User Manual

FREEZE DRYER
LIOSMART 100

January, 2020

WARRANTY

Cinquepascal S.r.l guaranties that the product delivered has been thoroughly tested to ensure that it meets its published specifications. The warranty is valid only if the product has been installed and used in accordance to the instructions supplied.

Cinquepascal S.r.l shall in no event be liable for incidental or consequential damages, including without limitations, lost profits, loss of income, loss of business opportunities, loss of use, and other related exposures, caused by incorrect use of product.

Warranty is valid for **13 months** from date of shipping and includes spare parts and labor.

Type:	LIOSMART 100

Serial number:	19116384

Date of shipping:	

Signature/Stamp:	

Manufacturer:
Cinquepascal S.r.l
Via Carpaccio, 35
Trezzano Sul Naviglio
20090 (MI) Italia
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Thank you for your trust and for buying this device. We hope it will successfully serve the purpose for many years.

CAREFULLY READ THESE INSTRUCTIONS BEFORE USING THE DEVICE!

CONTENT

1.0 WARNINGS AND SAFETY PRECAUTIONS

READ ALL INSTRUCTIONS BEFORE USE!

Reduce the possibility of injury and failure!

WARNING
Before you perform any kind of maintenance, disconnect all electrical power to the unit! DO NOT operate this unite without a properly grounded, properly polarized power cord! DO NOT connect this unite to a non-polarized outlet!

DANGER

Appliance must not be installed in a room where the possibility of explosive atmosphere is present!

DANGER OF BREAK DOWN

Service is only allowed to authorized personnel!

WARNING
Never use with toxic, corrosive, flammable or organic materials unless special precautions are in place to prevent injury to personnel or damage to equipment!

WARNING

Never operate the appliance with the housing removed!

DANGER OF BREAK DOWN
Close the door tightly before start! Do not try to open the door during the cycle!

DANGER OF BURNS

Use safety gloves when operating with high / low temperatures!

2.0 INTRODUCTIONS

Appliance description

Controller

This unit is equipped with microprocessor controller which is specially designed for automatization of freeze drying cycles. Controller enables 50 different programs. Each of these 50 programs has ability to set 50 different cycle steps.
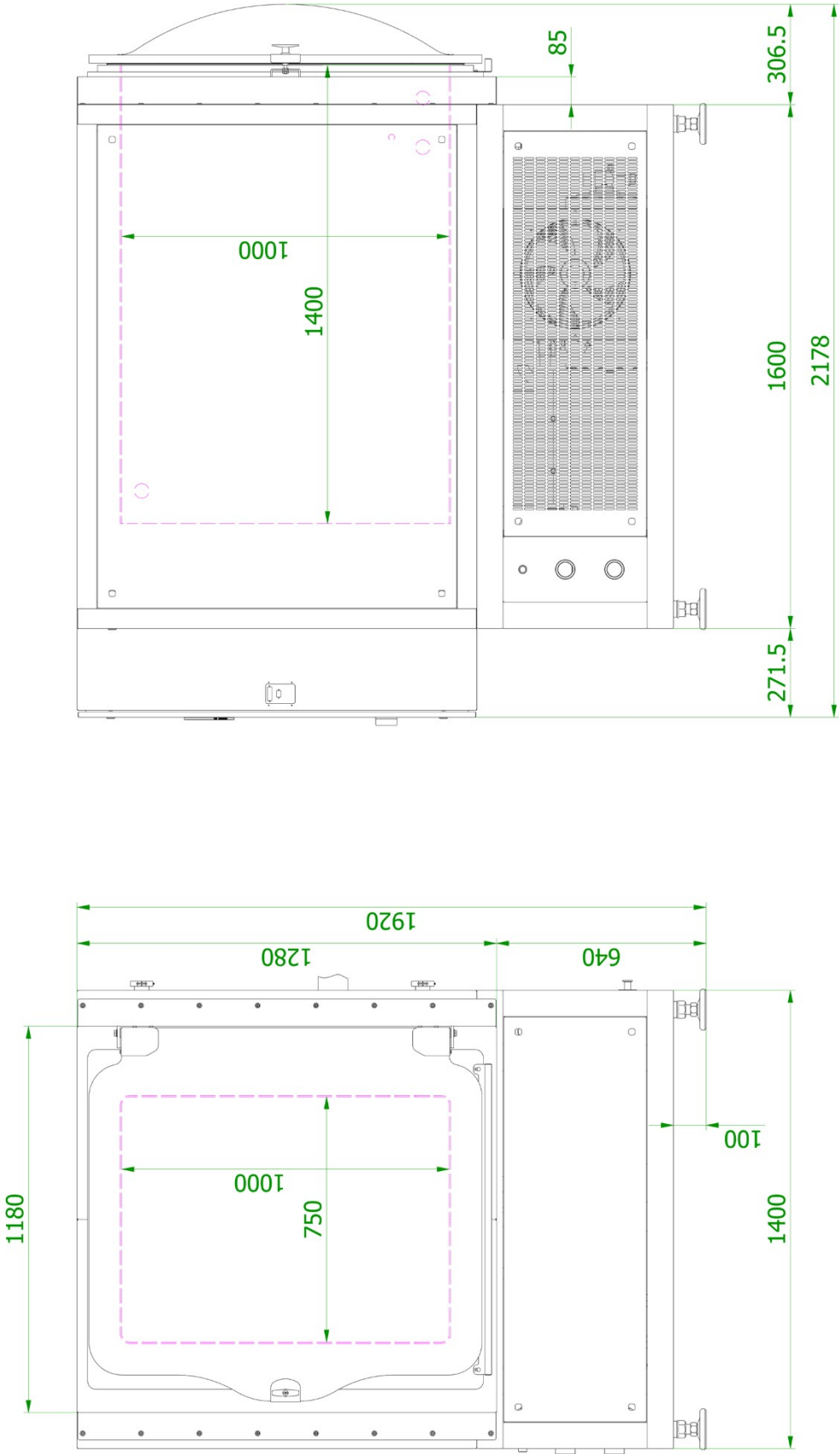
Calibration, validation
The basic calibration is performed by the manufacturer. If ordered the calibration report is delivered with the unit. Calibration, validation can also be done by the user because the appliance has a special sub-program that allows easy settings and adjustments for temperature probes without mechanical intervention on the device.
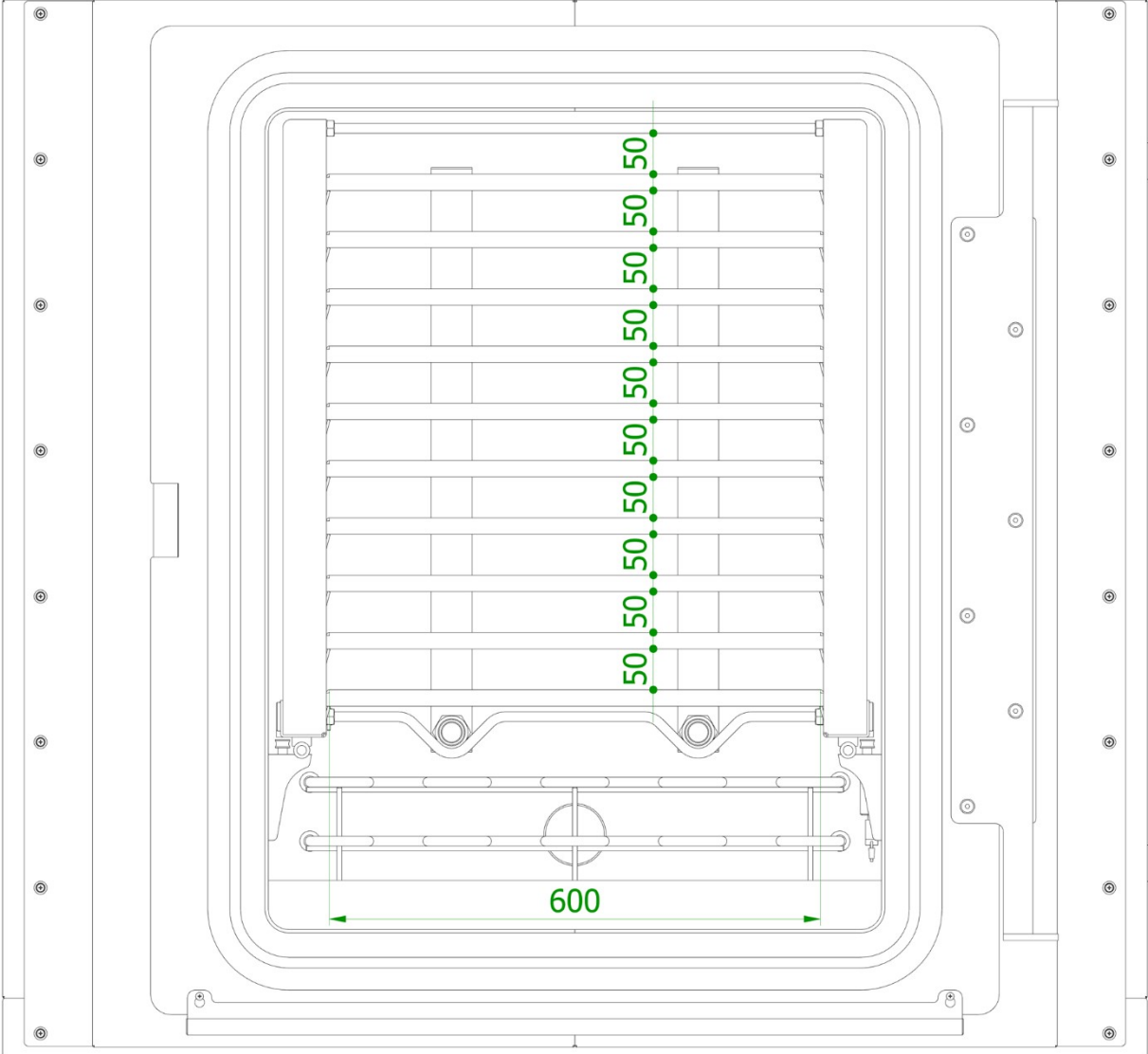
3.0 TECHNICAL DATA

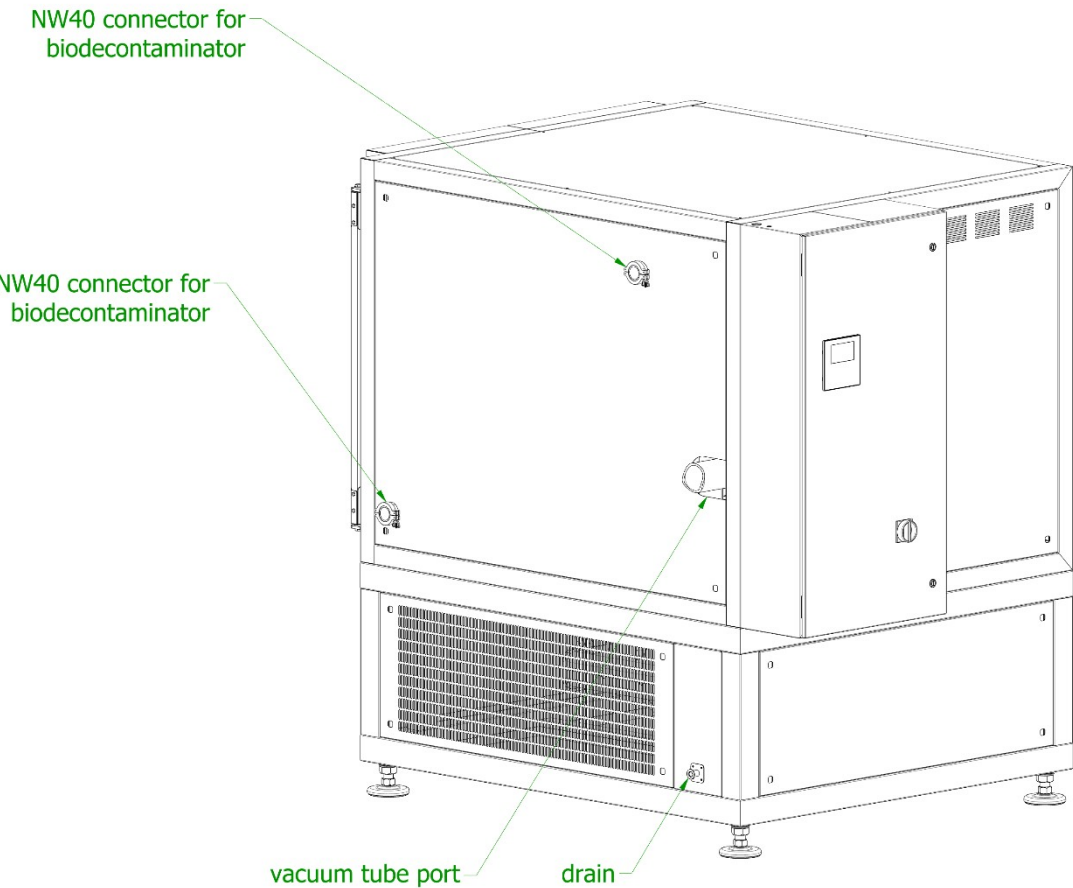|	LIOSMART 100
Exterior dimensions (W x D x H)	1400 X 2178 x 1920 mm
Chamber dimensions (W x D x H)	750 x 1400 x 1000 mm
Ice condenser capacity	100 kg
Condenser	In chamber
Ice condenser temperature	-50°C
Ice condenser defrost	Reversible refrigeration system
Number of shelves	10
Shelve size	1240 x 600 mm
Shelve surface	$10 \times 0.74m^2 = 7.4$ m2
Shelve spacing	50 mm
Shelve Temperature range	- 40 ...+ 70 °C
Temperature stability	±0,1 °C
Cooling	Water cooled compressor system – condenser Water cooled compressor system - shelves
Heating	electrical
Doors	Fully transparent single-handed closing
Power supply	3x400 V 50 Hz 57A (24 kW)
Communication	RS-232 / USB
Temperature probe	PT-100 – shelve temperature PT-100 – condenser temperature PT-100 Material
Vacuum probe	1 x Pirani vacuum on pump 1 x Pirani vacuum chamber
Vacuum pump	Edwards EDS 200
Compressed air	min 4 bar Dry and oil free Consumption negligible
Condenser drain	Drain function to be manually activated on the controller (Available only when program is Stopped)
Water supply	Cooling water - min 2 bar - max temperature 25°C
Trolley	1 for shelves removal at maintenance
Tray	20 trays 600x600x30 mm

Dimensional drawing:

Dimensional drawing - shelves view:

Connections:

power supply chord

compressed air supply

touch display and
keyboard

communication ports
RS232 and LPT

main switch

connections for vacuum pump

cooling water out

cooling water in

NW40 connector for
biodecontaminator

NW40 connector for
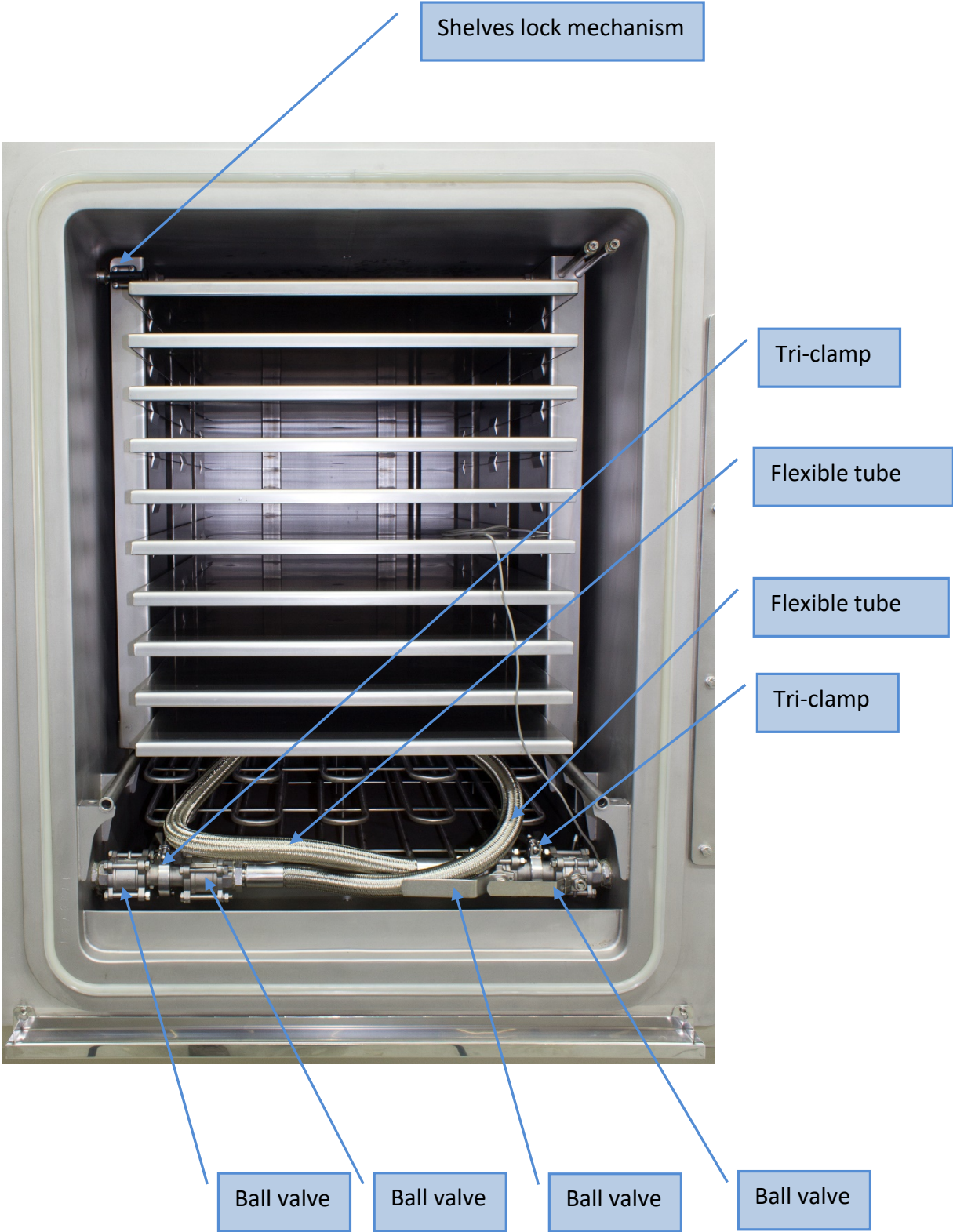biodecontaminator

vacuum tube port

drain
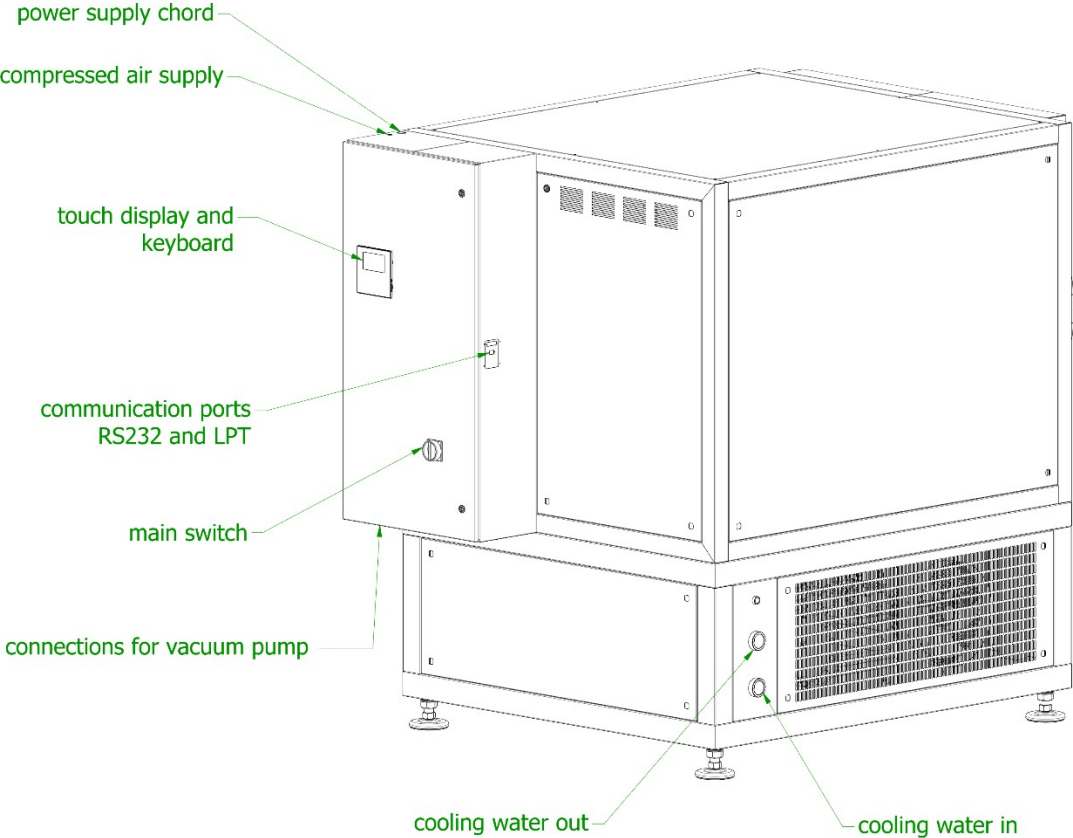
Shelves removal at maintenance:

1. **Switch off device**
2. **Remove trays (use rod for tray removal)**
3. **Close all 4 ball valves at shelves connections**
4. **Disconnect flexible tubes (tri-clamp TC 50.5 connections)**
5. **Connect trolley to chamber (use two trolley safety bolts)**
6. **Deblock shelves**
7. **Carefully move shelves on trolley**
8. **Secure shelves with two shelve safety bolts**
9. **Disconnect trolley (remove two trolley safety bolts)**
10. **Carefully move trolley with shelves from chamber**

Rod for tray removal

Tray

Shelves lock mechanism

Tri-clamp

Flexible tube

Flexible tube

Tri-clamp

Ball valve

Ball valve

Ball valve

Ball valve

Trolley safety bolt

Shelves safety bolt

Trolley

4.0 USE PURPOSE AND SAFETY ELEMENTS

This freeze dryer is designed and build for many pilot and research or even small production purposes.

Given the wide scope of specification, appliance is useful in many areas as, pharmacy, food industry, biotechnology, …

It is not allowed to heat-up any material which could form explosive atmosphere.

Do not store any fluids on top of the housing!

The appliance may only be used in rooms where the possibility of explosive atmosphere is not present!

Operating the unite with open doors can cause different errors or even break down.

Microprocessor controller has a special safety system which turns heaters off if temperature rises for more than 5 °C above set temperature.

In case of an error on this system, a mechanical over temperature shut-off will disable heating. If this happens the cause must be found and the over temperature shut-off must be manually reset. The over temperature shut-off device is located behind the rear plate of the housing and is manually reset by pressing the spring next to the thermostat setting shaft.

The appliance may only be used by trained personnel with enough practical experience regarding heating, cooling and conditioning.

Each user is responsible for correct and safe use.

The device does not cause noise greater than 75 dB (excluding vacuum pump).

When indicating error, press "START/STOP" and switch the main switch in the off position immediately. Contact service

5.0 INSTRUCTION FOR USE

ATTENTION:

Safety gloves use is a must when working with high/low temperatures!

Transport is usually carried in the original packaging. In case that the appliance has to be replaced, it must be manually placed on a transport palette and only then lifted and transported with a vehicle. Installation must be done in a dry, well ventilated room. Be sure that the chamber seal is always clean and in superb condition!

Maintain top level condition of the vacuum pump.

5.1 Vacuum pump

Vacuum pump is one of the most important parts of every freeze dryer. Follow the original manufacturer user and maintenance plan for vacuum pump.

5.2 Control panel
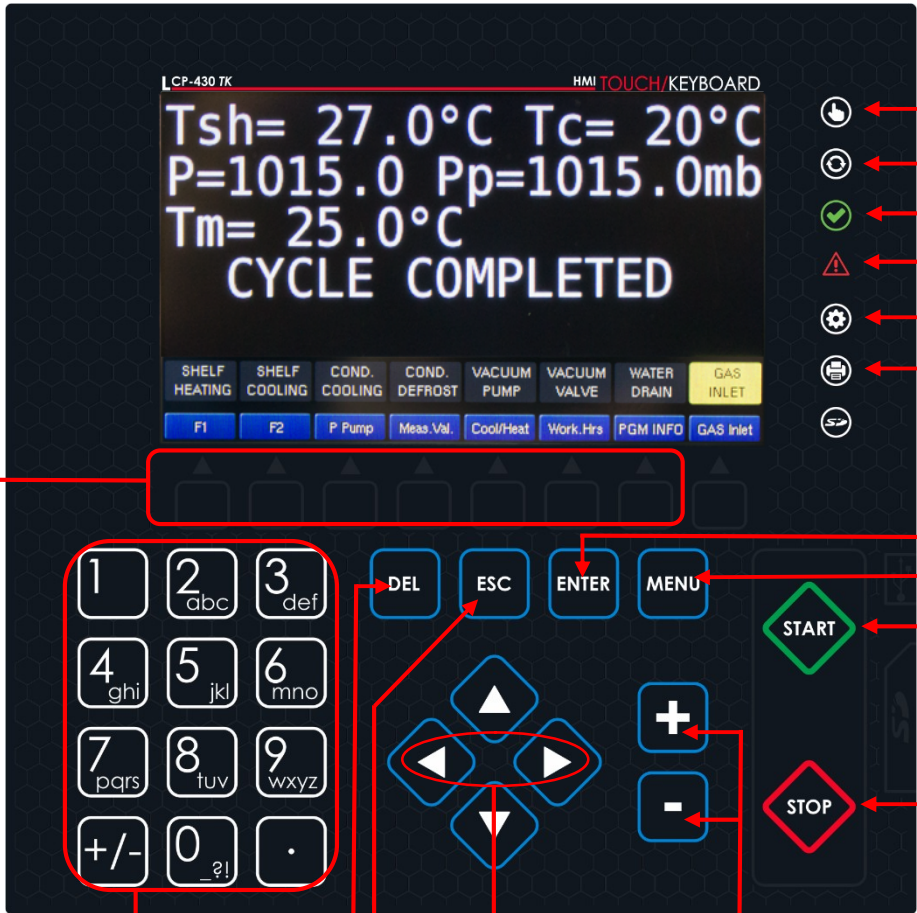
Manual cycle

Automatic cycle

Cycle ended

Error
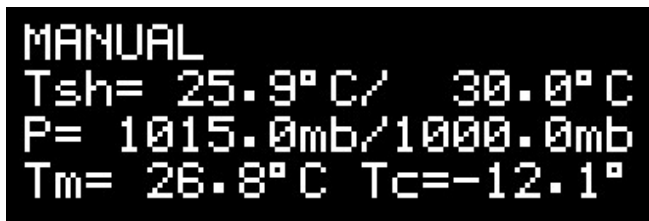
Settings ON

Printer ON (Printer error if light flashes)

Confirmation

Main menu

Start program

Stop program

Value increase/decrease

Nun pad

Clear

Exit form menu

Parameter selection

- F1 *program copy* confirmation button
- F2
- P Pump
- Measured value
- Cooling / Heating
- Working hours
- Program INFO
- Gas inlet – Vacuum break

* An operation is currently running if a function on the screen is colored in yellow.
- *Example: Gas inlet is ON*

SHELF HEATING	SHELF COOLING	COND. COOLING	COND. DEFROST	VACUUM PUMP	VACUUM VALVE	WATER DRAIN	GAS INLET
F1	F2	P Pump	Meas.Val.	Cool/Heat	Work.Hrs	PGM INFO	GAS inlet

5.3 D

```
MANUAL
Tsh= 25.9°C/   30.0°C
P= 1015.0mb/1000.0mb
Tm= 26.8°C Tc=-12.1°
```
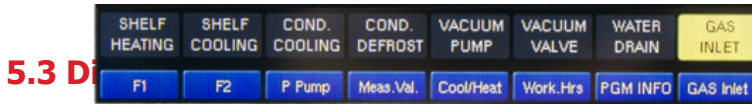
Tsh … current shelf temperature
P … current/ set pressure in chamber
Tm …temperature on material probe
Tc … current condenser temperature

```
STEP Nr.: 1 :   10:00
Tsh= 25.9°C/ -20.0°C
P= 0.0000mb/1000.0mb
Tm= 26.8°C Tc= 20.6°
```
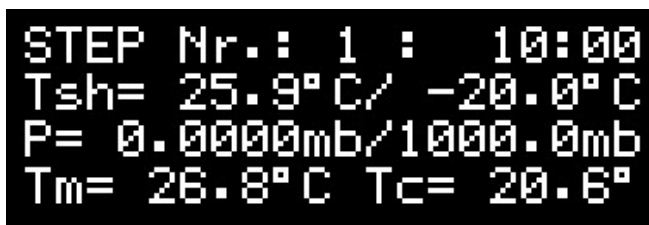
Step Nr.:1: duration (10 minutes)
Tsh … current/set shelf temperature
P … current/ set pressure in chamber
Tm … temperature on material probe
Tc… current condenser temperature

5.4 Basic setup

Step 1: Check condenser is clean and condensate removed

Step 2: Check power supply 3 x 400 V ±10%; 50Hz

Step 3: Place the material in chamber Close the chamber door.

Step 4: Put the main switch in position 1

Step 5: Select the preset program and press **"START"**

Step 7: From this moment on the device runs completely automatically

Step 8: Press **"STOP"** to stop the device (last step is always endless to keep the condenser cold and system in vacuum)

Step 9: Press "Gas inlet – Vacuum brake" to be able to open the door and remove the material

Step 10: Start manual program "program 0" and trigger condenser defrost, condenser defrost will automatically stop after 10 minutes! (condenser defrost is not necessary also you can leave the door open and wait overnight to melt the condenser naturally)

5.5 Program selection and Start

Turn on the main switch
Display:

```
Tsh= 15.6°C Tc= 19°C
P=1015.0 Pp=1015.0mb
Tm= 13.1°C
   CYCLE COMPLETED
```

Tsh = 15.6°C   ...current shelve temperature
Tc = 19°C   ...current condenser temperature
P = 1015.0mb   ...current vacuum / pressure in chamber
Pp = 1015.0mb ... current vacuum / pressure in vacuum pump
Tm = 13.1°C   ...Current temperature on material probe

Press MENU to enter main menu

Display:

```
1-START PROGRAM
2-MANUAL
3-PROGRAM SETUP
4-SPECIAL SETUP
```

Press a number on a keyboard to enter in the selected sub-menu

Press [1]

```
1-START PROGRAM
2-MANUAL
3-PROGRAM SETUP
4-SPECIAL SETUP
```

```
   SELECT PROGRAM
      TO START
PGM1
SELECTED PROGRAM:    1
```

1

To choose between programs press on the number (below display) or use [+] [-] and press [START].

```
**** S T A R T ****
PROGRAM :         1
```

In the process

```
STEP Nr.: 1 :   10:00
Tsh= 26.0°C/ -20.0°C
P= 1015.0mb/1000.0mb
Tm= 26.8°C Tc= 19.0°
```

Meaning:

STEP Nr: 1: 10:00	First step in the process. Time set to 10 minutes [when temperature reaches the tolerance area and parameter Tsh/Tm in in set limit the time count down starts. See special settings]
Tsh=26.0°C / -20.0°C	Current shelve temperature is 26.0°C, set temp. -20.0°C
P= 1015.0mb / 1000.0mb	Current chamber pressure is 1015.0 mbar set pressure is 1000 mbar
Tm = 26.8°C	Current temperature on material
Tc = 19.0°C	Current condenser temperature

WARNING:

This kind of display indicates automatic running of selected program.

---

*Vacuum value from Pirani vacuum gauge. All values above 10 mb are treated as atmospheric pressure. Only values below 10 mbar can be considered as correct measured value!

6.0 SETTINGS

6.1
## Parame

Press MENU to enter main menu

Display:

```
1-START PROGRAM
2-MANUAL
3-PROGRAM SETUP
4-SPECIAL SETUP
```

If you press the number next to the written description you enter the described sub menu.
Press ②abc

ATTENTION:
If you press 2 – MANUAL manual program starts immediately! Parameters for manual program can be set while in operation!

To move between parameters press ◄◊►, to set value press ±.
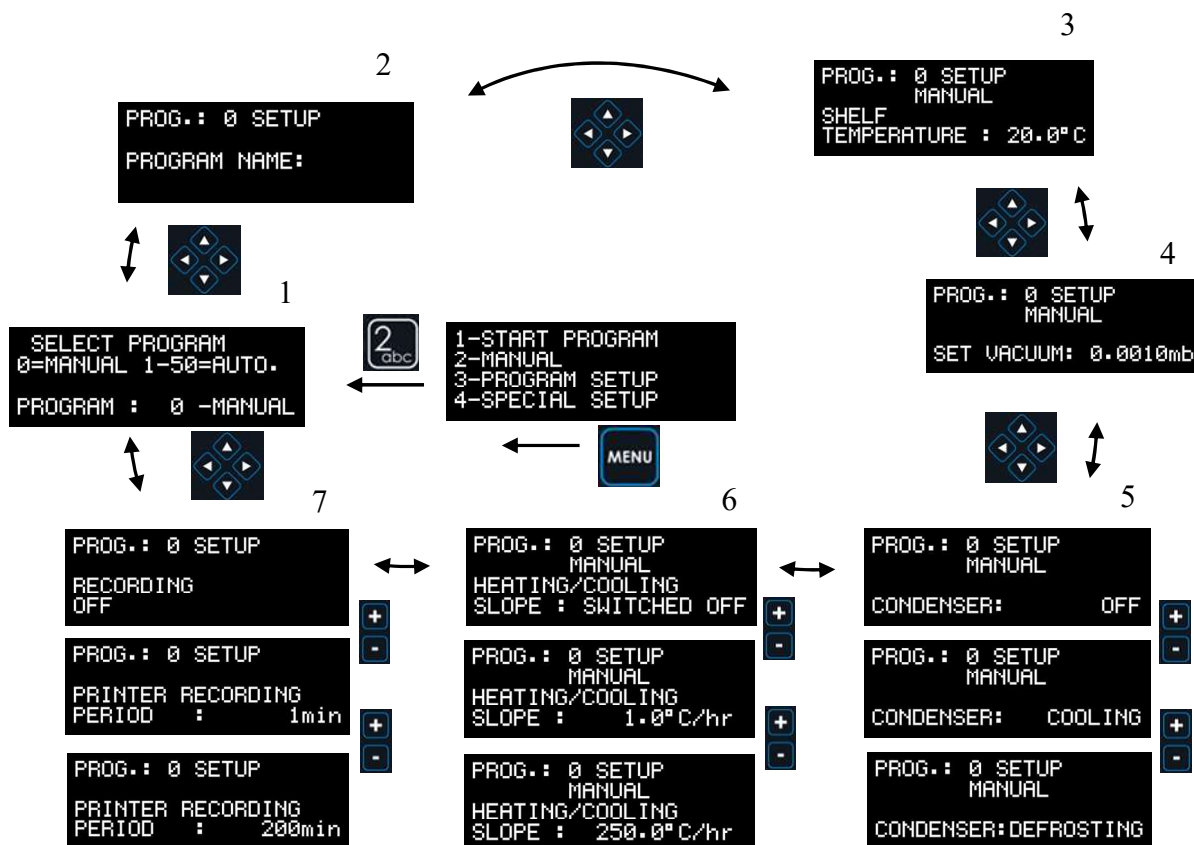
1. **Select program**

   - Select desired program to set settings. Program 0 is reserved for manual program

2. **Program name**

   - Enter program name (the selected program can be named). Use numpad to enter letters and numbers

3. **Shelve temperature**

   - Set desired shelve temperature (temperature range is limited by machine capacity).
     Heating and cooling with closed loop thermal fluid.

4. **Vacuum**

   - Set desired vacuum/pressure in chamber. On display you can see an available vacuum range in mbar.

ATTENTION:

If you set value 0.0010 mb, vacuum line towards vacuum pomp is constantly open!

---

5. **Condenser working mode:**

   - OFF
   - Cooling: should only be used for shelf conditioning and not for material freezing
   - Defrosting: when defrosting condensate must be drained from chamber

6. **Cooling / Heating speed**

   - You can set temperature change rate of the shelve (°C/min)
     (1°C/h…..250°C/h)
     (system limits apply!)

7. **Recording period**

   - Recording interval can be set from 1 in 200 minutes or switched off

---

ATTENTION:

If you set value lower than 1 minute recording is set to OFF!
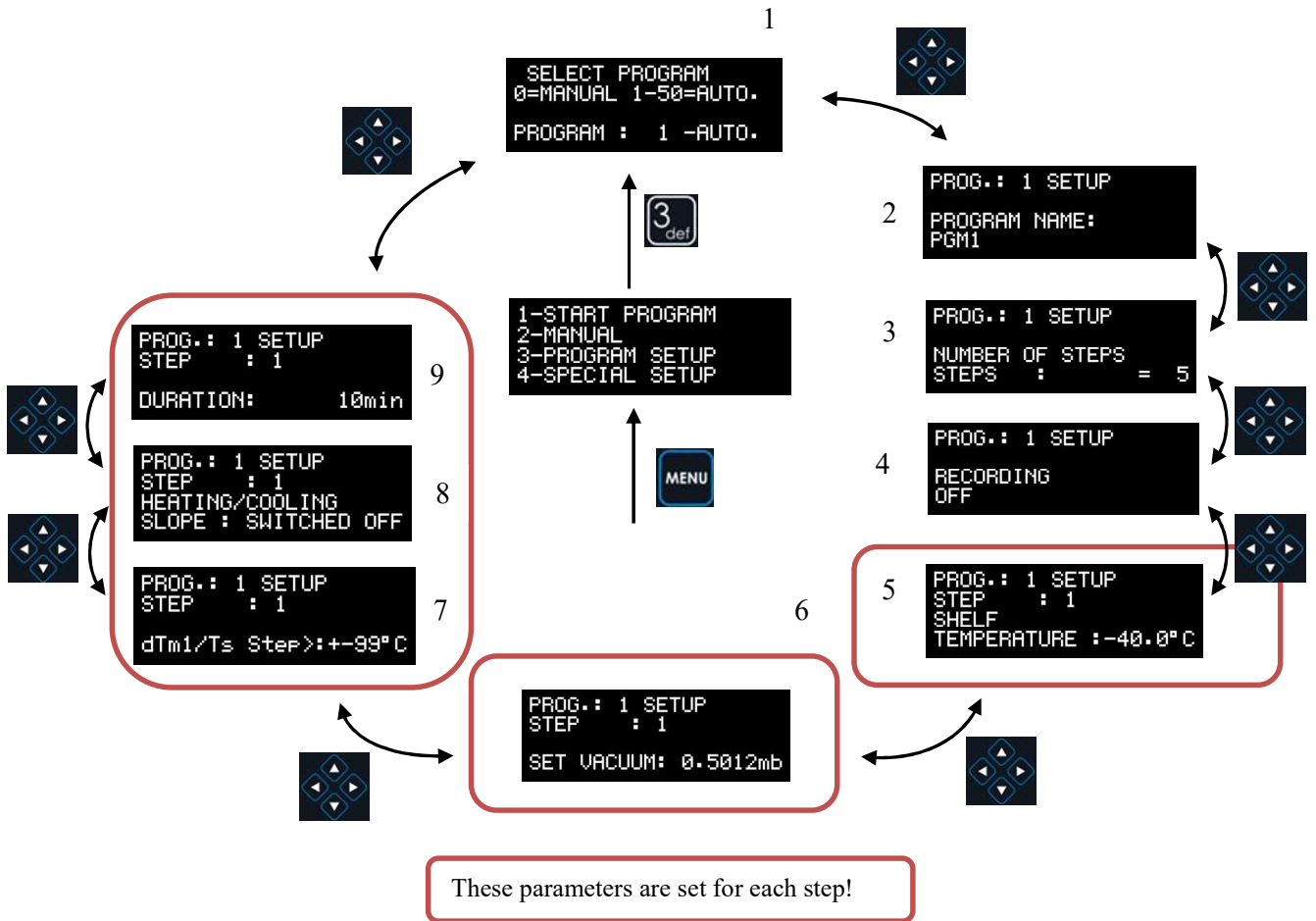
---

8. Recording period

- Recording interval can be set from 1 in 200 minutes or switched off

ATTENTION:

If you set value lower than 1 minute recording is set to OFF!

6.2
Parame

1

SELECT PROGRAM
0=MANUAL 1-50=AUTO.

PROGRAM : 1 -AUTO.

3 def

1-START PROGRAM
2-MANUAL
3-PROGRAM SETUP
4-SPECIAL SETUP

MENU

2

PROG.: 1 SETUP

PROGRAM NAME:
PGM1

3

PROG.: 1 SETUP

NUMBER OF STEPS
STEPS   :   = 5

4

PROG.: 1 SETUP

RECORDING
OFF

5

PROG.: 1 SETUP
STEP   : 1
SHELF
TEMPERATURE :-40.0°C

9

PROG.: 1 SETUP
STEP   : 1

DURATION: 10min

8

PROG.: 1 SETUP
STEP   : 1
HEATING/COOLING
SLOPE : SWITCHED OFF

7

PROG.: 1 SETUP
STEP   : 1

dTm1/Ts Step>:+-99°C

6

PROG.: 1 SETUP
STEP   : 1

SET VACUUM: 0.5012mb

These parameters are set for each step!

1. Choose desired program to set settings:

- choose program from 1-50

To change program number press [+]/[−].

2. Program name

- Enter program name (the selected program can be named). Use numpad to enter letters and numbers.

3. Number of steps:

- Choose the required number of cycle steps (freezing, primary drying secondary drying,..). Maximum number of different steps is 50.

To change value press [+]/[−].

4. Recording period:

- Here you can set the printing interval for printer. You can set the interval from 1 min to 200 min.

If printer is not connected to the machine printing should be switched off = 0 min!

To change value press [+/-] .

5. Shelve temperature setting

- Set desired shelve temperature for the first step.

To change value press [+/-] .

6. Vacuum / pressure for step 1.

- Set the desired vacuum / pressure for the first step.

To change value press [+/-] .

7. Difference between material temperature and shelve to jump to next step

- You can set difference between shelve temperature and material temperature to jump to next step
  When this is set to ±99 °C , step will only run for duration time!
  When this is set to for example +-3°C step will wait that the difference betwean shelve temperature and material temperature is inside +-3°C + duration time.
  This function works in freezing as well as in other (drying) steps.

8. Cooling / Heating speed

- You can set temperature change rate of the shelve (°C/min)
  (1°C/h…..250°C/h)
  (system limits apply!)

9. Duration time

- Set desired duration time for (in time range from 1 min to 1440 min).
- Duration time can also be set endless (under 1 min or above 1440 min)

If you selected more than 1 step, then parameters for other steps must be set the same way as for the first step.

When you finish with settings return to main menu by pressing [MENU] .

7.0 SPECIAL SETUP

7.1
Special

Press [MENU] to enter main menu

Display:

```
1-START PROGRAM
2-MANUAL
3-PROGRAM SETUP
4-SPECIAL SETUP
```

Press number [4 ghi] to enter special setup menu

Display

```
1-TIME SETUP
2-CORRECTIONS SETUP
3-USERS PASSWORDS
4-PROGRAM COPY
```

Press number [1] to enter sub menu time setup

Display

```
SETUP
TIME AND DATE
TIME  :     15:02:12
DATE  :     27-11-18
```

To change value under blinking line press [+/-] , to move blinking line press [arrows] .

To save and exit setting press [ENTER] .

7.2
Correct

To enter this menu press [MENU] button.

Display:

```
1-START PROGRAM
2-MANUAL
3-PROGRAM SETUP
4-SPECIAL SETUP
```

Press [4 ghi] to enter special setup menu

Display:

```
1-TIME SETUP
2-CORRECTIONS SETUP
3-USERS PASSWORDS
4-PROGRAM COPY
```

Press [2 abc] to enter correction setup menu

To enter correction setup during program in operation hold [▼] for app. 10s.!

If password protection is active you must enter password:

```
ENTER ENTRY
CODE :    0000
```
```
ENTER ENTRY
CODE :    0207
```

Enter password (use numeric keyboard) and finish with enter.
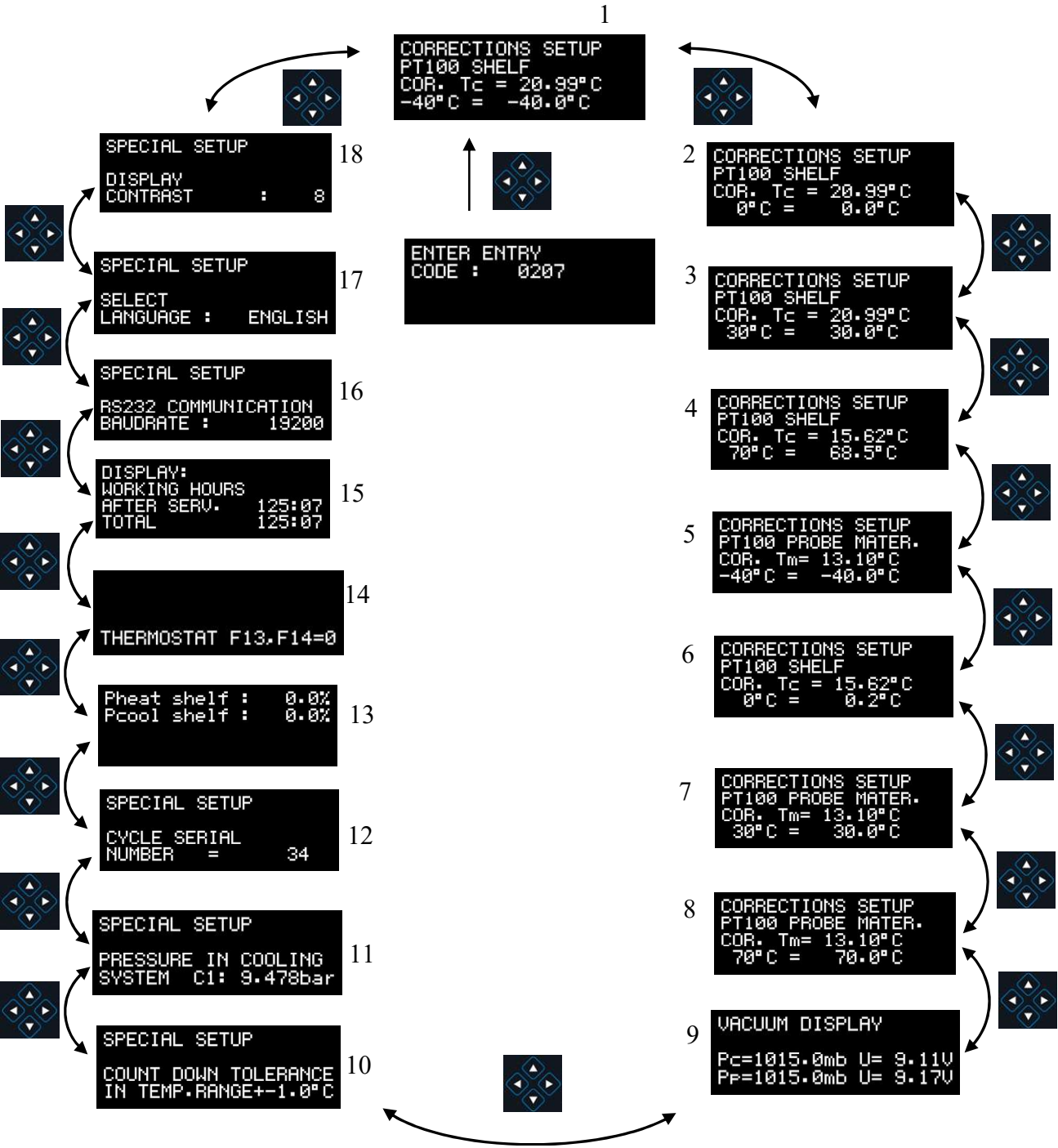

ATTENTION:
See chapter 7.4 SPECIAL SETTINGS – USERS PASSWORDS

ATTENTION:

Special settings should only be changed by the authorized personal on the basis of relevant measurements or other proofs!

Corrections are allowed to be changed only on credible measures basis, by personnel with suitably equipment and knowledge to perform calibration.

7.3
Correct

1
```
CORRECTIONS SETUP
PT100 SHELF
COR. Tc = 20.99°C
-40°C =  -40.0°C
```

18
```
SPECIAL SETUP

DISPLAY
CONTRAST      :    8
```

17
```
SPECIAL SETUP

SELECT
LANGUAGE :    ENGLISH
```

16
```
SPECIAL SETUP

RS232 COMMUNICATION
BAUDRATE :     19200
```

15
```
DISPLAY:
WORKING HOURS
AFTER SERV.   125:07
TOTAL         125:07
```

14
```


THERMOSTAT F13.F14=0
```

13
```
Pheat shelf :    0.0%
Pcool shelf :    0.0%
```

12
```
SPECIAL SETUP

CYCLE SERIAL
NUMBER    =      34
```

11
```
SPECIAL SETUP

PRESSURE IN COOLING
SYSTEM  C1: 9.478bar
```

10
```
SPECIAL SETUP

COUNT DOWN TOLERANCE
IN TEMP.RANGE+-1.0°C
```

```
ENTER ENTRY
CODE :    0207
```

2
```
CORRECTIONS SETUP
PT100 SHELF
COR. Tc = 20.99°C
  0°C =     0.0°C
```

3
```
CORRECTIONS SETUP
PT100 SHELF
COR. Tc = 20.99°C
 30°C =    30.0°C
```

4
```
CORRECTIONS SETUP
PT100 SHELF
COR. Tc = 15.62°C
 70°C =    68.5°C
```

5
```
CORRECTIONS SETUP
PT100 PROBE MATER.
COR. Tm= 13.10°C
-40°C =   -40.0°C
```

6
```
CORRECTIONS SETUP
PT100 SHELF
COR. Tc = 15.62°C
  0°C =     0.2°C
```

7
```
CORRECTIONS SETUP
PT100 PROBE MATER.
COR. Tm= 13.10°C
 30°C =    30.0°C
```

8
```
CORRECTIONS SETUP
PT100 PROBE MATER.
COR. Tm= 13.10°C
 70°C =    70.0°C
```

9
```
VACUUM DISPLAY

Pc=1015.0mb U= 9.11V
Pp=1015.0mb U= 9.17V
```

1-4: Temperature shelve probe correction

- 4 corrections points are defined. (-40, 0,+30,+70)

For each correction point correction can be set.   To change value use [+/-] .

5-8: Material temperature probe correction

- For material temperature *probe*, 4 corrections points are defined.

For each correction point correction can be set. To change value use [+/-] .

9: Vacuum display

- Pc ... Current chamber pressure
- Pp ... Current vacuum pump pressure

10: Time count-down tolerance (temperature)

- You can set the time of each temperature step. The countdown will start when temperature is in set limits.

For example:

Set temperature: 50°C
Set time: 60 min
Set START TIME COUNT IN RANGE : +- 1°C

The countdown will start when the temperature will be between 49.0°C and 51.0°C !

11-15: Information valid only for service personal!

16: Communication port setup

17: Selection of menu language

- English
- Slovensko
- Deutsch

18: Display contrast setup

7.4
Special

To enter this menu press [MENU] button.

Display:

```
1-START PROGRAM
2-MANUAL
3-PROGRAM SETUP
4-SPECIAL SETUP
```

Press [4 ghi] to enter special setup menu

Display:

```
1-TIME SETUP
2-CORRECTIONS SETUP
3-USERS PASSWORDS
4-PROGRAM COPY
```

Press [3 def] to enter user passwords setup menu

WARNING:
Changing passwords is enabled only with the administrator password login!

OPERATOR PASSWORD SETUP:

```
   PASSWORDS SETUP          PASSWORDS SETUP
 1 - OPERATOR             2 - OPERATOR
PASSWORD:      0****      PASSWORD:      0****
NAME:                     NAME:
```

We have passwords for two operators.
Operator password allows us to access the selection of pre-set program, run the program and stop the program.

TECHNICIAN PASSWORD SETUP:

```
   PASSWORDS SETUP          PASSWORDS SETUP
 3 - TECHNICIAN           4 - TECHNICIAN
PASSWORD:      0****      PASSWORD:      0****
NAME:                     NAME:
```

We have passwords for two technicians.
Technician password allows us to access all operator functions, settings of programs and special setup settings. The users passwords settings are not accessible and they are not allowed to change.

ADMINISTRATOR PASSWORD SETUP:

```
    PASSWORDS SETUP
   5 – ADMINISTRATOR
PASSWORD :        5***
NAME   : 5
```

We have one administrator password. The administrator password allows us to access and modify all settings.

WARNING:
If the administrator password is set to 0000, are all passwords turned off!

7.5 Special Setup – Program copy

To enter this menu press MENU button.

Display:

```
1-START PROGRAM
2-MANUAL
3-PROGRAM SETUP
4-SPECIAL SETUP
```

Press 4 ghi to enter special setup menu

Display:

```
1-TIME SETUP
2-CORRECTIONS SETUP
3-USERS PASSWORDS
4-PROGRAM COPY
```

Press 4 ghi to enter program copy setup menu

Display:

```
PROGRAM COPY       :
DATA FROM PROG. :   1
COPY TO PROGRAM : 12
CONFIRM COPY=F1 3sec
```

DATA FROM PROG. : 1   Data from selected program (number 1) will be copied
COPY TO PROGRAM : 2   to selected program (number 2).

To move between parameters press ◄◊► , to set value press ⊞ .

To confirm copy press F1 button for 3 seconds.

8.0 SERVICE AND MAINTENANCE

⚠	**WARNING** In case of maintenance interventions, disconnect all electrical power to the unit!

Maintenance and service within the warranty period may only be performed by the authorized service person.

Please advise manufacturer in before alternation & modification. It is not allowed to change or rebuild any part of the construction without producer's written permit.

All spare parts are in stock in the producer's magazine. It is only allowed to use the original spare parts.

Maintenance and service within the warranty period may only be done by the producer's service department or authorized service.

With proper care the instrument should require very little maintenance. Keep the interior and the exterior clean. For cleaning use some soft cleaning detergents and soft cloth.

In the event of failure, call the service!
Please   find   contacts   on   page   1.

9.0 REQUIRED SPACE AND CONNECTIONS

The appliance must be installed at least 500 mm away from the nearest wall. It must also be in a dry and well ventilated room.

Additional space or relocation of the apparatus may be necessary when carrying out any maintenance or servicing.

The user must provide electrical connection: 3x 400V±10% / 50Hz, 60Hz.

Environmental and operational conditions	
Temperature	**+23°C ± 5°C**
Relative humidity	**from 15 % to 75 %**

10.0 DISMANTLING AND DISPOSAL

This symbol means do not dispose of your product with your other household waste. Instead, you should protect human health and the environment by handing over your waste equipment to a designated collection point for the recycling of waste electrical and electronic equipment. For more information please contact your household waste disposal service. Be aware that cooling system is filled with cooling gas R-404A.

11. ATTACHMENTS

11.1 CE declaration of conformity

11.2 Electro diagram