DYNABLOT HEAT

Service Manual

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Revision Table

Revision	Date	Changes
0	6.4.2016	First official edition
1	12.5.2016	I-parameters table updating
2	16.9.2016	Real time clock compensation updating
3	23.11.2016	Regular maintenance operations updating
4	23.2.2017	Change in 6.2 Mainboard firmware update
5	10.10.2019	The capter 7 Auxiliary screens addition

Content

1. Instrument general description 5
   1.1. Instrument control 5
   1.2. Dispensing system 5
   1.3. Aspiration system 5
   1.4. Rocking system 6
   1.5. Reaction trays heating and cooling system 6
   1.6. Reagents heating system 6
2. System control 7
   2.1. Main board 7
   2.2. Chassis board 7
   2.3. Sensor board 8
   2.4. Regulator board 8
3. Moving mechanical parts 9
   3.1. X-shift 9
   3.2. Aspiration arm 9
   3.3. Rocking 10
4. Vacuum checking and sensor adjustment 11
5. Regular maintenance operations 12
   5.1. Reagent tubing and pump casettes replacement 12
   5.2. Heated blocks temperature precision check 17
   5.3. Reagents heating positions temperature precision check 17
6. DynLab software 19
   6.1. DynLab connection 19
   6.2. Mainboard firmware update 19
   6.3. The other board firmwares update 20
   6.4. Segments update 21
   6.5. I-parameters update 22
   6.6. Real time clock compensation 27
   6.7. Block address 27
   6.8. Block temperature sensor compensation 29
7. Auxiliary screens 30
   7.1. 1 – 8 Temperature controler screens 32
   7.2. 9 I2C screen 32
   7.3. 10 Test KM 33
   7.4. 11 The liquid sensors of the reagent lack 33
   7.5. 12 Real time clock 34
   7.6. 13 Various system internal parameters 34

1. Instrument general description

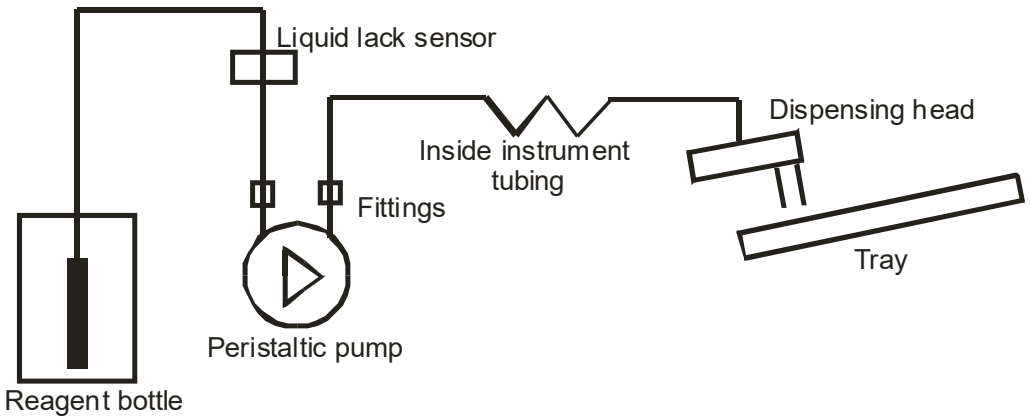
1.1. Instrument control

The instrument is controlled by the operator with the help of colour graphic display with touch screen buttons.

1.2. Dispensing system

Dispensing system contains 8 channels for the reagents. Each channel is equipped with the peristaltic pump, tubing, LED indicator and the sensor for the liquid lack in the tube. The tubes are connected to the dispensing head. The first version of the dispensing head has 2 outlets and 3 channel tubes are connected in each outlet. So the number of used reagents channels is 6 (2 channels are spare now – for the next possible use). 2 outlets head can be used for separation of the conjugate and the substrate – no contact in dispensing system.
The channels 7 and 8 are prepared for the heated reagents. The teflon tubing is used to reduce reagent heat loss during its transport. Also firmware function for tubing and pump head preheating before dispensing is added to these two channels.

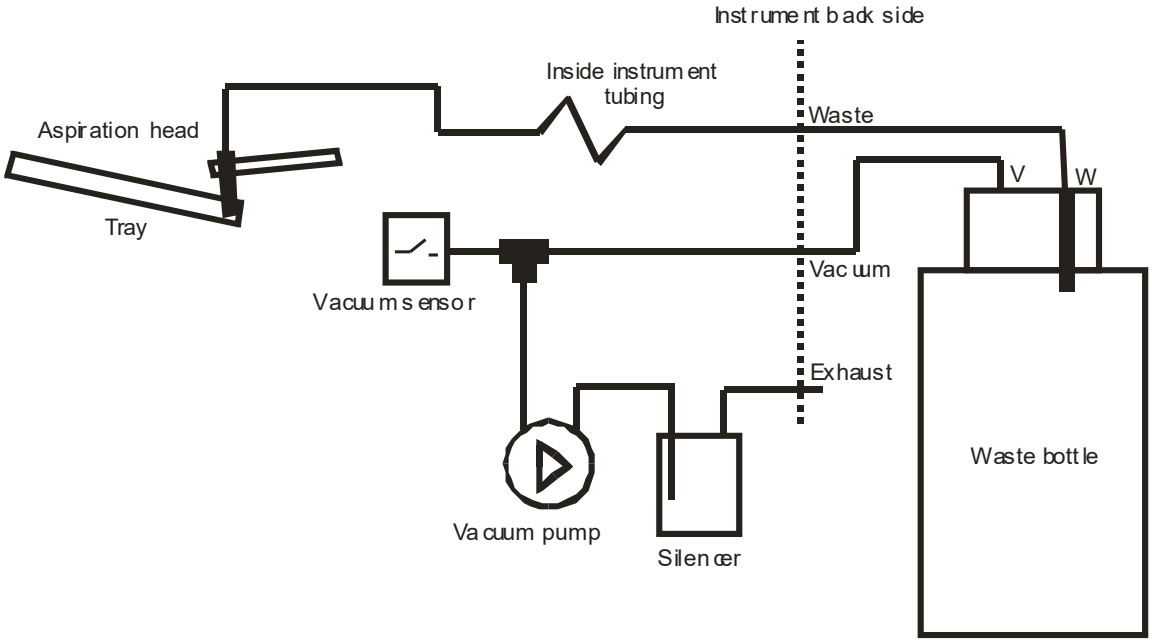
One dispensing channel diagram



1.3. Aspiration system

The well content is aspirated by vacuum to the waste bottle. The aspiration arm is placed together with dispensing head on the X-shift arm. The vacuum pump is placed inside the instrument together with the vacuum sensor and the exhaust silencer. The waste bottle input W is connected to the aspirating tube, the input V is connected to the vacuum pump. The waste bottle is equipped with two floaters for the level detection – the bottle is full and the bottle is overfilled.

Scheme of aspirating system



1.4. Rocking system

The rotating eccentric wheel makes the tray holder rocking via the small pulley. The rocking holder can be taken off around its spigot to get the good access bellow it.

1.5. Reaction trays heating and cooling system

The three identical blocks are used for the 10-well reaction trays. The block is heated by resistance heating segment that forms the bottom of the space for the tray. The cooler with two fans is placed on the other side of the heating element. The whole system is placed in the heat insulation. The temperature probe is placed in the centre of the cooler. The lid of the block contains the transparent heating foil.
The green LED in the front side of the block indicates heating activity.
Each block contains its control electronic board.
The 3 fans under the front instrument cover bring the air into working area during block cooling.

1.6. Reagents heating system

There are two heated positions for the reagent bottles at the drawer. The position is heated by the resistance heating segment and contains the internal temperature probe and the stepper motor for the magnetic stirrer. The external temperature probes could be connected to the connectors near the positions. They are used for the immersing into the reagents bottles.
The adaptors with heat insulation are placed to the heated positions and they fit to different bottles

2. System control

The instrument control system is a modular and it consists from the following electronic boards

- Main board
- Chassis board
- Sensor board
- Regulator boards (3)

Each board contains processor with its firmware which controls the devices in its neighborhood. It reduces the wiring inside the instrument. The firmware versions of all boards can be seen on the welcome screen after the switching on the instrument.

The system control is supplied with switching power supply 220 V AC / 24 V DC. It is placed on the back side of the instrument chassis.

2.1. Main board

The mainboard is placed in the housing on the left side of the drawer. It is responsible for the main control of the instrument and its peripheries placed in the drawer:

- Display with touch screen
- USB
- Peristaltic pumps
- Heating of the reagent positions
- Stepper motors of the magnetic stirres in the reagent positions

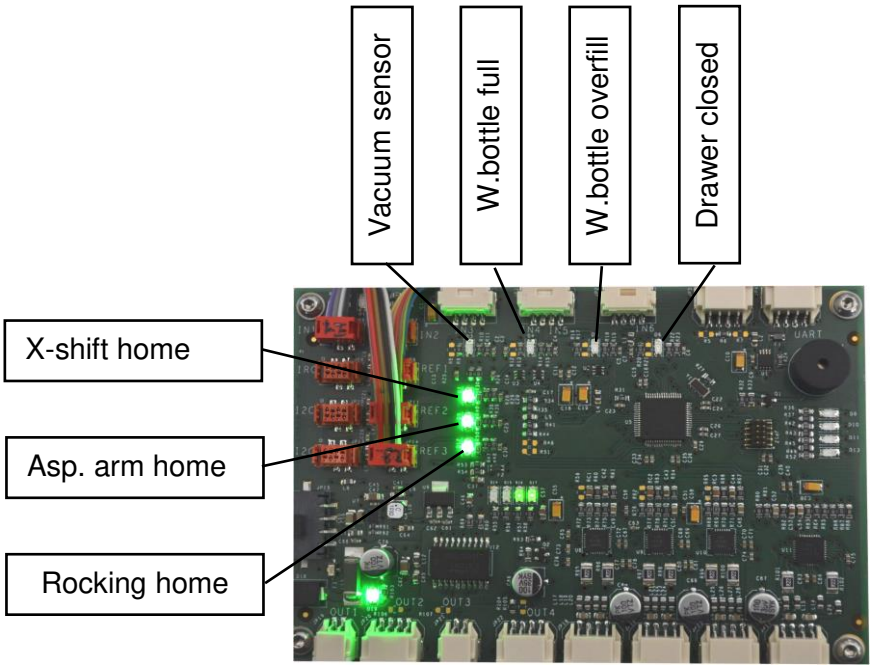
The main board contains the holder with SD card – memory space for assays, languages versions, log files, etc.
The holder with battery for the real time clock is placed near the mainboard.
The mainboard controls the serial communication with the others boards.

2.2. Chassis board

The chassis board is placed on the instrument back side. It controls the devices placed in the instrument chassis :

- X-shift stepper motor with the home sensor
- X-shift incremental sensor
- Aspiration arm stepper motor with the home sensor
- Rocking stepper motor with the home sensor
- Vacuum pump
- Drawer lock solenoid
- Reagents area lighting
- Vacuum sensor
- Waste bottle full sensor
- Waste bottle overfill sensor
- Drawer close sensor

The board contains the LED indicators of the inputs status which can be used during servis.



2.3. Sensor board

The sensor board is placed in the drawer above the peristaltic pumps and it contains the LED indicators and the sensors for the liquid lack in the tubes.

2.4. Regulator board

The block board is placed in every heated block. It controls the devices in the block:

- bottom heater
- temperature probe
- lid heating foil
- cooling fans
- green LED indicator

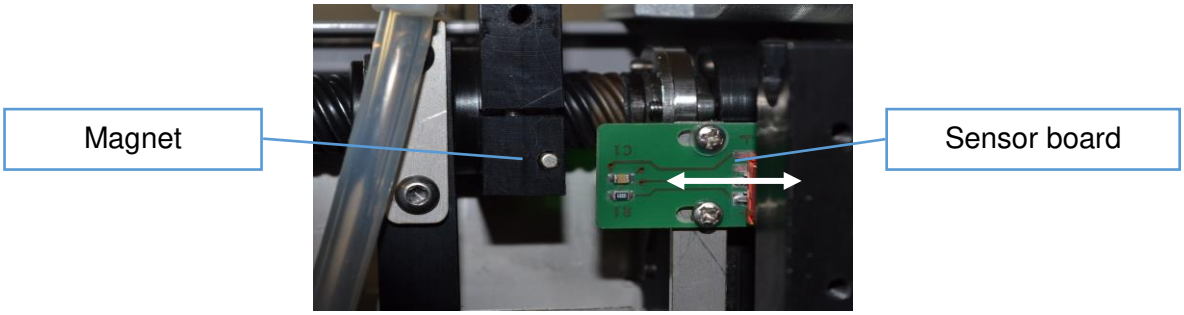
3. Moving mechanical parts

The instument contains three main moving parts driven by the stepper motors

- X-shift
- Aspiration arm
- Rocking

3.1. X-shift

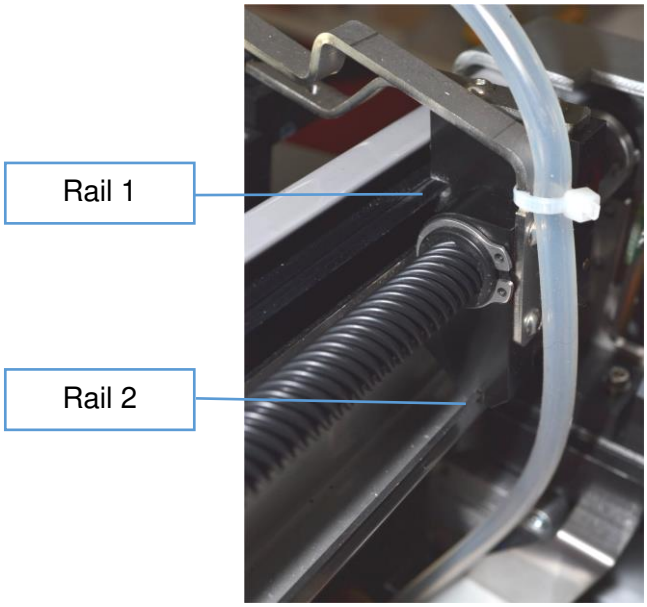
The X-shift movement is driven by the stepper motor via the toothed belt and the threated rod. The home position is detected by the magnetic sensor.



The sensor board can be slightly moved for the X-shift home position. For the proper board position the X arm stops after homing so that the aspiration tube is aproximately in the centre of the priming bowl.

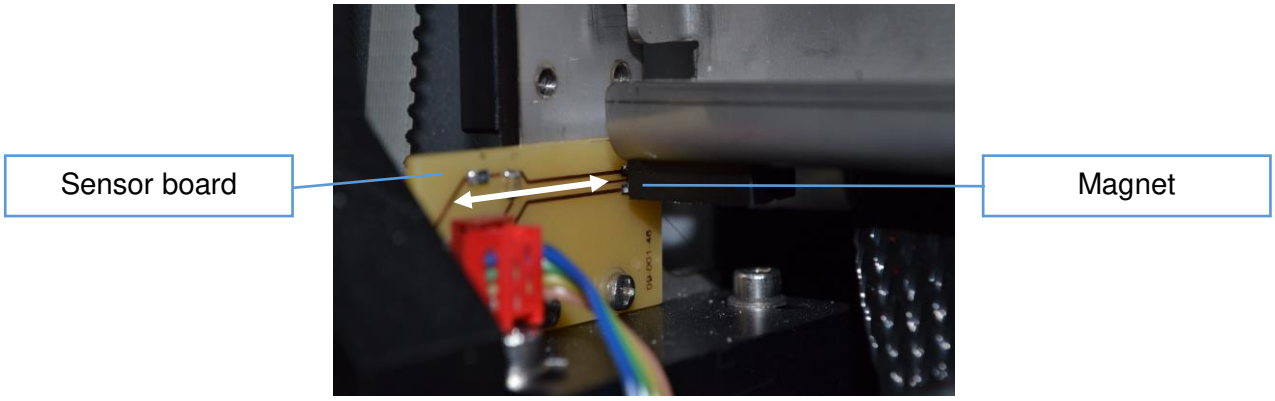
The X-shift is checked during its movement by the magnetic incremental sensor. It is placed at the toothed beld pulley.

The maintenance of X-shift mechanism is performed by the lubrication of the two metal rails where the supports slide on it.



3.2. Aspiration arm

The aspiration arm is driven by the stepper motor via the toothed belt. The home position is detected by the magnetic sensor.

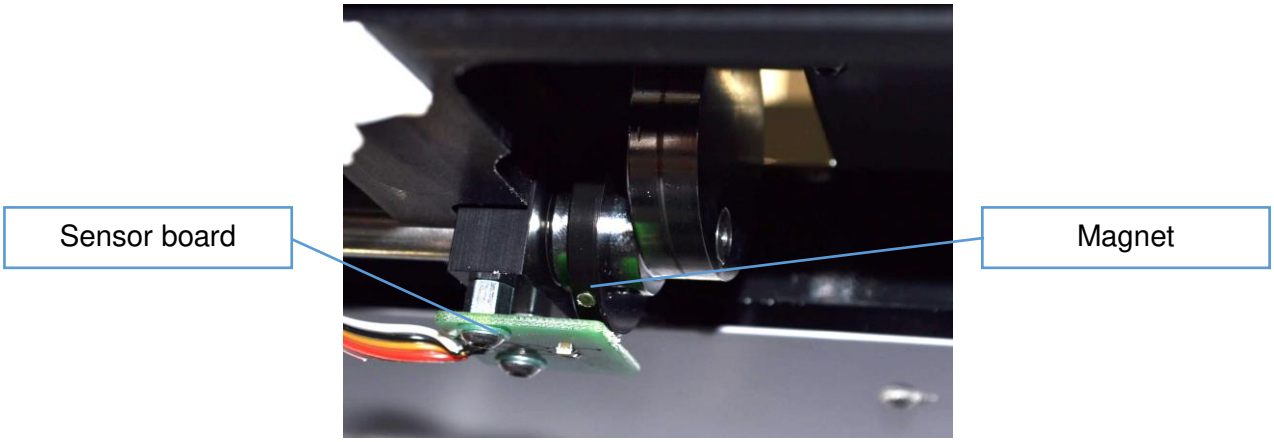


The sensor board can be slightly moved for the aspiration arm home position. For the proper board position the aspirating tube stops in upper position so it does not hit other parts during X-shift movement.

The aspiration arm mechanism does not need a special maintenance.

3.3. Rocking

The rocking is driven by the stepper motor via the toothed belt. The home position is detected by the magnetic sensor.

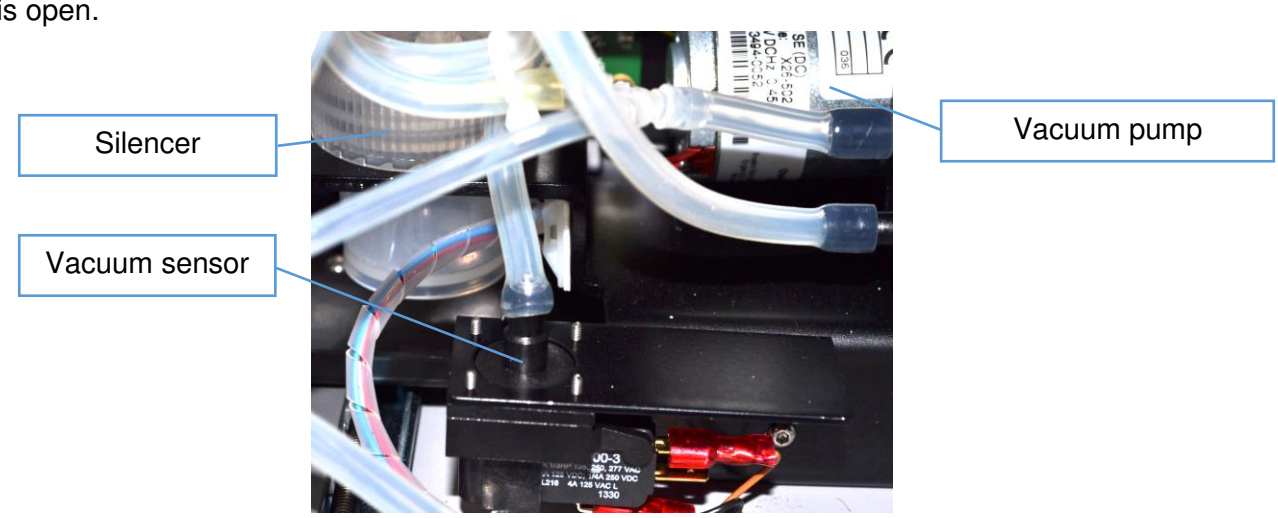


The magnet is placed in the plastic wheel. It is secured on the eccenter pivot with a small screw. For the proper plastic wheel position the tray holder stops very near to the horizontal position which comes after the holder passes upper position (the eccenter turns counterclockwise).

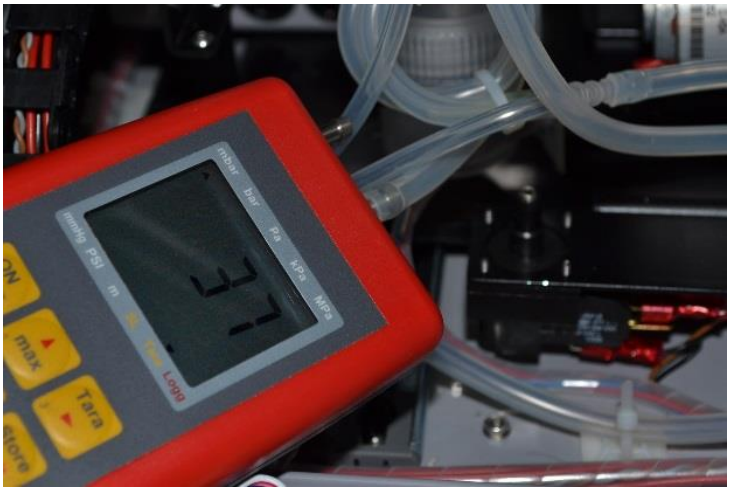
During maintenance must be checked if the pulley bellow the tray holder can turn easily. If it does not it must be replaced.

4. Vacuum checking and sensor adjustment

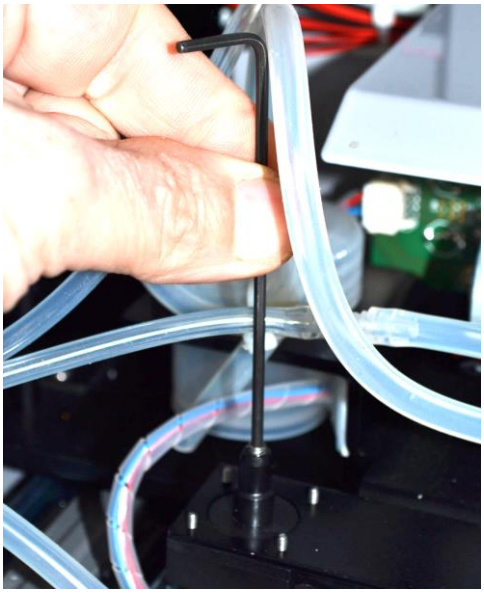
The vacuum is checked by the sensor placed near the vacuum pump. It is accessible when the back lid is open.



The pressure meter can be connected to the vacuum sensor tubing and the vacuum can be measured by the pressure meter. The vacuum pump must be switched on (see User manual, Instrument checking) and the waste bottle conected. The vacuum must be about 40 mBar.



The pressure threshold of the sensor can be adjusted by the screw after disconnection of the tube.



For the control of the correct adjustment:

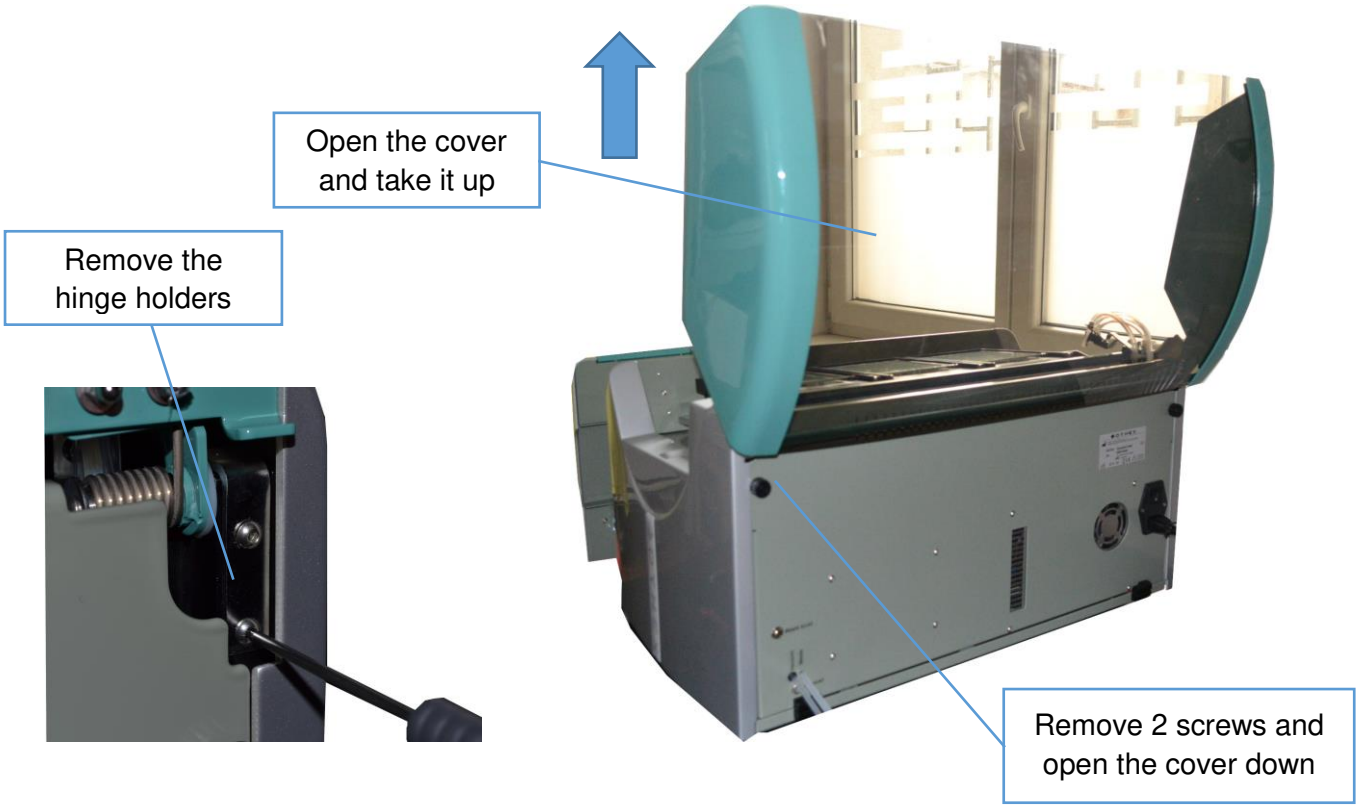
- Connect the waste bottle and switch on the vacuum pump
- The sensor must be switched on (see the LED on the chassis board or the icon on the instrument checking screen)
- Slightly unscrew the waste bottle cap (1/4 turn)
- The sensor must be switched off

5. Regular maintenance operations

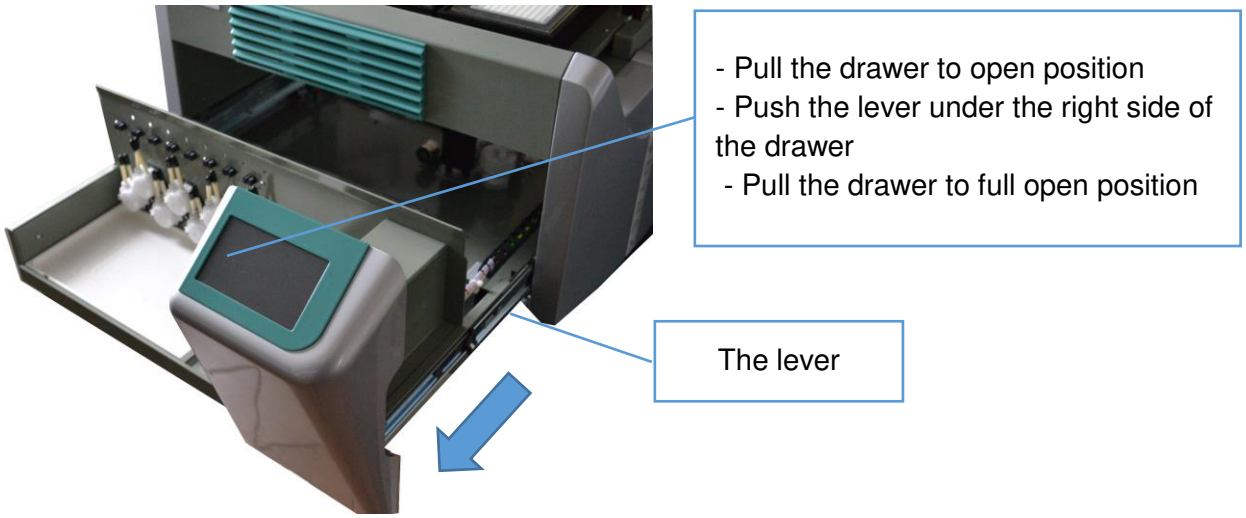
5.1. Reagent tubing and pump casettes replacement

To get the good acces to the instrument for tube replacement

- open the rear removable cover
- remove the workspace cover

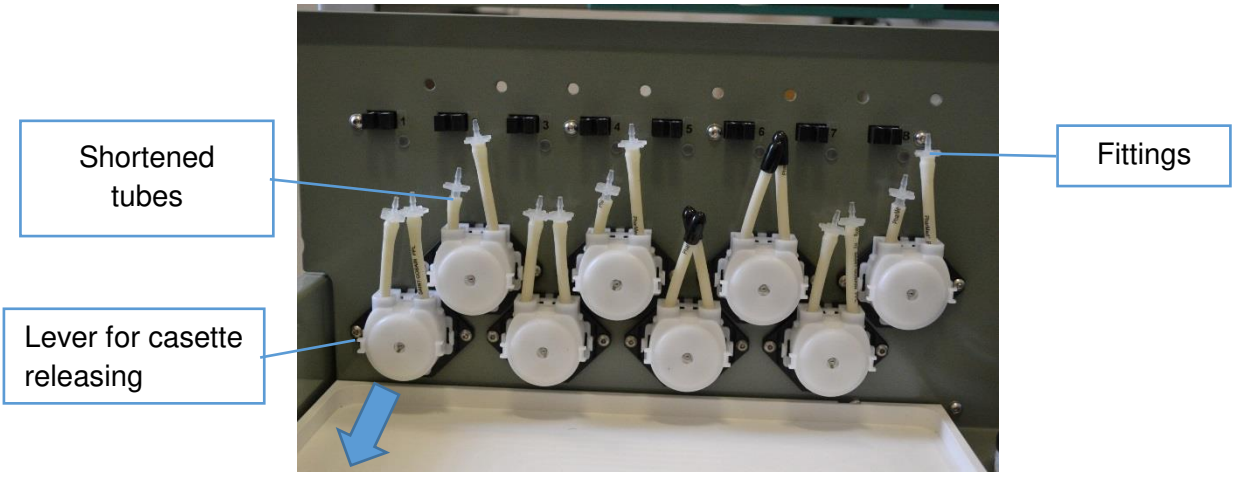


- open the drawer to the full front position (see picture)

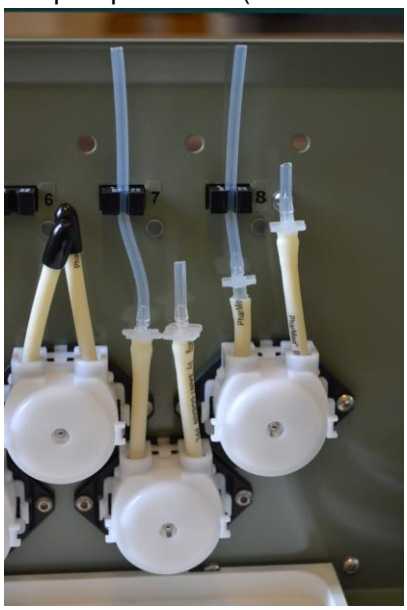


For the peristaltic pump casette replacement push two levers on left and right side of the cassette and pull the cassette down from the shaft. The shaft can be slightly roughen by a fine sandpaper in the longitudinal direction (for better adhese between shaft and the casette cylinders).

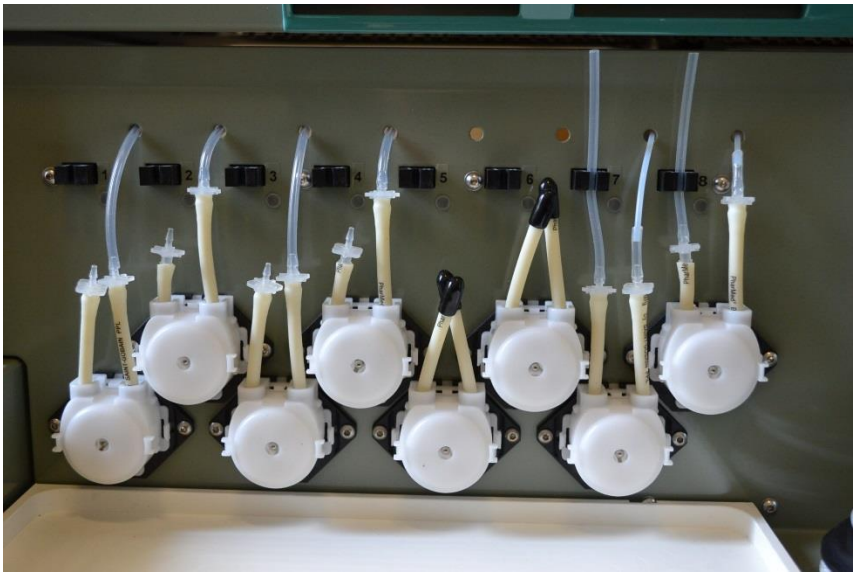
If the new peristaltic pump cassettes are used, shorten the left side tubes at pumps 2,4,6 and 8. Put on the fittings to the pump tubing.



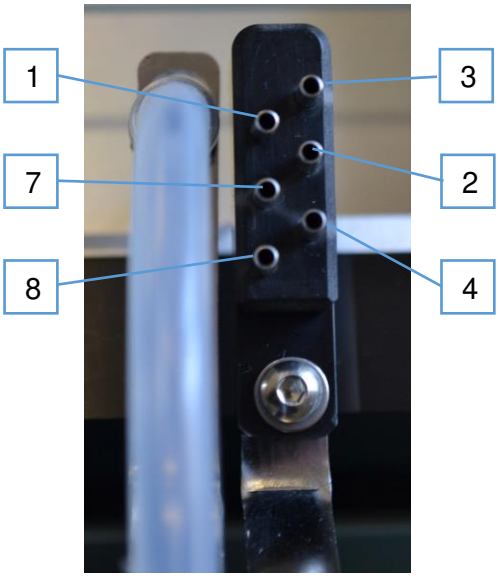
Put the silikon tube conjuctions to the pump 7 and 8 (it will be used for the teflon tube connection).

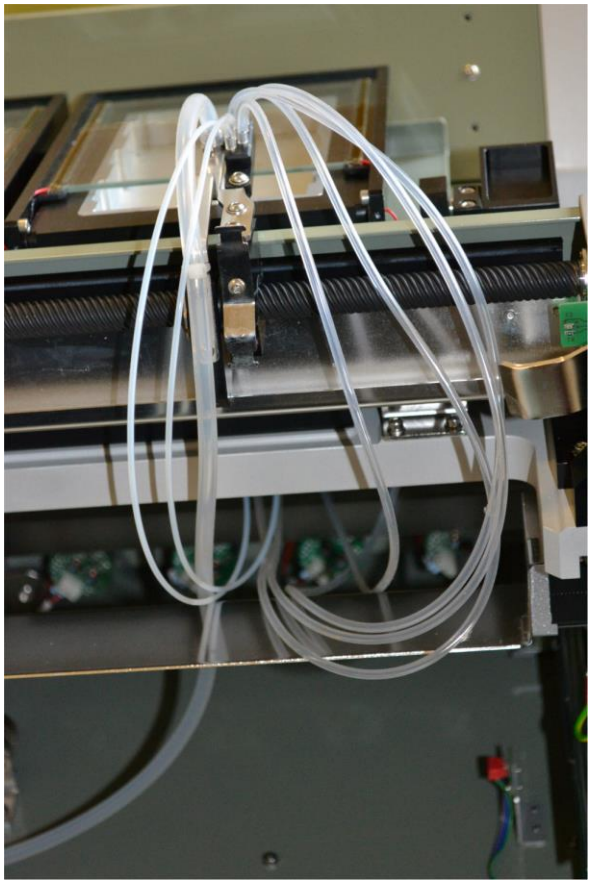


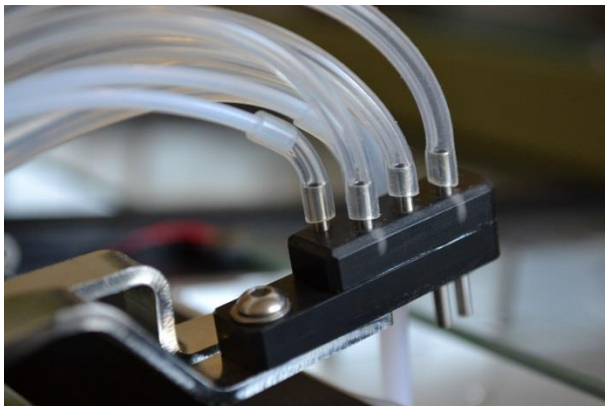
Put the silicon and teflon tubes to all pumps and push it through the holes into the instrument inside.



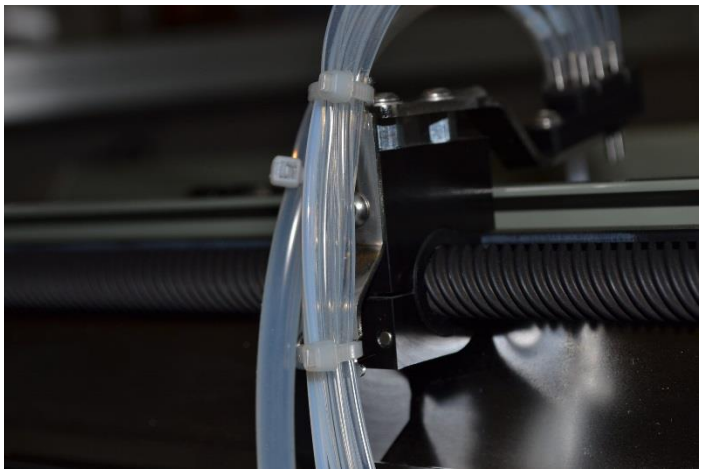
Put the tubes to the dispensing head according to the picture. Use the silicon tube conjuctions for the channnels 7 and 8.


1
3
7
2
8
4

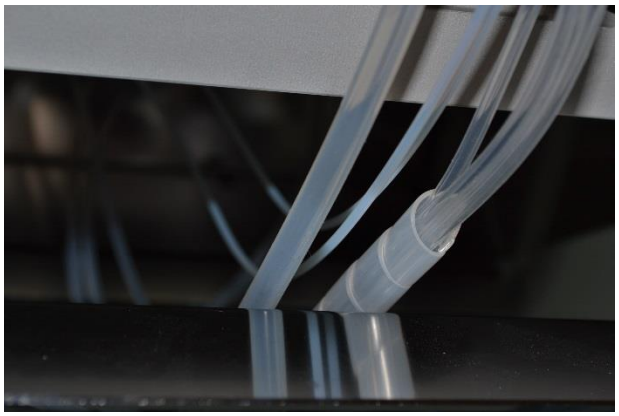




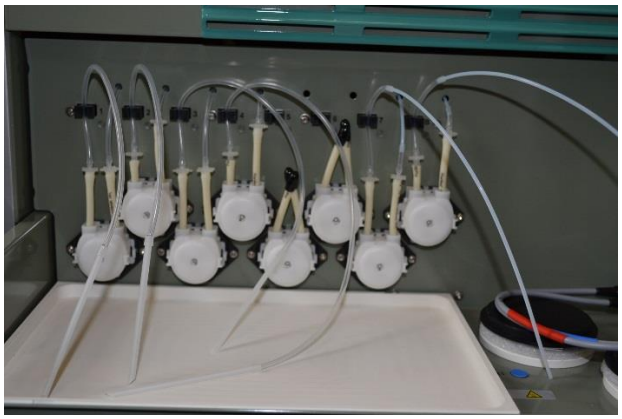
Secure the tubes to the holder on the back side of the x-shift arm. Use the plastic bindings.



Put the binding spiral on the silikon tubes and move it to position according to the second picture.

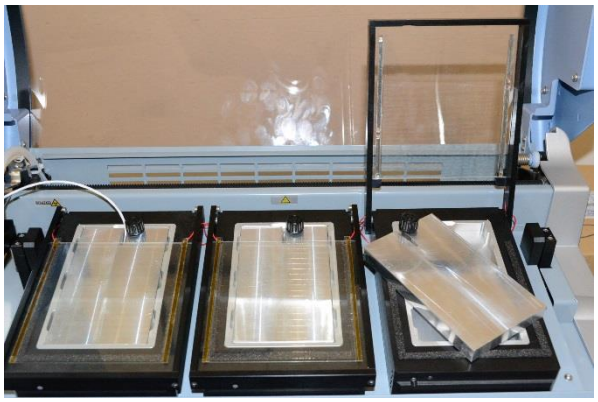


Put the bottle tubes with straws to pumps. Place it into the sensors bodies.



5.2. Heated blocks temperature precision check

Use the ***Setup/Instrument checking/Heating bloks/Heating block 1,2*** or 3 menu **–** set Setpoint 40,0 and 60,0 ºC. Wait for temperature stabilization. Measure the real temperature of the heating blocks by the adapters. The real temperature deviation must be less than +/- 0,5 ºC.
The time effective method is to use 3 adapters. First set the 40 °C setpoint. After temperatures value on the instrument display stabilization put the temperature probe step by step to the adapters. Then repeat it for 60 °C setpoint. During heating and measurement keep the instrument cover closed.
In case the real temperature is out of range the temperature calibration must be done (see User manual, capter 4.7.1 Temperature calibration).



5.3. Reagents heating positions temperature precision check

<u>Temperature – internal thermo probes</u>

Select the external reag. Positions sensors (***Setup/Reag.positions sensor/Internal***).
Use the ***Setup/Instrument checking/Heating bloks/Reagent positions 1*** or ***2*** menu **–** set Setpoint 50,0 ºC. Wait for temperature value on the instrument display stabilization. Measure the real temperature at the heating plates by the adapter. Actual temperature range 49,5 - 50,5 ºC. Surface temperature 49,0 – 51,0 ºC.

Temperature – external thermo probes

Select the external reag. Positions sensors (***Setup/Reag.positions sensor/External***)
Use the ***Setup/Instrument checking/Heating bloks/Reagent positions 1*** or ***2*** menu **–** set Setpoint 50,0 °C. Wait for temperature value on the instrument display stabilization – it will oscilate a little around the set point. Measure the real temperature in the bottles with DI H2O. Actual temperature range 49,0 – 51,0 °C. DI H2O measurement temperature +/- 1 °C around actual temperature.

6. DynLab software

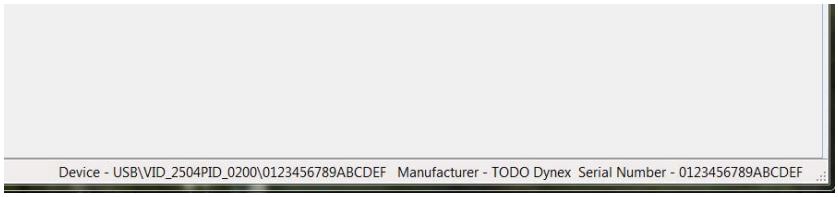
DynLab is the service software. It can be used for the instrument firmware and update of parameters. Settings must be set according to the manufacturer instruction to avoid the instrument malfunction.

6.1. DynLab connection

Switch on the instrument and set the connection
Main menu / PC connection

Connect the USB cable (Instrument – PC)

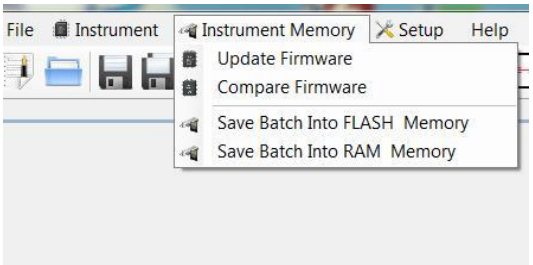
Open the DynLab software. If the instrument is correctly connected the identification data are in the bottom bar



6.2. Mainboard firmware update

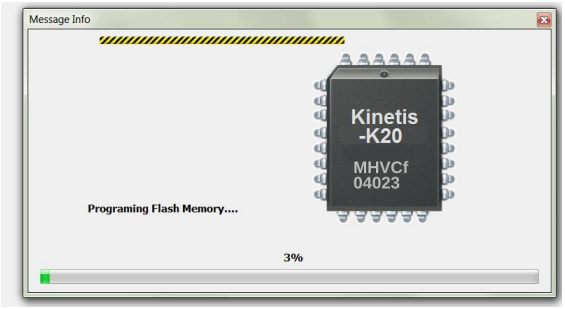
The firmware for the mainboard can be updated by PC with DynLab SW.
It is distributed as the *DBH_MB_a.b.c.d.S19* files.
a, b – numbers of FW version. It apperars on the display after the instrument switch on (f.e. 1.3)
c – number which must fit with language files versions that are saved in the directory LANG at the instrument SD card. (f.e. C=1 then English 1.0 or English 1.1, ...)
d – everytime d = 0. It means released version of the firmware.

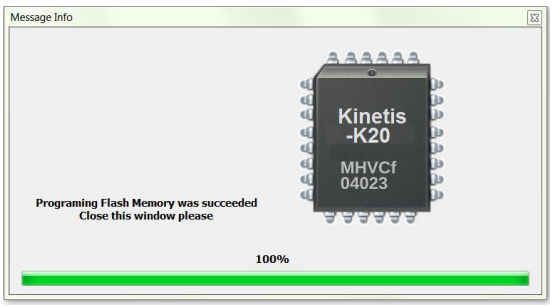
Update procedure:
Use the menu Instrument memory / Update Firmware



The instrument connects as the Bootloader now

Select appropriate .S19 file in the dialog window and open it. The data transfer starts.





When programming is finished close the Message info window and DynLab.
Switch off the instrument and disconnect the USB cable.
If the new firmware is not compatible with language files saved in the directory LANG at the instrument SD card the default small english font is used for texts displaying. Copy correct versions of langusge files to the SD card and use *Setup / Language* menu for required language selection.

6.3. The other board firmwares update

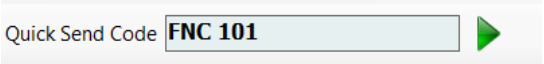
The chassis board, sensor board and 3 regulator boards firmwares can be updated via files saved on the SD card.

Update procedure :
Connect the instrument with PC via USB

Use file explorer and open SD card (drive called DBH), copy the updated firmware files to corresponding directories in the FW directory:

CHASSIS – DBH_CHASSIS_BTLD_x_xx.bin
SENSOR - DBH_SENSOR_BTLD_x_xx.bin
REGULATOR – DBH_REGULATOR_BTLD_x_xx.bin

- open the Dynlab SW. Use Quick Send Code line for corresponding command sending



. Write instructions and press (or Enter):

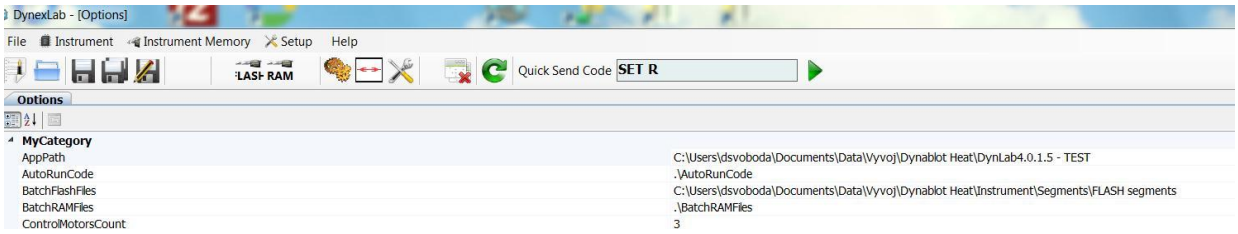
Board	Instruction
Regulator of the 1. block	FNC 101
Regulator of the 2. block	FNC 102
Regulator of the 3. block	FNC 103
Sensor board	FNC 104
Chassis board	FNC 105
All boards	FNC 110

The instrument comes to FW programming mode. The display showes the programming procedure messages :
(example for the chassis board)
BOOT CHASSISBOARD
Load: 0:\FW\CHASSIS\ DBH_CHASSIS_BTLD_1_11.bin
Clear FLASH
Done
Ctc : xxxxxxx Adr : xxxxxxx
Programming finished. Please reboot.
Switch OFF the instrument. Switch ON the instrument and check the FW number in the initial display.

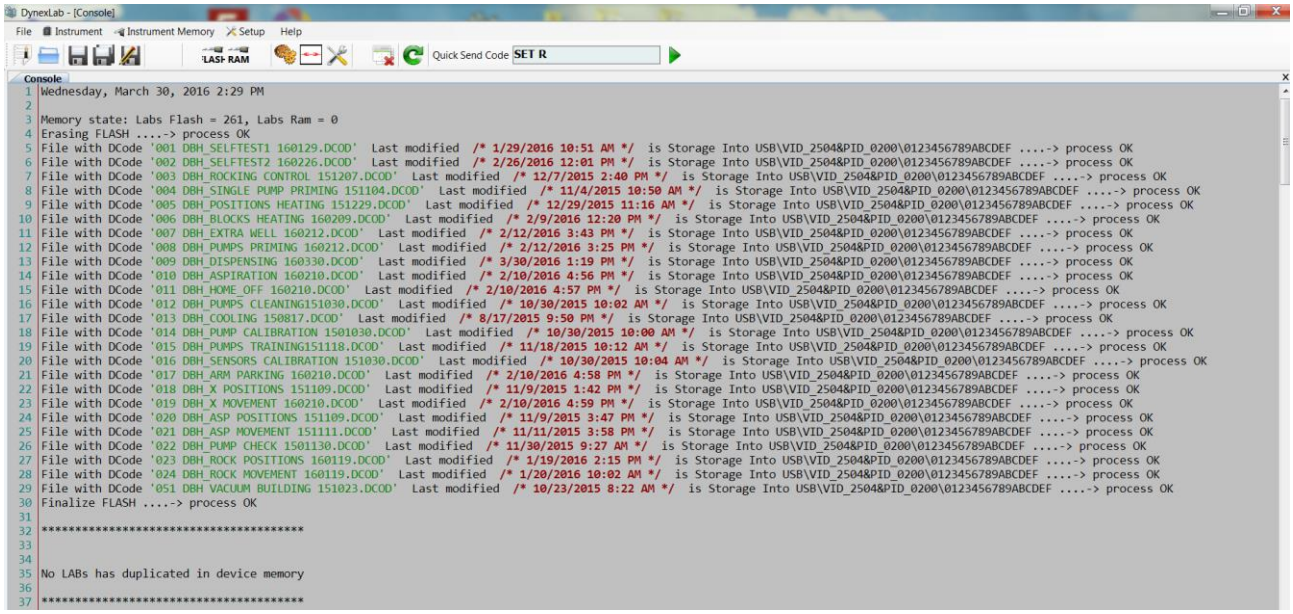
6.4. Segments update

The segments are short subroutines in the D-code language and they are issued in the segment package – a directory with files. Name of the segment package and directory is DBH_segment_pack_YYMMDD (year, month and day of the release)

Update procedure:
Copy the pack files to a directory. The path to this directory must be set in Setup/Options/ BatchFlashFiles or use the button



Then select Instrument memory/Save Batch into FLAHSH memory or use the button .
The segments will be saved to the instrument memory.



Close the DynLab and safely remove the USB cable.

6.5. I-parameters update

The I-parameters are numeric constants saved in the instrument FLASH memory. It is used for the adjustment of the instrument operation.

Number	Typ.	Name	Comment
[Motors calculation]			
R1001	1	Steps calculation, multiplier ASP ARM	Don´t change this parameters
R1002	1	Steps calculation, factor ASP ARM	
R1003	-120	Home switche Offset ASP ARM	
R1004	0	Zero Offset ASP ARM	
R1005	0	Home direction ASP ARM	
R1006	15	Low current ASP ARM	
R1007	40	High current ASP ARM	
R1008	500	Initial movement speed ASP ARM	
R1011	10	Steps calculation, multiplier X	
R1012	1	Steps calculation, factor X	
R1013	-500	Home switche Offset X	
R1014	0	Zero Offset X	
R1015	0	Home direction X	
R1016	15	Low current X	
R1017	35	High current X	
R1018	500	Initial movement speed X	
R1021	1	Steps calculation, multiplier ROCKING	
R1022	1	Steps calculation, factor ROCKING	
R1023	200	Home switche Offset ROCKING	
R1024	-200	Zero Offset ROCKING	
R1025	1	Home direction ROCKING	
R1026	1	Low current ROCKING	
R1027	20	High current ROCKING	
R1028	400	Initial movement speed ROCKING	
[Calibration]			
R1031	80	Pump 1 calibr.	These parameters are saved during the peristaltic pumps calibration
R1032	80	Pump 2 calibr.	
R1033	80	Pump 3 calibr.	
R1034	80	Pump 4 calibr.	
R1035	80	Pump 5 calibr.	
R1036	80	Pump 6 calibr.	
R1037	80	Pump 7 calibr.	
R1038	80	Pump 8 calibr.	
R1039	3	Pumps calibr.correction	Correction of the pump calibration constants. It is used during constants saving. 0% - without correction, Value can be -/+ X %.
R1700	0	Blok1 calib. A1 1/2	These parameters are saved during the Blocks temperature calibration. Typ. Values of the parameters are for neutral calibration.
R1701	16256	Blok1 calib. A1 2/2	
R1702	0	Blok1 calib. B1 1/2	
R1703	0	Blok1 calib. B1 2/2	
R1704	0	Blok2 calib. A1 1/2	
R1705	16256	Blok2 calib. A1 2/2	

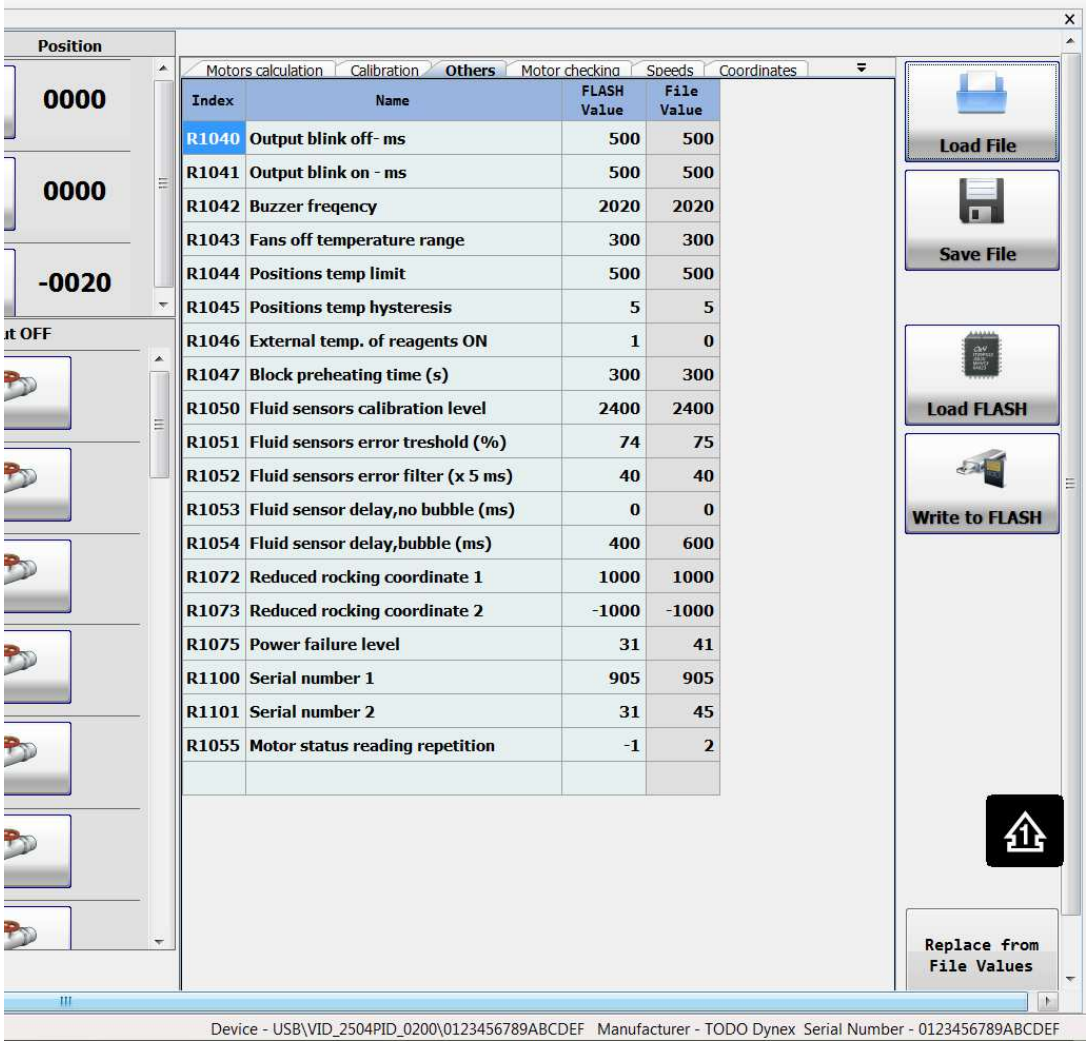
R1706	0	Blok2 calib. B1 1/2	
R1707	0	Blok2 calib. B1 2/2	
R1708	0	Blok3 calib. A1 1/2	
R1709	16256	Blok3 calib. A1 2/2	
R1710	0	Blok3 calib. B1 1/2	
R1711	0	Blok3 calib. B1 2/2	
[Others]			
R1040	500	Output blink off- ms	Don´t change this parameters
R1041	500	Output blink on - ms	
R1042	2020	Buzzer freqency	
R1043	300	Fans off temperature range	Temperature change per minute to stop the block cooling. 100 equal 0,1°C
R1044	500	Positions temp limit	Don´t change this parameters
R1045	5	Positions temp hysteresis	
R1046	0	External temp. of reagents ON	The parameret is saved according to selection in Setup/Reag.positions sensor
R1047	300	Block preheating time (s)	The time for the blocks preheating after external reagent sensors meassure temperatures over the thresholds.
R1050	2400	Fluid sensors calibration level	Don´t change this parameters
R1051	50	Fluid sensors error treshold (%)	
R1052	8	Fluid sensors error filter (x 25 ms)	
R1053	300	Fluid sensor delay (ms)	
R1054	-1	Reserve	
R1055	2	Motor status reading repetition	
R1056	15	Communication check mask	4 bits, 8-sensor b. 4-Block b.3 2-Block b.2 1-Block b.1
R1072	1000	Reduced rocking coordinate 1	Don´t change this parameters
R1073	-1000	Reduced rocking coordinate 2	
R1075	41	Power failure level	
R1100	905	Serial number 1	Instrument serial number in two parts
R1101		Serial number 2	
R1102	0	Setup code	Setup menu access code
[Motor checking]			
R1060	95	ASP ARM front range	Don´t change this parameters
R1061	50	ASP ARM rear range	
R1062	30	ASP ARM microsteps tolerance	
R1063	600	ASP ARM reference timeout	
R1064	-19700	X IRC coeficient	
R1065	-1	Reserve	
R1066	300	X microsteps tolerance	
R1067	6000	X reference timeout	
R1068	200	ROCKING front range	
R1069	200	ROCKING rear range	
R1070	150	ROCKING microsteps tolerance	
R1071	12000	ROCKING reference timeout	
[Speeds]			
R1500	100	Asp.arm accel -low	Don´t change this parameters
R1501	100	Asp.arm speed- low	
R1502	300	Asp.arm accel -high	

R1503	500	Asp.arm speed- high	
R1504	100	X accel -low	
R1505	100	X speed- low	
R1506	80	X accel -high	
R1507	1000	X speed- high	
R1508	50	Rocking accel - default	
R1509	800	Rocking speed- default	
[Coordinates]			
R1550		X priming bowl	These parameters are saved by adjusting in Setup/X-shift position menu
R1551		X 1. block	
R1552		X 2. block	
R1553		X 3. block	
R1554		Asp.arm priming bowl	These parameters are saved by adjusting in Setup/Aspiration arm position menu
R1555		Asp.arm well	
R1556	-2300	Rocking up	Rocking up coordinate
R1557		Rocking horizontal	These parameter are saved by adjusting in Setup/Rocking position menu
R1558	3100	Rocking down	Rocking down coordinate
R1559	94	X well offset	X-shift step between wells
R1560	2000	Rocking down -disp.mixing	Rocking coordinate for mixing after filling of every 3 wells
R1561	400	Asp.arm ready offset	Coordinate for the aspiration arm above well bottom. The arm moves slowly down from this position.
[Constants]			
R1601	30	Priming volume Pump 1	Volume in 0,1 ml used for the first pump priming when Drop button is pressed. It is used for reagent saving too. Adjust this values for reagents tube lenght. It is important for Auto preparation.
R1602	30	Priming volume Pump 2	
R1603	30	Priming volume Pump 3	
R1604	30	Priming volume Pump 4	
R1605	30	Priming volume Pump 5	
R1606	30	Priming volume Pump 6	
R1607	20	Priming volume Pump 7	
R1608	20	Priming volume Pump 8	
R1609	5	Priming volume reduced	Volume in 0,1 ml used for next pump primings when Drop button is pressed and priming before dispensing
R1610	1300	Aspiration time (ms)	Time for well aspiration
R1611	2000	Aspiration time extra(ms)	Not used
R1612	20	Extra well volume	Volume in 0,1 ml for extra wells filling
R1613	-14	Saving vol.heated reag. Pump 7	Volume in 0,1 ml for reagent saving during heated reagent channel preheating
R1614	-14	Saving vol.heated reag. Pump 8	
R1615	13	Priming vol.heated reag. Pump 7	Volume in 0,1 ml for reagent priming during heated reagent channel preheating
R1616	13	Priming vol.heated reag. Pump 8	
R1621	5	Bloks temp.warning limit high	Temperature range in 0,1°C for blocks temperature out of range warning
R1622	15	Bloks temp.warning limit low	
R1623	15	Reag.pos.temp. warning limit high	Temperature range in 0,1°C for reag.positions temperature out of range warning
R1624	15	Reag.pos.temp warning limit low	
R1625		Time compensation register	See capter 6.5 Real time clock compensation
R1626		Compensation interval register	
[PID param]			

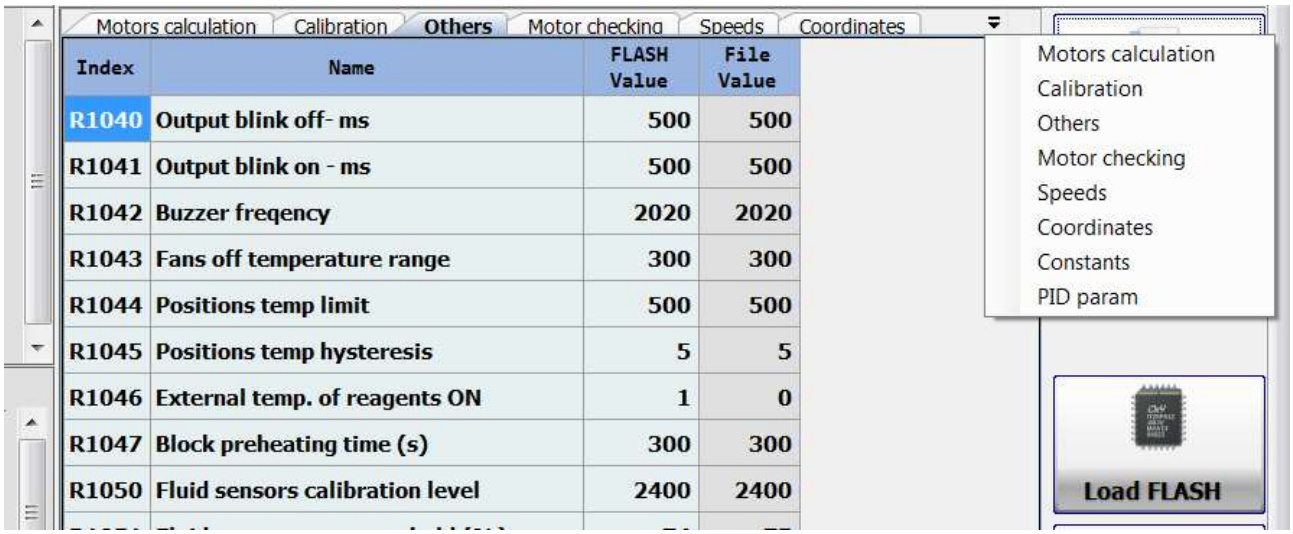
R1650	0	Blok1 Temperature sensor offset	Don´t change this parameters
R1651	200	Blok1 P	
R1652	1000	Blok1 I	
R1653	0	Blok1 D	
R1654	0	Blok2 Temperature sensor offset	
R1655	200	Blok2 P	
R1656	1000	Blok2 I	
R1657	0	Blok2 D	
R1658	0	Blok3 Temperature sensor offset	
R1659	200	Blok3 P	
R1660	1000	Blok3 I	
R1661	0	Blok3 D	
R1662	0	Pozice1 Temperature sensor offset	
R1663	700	Pozition1 P	
R1664	500	Pozition1I	
R1665	0	Pozition1D	
R1666	0	Pozice2 Temperature sensor offset	
R1667	700	Pozition2 P	
R1668	500	Pozition2 I	
R1669	0	Pozition2 D	

Use Instrument / Components control menu or the button . The Component control folder opens.

The right part of the screen is used for I-parameters handling.
Buttons:
Load file – the file (.ipar) with previously saved parameters is opened in File Value column and parameters are loaded from the instrument to FLASH Value column
Save file – saving values from FLASH Value column to the file (.ipar)
Load FLASH - parameters are loaded from the instrument to FLASH Value column, the default file (FlashParams.ipar in DynLab directory) is used for FILE Value column
Write to FLASH – saving values from FLASH Value column to the instrument memory and after confirmation to the file (.ipar)
Replace from file values – all values from File Value column are copied to FLASH Value column.



The parameters value can be changed in the FLASH Value column. They are organized in the folders. Pay atention - not all folders can be seen above the table. Some hidden ones are accessible from right pop menu.



6.6. Real time clock compensation

Built in real time clock needs the compensation for accurate operation. It can be done by saving the correction values to the processor registers.

Procedure :
Clear the compensation registers before the clock accuracy measurement.
Reset the parameters, save them to FLASH and switch the instrument off and on (zero values are active now)

R1625	0	Time compensation register
R1626	0	Compensation interval register

To find accuracy error set the instrument clock with some accurate clock (for example PC).
After 1or 2 days of measured time find the difference between clocks.

Count correction constants, use DBH_RTC_correction .xlsx table (see Help in it).

Set the compensation registers:

R1625	[Correction]	Time compensation register
R1626	[Intreval]	Compensation interval register

Switch the instrument off and on (new values are active now)

Example :

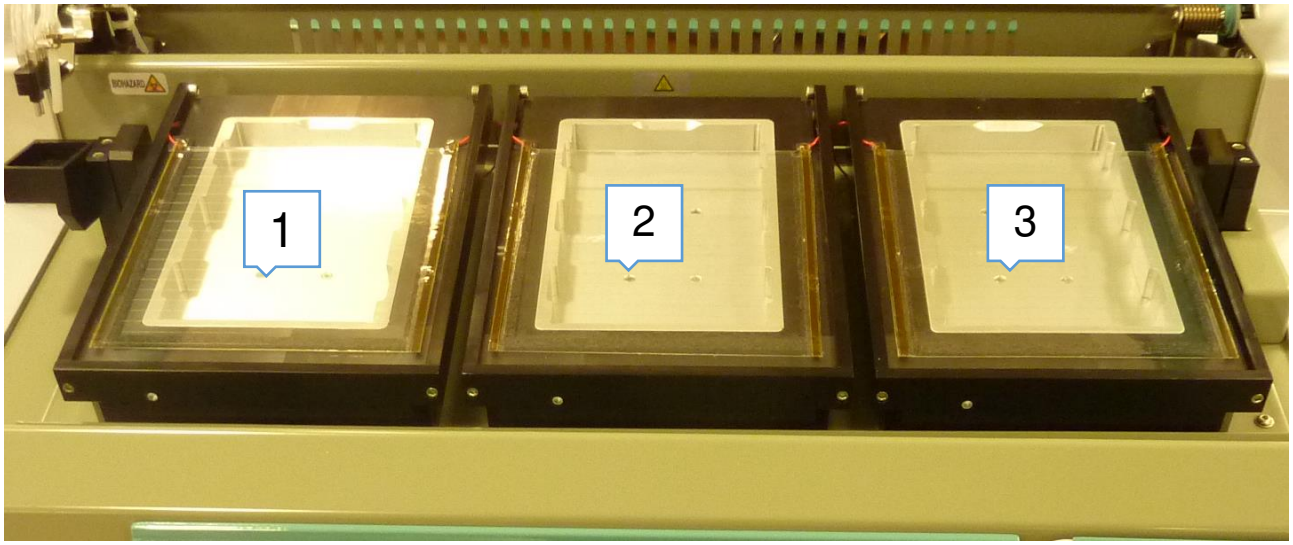
	PC	Instrument
Clock setting	20.9.2016	17:42:00
Time and clock reading	21.9.2016 10:47:00	10:47:18
Meassured time / RTC error	61 500 s	+18 s

The smallest number (0,007) is in green column A. In this row the green column E contains absolute value of Time compensation constant (115) and the G column contains raw compensation interval (12).
Set the compensation registers:

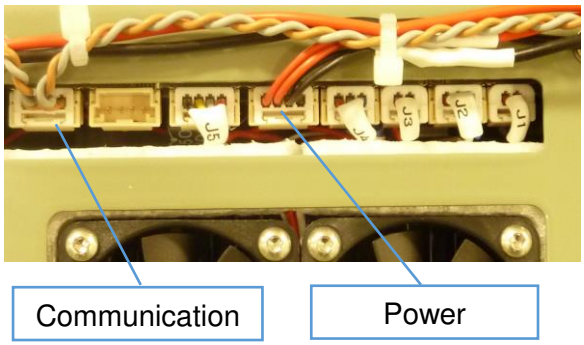
R1625	-115	RTC was faster therefore negativ value.
R1626	11	Value from the table decreased by one.

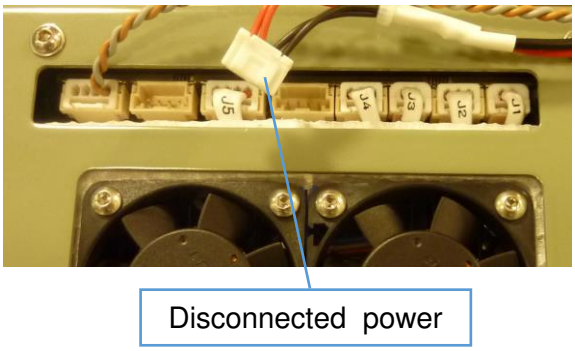
6.7. Block address

When the heated block is replaced its address must be set according to the block position on the rocking holder. Address numbers are 1, 2, 3 form the left side to right side.



When you look for the block current address disconnect the power connectors of the other two blocks. (Note : The new spare heated block are set to address 1).



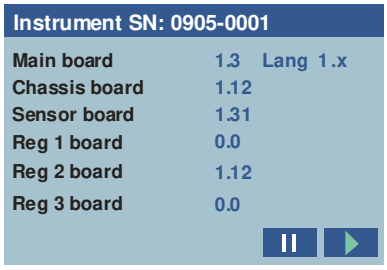


The communication connectors of all three blocks must be connected.
Switch on the instrument and check the number of the block 1,2,3 firmware versions - position the number of which is not equal 0.0 is the address of the connected block.

Its address can be changed by using the Quick send code line. Write instructions and press ▶ (or Enter):

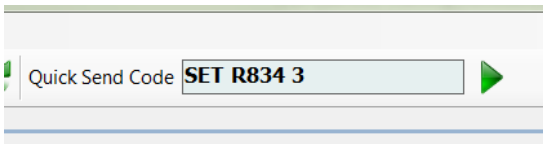
Current addres	Instruction
1	SET R833 [new address]
2	SET R834 [new address]
3	SET R835 [new address]

Example:
After replacement of the block on the 3. position disconnect the power on the 1. and 2. positions and switch on the instrument.



that means the current replaced block address is 2

We want to change it to 3.
Instruction is SET R834 3



Switch off the instrument and connect the power of all blocks.

6.8. Block temperature sensor compensation

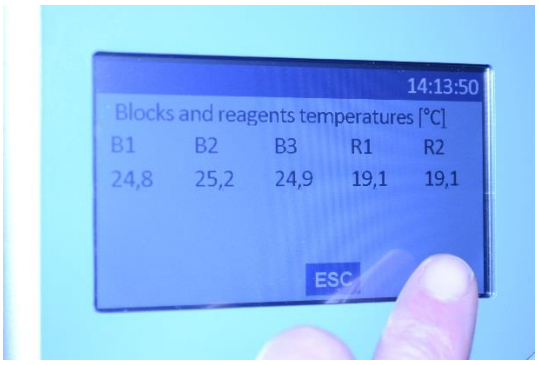
The block temperature built in probe offset can be compensated by saving the compensation constant to the block control board FLASH memory.
The measurement of compensation constants is doing at ambient temperature with the adaptor and the external thermometer. The constant is difference between temperature displayed by the instrument and by the external thermometer. After conpensation these two values are near the same.

Before the measurement must be actual constant saved in the block board FLASH memory set to 0 by using the Quick send code line.

Block address	Instruction
1	SET R839 0
2	SET R840 0
3	SET R841 0

The special service screens can be used for the display of the block temperatures. It is accessible by the hidden button pressing :

and



2 – 1. block regulator
4 – 2. block regulator
6 – 3. block regulator

Block temperature

Use buttons for listing in regulators screens.

Insert the adaptor to block, insert the probe to adaptor, close the lid and wait for both values stabilization.

Then calculate value :
Correction = Ext.termometer temp - Block temp.

Rounded value in tenths of ºC set to FLASH.

Block address	Instruction
1	SET R839 [Correction]
2	SET R840 [Correction]
3	SET R841 [Correction]

Example :

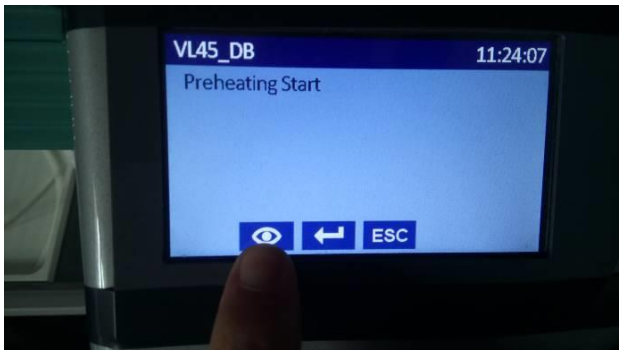
Block temperature: 26,54 º C
External thermometer temp.: 25,82 ºC

Correction = 25,82 - 26,54 = -0,72

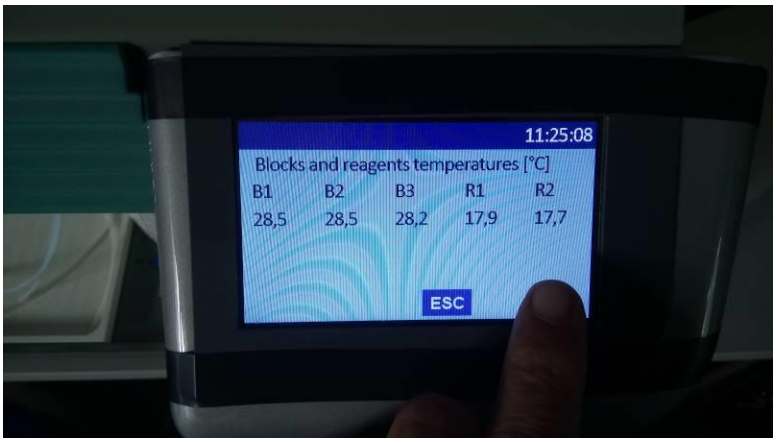
In case of the block 1 : SET R839 -7

7. Auxiliary screens

The auxiliary screens can be used during the service works for the analysis of some instrument components operation.
First open the screen *Block and reagents temperatures*. It can be done by the „Eye“ button or the hidden button in the right bottom button in the *Main menu* sceen.



Push the hidden button in the right bottom button in the *Block and reagents temperatures* sceen.



The first auxiliary screen is opened. The movement among the screens is done by the arrow buttons left and right. For the auxilary screen closing use the ESC button.

List of the screns :

1. Temperature controller 1 – the lid heating of the 1. heating block
2. Temperature controller 2 – the body heating of the 1. heating block
3. Temperature controller 3 – the lid heating of the 2. heating block
4. Temperature controller 4 – the body heating of the 2. heating block
5. Temperature controller 5 – the lid heating of the 3. heating block
6. Temperature controller 6 – the body heating of the 3. heating block
7. Temperature controller 7 – the reagent position 1. (blue)
8. Temperature controller 8 – the reagent position 2. (red)
9. Test I2C
10. Test KM
11. The liquid sensors of the reagent lack
12. Real time clock
13. Various system internal parameters

7.1.1 – 8 Temperature controler screens

PWM	1 – 8 OFF / ON	The controller number, the status OFF or ON
Zadana	Number x.xx °C	The temperature setpoint
PID P	Number	The controller Proporcional constant
PID I	Number	The controller Integrative constant
PID D	Number	The controller Derivative constant
TAct	Number 0 – 100 %	The controler output
FANInt	Neprobehl / Probehl	Test of the blocks fans turning. Neprobehl – no turning, Probehl - turning
Skutecna	Number x.xx °C	The temperature measured by probe, in case controllers 7 and 8 the internal or external probe is displayed acccording to Reagents position sensors setting.
Maximalni	Number x.xx °C	Limit of temperature
PID Fix	Number 0 – 100 %	The controler output fix value (no regulation to a setpoint)
PID Max	Number 0 – 100 %	Max alloved value of the controller output
PID Sum	Number	The controller Integrative variable current value
FANPer	Number	The variable displayed the fan of the blocks rotation

7.2.9 I2C screen

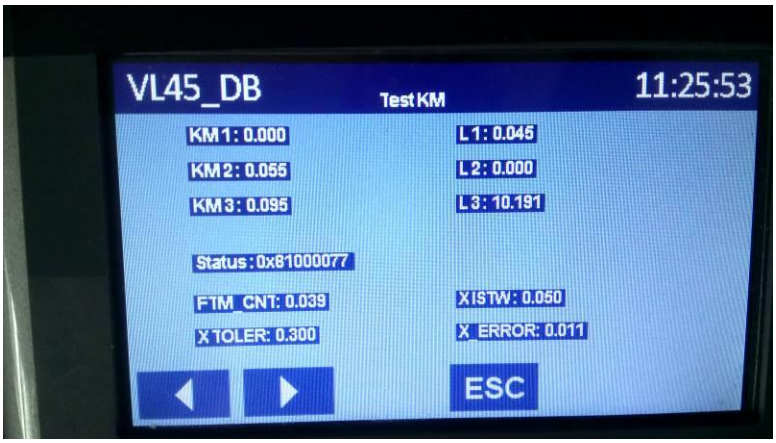
The temperature values [xx.xx oC] of the sensors of the reagent positions 1 and 2

The temperature values at the address lines are assigned to sensors related to setting of the menu Setup / 02 Reag positions sensors :

Address	Reag. position probes setting : Internal	Reag. position probes setting : External
0x90	Internal probe of the position 1	External probe of the position 1 (blue)
0x94	Internal probe of the position 2	External probe of the position 2 (red)
0x98	External probe of the position 1 (blue)	Internal probe of the position 1
0x9C	External probe of the position 2 (red)	Internal probe of the position 2

7.3.10 Test KM

The stepper motors coordinates



KM1	Number	Aspiration arm actual position coordinate
L1	Number	Aspiration arm number of steps lost at the time to going back to 0 coordinate
KM2	Number	X shift actual position coordinate
L2	-	Not used
KM3	Number	Rocking actual position coordinate
L3	Number	Aspiration arm number of steps lost at the time to going through 0 coordinate
Status	Number	Internal status word of the motors control
FTM_CNT	Number	Counter of pulses from x-shift incremental sensor
XISTW	Number	Counter of the x-shift stepper motor steps
X_TOLER	Number	Max allowed tolerance between FTM_CNT and XISTW (set by i-parameter R1066 X microsteps tolerance)
X_ERROR	Number	X_ERROR = XISTW - X_TOLER, if (X_ERROR > X_TOLER) -> *105 X shift error* appears

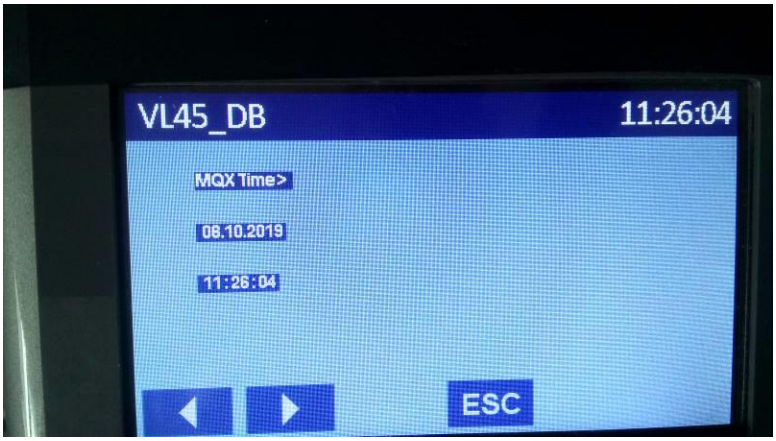
7.4.11 The liquid sensors of the reagent lack

The value of signal from the liquid sensors (Cannnel 1- 8)

ADC0 : 0 - 7	Number / _ K or E	The signal from the sensors. _ - the calibration has not done K - the calibration was successfully done, the value is near 2,4 E - the calibration was done but without sucess (warning message is generated)
BublError	Number	Reagent lack detection during the dispensing

7.5. 12 Real time clock

On line value of the date and the time in the RTC on the mainboard.



7.6. 13 Various system internal parameters

Komparator PFI – comparator of the power supply level used for the power supply failure handling

CMP24V	0/1	O and 1 quickly change when the comparator is in the balance
CMP24V	Number	Value proportional to the supply voltage. When this value fails down bellow the value of the i-parameter *R1075 Power failure level* the instrument saves the protocol run status for recovery.

Kalibrace komunikace – counter value of the baud speed calibration between the mainboard and auxiliary boards

KalibCtc	Number	Value changes according to the baud speed calibration
KalibICS	Number	Calibraton status