INSTRUCTION MANUAL

CONTECH
CAL SERIES MOISTURE BALANCES

CONTECH
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INTRODUCTION AND FEATURES

CONTECH® CAL series Moisture balances employ most modern technology combined with best computing capabilities to produce a very reliable, accurate and fast determination of moisture content in a sample, using weight loss on drying method. It incorporates a 5" touch screen display to easily enter the testing and other parameters.

Features :

- 3 types of Testing Methods:- Manual, Time Programmable, Automatic.
- Drying using infrared halogen lamp for faster moisture determination.
- Uniform heating due to the reflecting sample chamber.
- Moisture measurement Unit - % Moisture on wet base
  % Moisture on dry base
  % dry to wet weight ratio
  % wet to dry weight ratio
  % Weight loss in grams
- 5" Touch screen graphic display.
- Real time graph of moisture loss on the display.
- 10 programmable drying methods.
- Storage of 100 test results in memory.
- Admin and ten users for GLP reports.
- Bidirectional RS 232 interface to interface with computers and printers.
- Printing & Display of test results on the completion of the test.
- Programmable periodic printing of moisture % while testing.

Optional Accessories :

- Aluminum sample pan
- Certified standard weights
- Certified temperature kit
- RS 232 to USB convertor
- 21CFR Part 11 / GLP compliant.
- Thermal printer / Dot matrix printer

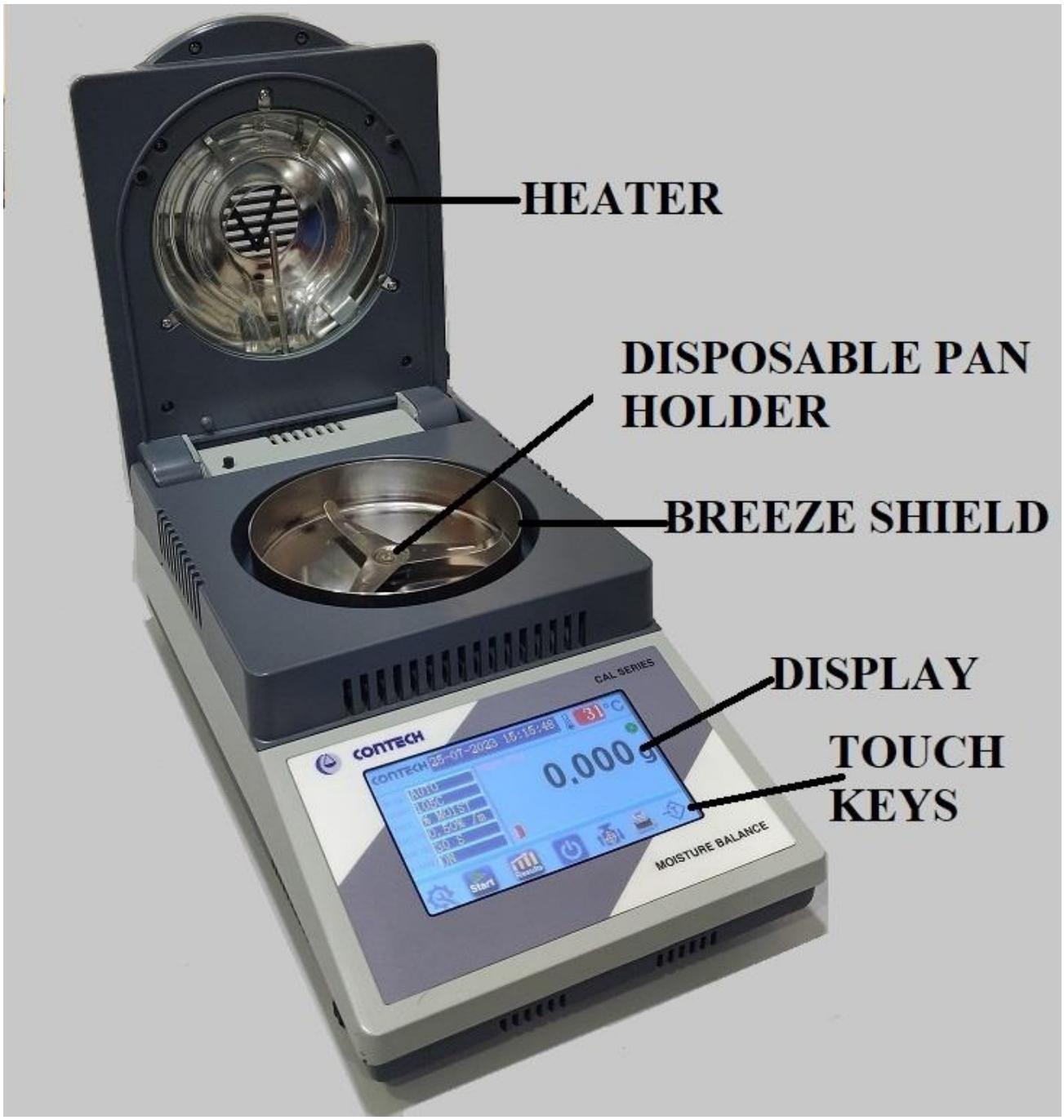
Specifications :

Moisture Content :

- Accuracy : 0.05% for sample above 5g
  0.1% for sample below 5g
- Resolution : 0.01%
- Temp. range : Ambient to 200 deg C in 1 deg increment
- Timer setting : 3min. to 120min. in 1min. increment.
- End point setting in auto mode : 0.01% per minute to 5% per minute
- Print interval selection : 10, 20, 30, 60, 120 seconds
- Taring Range : Up to full capacity
- Power Req : 230V±10%V AC, 50/60Hz, 550 Watt
- Operating Temperature : 15~50 deg C

Dimension (mm) : 345 (L) x 185 (W) x 145 (H) when cover is closed.
: 345 (L) x 185 (W) x 300 (H) when cover is open.

MOISTURE BALANCE



INSTALLATION

a) Unpacking

Unpack the balance. Save the packing container for future use.

b) Electrical requirements

The product requires very stable power. It works on 230V AC supply with PROPER EARTHING. The power outlet used for the balance should not be shared with any other devices which draws current in inconsistent manner like Airconditioner or refrigerator etc.

c) Environmental requirements

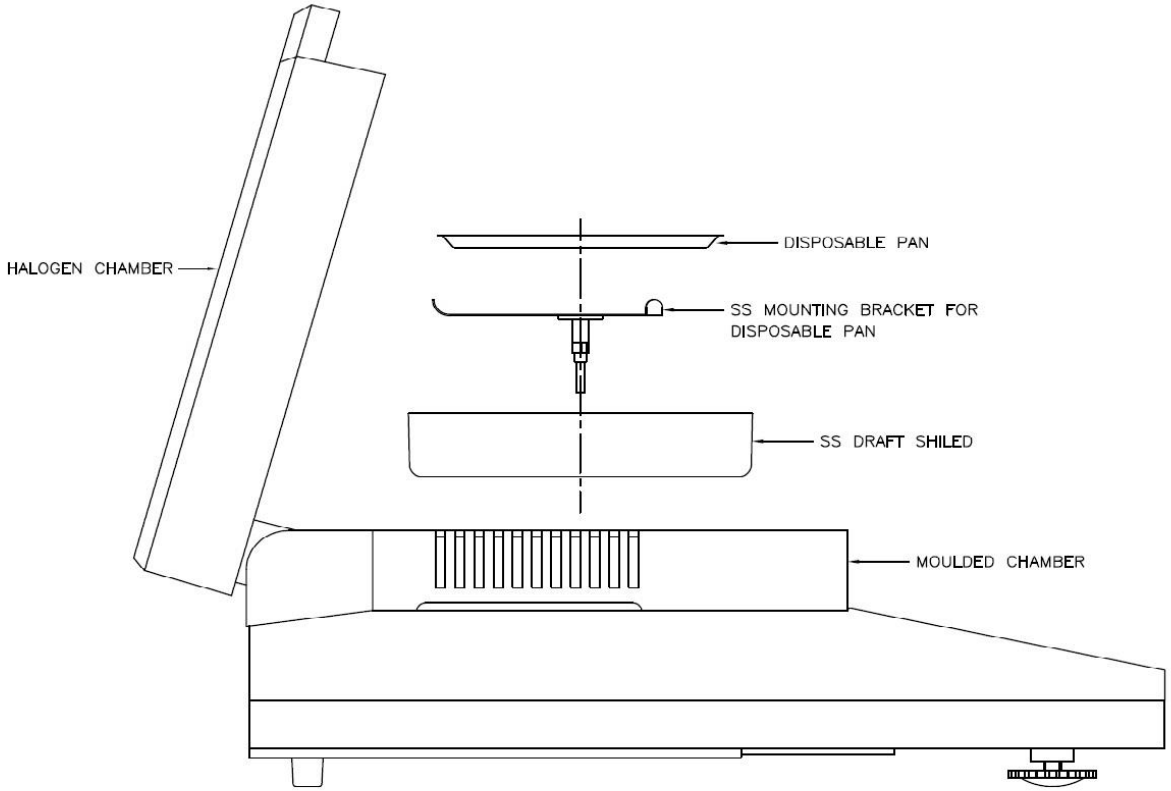
For best results, the balance should be placed on a level surface which is free from drafts. It should not be exposed to direct sunlight or radiated heat. The balance should not be subjected to sudden ambient temperature changes. Table used for balance should be sturdy and should not transmit vibration from other equipments and free from the movement of people. No vibration producing equipment should be operated on the same platform as balance.

WARNING !!!!

- Do not use a sample that could trigger a chemical reaction and cause an explosion or emits poisonous gas, when the sample is dried.
- Keep flammable materials away from the balance.
- Do not touch the heating chamber while testing, It may very hot.
- Parts of the balance become very hot. Materials placed near it might catch fire.
- Do not use the balance in any atmosphere where it may cause explosion and fire.
- Use correct power source (voltage, frequency, outlet type) adapted to the specification of the balance.
  Moisture balance should be opened by trained and authorized persons only. There is a danger of Electric Shock.
- Turn off the power switch and remove the power cord from the power outlet, when replacing the halogen lamp.
  Do not touch the halogen lamp immediately after a test. It may be very hot.
- Do not disassemble the balance.

d) Power on

Assembly of Draft shield and Weighing pan

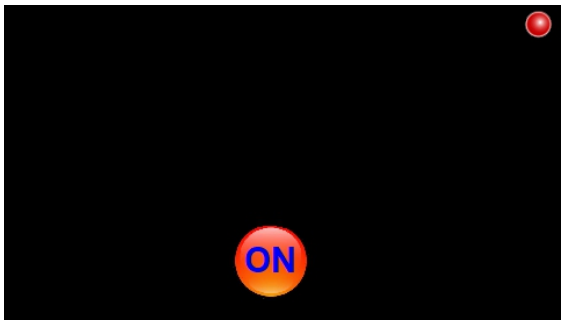


Place the instrument on a sturdy levelled surface. Level indicator is placed on the rear side of the balance. Turn the front knob screws to level the balance, if required.

Lift the Halogen chamber.

Place the SS draft shield, pan mounting bracket and disposable pan as shown above.

Power to the instrument is supplied through mains outlet on the rear side of the instrument. Connect the mains cord to a mains outlet with PROPER EARTHING. Turn on the power. Balance will display,

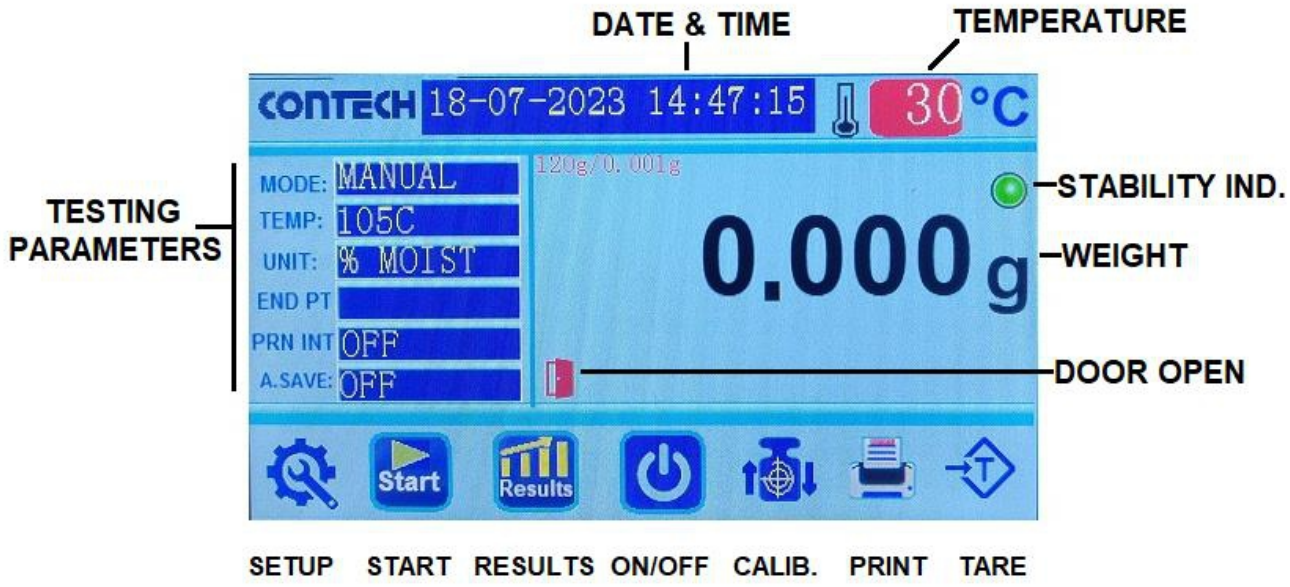


Press 

.

Balance goes through the self test and subsequently starts displaying weight

MOISTURE BALANCE DISPLAY



Press  key to zero the weight, if required.

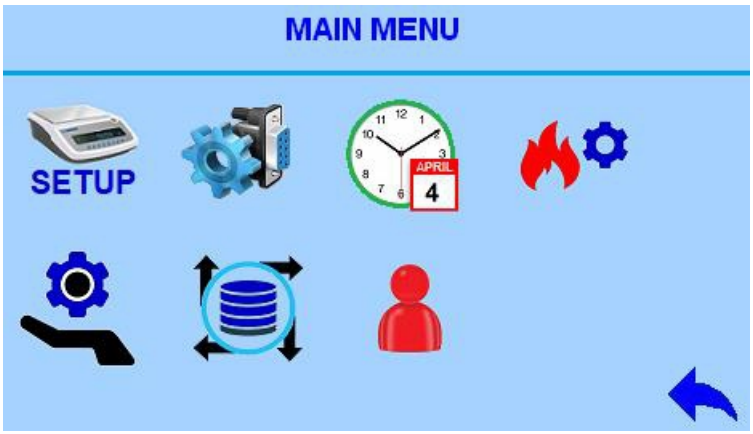
NOTE: Please note that these balances need a warm up time of approx. 30 minutes before it is used. No adjustment should be done to the balance during this period. Moisture Balance is ready for use after warm up period.

SETUP PARAMETERS

Parameters required for the functioning of the balance and for testing of samples can be modified to suit a particular application.

Pres  key

Balance displays the following menu.



BALANCE PARAMETERS : Use this menu to change parameters required for the functioning of the balance.


SERIAL PORT SET: Use this to change parameters associated with Serial communication.


TESTING PARAMETERS: Use this option to change drying application parameters.

DATE/TIME ENTRY: Use this option to change Date, Time, Machine ID etc.


PROGRAMM SET/RECALL: To change testing parameters of 10 programmable drying method.

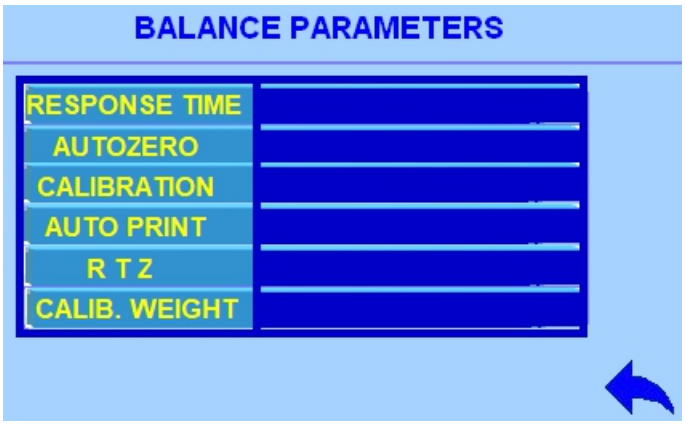

DATA RECALL: To retrieve test data from memory.


USER SETUP: To setup users.

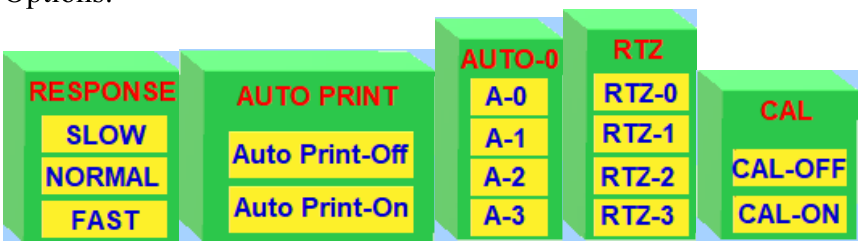

Return to Previous Menu.

BALANCE PARAMETERS.

Balance parameters like Response time, Auto Print, Auto-zero, RTZ, Calibration enable and calibration weights can be modified.



Options:



Menu	*Explanation*	*Factory settings*
RESPONSE TIME	ENABLES USER TO CHANGE MEASUREMENT RESPONSE	NORMAL
AUTO-PRINT	ENABLE/DISABLE AUTO PRINT OF TEST RESULTS	Auto Print-Off
AUTO-ZERO	AUTOMATIC ZERO TRACKING	A-1
R.T.Z.	RETURN TO ZERO TRACKING	RTZ-1
CALIB	EXTERNAL CALIBRATION	CAL-OFF

Press required menu, a pop up window will appear. Select the desired parameter.
.

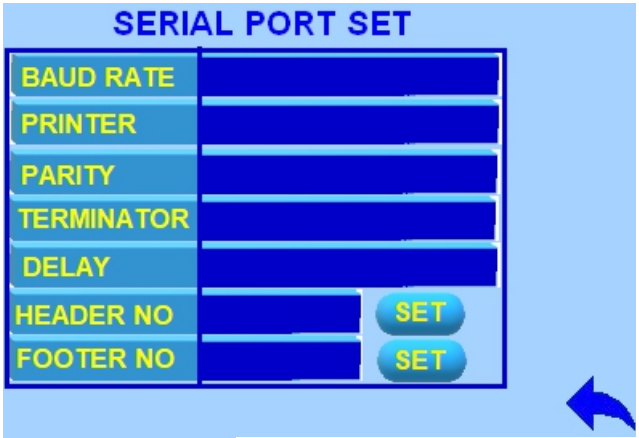
Select 

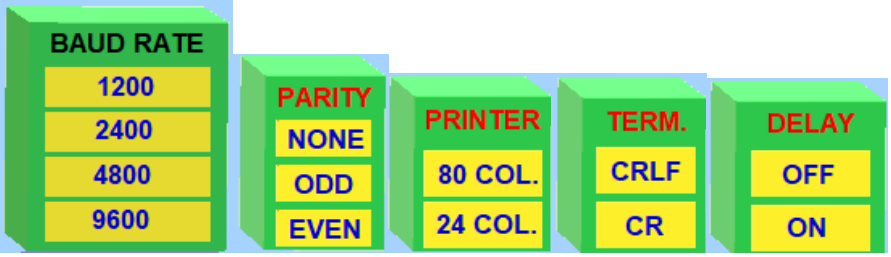
function select the weight for calibration. refer chapter on calibration for details.

 Return to Previous Menu.

SERIAL PORT SET

Serial port parameters like baud rate, parity, data terminator and print delay can be modified in this menu.





Menu	*Explaination*	*Factory settings*
BAUD RATE	COMMUNICATION SPEED	4800
PARITY	PARITY BIT	NONE
TERMINATOR	TERMINATOR STRING	CRLF
PRINTER	TYPE OF PRINTER	80 COL
PRN-DELAY	TIME DELAY IN DATA OUTPUT	OFF

Press required menu, a pop up window will appear. Select desired parameter.

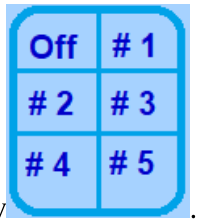
 Return to Previous Menu.

HEADER FOOTER SETTINGS:

Header and footer required to be printed along with test reports or weight, can be set. 5 different header and footer settings can be stored.

Header/footer #5 is used for drying test.

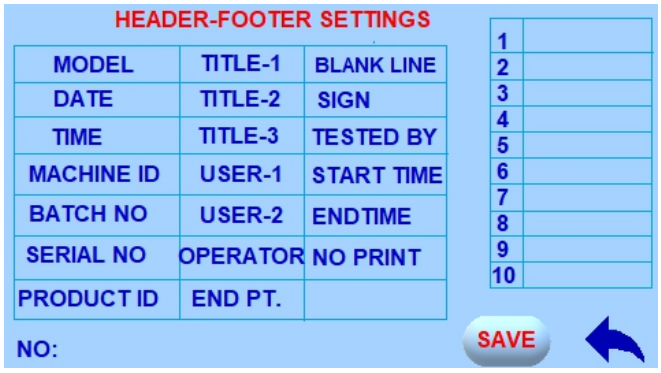
Select Header No/ Footer no.

Balance will display 

.

Select the required number. Press 

key, it will display



Select 10 parameters, which are needed for printing the report.

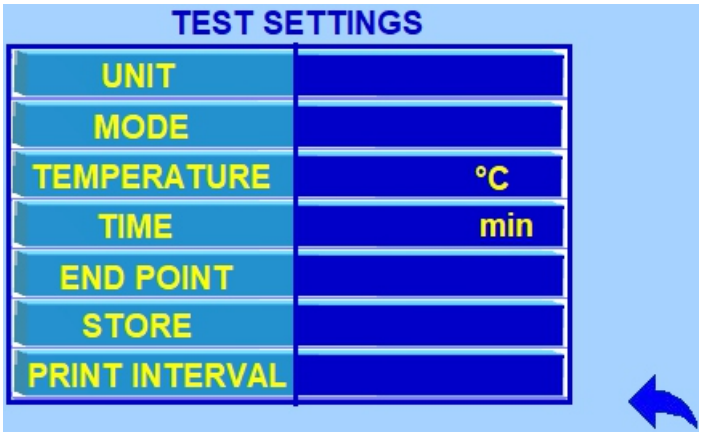
Press 

key to save.

Repeat the above for footer also.

TESTING PARAMETERS:

Use this menu to change test parameters like Measurement unit, Measurement Mode, Temperature, Test Time , End point, Auto Store, Print interval.



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UNIT	EXPLANATION	DISPLAY SYMBOL
% MOISTURE	WET WEIGHT – DRY WEIGHT X 100 / WET WEIGHT	%
% MOISTURE-DRY	WET WEIGHT – DRY WEIGHT X 100 / DRY WEIGHT	%d
DRY WEIGHT %	DRY WEIGHT X 100 / WET WEIGHT	dw %
WET WEIGHT %	WET WEIGHT X 100 / DRY WEIGHT	ww %
GRAMS	WEIGHT IN GRAMS	g

: _____

MANUAL - DRYING PROCESS IS STARTED AND STOPPED BY PRESSING A KEY

AUTO - DRYING PROCESS IS STOPPED IF PROGRAMMED MOISTURE LOSS/ MINUTE IS ACHIEVED

TIMER - DRYING PROCESS IS STOPPED AFTER PROGRAMMED TIME LIMIT REACHED.

[redacted]

End point settings determine the sample drying time. END POINT can be modified to change the accuracy of the result. If 0.01% / min is programmed , the drying process is continued till the moisture loss reaches 0.01% per minute. END POINT is applicable only in AUTO measurement mode.

9 settings from 0.01%/minute to 5%/minute are available in the moisture balance.

OPTIONS	END POINT CRITERIA
0.01%/min	MOISTURE LOSS IS 0.01%/MIN OR BELOW
0.02%/min	MOISTURE LOSS IS 0.02%/min OR BELOW
0.05%/min	MOISTURE LOSS IS 0.05%/min OR BELOW
0.1%/min	MOISTURE LOSS IS 0.1%/min OR BELOW
0.2%/min	MOISTURE LOSS IS 0.2%/min OR BELOW
0.5%/min	MOISTURE LOSS IS 0.5%/min OR BELOW
1.0%/min	MOISTURE LOSS IS 1.0%/min OR BELOW
2.0%/min	MOISTURE LOSS IS 2.0%/min OR BELOW
5.0%/min	MOISTURE LOSS IS 5.0%/min OR BELOW

[redacted]

Drying temperature can be changed from ambient to 200 deg C in 1 deg increment to suit various drying needs.

[redacted]

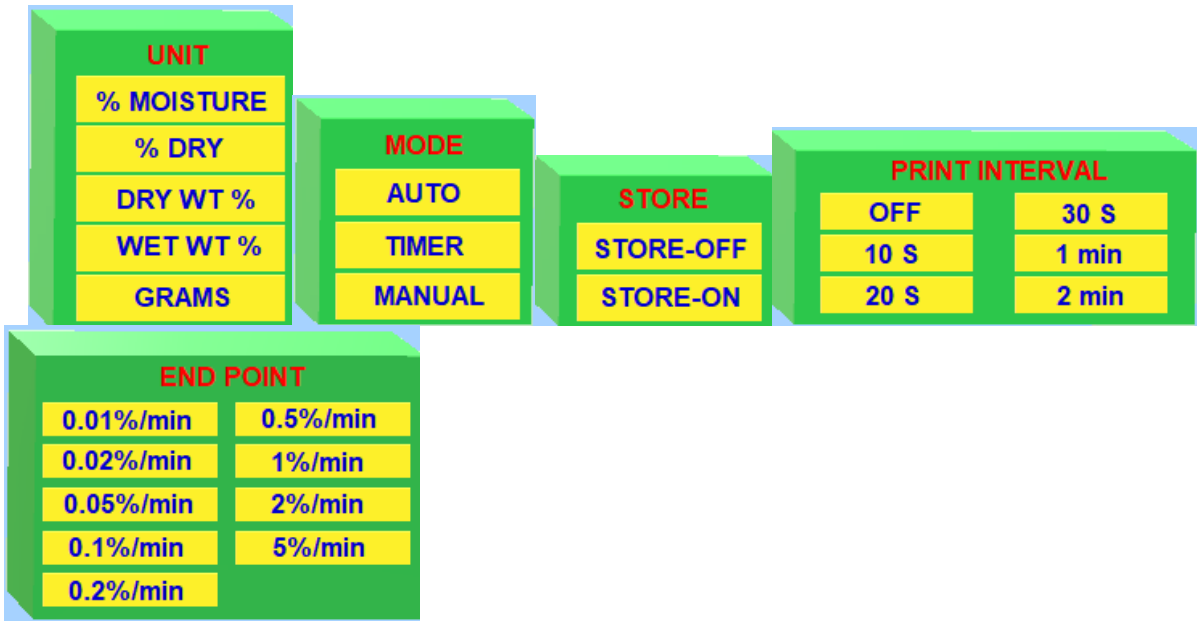
DRYING TIME can be changed from 3 minutes to 120 minutes to suit different applications. This can be changed only if TIMER mode is selected.

[redacted]

Enable Auto Store feature if the test results are required to be stored in memory automatically once the test is terminated normally.

PRINT INTERVAL can be selected among 10 Sec, 20 Sec, 30 Sec, 1 min, 2 min options, to select the interval for data output during drying process.

CHANGING SETTINGS.



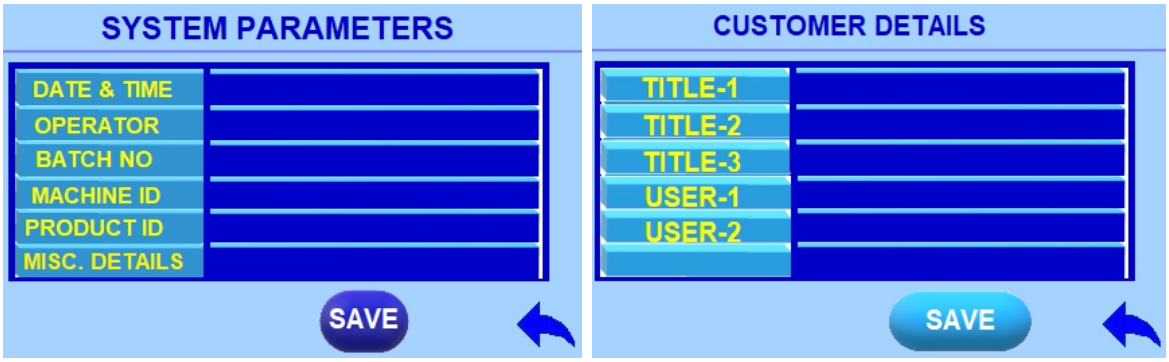
Press required menu, a pop up window will appear. Select desired parameter.

In case of temperature or time entries, a popup window with numeric keys will appear.

Key in desired value and press Enter.

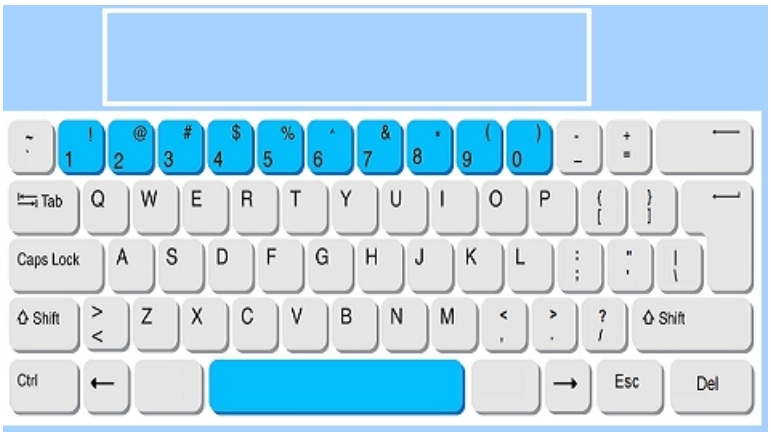
 Return to Previous Menu.

SYSTEM PARAMETERS ENTRY



Date, time, machine-id, operator name, batch number, product id and customer details entries can be accessed through this menu.

Press the required parameter, a popup featuring alpha numeric keyboard will appear on the screen.



Key in the parameter and press Enter key.

Before returning to previous menu, Press 

key to save all the parameters.

Press 

for changing customer details.

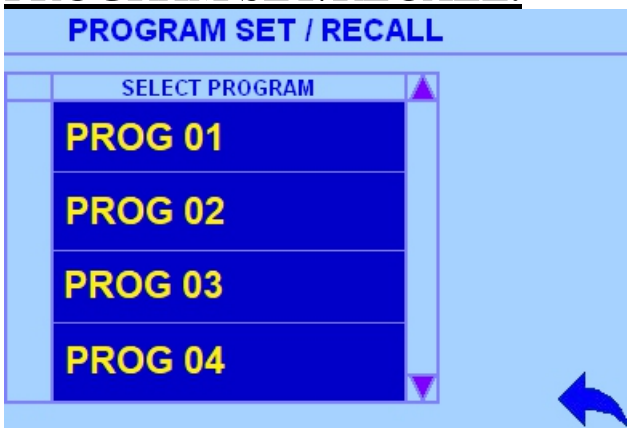
 **Return to Previous Menu.**

[illegible]

A popup window will appear. Enter Date and Time in YYYY-MM-DD HH-MM-SS format.

July 4, 2023 12:30:00 should be entered as (2023-07-04 12-30-00)

PROGRAM SET/RECALL.



Moisture balance has a provision for storing 10 drying methods (**PRG-1 to PRG-10**) in memory for easy recall. All the Testing Parameters i.e., Measurement unit, Measurement Mode, Temperature, Test Time, End point, Auto Store and Print interval can be modified and stored in individual memory for later use.

To modify a particular memory Use  or  to scroll through till PROG 10. Press required program key to select.

A Popup will appear as 

Press 

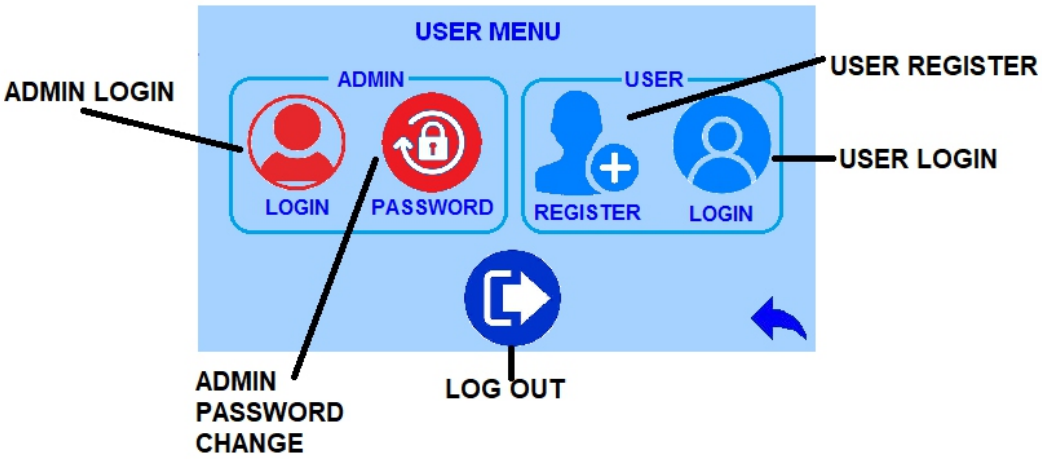
to select the method or Press 

to modify the testing parameters.

TO MODIFY A TEST METHOD FOLLOW INSTRUCTIONS MENTIONED UNDER SUB HEADING [illegible] EARLIER.

USER MENU

Select  from the main menu. User menu appears on the screen.

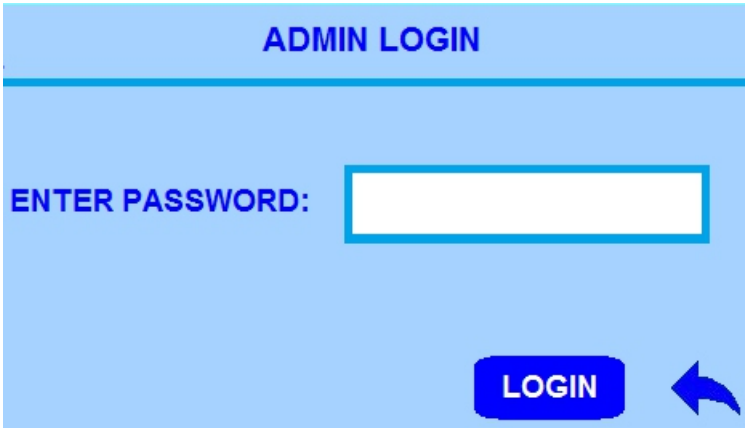


Press  Return to Previous Menu.

ADMIN LOGIN

Press 

key.



Alphanumeric keyboard will be displayed. Enter Admin password and press Enter.

Press login key to login as Admin.

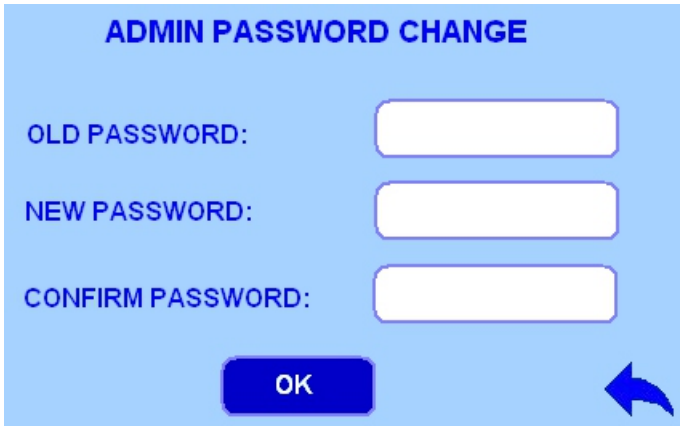
Word “Admin” will be displayed at the right top corner of the User Menu.

CHANGE ADMIN PASSWORD

Existing password will be required to change the Admin password. New password should be atleast 6 characters.

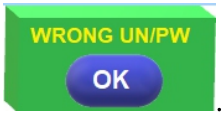
Press 

key. Balance will display,



Using alphanumeric keyboard enter all the 3 details. Press 

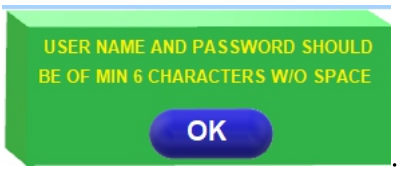
key.

If old password is not matching, it will display 

. Press OK and reenter the data.

If New password and confirm password are not same, it will display 

.

If New password is less than 6 characters, it will display 

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New password will be saved, if the all the above are satisfied.

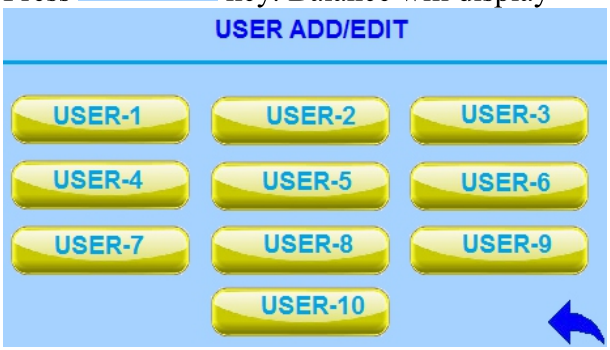
USER REGISTER

Up to 10 users can be registered, with username and password.

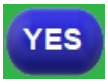
ONLY ADMIN CAN REGISTER/EDIT USERS.

Press 

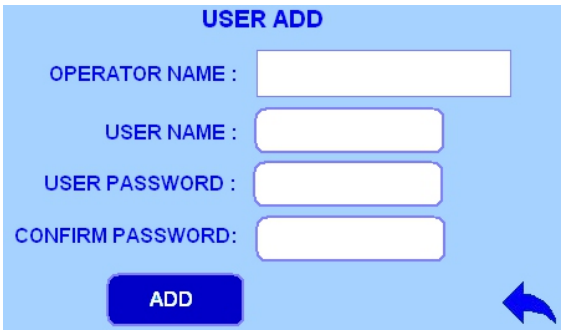
key. Balance will display



Select the user to be registered or modified and confirm the action. It displays,

If 

is pressed, Balance will display



Enter Operator name(Upto max 15 characters) , User name(Max upto 10 char), and passwords(min 6 char).

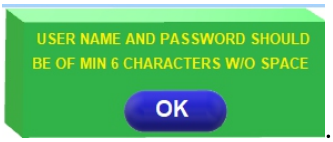
Press 

key.

If New password and confirm password are not same, it will display 

.

If New password, user name or Name are less than 6 characters, it will display



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Else, new user details will be saved.

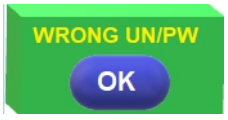
USER LOGIN

Press 

key from the User Menu. Balance will enter user login menu.

Enter user name and password using the alpha numeric keyboard and Press 

key.

If either user name or password is incorrect, it will display 

If user name and password match, user name will be displayed at the right top corner of the User Menu.

OPERATION OF MOISTURE BALANCE.

Set the test parameters as per the requirement.

Select **MODE, UNIT, TEMPERATURE, TIMER/END PT., PRINT INTERVAL, MEMORY STORE STAUS, AUTO PRINT** to suit a particular drying test.

Though moisture balance can be used with sample weight of 0.005g and above, it is always recommended to use sample of sufficient weight (at least 2g) for better accuracy and repeatability of test results. If an accuracy of 0.5% is needed, use at least 5g sample and for 0.1% accuracy use at least 15-20g. Samples with lower weight may result in lesser accuracy and repeatability.

Spread the sample evenly on the pan to make sample heating uniform and also to get better results.

Do not use a sample that could make a dangerous chemical reaction and cause an explosion or poisonous gas, when the sample is dried.

Do not use samples which contain volatile substances, as it will result in incorrect results.

Do not allow testing samples to absorb moisture from the atmosphere. If required maintain samples at constant temperature.

When testing samples repeatedly, user must ensure to put samples on a sample pan, which is at room temperature. Placing samples on a hot sample pan may give wrong results, as some moisture may be lost even before the test is begun. In such cases, it is recommended to use multiple pans.

While doing multiple testing, it is recommended to wait till the temperature of the heating chamber is cooled down to room temperature for better accuracy.

Ensure to avoid external disturbances like air conditioners or any vibration producing equipments from affecting the weighing results. Unstable weighing will result in inaccurate test results.

KEEP SAMPLE PAN ON THE PAN HOLDER.

PRESS  KEY TO MAKE WEIGHT READING ZERO.

PUT SAMPLE ON THE PAN.

CLOSE THE HEATING CHAMBER.

PRESS 

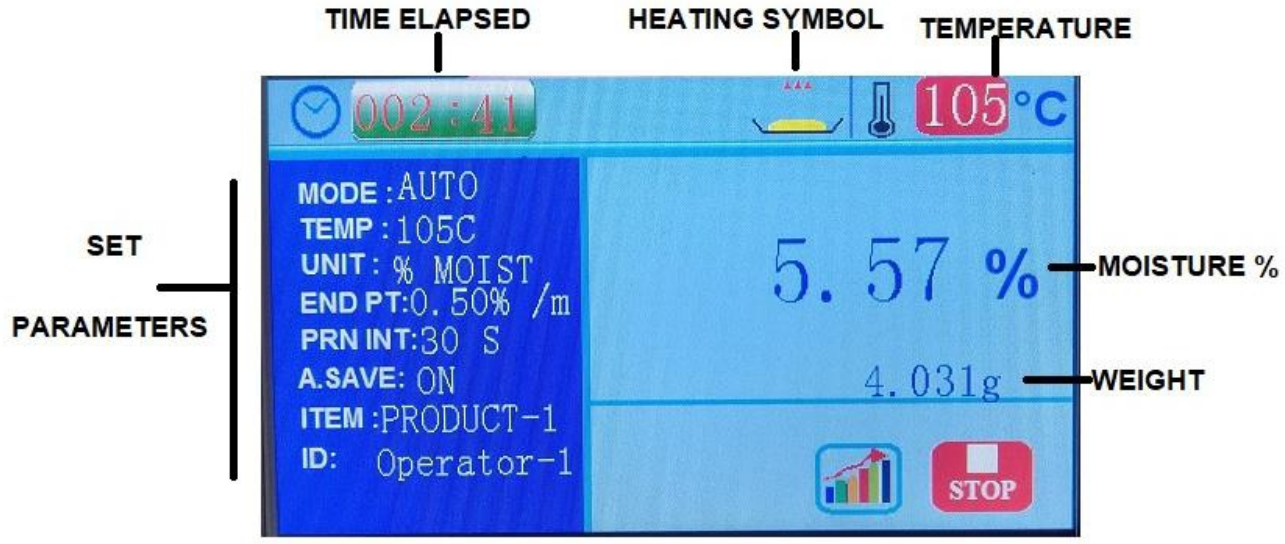
KEY. A popup message will appear

Press  to start the test.

If chamber is not closed properly, 

will display. Close the lid and start once again.

HALOGEN HEATER IS TURNED ON AND THE DRYING TEST IS COMMENCED.



Balance will continuously display % moisture (or whichever unit is selected) along with current temperature and elapsed time (or remaining time in TIMER mode) along with other set parameters.

Heater will quickly reach the set temperature and will remain at the set temperature till the test is terminated.

Press  to view the graph

Test will continue till the END POINT CRITERION is met,

IN AUTO MODE : % MOISTURE LOSS/min IS REACHED

IN TIMER MODE : SET TIME IS REACHED

IN MANUAL MODE : PRESS 

key.

Balance will output data through the serial port at the Print interval set. It will output Time, Weight and % moisture.

IN ANY CASE, A DRYING TEST CAN BE TERMINATED BY PRESSING

KEY, IRRESPECTIVE OF THE SET MODE/UNIT.

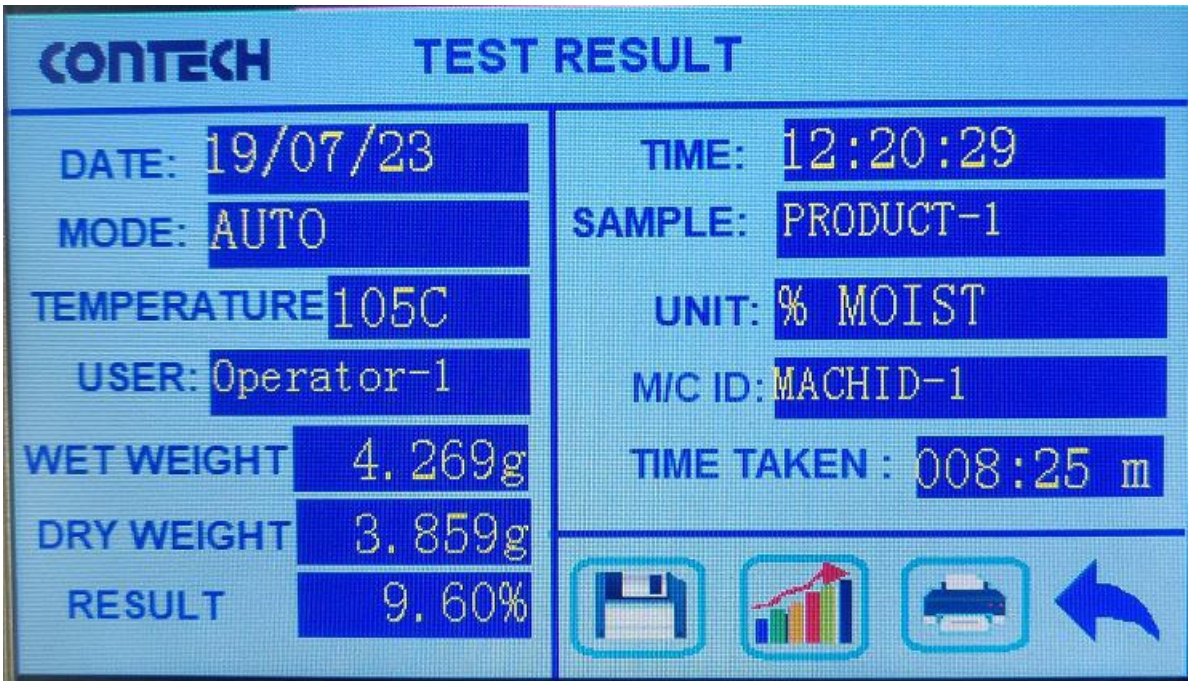
Sample Printout appears as below.

EL.TIME min.	WEIGHT g	MOISTURE %
00:00	2.739 g	0.00 %M
00:10	2.742 g	0.00 %M

00:20	2.718 g	0.76 %M
00:30	2.681 g	2.11 %M
00:40	2.682 g	2.08 %M
00:50	2.655 g	3.06 %M
01:00	2.655 g	3.06 %M
01:10	2.655 g	3.06 %M
01:20	2.656 g	3.03 %M
01:30	2.653 g	3.13 %M
01:40	2.649 g	3.28 %M
01:50	2.646 g	3.32 %M
02:00	2.646 g	3.32 %M
02:10	2.648 g	3.32 %M
02:20	2.648 g	3.32 %M
02:30	2.648 g	3.32 %M

Once a drying test is ended, results are output through the serial port, if auto print option is set. HEATER IS TURNED OFF.

Balance displays the results.



RESULTS ARE STORED IN MEMORY AUTOMATICALLY, IF STORE FUNCTION IS ENABLED AND WILL DISPLAY 

IF AUTO SAVE IS NOT ENABLED, RESULTS CAN ALSO BE STORED BY PRESSING

 KEY AFTER THE RESULTS ARE DISPLAYED

PRESS  KEY TO VIEW THE GRAPH.

TO PRINT RESULTS, PRESS  key.

The following is the basic print format. Print Header and footer can be set to print them along with the result.

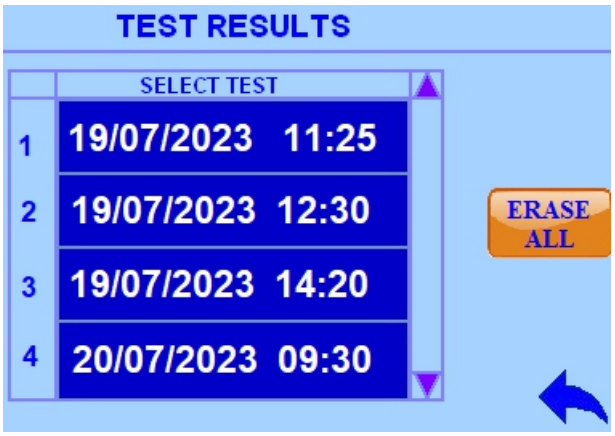
TEST DATE : 19/07/23
TEST TIME : 12:20:29
TEST MODE : AUTO
TEST UNIT : % MOIST
TEMPERATURE : 105 DEG C
INITIAL WT. : 4.269 g
FINAL WT. : 3.859 g
TOTAL TIME : 08:25min
FINAL RESULT: 9.60 %M

 **Return to Previous Menu.**

DATA RECALL.

This option enables the user to retrieve test results stored in memory.

Select  function from the Main Menu.

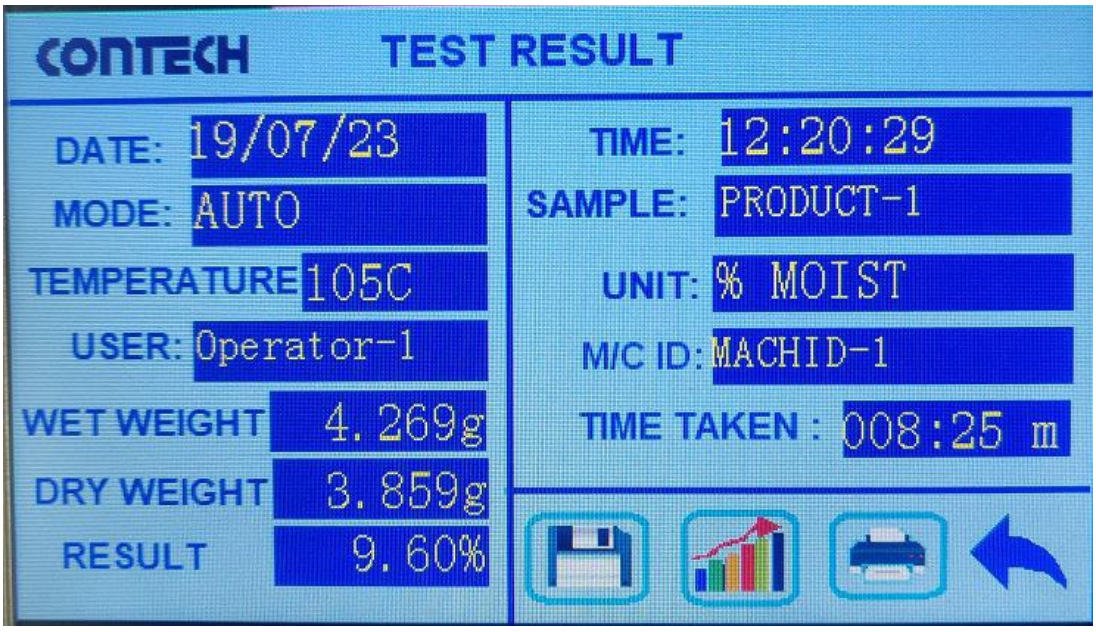


To clear the memory press 

. Only admin can erase the memory.

Or  Return to Previous Menu.

Use  or  to scroll through till the last test. Press required test to view.



Press  key to view the graph.

To print results, press  key.

Press  Return to Previous Menu.

BIDIRECTIONAL RS-232 INTERFACE.

Bi-directional RS-232 interface is provided in these balances to communicate with devices like computer, printer etc. The interface is provided through a nine pin D-type connector provided at the rear side of the balance. Connections are as below.

Pin 2 – RXD – Receive Data
Pin 3 - TXD – Transmit Data
Pin 7 – Ground.

The Serial data transmitted and received are in standard ASCII mode (+/- 12V) - ASYNCHRONOUS , 8 BITS, NO PARITY, 1 STOP BIT.

Baud rate: selectable from 1200 to 9600.

A Stable weight data is output as follows:

S	+	w	w	w	w	w	.	w	w	w		g		CR	LF

S – stable Data
blank space - 20 hex
CR- Carriage Return – 0D hex
LF – Line feed - 0A hex

An unstable weight data is output as follows:

U	+	w	w	w	w	w	.	w	w	w		g		CR	LF

U – stable Data
blank space - 20 hex (32 DEC)
CR- Carriage Return – 0D hex (13 DEC)
LF – Line feed - 0A hex (10 DEC)

Current Temperature is output in the following format:

t	t	t	C	CR	LF

t t t = CURRENT TEMPERATURE

C = Unit(Centigrade)
CR- Carriage Return – 0D hex (13 DEC)
LF – Line feed - 0A hex (10 DEC)

Moisture %, during drying process, is sent as per the following format:

m	m	m	m	.	m	m	%	CR	LF

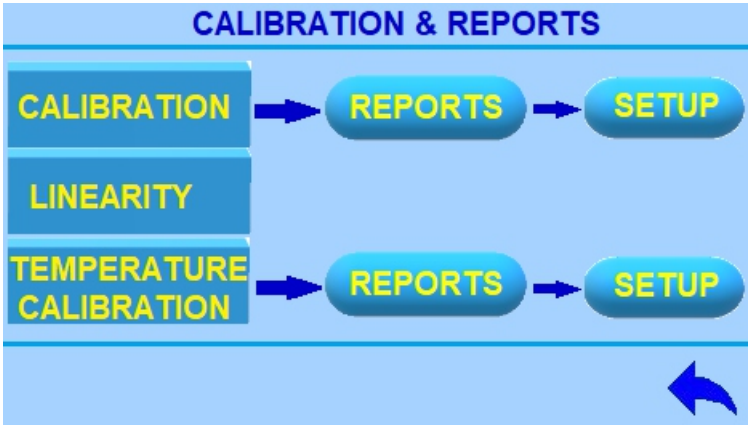
mmmm.mm% = CURRENT MOISTURE %
CR- Carriage Return – 0D hex (13 DEC)
LF – Line feed - 0A hex (10 DEC)

During drying process, request for complete data could be sent to the balance.

CALIBRATION WITH EXTERNAL WEIGHTS

CAL-Series balances can be calibrated for weight with standard mass. Balances can be calibrated with 50g, 100g weights depending on the models.

Press  key. Balance displays

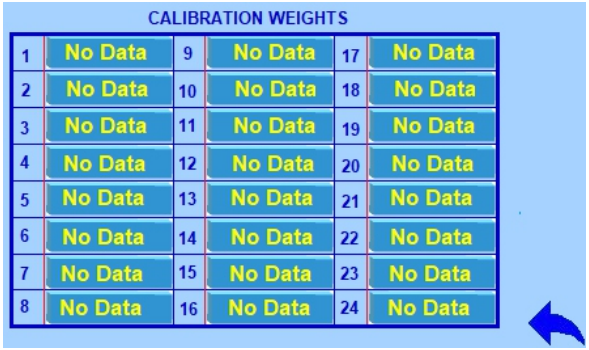


CALIBRATION :

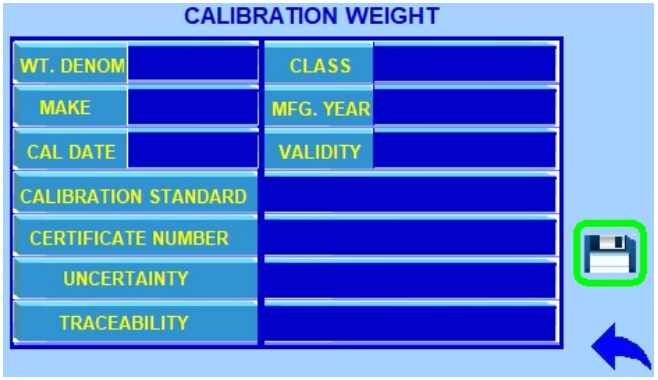
CALIBRATION WEIGHT DETAILS:

Details of the weights used for calibration are required to be filled in, before attempting calibration of balance.

Select  from the BALANCE PARAMETER menu., Balance will display,

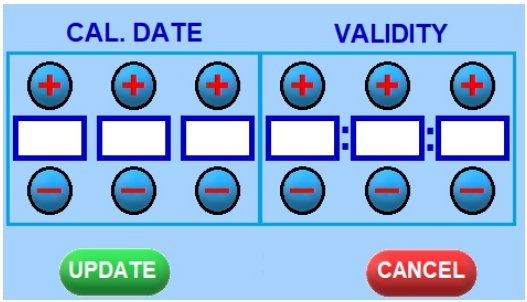


Select item 1., Balance will display



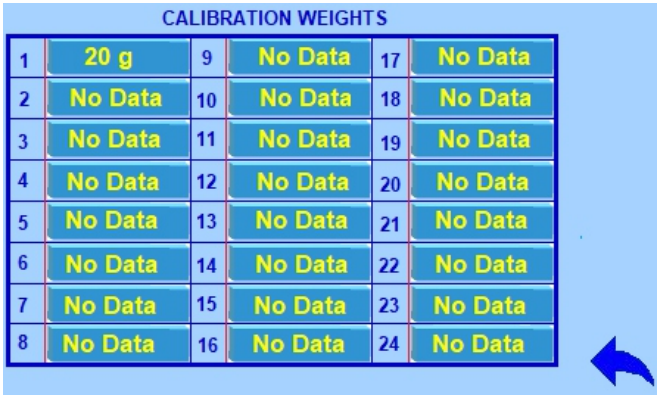
Options for weight denominations and class are

CAL DATE AND VALIDITY ENTRY:



Enter all other details using the alpha numeric keyboard and press Enter.

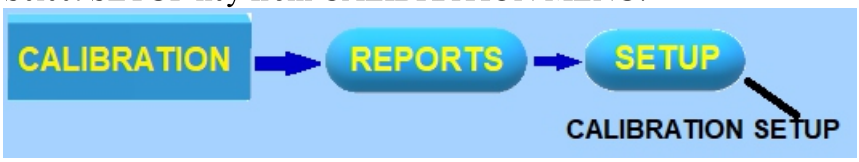
Press  to save 1st weight, say 20g, It will display



Similarly enter details of other weights used for calibration.

CALIBRATION REPORT SETTINGS:

Select SETUP key from CALIBRATION MENU.



Balance will display 

Select header, it will display

Select 10 parameters, which are needed for printing the report.

Press 

key to save.

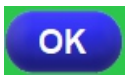
Repeat the above for footer also.

CALIBRATION:

Press 

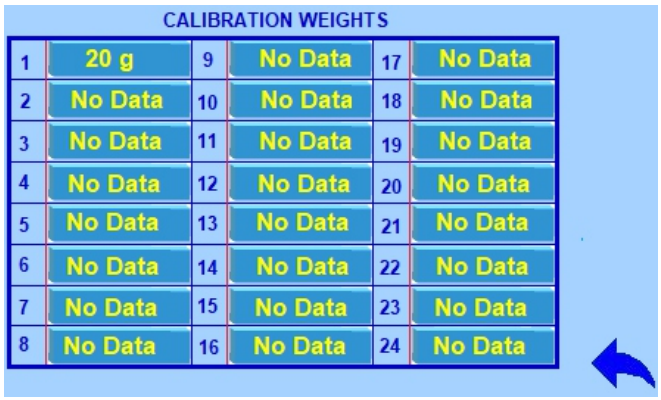
key, balance will display,

If the present weight not 0.000, then it will display 

Press 

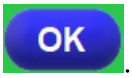
key, make the weight zero and repeat the calibration process.

If the weight is zero, balance will prompt for selection of calibration weight.



Select the weight used for calibration.

Balance will display 

Keep the weight and Press 

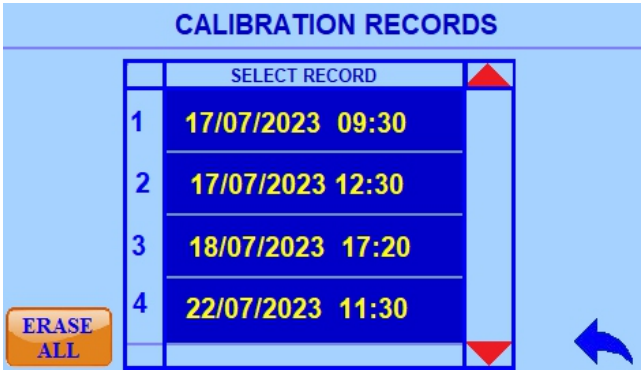
. Balance will start calibration and will display the calibrated weight and display the same.

The calibration details will be stored in memory. Up to 50 calibration results can be stored in memory.

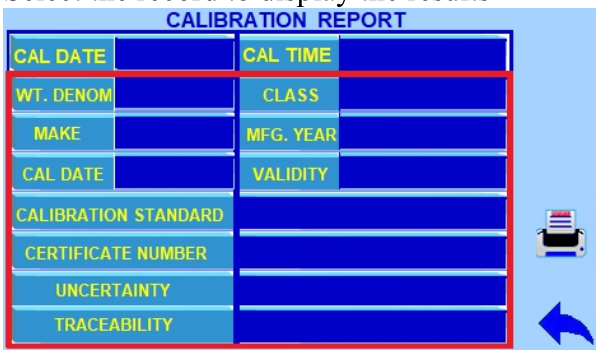
CALIBRATION REPORTS:

Select REPORTS from the calibration menu.

Balance will display,



or key to scroll up and down the results.
Select the record to display the results



Press  to print the results.

A sample calibration report will be as per below.

Calibration Report
CONTECH
Cal.Date: 17/07/23
Cal.Time : 09:30
Wt.Make:CONTECH
Mfg.Year: 2022
Wt.cal.date:12.05.22
Wt.Validity:11.05.23
Wt.class : F1 class
Calibrated with std. wt
Mass : 50g

Operator: abc
Tested by:

Signatue:

50 calibration records can be stored.

Deletion of records:

Only Admin can delete the records.

To delete the records, Press 

key from calibration records menu.

Balance will prompt for confirmation, 

.

Press 

to delete data or press 

to cancel.

TEMPERATURE CALIBRATION

Temperature calibration should be performed by a qualified engineer only.

Instrument is tested at 2 different temperature and calibration values are calculated accordingly.

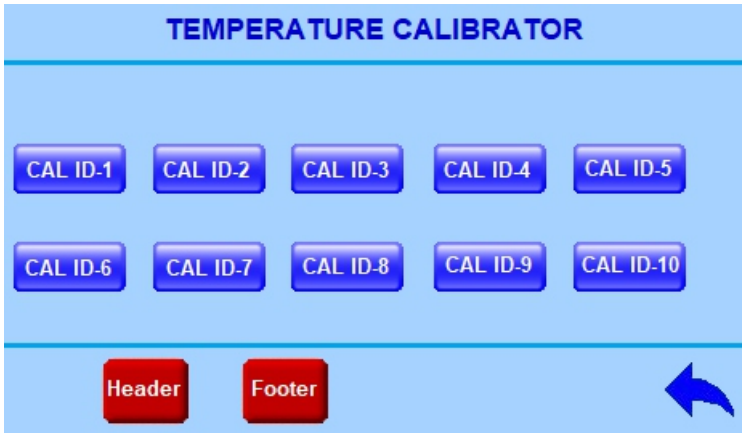
Temperature calibration can be done in admin mode only.

SETUP TEMEPRATURE CALIBRATOR

Temperature calibration is done by comparing the temperature values of the balance with that of a calibrated temperature calibrator.

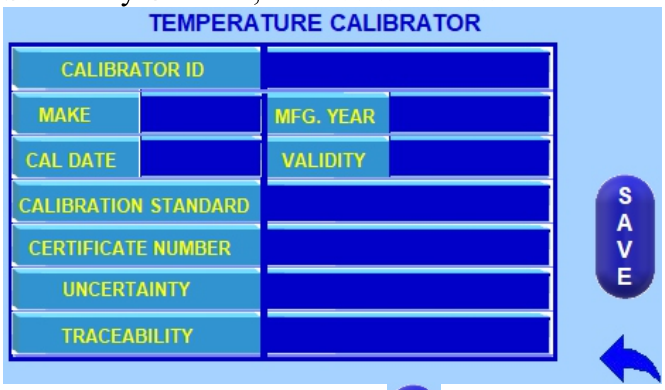
10 Temperature calibrator details can be stored in the balance.

Press SETUP key from temperature calibration menu.



10 calibration IDs, header and footer details can be set.

Select any CAL-ID, balance will show



Enter all the details and press 

key to save the details.

Select 

or 

key for setting up header and footer details.

Select header, it will display

Select 10 parameters, which are needed for printing the report.

Press 

key to save.

Repeat the above for footer also.

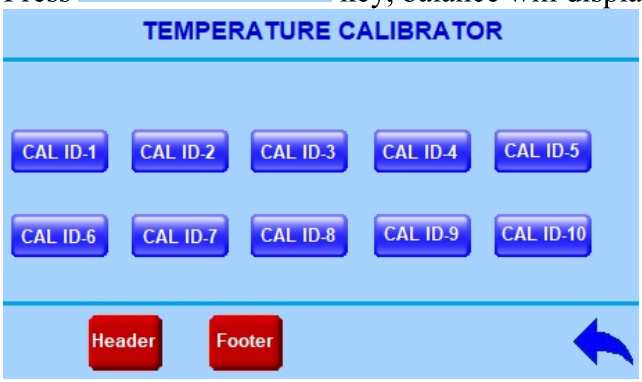
TEMPERATURE CALIBRATION

Temperature calibration is performed at 2 different temperatures, say room temperature and 100°c.

Set test temperature to 100 (Refer TESTING PARAMETERS section).

Press 

key, balance will display,

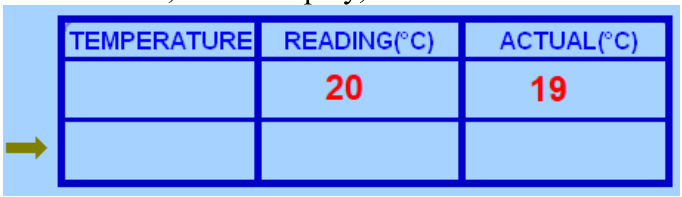


Select the calibrator, it will further display,

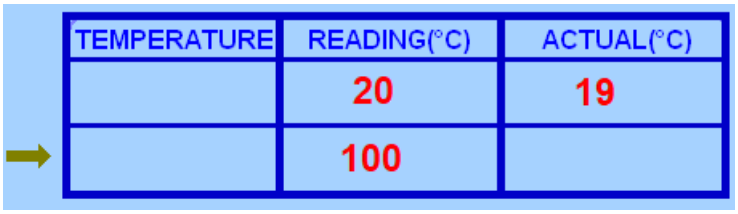
Enter Actual temperature(display on the calibrator) against the reading on the right column.

Say,19.

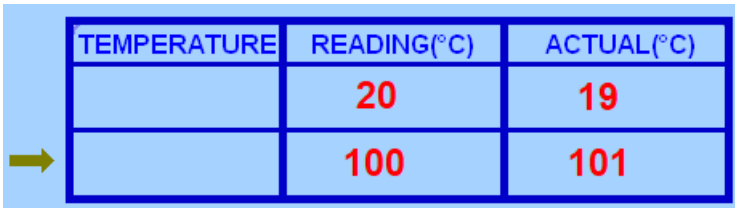
Press  , it will display,



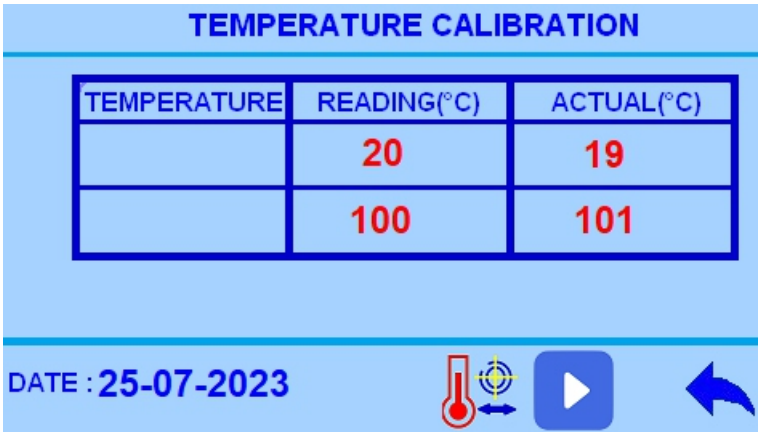
Balance heater will become on and starts heating the chamber, it will stabilize at the set temperature.



Enter actual temperature against this on the right side column, say 101



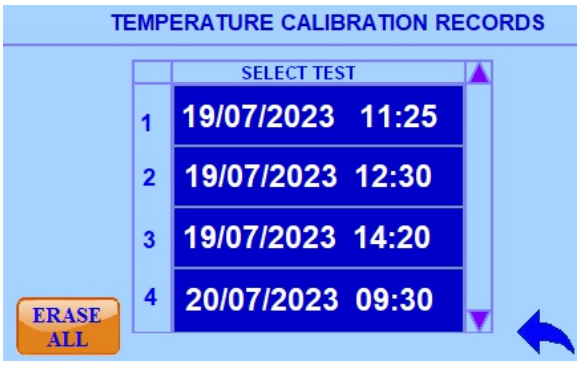
Press  , Heater will be switched off and it will display,



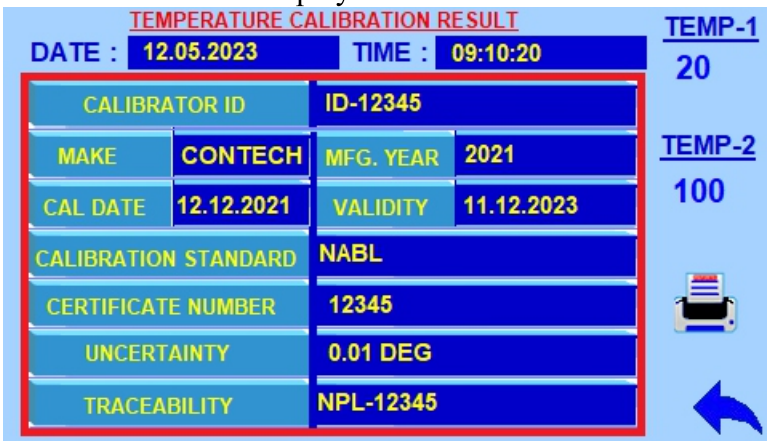
Press  key. Balance will perform temperature calibration and results are stored in memory.

TEMPERATURE CALIBRATION RESULTS

Press REPORTS key, balance will display



or key to scroll up and down the results.
Select the record to display the results



Press to print the calibration results.
A sample print out is shown below.

Temp. Calib. Report
CONTECH
Cal.Date:12.05.23
Cal.Time:09:10:20

Calibrated with std
Calib.id:ID-12345
Temp.1 : 20 DEG C
Temp.2 : 100 DEG C

25 calibration records can be stored.

Only Admin can delete the records.

To delete the records, Press ERASE ALL key from calibration records menu.

Balance will prompt for confirmation, 

.

Press 

to delete data or press 

to cancel.

SPECIFICATIONS:

TO BE ADDED