 minutes. (The Mincarb Thermal analysis input is set as a type “K” thermocouple) Inject an ambient temperature and ensure the Mincarb resets and shows a steady green cup light. Inject a simulated measurement and observe the small digital units in the top right hand corner of the LCD screen. The display incorporates a delay but will level out at a steady reading which should agree with the injected signal. Record the reading and inject the next setting, repeating for a reasonable range ( if using a Mincal simply inject first Low then High input ). If the reading is erratic or a significant error exists this may be due to faulty wiring, incorrect compensating cable or poor cup connector. If all is in order and the instrument is believed to require calibration , follow the procedure below.

## **Verification of temperature lance instrument accuracy**

Connect a "Mincal" lance simulator or calibrated thermocouple source with automatic cold junction compensation directly to the lance tip, and allow the system to equalise in temperature for at least 10 minutes. (The Mincarb Lance input can be set to either R, S, or B type thermocouples ensure the test instrument is compatible) Inject an ambient temperature and ensure the Mincarb resets and shows a steady green lance light. Inject a simulated measurement and observe the Large LED temperature display. The reading should agree with the injected signal and the red lamp light to indicate that a plateau is detected. (**NOTE:** Some simulator instrument overshoot the required output for a few seconds which the Mincarb can detect as a plateau, if this is suspected simply short out the output of the source whilst set to the required setting to give a green light, and remove the short to display the reading.) Repeat the procedure for the intended range.

## **Calibration Procedure Thermal Analysis TA input**

Select calibration mode for the TA input ( F2 – 3 – 1 ) connect a calibrated mV source designed for calibration of thermocouple instrumentation to the cup stand using "K" type compensating or extension leads. [NOTE: it is important to test from the cup stand as this is testing the full instrumentation system.] **Allow 10 minutes for the connection point temperature to stabilise.** Note the desired calibration temperature on the Mincarb screen and input the corresponding signal. (either converted to degrees C with automatic cold junction compensation, or as a true mV with a manual offset for cold junction depending on test instrument used). The actual reading will be displayed on the LCD screen to one decimal place and after a stable temperature is reached the measurement will be stored and an offset calculated. You will then be prompted to accept or reject this new offset (the old offset is left on the screen for reference). If accepted the new offset is stored , if rejected the Mincarb returns to the old offset.

## **Calibration Procedure Temperature (lance) input**

As for "cup" calibration but using the correct compensating cable and connector system for the type of Thermocouple in use. (if the reading is unstable or a large discrepancy seen, it may be a possibility that the insulation within the lance is failing and a full lance rewire should be carried out).

**NOTE: All Changes to parameter are accepted by "Enter" and exited by "ESC"**

## **DATA DOWNLOAD**

If the Mincarb is operating on software version 20a or higher, it is capable of downloading the Data from the in-built memory to a PC via a serial link. This can be used as a Database or for direct correlation between Laboratory and Thermal analysis. ( If the Mincarb is running on an older software version, it will be possible to upgrade , contact Minco for assistance.)

## **Installing "MINCARB REPORT" Data Download software onto PC**

Minco can supply a "Mincarb Report" program which can be installed onto a PC / Laptop running under Windows 95 or higher. To install, insert the CD into the drive and select "RUN" from Start Menu. Click "Browse" and select the setup.exe program from the install folder in the CD Drive (i.e. D: / E: etc.) . Click open and the install shield will run. Follow the on screen commands to complete installation. After installation a "Mincarb Report" short cut icon appears in a window, Copy the shortcut to the desktop if required and close window. Important Note: Before running the program ensure the correct dBase level is set in the PC. Proceed as follows. From the start menu, select "settings" – "control panel". Double click on the BDE Administrator. When in the administrator click + on drivers, + on native and click Dbase icon. The level on the software should be set to Level 5. If not, click in the box and use pull down arrow to set to 5. Close the window using the X button and ensure to save the change on exit. Close control panel .

## **Running "MINCARB REPORT" Data Download Software**

Using a serial download lead, connect the Mincarb serial output ( 25 pin D type male plug) to the serial input COM 1 of the PC / Laptop. Click "Mincarb Report" Icon on desktop or from start menu select Programs / Mincarb / Mincarb Report. When the Program window is running pull down the File Menu and select "new" to create a new database or "open" to add data to an existing data base. **NOTE: As the program operates on dBase files the names must have a maximum of 8 characters with no spaces.** Select the file name and click Open. To Download Data simply select Download from the File menu or Click the Download button on the top toolbar. All of the results held in memory on the Mincarb will be input into the correct column in the data base with the Temperature and Thermal Analysis results appearing together in Date Time order. The Thermal analysis will be allocated measurement type 0 and Temperature readings type 1, with the measured temperature appearing in column 21 which may be off screen depending on the resolution of the monitor. NOTE: (should an error message appear during download stating "device already open" it is possible that com port 1 is already used by another program or device, this should be exited before retrying).

## **Sorting / Correlate the Data**

### **Sorting**

To sort the Data, Click the Select button on the top toolbar. A window will appear to allow the data to be sorted by Date (range), Measurement Type, Metal Type or Filter (Note: The date defaults to the date of the download, ensure the date or date range of the required measurements are selected to the display relevant data). Multiple selections can be made to allow specific sorting, i.e. Results from 11<sup>th</sup> to 15<sup>th</sup> November for Thermal Analysis of metal types 2 & 6 with Carbon between 3.4% and 3.6%. Once the filters have been set click OK to sort Data.

Data can be further edited via the edit button and deleted using the – button. Once sorted the report can be previewed on screen or printed using the toolbar buttons.

If more advanced data handling or SPC is required, close the Mincarb Report program (the raw Data is saved automatically) and import the file into any program capable of reading \*.dbf files (i.e. Spreadsheet or SPC programs).

### **Correlate**

This facility can be used to correlate the Mincarb results with the Laboratory, however this feature should be carried out with caution as altering the equation used can greatly effect overall results.

To correlate the data, input the Lab Carbon and Silicon into the column provided (both must be entered) using the Select tab, tick the bottom box "show only data with lab entries" (ensure correct date range is set) and click "OK". Pull down the Calculate menu and click "regression C & Si" new figures will be shown and applying the new equation . It is then possible to graph the result and show the new equation to be entered into the Mincarb for improved agreement between lab and thermal analysis. This must be done manually and silicon 2 must be selected in the parameters for the metal type in the configuration menu.

## **TECHNICAL ASSISTANCE**

Minco can offer a full support package including training, calibration and assistance in configuring the Mincarb to give results that consistently correlate with laboratory analysis. If assistance is required please contact your Minco representative.