Automated Slide Stainer FS-16-25

Instruction for Use

Read carefully before working with the stainer
Always keep this Instructions for Use near the stainer

V1.1 English – 10.02.2021

IVD

Dubna

Revision history

Revision	Effective date	Change	Written by
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1.1	10.02.2021	For CE marking	Kutepov M.V. Bezrukov A.V.

FORBIDDEN TO OPERATE THE STAINER WITHOUT PRIOR READING THE INSTRUCTION FOR USE.

CAUTION! ALWAYS KEEP THIS INSTRUCTION FOR USE NEAR THE STAINER.

MLT LLC reserves the right to change technical specifications as well as manufacturing processes without prior notice. Only this way is it possible to continuously improve the technology and manufacturing techniques. The information on important changes is added to the technical file of the device and is published on the manufacturer's website www.mlt.ru.

The latest technological programs, tutorial video materials, as well as supplementary documents for the device FS-16-25 are available on the website www.fastainer.com, section http://fastainer.com/resources.

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For the device serial number and year of manufacture, please refer to the nameplate at the back of the device.

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1 Important information

General

This instruction for use includes important information related to the operating safety and maintenance of the automated slide stainer FS-16-25 (further – Stainer). The instruction for use is an important part of the product. It must be read carefully and completely before setup and prior use of the Stainer and must be kept near the device at all times. If additional requirements on accident prevention and environmental protection exist in the country of operation, the instruction for use must be supplemented by appropriate instructions to ensure compliance with such requirements.

Diagnosis should not be made only with staining results obtained with Stainer.

FORBIDDEN TO OPERATE THE STAINER WITHOUT PRIOR READING THE INSTRUCTION FOR USE. First of all, be sure to carefully read and comply with chapter 2 “Safety”.

1.1 Used symbols and indications

1.1.1 Warning words.

Warning words: **CAUTION!**, **FORBIDDEN** are marked by capital letters and white font color on black background. The text following the warning words is marked by capital letters.

When several warnings are standing together, they are grouped in such a way that the first ones refer to the safety of personnel.

Symbol	Description
CAUTION!	The CAUTION! sign is used to attract the attention of personnel to the ways and methods that should be strictly followed to avoid mistakes in operation and repair of the Stainer, or when extra carefulness is vital in handling the device or materials.
FORBIDDEN	The FORBIDDEN sign is used to indicate that a violation of the defined limitations or nonobservance of the requirements, referring to the usage of materials, as well as to the ways and methods of handling the Stainer, may lead to violation of safety measures.

1.1.2 Symbols.

Symbol	Name of the symbol	Location, designation
	Warning, danger	Lid of the Stainer. A warning about handling of toxic and corrosive reagents, about the necessity to use protective equipment.
	Fire hazard	Lid of the Stainer. A warning about the handling of highly flammable liquids.
	Biological hazard	Lid of the Stainer. A warning about handling of hazardous biological samples, about the necessity to use protective equipment.
	Warning, danger	Rear panel of the Stainer beside the fuses' lid. A warning about the risk of setting the device on fire if fuses with the wrong rating are used.
	Warning, danger	Manipulator housing in the center of the working chamber. A warning about the risk of injuries by moving manipulator.
	Hot surface	Inside the working chamber beside the drying station. The symbol indicate a risk of burns because of hot surfaces. Do not touch these parts. The symbol shown here indicates areas where the temperature may exceed 60°C
	OFF	Right panel of the control unit, power switch.
	ON	Right panel of the control unit, power switch.
	Device for IN VITRO diagnostics	Instruction for use, label on the rear panel of the Stainer.
	Serial number	Instruction for use, label on the rear panel of the Stainer.
	Catalog number	Instruction for use, label on the rear panel of the Stainer.
	Manufacturer	Instruction for use, label on the rear panel of the Stainer.
	Manufacture date	Instruction for use, label on the rear panel of the Stainer.
	Authorized representative in the EU	Instruction for use l, label on the rear panel of the Stainer.
	Fuse rating	Instruction for use, label on the rear panel of the Stainer.
	Refer to the instruction for use	Operational documentation.

	UP	Labels on the packing box of the Stainer, indicating the correct position of the cargo.
	Fragile. Caution. Fragility of the cargo. Careful handling of the cargo.	Labels on the packing box of the Stainer, stating the necessity of careful handling of fragile cargo.
	Limit on the number of tiers in a stack.	Labels on the packing box of the Stainer. The limit number of tiers when piling in a stack – 2 (Two).
	Protect from moisture.	Labels on the packing box of the Stainer, stating the necessity to protect the cargo from moisture.
	Protect from sun radiation.	Labels on the packing box of the Stainer, stating the necessity to protect the cargo from sun radiation.
	Open here	Labels on the packing box of the Stainer. Operational documentation.
	MLT LLC logo	Instruction for use, label on the rear panel of the Stainer, labels on the packing box of the device. A stylized image of the manufacturing company's name.

1.1.3 Stainer label.

The label containing the Stainer's name, its serial number, the year of manufacture and other information is situated at the rear panel of the device. (📖 3.1.1)

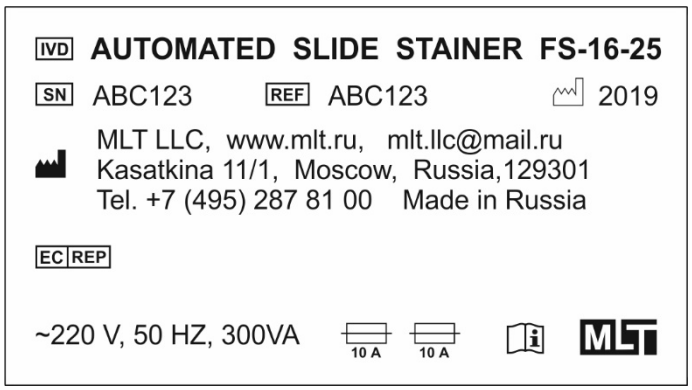


Figure 1. The appearance of the Stainer label.

1.1.4 Designation of menu sections, touch screen buttons, and operational actions.

Menu sections are designated with capital letters between double angle quotation marks, e.g., «PROCESS», «SERVICE», «CONFIGURATION», etc.

Touch screen buttons are designated in the text as inscriptions in capital letters placed in a frame, e.g., ENTER, YES, STOP. The symbol ⇔ is designated a cyclic switching of buttons.

Use of touch screen buttons with icons.

◄► – to switch between two screens with a list of names of technological programs.

▼, ▲ – to switch between screens with the same application (6 screens with a list of reagents, screens with listings of a program).

– to erase the last entered symbol (digit).

Messages on the screen are designated with capital letters between single angle quotation marks, e.g., <PROGRAM WAS CHANGED>, <SAVE THE CHANGES?>.

1.2 Intended use

The automated slide stainer FS-16-25 is a device for IN VITRO diagnostics. The device is designated for the staining of biological preparations on slides. The primary intended use is histology (particularly – H&E technique) and cytology (particularly – Papanicolaou stain, for conventional and LBC preparations). The device also can be successfully used for preparation staining in hematology, microbiology, parasitology.

FORBIDDEN TO USE THE STAINER FOR ANY PURPOSE OTHER THAN THE DESIGNATED ONE.

The violation of this requirement may result in accidents, injuries, damages to the device. The designated use comprises observance of all requirements of the instruction for use, including observance of the control and maintenance intervals, a routine check of expiry dates, and quality of reagents. The Stainer performs a chosen technological program automatically. The manufacturer is not liable to respond if a mistake in programming or during operation is made, inappropriate reagents are used, the reagents are placed inappropriately, a program is started with closed lids of troughs, etc.

1.3 Compatibility with reagents and accessories of other manufacturers

The Stainer is an open system. The programs, supplied with the Stainer, may need corrections of parameters or changes in programs if used with reagents of other manufacturers. In most cases, a correction of the duration of technological treatments might be needed. Staining kits manufactured by MLT LLC are supplied with an operational instruction with a recommended technological program. The responsibility for independently compiled programs, for reagents purchased from other manufacturers, or for self-manufactured reagents is born by the end-user.

FORBIDDEN TO USE ACCESSORIES AND SPARE PARTS, NOT AUTHORIZED BY THE MANUFACTURER.

1.4 Qualification of personnel

The FS-16-25 may be operated only by trained laboratory specialists – doctors and lab technicians. All laboratory personnel designated to operate the Stainer must read this instruction for use with all appendices carefully and must be familiar with all technical features of the Stainer before attempting to operate it.

FORBIDDEN TO OPERATE THE STAINER UNLESS THE PERSONNEL HAS COMPLETED A SAFETY TRAINING, AND UNLESS READ CAREFULLY THIS INSTRUCTION FOR USE WITH ALL APPENDICES.

2 Safety

2.1 General safety statements

This Stainer has been developed, manufactured, and tested under safety requirements for electrical laboratory devices. To maintain a safe technical state of the Stainer, the operator must observe all requirements of this instruction for use. If the instructions are not followed, then the protection provided by the device may be impaired. All users must read and understand the Instruction for Use and only operate the Stainer in accordance with this instructions. A warning is given in the document if there is a danger of personal injury or damage to samples or equipment. If additional requirements on accident prevention and environmental protection exist in the country of operation, the instruction for use must be supplemented by appropriate instructions to ensure compliance with such requirements.

2.2 Special safety statements

The Stainer weighs 22 kg. When packed, two boxes with accessories are placed inside the working chamber, so that the total weight amounts to about 25 kg.

FORBIDDEN TO UNPACK AND TO CARRY AN UNPACKED STAINER ALONE.

FORBIDDEN TO RAISE AND CARRY THE DEVICE, HOLDING IT BY THE UPPER PANEL (20) (📖 Fig.4, Fig. 6).

Toxic and corrosive reagents, highly flammable liquids, as well as potentially hazardous biological preparations may be used during operation.

Refer to your own laboratory procedures and material safety data sheets (MSDSs) when using reagents. Material safety data sheets can be obtained from the supplier of the chemicals. They are also available on the Internet: http://www.msdsonline.com.

FORBIDDEN TO HANDLE REAGENTS AND BIOLOGICAL PREPARATIONS WITHOUT APPROPRIATE PROTECTIVE EQUIPMENT: LAB COAT, GLOVES, GOGGLES.

FORBIDDEN TO HAVE MEALS IN THE ROOM, WHERE THE STAINER IS INSTALLED.

The Stainer is connected to the power supply net ~ 220 V with a cable with protective grounding. The socket must also be grounded.

FORBIDDEN TO OPERATE THE STAINER, IF IT IS NOT CONNECTED TO GROUNDING.

Toxic and corrosive reagents may be used during the operation, so the device must be either connected to the laboratory exhaust ventilation system or installed in an exhaust hood.

FORBIDDEN TO OPERATE THE STAINER, IF IT IS NOT CONNECTED TO VENTILATION OR BEYOND EXHAUST HOOD.

Highly flammable liquids, such as spirits, spirit-based dyes, xylene or xylene substitutes may be used during an operation.

FORBIDDEN TO INSTALL THE STAINER IN DIRECT VICINITY OF A FLAME OR IGNITABLE SPARKS.

FORBIDDEN TO INSTALL THE STAINER IN A ROOM WITH NO FIRE EXTINGUISHING MEDIA, SUCH AS CO2 OR HALON FIRE EXTINGUISHER.

A standard instruction on fire safety measures given in Appendix A.

FORBIDDEN TO DISMANTLE THE STAINER: ELECTRIC SHOCK MAY RESULT! ANY UNAUTHORIZED DISMANTLING OF THE STAINER RENDERS THE WARRANTY INVALID.

Only authorized and qualified service personnel may repair the instrument and access the instrument's internal components.

Do not modify the instrument – if unauthorised modifications are carried out, the instrument may be made unsafe and the warranty may be invalidated.

3. General characteristics

3.1 Description of Stainer

3.1.1 Construction of Stainer.

The Stainer consists of a technological unit (5) with a working chamber and a lid (1) and a control unit (3) with a touch-screen (4).

Figure 2. Front view of the Stainer.

1 – transparent lid; 2 – uploading gateway; 3 – control unit; 4 touch-screen; 5 – technological unit with a working chamber, 6 – handle of the lid.

Figure 3. Rearview of the Stainer.

1 – transparent lid; 7 – exhaust water outlet; 8 – exhaust ventilation grid with an outlet* 9 – tap water inlet; 10 – Stainer label with a serial number, manufacturing year; 11 – power supply inlet**;12 – protective cover for 10 A electric fuses; 13 screw-type feet;

* An inflow ventilation inlet, protected by a removable lid and a filter, is situated on the bottom of the Stainer.

**The power switch is placed on the left side panel of Stainer.

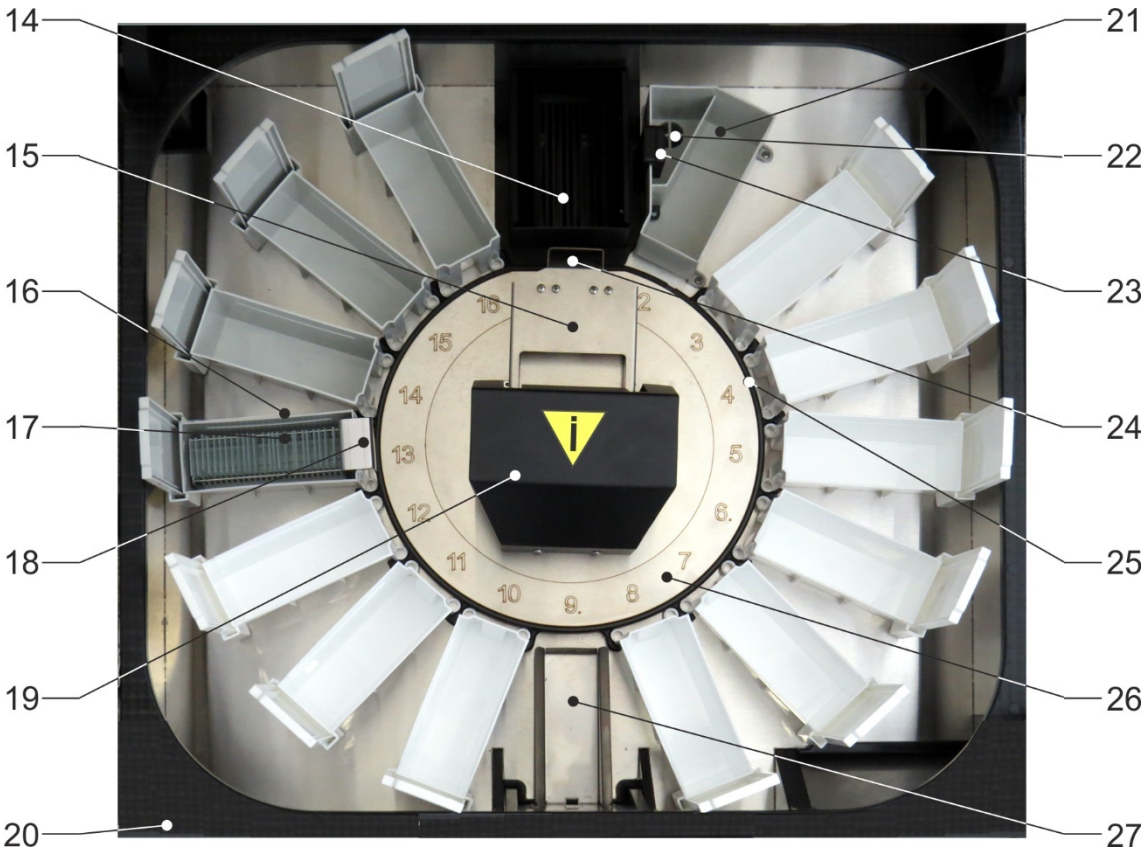


Figure 4. Top view of the Stainer, working chamber of the technological unit.
14 – drying station; 15 – arm of manipulator; 16 – trough with a rack inside; 17 – rack with slides; 18 – handle of rack; 19 – manipulator housing; 20 – upper panel of Stainer; 21 – flow-through trough; 22 – drainage hole of flow-through station; 23 – water level sensor; 24 – grab of manipulator; 25 – positioning disk; 26 – index plate of stations numeration; 27 – tray of gateway (parking station №9).

3.1.2 Accessories: troughs and racks.

The Stainer is supplied with RV-25 racks for 25 slides.

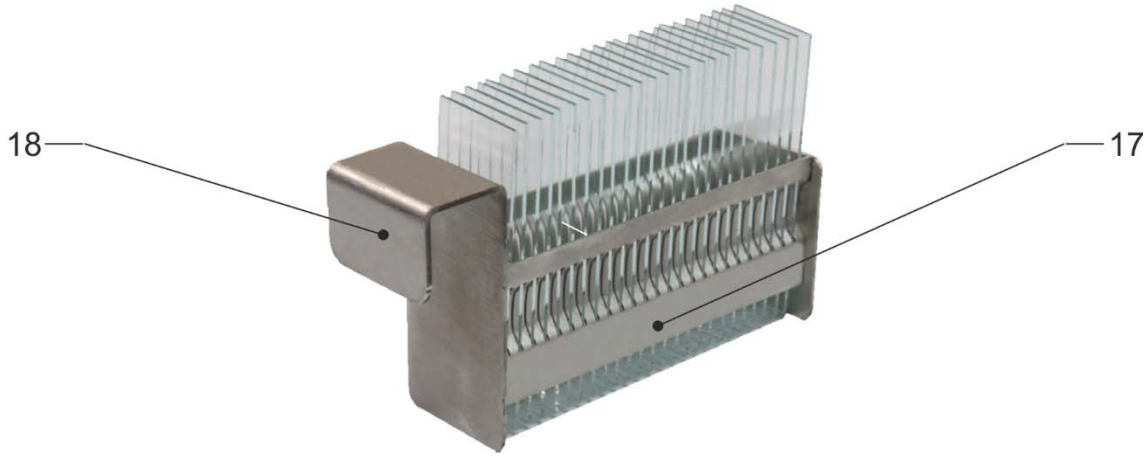


Figure 5. Stainless steel rack RV-25 with slides.

17 – rack; 18 – handle of the rack

The Stainer is supplied with two types of troughs:

TV-25-POM – a polyoxymethylene trough **(color: grey)** for RV-25 racks; **recommended when handling xylene; substitutes of xylene**; aqueous solutions; and solution with pH≥7.

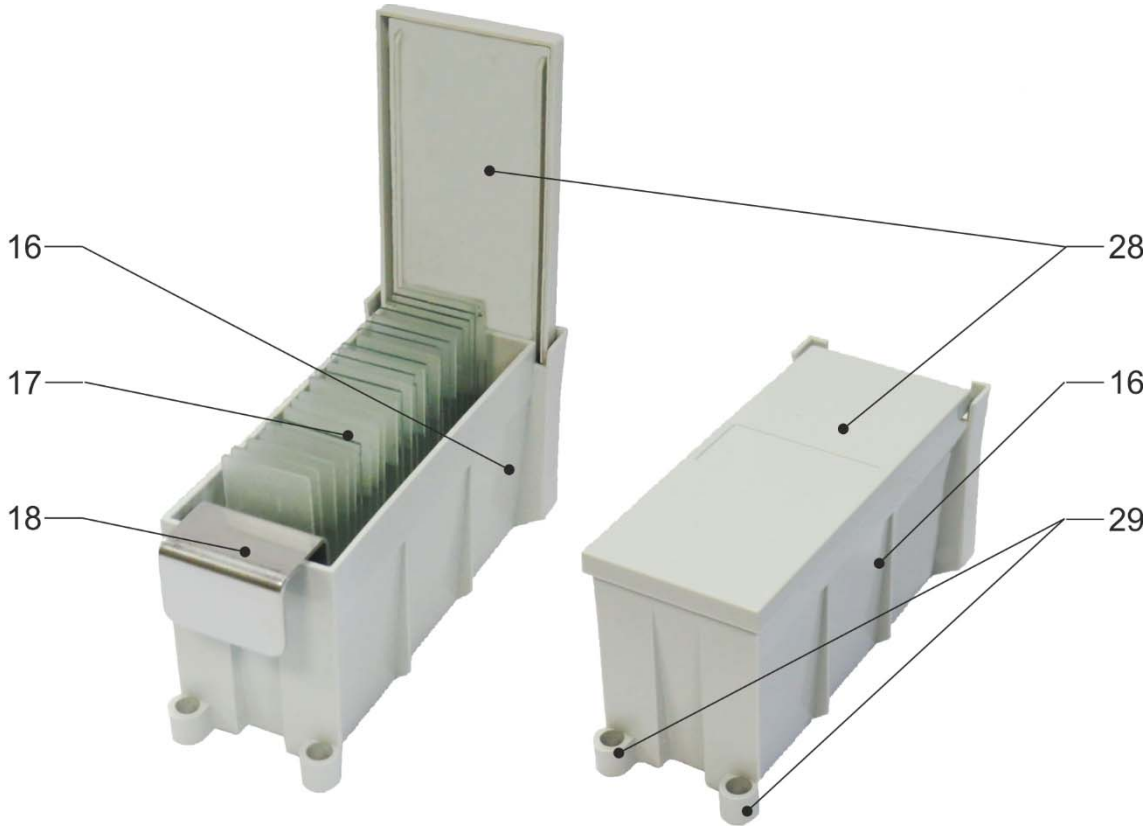


Figure 6. Accessories for the Stainer.

16 – TV-25-POM trough; 17 – rack; 18 – handle of the rack; 28 – the lid of the trough; 29 – positioning element of the trough.

TV-25-PP – a polypropylene trough **(color: either white or natural half-transparent)** for RV-25 racks; recommended when handling aqueous solutions; spirits; and acetone.

Recommended volume of liquid in troughs:

when there are 25 slides loaded into the rack – 210 ± 10 ml.

when there are 12 slides loaded into the rack – 220 ± 10 ml.

when there are 5 slides loaded into the rack – 230 ± 10 ml.

3.1.4 Micro SD card and micro SD card slot.

The Stainer is supplied with micro SD card, and the micro SD card slot. The memory card is used to store microprocessor firmware data. The firmware can be updated or edited using the software for PC "Fastainer Firmware Editor" (APPENDIX F).

The micro SD card slot is placed inside the control unit (3). All manipulations with the micro SD card are allowed only for engineering personnel who have been instructed by the manufacturer. The use of the "Fastainer Firmware Editor" software for the development of technological programs is allowed for any laboratory personnel.

3.1.5 Working principle of Stainer.

The principle of the staining process is the sequential programmed movement of racks with slides from station to station where technological operations are carried out.

The working chamber of Stainer is covered with a transparent lid and has compulsory ventilation, which ensures safety in handling toxic reagents.

The Stainer are equipped with the following types of stations:

● one station with a flow-through trough (tap water);

● one station for drying or heating with warm air flow;

● one station for automated loading and unloading of racks;

● combined stations – either for placement of troughs with liquid reagents, or for placement of racks with slides, what makes it possible to create an optimum configuration of a device for each staining technique and even for each laboratory.

The device stains slides using a group method. The slides are put into a rack. The racks are loaded into the working chamber and arranged at parking stations automatically with the help of a manipulator (15). When the loading of racks is complete, the Stainer starts to perform a technological program: the manipulator transfers the racks with slides from station to station, where there are troughs with reagents, and where

technological operations are carried out (fixation, staining, washing, drying, blotting and so on).

Operation duration, reagent, and station, in which the operation is performed, are programmable and changeable. Control and programming are performed with a color touch-screen display. Programming functions include not only the consequence and duration of technological operations but also their parameters and modes. For instance, a technological operation can be performed in a number of ways: immersion into the reagent, immersion with a programmed period of activation, repeated dipping of slides into the reagent (can accelerate the speed of procession).

When processing of a rack is complete, it goes back to the initial station, where it has been loaded in the beginning*— the Stainer signals about the completion of processing of each rack and all loaded racks. Unloading of racks is performed automatically with the help of the manipulator.

The mechanics of Stainer is unique in simplicity and reliability. The racks with slides rotate not only in a horizontal plane but also up and down. The rising of a rack from reagent is accompanied with inclining and vibration, which facilitates the draining of excess liquid from slides and the rack. Thus, the transfer of reagents between troughs is very low. The manipulator's mechanism is designed in such a way that a rack gets firmly fixed in its grab, making it possible to carry out high-speed movements (during dipping, shaking, transfer from station to station, etc.). The option to program the duration of delay of a rack above the trough ('draining time') lets excessive reagent flow off. Programming the interval for the new rack processing launch makes it possible to configure programs with a parallel procession of several racks. To multiply performance, there is a possibility to install several troughs with the reagent that is used for a most time-consuming operation.

Thus, the Stainer offers a good number of opportunities to make the process of staining FAST, versatile, and efficient despite their compact size.

*There is one exception of this rule: the reagent <XYLENE-E>, assigned to a station, where the last operation of a program is performed, possess particular properties. When this reagent is assigned, the processed rack with slides remains at the last station in <XYLENE-E> and does not return to the parking station.

3.2 Technical data

Number of combined stations	13
Number of upload-unload stations (gateway)	1
Number of drying stations	1
Number of washing stations (with a flow-through trough)	1
Size of slides*	76 × 26 x 1,0 mm
Stained part of a slide	~ 26 × 55 mm
Capacity of RV-25 racks	25
Heating modes of the drying station	strong/weak
Ventilation of the working chamber	forced
Graphic touch screen (control)	480 × 272 pixels
Number of staining programs, supplied with the Stainer	1
Max. number of staining programs	32
Max. number of steps in a program	30
Max. number of programmed reagents' names	96
Power supply	~ 220 В ± 10%, 50 Hz
Power consumption, no more than	300 V*A
Dimensions	600x550x370 mm
Weight	22 kg

3.3 Environmental conditions

Operational temperature:	from 15 to 35 °C
Operational relative humidity:	80 %, non-condensing
Storage temperature:	from -40 to +50 °C
Storage relative humidity:	80 %, non-condensing
Transportation temperature:	from -40 °C to +50 °C
Transportation relative humidity:	80 %, non-condensing

* It is possible to order racks for slides of other sizes.

3.4 Delivery set

A standard delivery set includes:

Device	Product code	Quantity
Automated slide stainer FS -16-25	266012.006	1
Accessories		
RV-25 rack for slides (for 25 slides)	06.01.00	2
TV-25-PP trough for reagents with a lid	06.06.00	10
TV-25-POM trough for reagents with stainless steel lid	06.06.00-01	2
Blotter	07.10.00	1
Kit for tap water connection, including:	05.70.00	1
- Hose for water connection	05.70.01	1
- Drain hose	05.70.02	1
Power cord	05.50.00	1
Fuse	05.51.00	2
Instruction for use	266012.007 IU	1

4. Unpacking and installation of Stainer

4.1 Site requirements

The Stainer must be placed on a solid horizontal surface with the dimensions min. 0,6 m long and 0,6 m wide. A grounded socket for connection to power must be situated not father from the installation site than the length of the cable (1,5 m). The Stainer must be located within reach of a tap and drain (1 - 1,2 m), and the laboratory ventilation system. An installation in an exhaust hood is possible, in which case there is no need to connect to the ventilation system.

4.2 Unpacking of Stainer

The Stainer is packed in a corrugated cardboard box and a polyethylene film hood.

CAUTION! AFTER TRANSPORTATION AND STORAGE UNDER LOW TEMPERATURES AND BEFORE UNPACKING, THE STAINER MUST BE KEPT IN TRANSPORTATION PACKING FOR AT LEAST 4 HOURS UNDER NORMAL ENVIRONMENTAL CONDITIONS.

CAUTION! STAINER IS HEAVY. USE ADDITIONAL HELP WHEN LIFTING AND POSITIONING.

To unpack, cut open the box by cutting the band that fixes together the flaps on the upper side of the box. Open the box, by unbending the flaps, take out of the niche in the upper corrugated cardboard gasket a bag with documentation. Take off the upper gasket. Take out lateral gaskets.

Take out the Stainer, using the transportation belts (or polyethylene film, in which the device has been packed).

FORBIDDEN TO RAISE AND CARRY THE DEVICE, HOLDING IT BY THE UPPER PANEL (20) (🕮 Fig.4).

Set the Stainer free from the polyethylene film and transportation belts. Open the upper lid of the Stainer, take out of the working chamber corrugated cardboard boxes (31, 33), and gaskets by its sides (30.32).

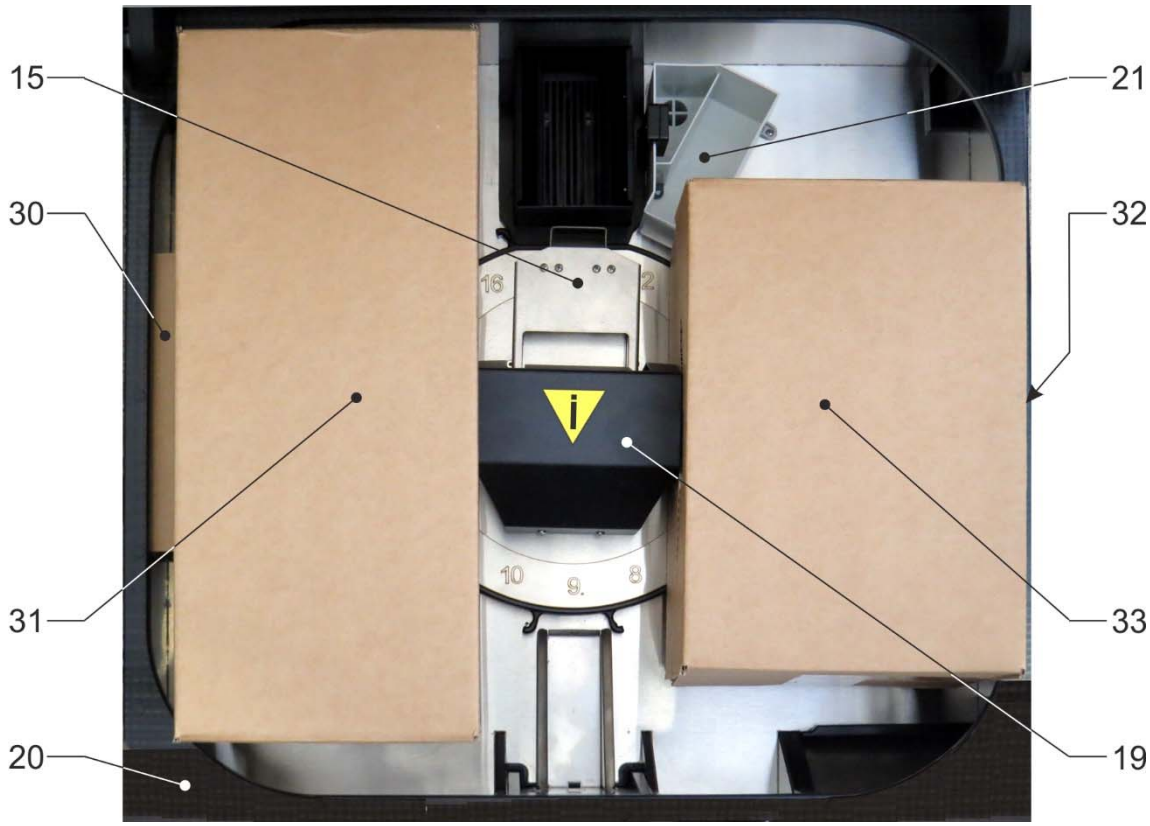


Figure 7. Unpacking of Stainer. Top view at the working chamber with the lid open. 15 – arm of the manipulator; 19 – manipulator housing; 20 – upper panel of Stainer; 21 – flow-through trough; 30 – «thick» corner gasket; 31 – big box with accessories (troughs with lids, racks, blotter); 32 – «thin» corner gasket; 33 – small box with accessories (kit for tap water connection).

CAUTION! IT IS RECOMMENDED TO KEEP THE BOXES (31,33) AND THE GASKETS (30,32) THEY WILL BE NEEDED TO PACK THE STAINER FOR TRANSPORTATION. THE BOX FIXES THE MANIPULATOR DURING TRANSPORTATION.

CAUTION! IT IS RECOMMENDED TO KEEP THE ORIGINAL PACKING OF THE STAINER AND ACCESSORIES.

CAUTION! ANY DEVICE, ITS PART, OR ACCESSORY, WHICH IS RETURNED TO MLT LLC, OR WHICH IS IN NEED OF MAINTENANCE AT THE OPERATION SITE, MUST BE APPROPRIATELY CLEANED AND DISINFECTED. (📖 5.4.2)

4.3 Connection of Stainer

Place the Stainer on the installation site. If necessary, align the device in a horizontal plane with the help of screw-type feet (12) (Fig. 3)

4.3.1 Electric connection.

The Stainer is connected to the electric socket with a power cord, which is supplied with the device. Connect the power cord to the power supply inlet (11) (Fig. 3) at the rear of the device. Connect the power cord to a grounded electric socket. The socket must be compatible with the power cord plug. If not, do not use adapters, but replace either the socket or the power cord.

4.3.2 Connection to ventilation.

If the Stainer is installed beyond an exhaust hood, it must be connected to the laboratory ventilation system, as a rule, with flat ventilation tubes made of plastic 110 x 55 mm in size, with respective fittings. Between the Stainer and the ventilation tubes, there is a flexible corrugated ventilation duct 100 mm in diameter (D100). The flexible ventilation duct is fixed at the Stainer's ventilation inlet (10) with a clamp. At the other end, a connector of round plastic ducts is installed and fixed with a clamp. Then the ventilation duct has lain following the peculiarities of the premises.

4.3.3 Connection to drain.

Connection to the drain system is analogous to that of a washing machine. A 1,5 m long, 3/4"-3/4" drain hose for washing machines (Fig. 8) is needed for water discharge.

Figure 8. Drain corrugated hose (for washing machines).

Connect the hose to the Stainer's water outlet (7) in the niche at the rear panel of the device. Fix the hose at the outlet with a clamp. Bring the second end of the hose to the drain system. The hose might be placed into the stub of the drainpipe, or put onto the pipe stub at the sink siphon, which is normally designated for connection of washing machines and dishwashers. When connecting to the sink siphon pipe stub, fix the hose with a clamp.

CAUTION! BEFORE CONNECTION, CHECK FOR A BACK-FLOW VALVE AT THE PIPE STUB OF SIPHON; IF THERE IS ONE – REMOVE IT, BECAUSE THE WATER DRAIN, FLOWS NATURALLY.

CAUTION! THE DRAIN HOSE MUST NOT BE KINKED, BENT, OR PINCHED CAUSING HOSE DAMAGE OR RESTRICTING WATER FLOW.

CAUTION! THE EXHAUST WATER OUTLET MUST BE LOCATED HIGHER THAN THE CONNECTION POINT OF THE HOSE TO THE DRAIN SYSTEM AND HIGHER THAN THE EDGES OF THE SINK, TO THE SIPHON OF WHICH THE STAINER IS CONNECTED. THE DRAIN HOSE MUST BE LAIN AND FIXED IN SUCH A WAY THAT ALL ITS SECTIONS WOULD BE LOWER THAN THE EXHAUST WATER OUTLET OF THE STAINER. WHEN LAYING THE HOSE, MAKE SURE THERE ARE NO REVERS SLOPES OF HOSE.

4.3.4 Connection to a water supply.

Connection to the water supply system is made with a flexible 3/4"-3/4" pipe thread connection hose for washing machines (included in the delivery set).

Figure 9. Connection hose for Stainer.
(flexible 3/4"-3/4" connection hose for washing machines)

Connect the hose corner fitting with a nut to the tap water inlet (8) at the rear panel of the Stainer. Tighten the nut with hand. Connect the other end of the hose to a cold water tap having a ¾” pipe thread. Tighten the nut with hand. Turn on the tap; check that there are no water leaks. If necessary, tighten the nuts of the hose.

CAUTION! THE WATER SUPPLY HOSE MUST NOT BE KINKED, BENT, OR PINCHED CAUSING HOSE DAMAGE OR RESTRICTING WATER FLOW.

CAUTION! THE CONNECTION HOSE MUST NOT BE TENSIONED. IF THE SUPPLIED HOSE IS TOO SHORT, CHANGE IT TO A LONGER ONE, WHICH CAN HOLD THE WATER PRESSURE IN THE WATER SUPPLY SYSTEM.

CAUTION! MAKE SURE THERE ARE NO LEAKS IN THE WATER SUPPLY AND IN THE DRAIN SYSTEMS AND THAT THERE ARE NO BENDS AT THE DRAIN HOSE BEFORE STARTING THE OPERATION.

CAUTION! WHEN THE WORK IS FINISHED, IT IS RECOMMENDED TO TURN OFF THE TAP.

5. Operation and control of functioning

5.1 Main menu, menu structure

Operation and functioning control of the Stainer is carried out with a 480 x 272-pixel color touch screen.

When the Stainer is switched on, it starts self-testing, and a splash screen with a manufacturer's (or dealer's) logo appears on the touch screen (Fig. 10), then the Stainer switches to the main menu (Fig. 11).

Figure 10. Splash screen.

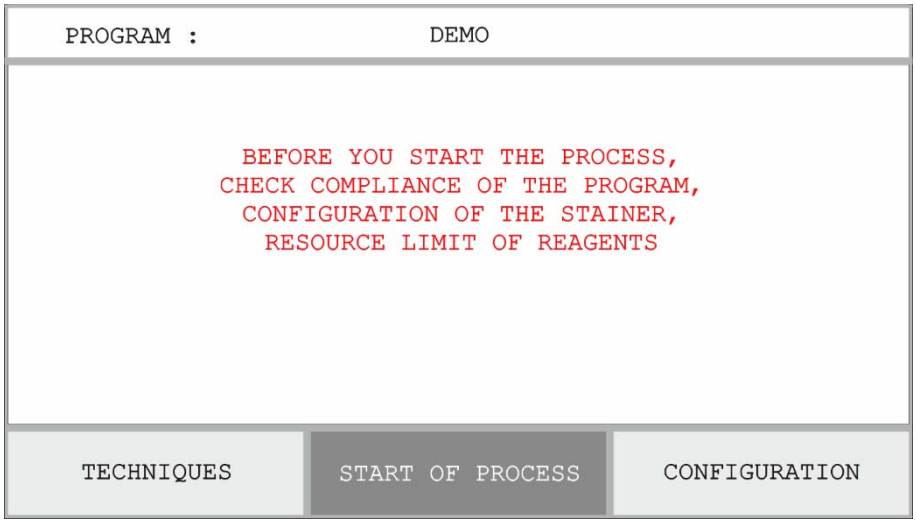


Figure 11. Main menu.

The upper line of the screen contains the name of the program.

In the middle part of the screen, there is a warning about a necessity to check the operational readiness of the Stainer: before the operation, a lab technician must arrange

troughs with reagents in the working chamber following the protocol of technological program, and check the expiry date of reagents.

The bottom part of the screen has the following buttons:

TECHNIQUES START OF PROCESS CONFIGURATION

TECHNIQUES – to switch to the menu section «TECHNIQUES» (choice of a technological program from the available ones, correction of parameters of a program, and programing a new technological program).

START OF PROCESS – to switch to the menu section **«**PROCESS**»** (**loading and unloading of racks,** processing of racks with slides according to a chosen program).

CONFIGURATION – to switch to the menu section «CONFIGURATION» (changing configuration of the Stainer: changing properties of stations, including the choice of reagent and delay time above a trough for draining of reagent; changing the interval for introduction of new racks; switching to the menu «SERVICE»).

5.2 Menu section «TECHNIQUES»: programming of new techniques, editing of parameters of previously downloaded techniques

To access the menu section «TECHNIQUES», press the button TECHNIQUES in the main menu.

.

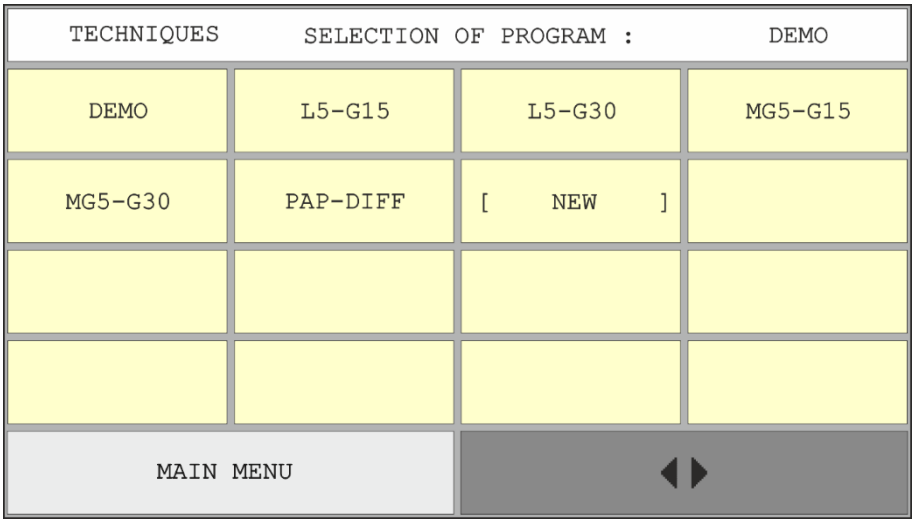


Figure 12. Menu section «TECHNIQUES».

The upper line indicates the application of the current screen: current menu section <TECHNIQUES> and current program: <DEMO>.

In the middle part of the screen, there is a choice of available programs, which have been recorded into the memory of the Stainer. To choose a program, press the button with

a respective name. Pressing the button DEMO starts a demonstration program for acquaintance with the Stainer and checks of its working capacity.

The bottom part of the screen has the following buttons:

MAIN MENU ◄►

MAIN MENU – to switch back to the main screen.

◄► – to switch between screens with a list of preprogrammed programs (in total 2 screens, each is with 16 reserved buttons).

To program a new program, press the button [NEW] and enter the number of technological operations (Fig. 13).

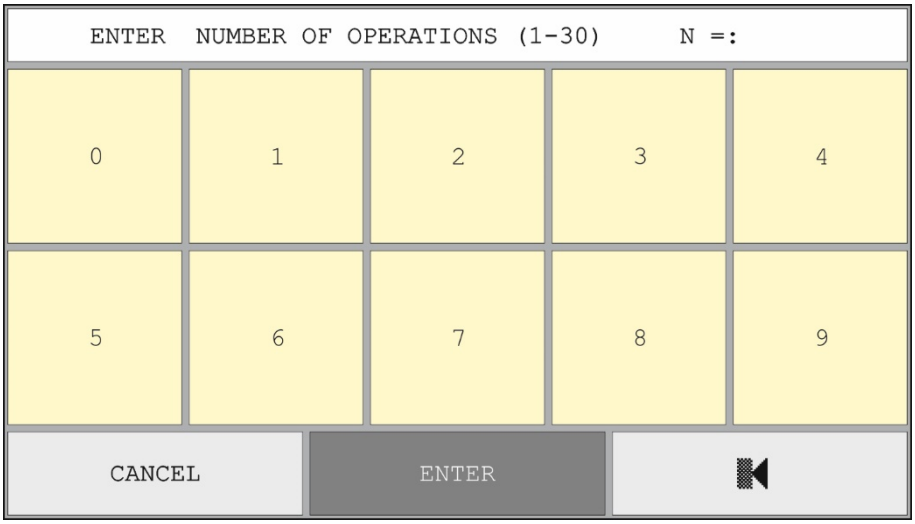


Figure 13. Entering the number of operations for a new program.

Enter the needed number of operations and press the button ENTER. Then enter the name of the new program (up to 12 alphanumerical symbols) (Fig. 14).

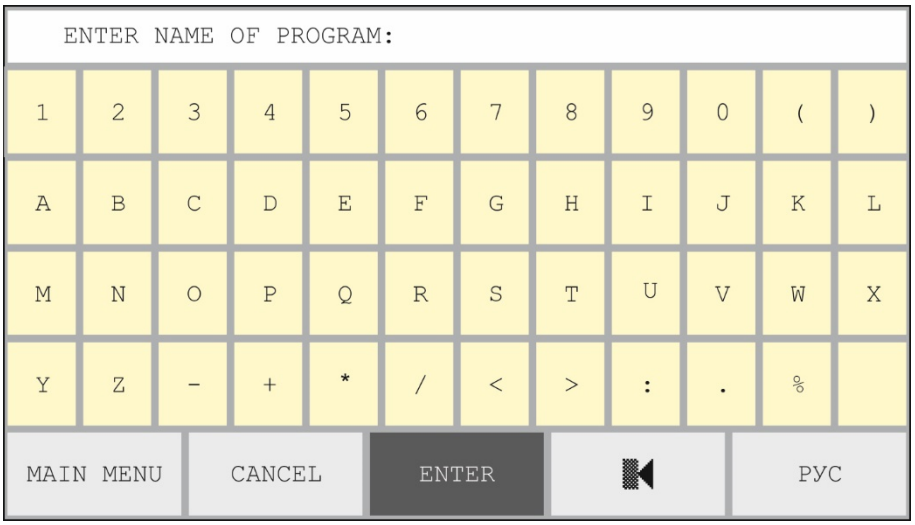


Figure 14. Entering a name for a new program.

Enter the name of the new program and press the button ENTER to switch to the screen of program editing. If the entered name is unique, i.e., it has not been entered before, a template of a new program (Fig. 15) with the already given number of operations appears on the screen. Otherwise, the Stainer will suggest entering a different name.

TECHNIQUES DEMO-4 N = 4

N	REAGENT	REGIME	AGITATION	TIME
1	DRYER	IMMERSION	00	00:06
2	DRYER	IMMERSION	00	00:06
3	DRYER	IMMERSION	00	00:06
4	DRYER	IMMERSION	00	00:06
5				

MAIN MENU | CANCEL | ENTER | ▲ | ▼

Figure 15. Sample of a new program DEMO-4 (4 technological operations).

Programming is performed by editing the template:

- Set a reagent for each technological operation. (<DRYER> (drying and heating) and <BLOTTER> (removal of liquid from a rack and slides' ends) are conventionally regarded as reagents). To start editing, touch the screen at the spot of the parameter, which you need to edit. Then perform editing by selecting reagents from the list. To enter a new reagent, press the button NEW (reagents screen No. 5). The manufacturer's list of reagents is given in Appendix B.

REAGENT SELECTION SCREEN 1 AC…AU (1-16)

1 ACETIC ACID	2 ACETONE	3 ACID SOLUTION	4 ALCOHOL
5 ALCOHOL-1	6 ALCOHOL-2	7 ALCOHOL-3	8 ALCOHOL-4
9 ALCOHOL-5	10 ALCOHOL-6	11 ALCOHOL100%	12 ALCOHOL100%-1
13 ALCOHOL100%-2	14 ALCOHOL100%-3	15 ALCOHOL SOLN.	16 AURAMINE-RHO.

CANCEL | ▲ | ▼

Figure 16. Screen of reagent selection No. 1 (in total up to 6 screens).

- Set an operational <REGIME> for the manipulator (<IMMERSION> or <DIPPING>). To change the regime, touch the screen at the spot of the needed parameter.

Regime <IMMERSION>. The regime, in which a rack with slides is immersed into the reagent and is kept in it until the end of a technological operation.

Regime <DIPPING>. The regime, in which a rack is dipped time after time into the trough with reagent without delays. The <DIPPING> regime requires setting the number of dipping cycles from 1 to 99, and not the time of processing. When the number of cycles is set to «1», the rack dips into the trough and rises immediately.

- **Set the value of the parameter <AGITATION>.**

The parameter <AGITATION> is programmed only for the regime <IMMERSION>. It defines the period of repetition of up-and-down movements of a rack without its full raising from the reagent. <AGITATION> lets the reagent mix and accelerates performing of a technological operation. The value of the parameter <AGITATION> is set within the interval 0-99 sec. At the value <00> up-and-down movements are not performed. The regime with the parameter value 00 is applied, when mixing of reagent is undesirable, e.g., when using Giemsa working solution which is prone to sediment. To program, touch the screen at the spot of the needed parameter and enter the required values with the screen digital keyboard.

- **Set the value of the parameter <TIME>.**

This parameter defines the duration of performing of a technological operation. To program, touch the screen at the spot of the needed parameter and enter the required values with the screen digital keyboard.

Parameters of previously loaded programs are changeable in the same way. To finish editing, press the button ENTER, and the Stainer will go to the screen of PIN (personal identification number) entering.

PIN is useful to prevent unauthorized program editing. It is possible to choose any 3-digit PIN in the range 000-999. After entering a NEW PIN, press the button ENTER, and the Stainer will return to the main menu.

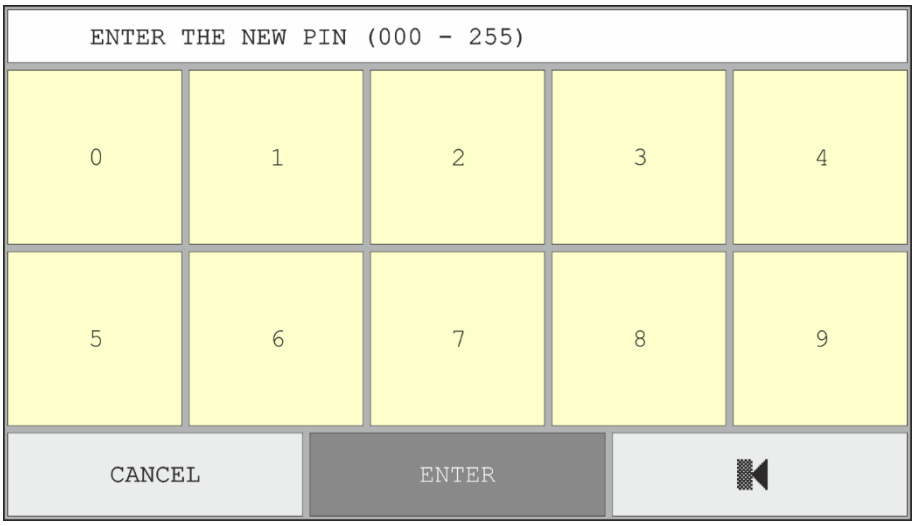


Figure 17. NEW PIN entering screen.

CAUTION! A CONFIRMATION IS OBLIGATORY FOR SAVING A NEW PROGRAM AND FOR SAVING CHANGES.

An offer to save a new program (Fig. 18) appears on the screen after pressing the button START OF PROCESS in the main menu.

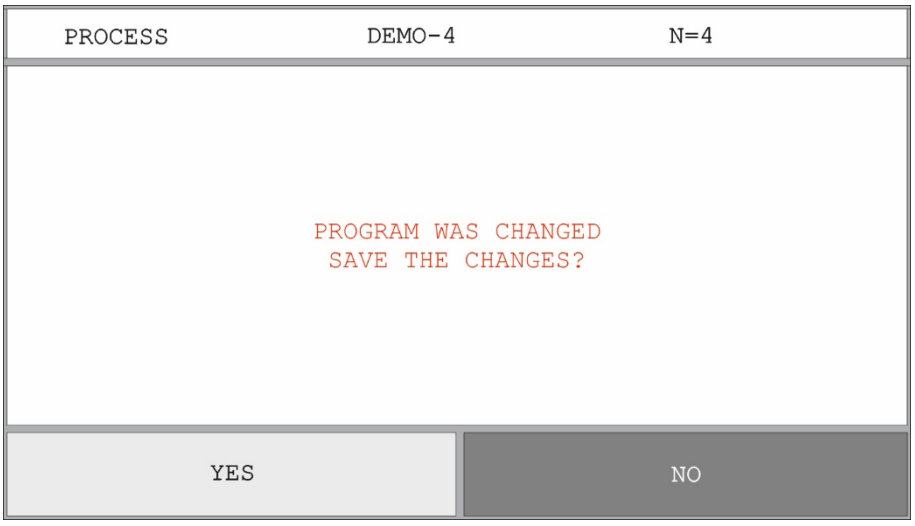


Figure 18. Saving confirmation screen.

If you press the button NO, the program will be launched, but after you switch off the Stainer, it will be erased from memory.

CAUTION! FOLLOW THE PIN INPUT FORMAT (3 DIGITS)

If you enter a PIN of one or two digits (invalid format), the technology program is assigned a default PIN code (255), and a message appears on the screen:

<INCORRECT PIN FORMAT
DEFAULT SETTED PIN IS 255
TOUCH THE SCREEN TO CONTINUE>

The Stainer allows you to wright and save up to 32 programs. All programs, including the preprogrammed ones (factory programs), can be edited. An edited program can be saved under a new name (as a new program), herewith a message will appear on the screen:

<SAVE CHANGED PROGRAM
UNDER A NEW NAME?>

If you press the button YES, the edited program will be saved under a new name and a new PIN. The saved program will be added to the section «TECHNIQUES». If you press the button NO, it will be needed to enter the PIN, which was entered before in the course of new program saving.

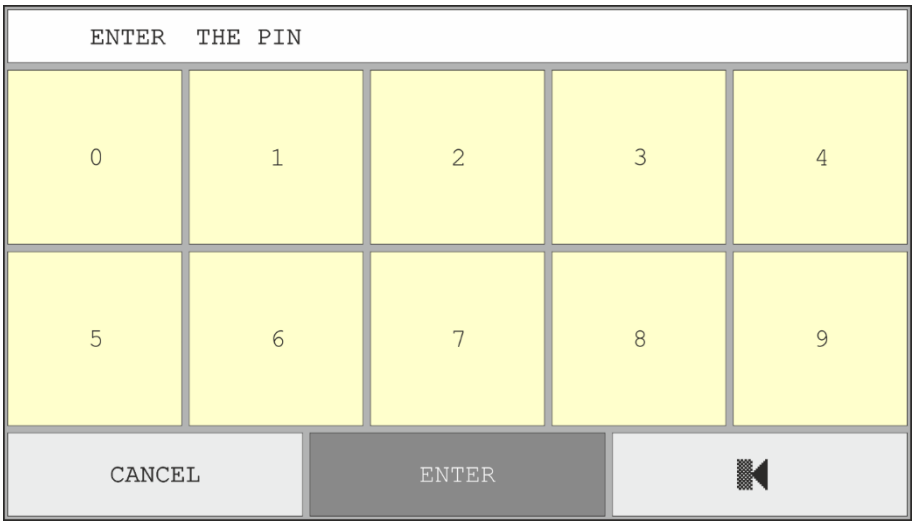


Figure 19. The PIN entering screen (saving changes in program under old name).

After PIN entering, press the button ENTER, and the Stainer will return to the main menu.

CAUTION! DO NOT ENTER INCORRECT PIN

If the newly entered PIN was correct, after pressing the button START OF PROCESS on the screen will be message, offering to save the edited program under the previous name:

<PROGRAM WAS CHANGED
SAVE THE CHANGES?>

If you press the button YES, the edited program will be overwritten.

If you press the button NO, the edited program will be launched, but after you switch off the Stainer, the changes will not be saved.

If the newly entered PIN was incorrect, after pressing the button START OF PROCESS on the screen will be message:

<INCORRECT PIN IS ENTERED
ALL CHANGES MADE TO THE PROGRAM ARE CANCELED
TOUCH THE SCREEN TO RETURN TO THE MAIN MENU>

Before programming a new program, it is rational to define, which reagents will be used, to count the number of technological operations, to think over how to arrange troughs with reagents. To develop a new program, use the special form, the template for which is given in Appendix C. An editable file with template can be uploaded at the website www.fastainer.com in the “support” section.

There is also an opportunity to write a new program with special personal computer software «FASTAINER FIRMWARE EDITOR» (Appendix F).

5.3 Menu section «CONFIGURATION»: programming and control of the configuration, performing of service functions

To access the menu section «CONFIGURATION», press the button CONFIGURATION in the main menu.

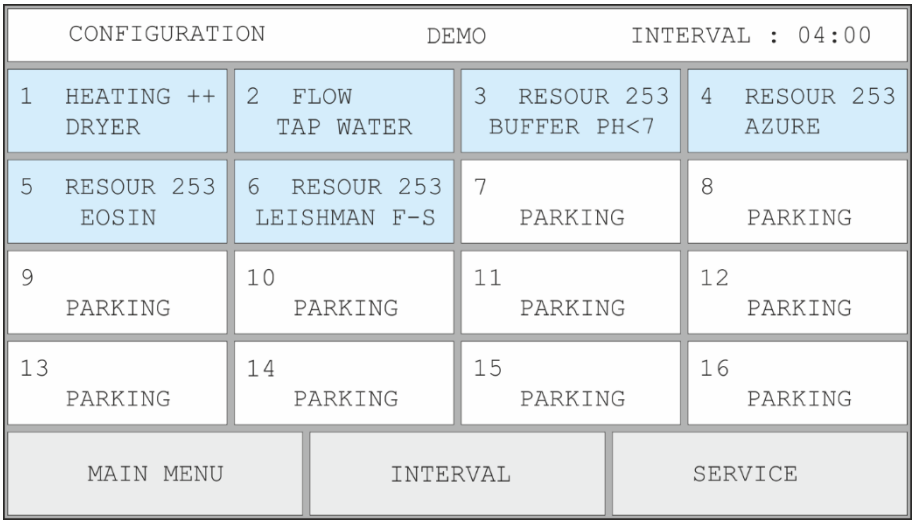


Figure 20. Menu section «CONFIGURATION».

The upper line indicates the application of the current screen: current menu section <CONFIGURATION>, current program: <DEMO>, and the interval of the introduction of new racks into the process in the format HH:MM:SS.

In the middle part of the screen, there is a configuration view of the Stainer for a chosen program, represented by 16 rectangular buttons, which correspond to 16 stations. The buttons for technological stations are colored in blue. They contain the following information: the number of a station, the appointed reagent, the value <RESOURCE> (the remaining number of technological operations in a station with reagent until it has to be changed). The buttons for parking stations are colored in white, and they contain an inscription <PARKING>, as well as the number of a station. Parameters and application of each station can be changed by pressing the button with a respective number.

The format of buttons:

NN	RESOUR	XXX
STATION APPLICATION		

where: <NN> – number of station, <STATION APPLICATION> – application of station, <RESOUR XXX> – how many times it is left for a manipulator to revert to a station with reagent until it has to be changed (resource limit of a reagent), (the limit is set by the operator within the interval 0-255, default value is 255).

The <STATION APPLICATION> parameter can acquire the following values:

- <DRYING> (only for station No. 1)
- <FLOW> (only for station No. 2)
- <PARKING> (parking station, into which a rack with slides will be loaded). The parameter is not editable, as the loading of racks is automatic.
- <TECHNOLOGICAL> (station, in which preparations are processed). When a trough with reagent is assigned to a station, the reagent either has to be chosen from a list of 64 preprogrammed ones in Appendix B or its new name should be entered (in total up to 96 names).

To edit changeable parameters of configuration (e.g., <MODE> for station No. 1), press the blue button to the right of the button with the name of a parameter.

The station <DRYER> (station No. 1) has the following configuration parameters (Fig. 21):

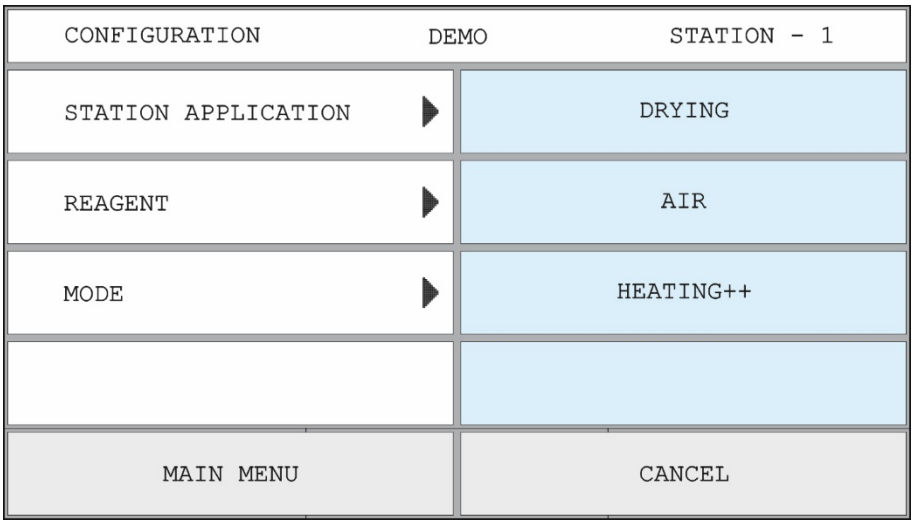


Figure 21. Configuration of station No. 1 <DRYER>.

- < STATION APPLICATION > parameter < DRYING > – not editable.
- <REAGENT> parameter <AIR> – not editable.
- <MODE> parameter <HEATING++> – modes of heating of air in the drying station. Pressing the button switches between modes <HEATING+> (weak) and <HEATING++> (strong).

At the mode <HEATING+> (weak), the temperature of the airflow is ~ 40ºC (the air is heated by ~15 – 20 ºC). At the mode <HEATING++> (strong), the temperature of the airflow is ~ 55ºC (the air is heated by ~ 20 – 25 ºC).

The station <FLOW-THROUGH> (station No. 2) has the following configuration parameters (Fig. 22):

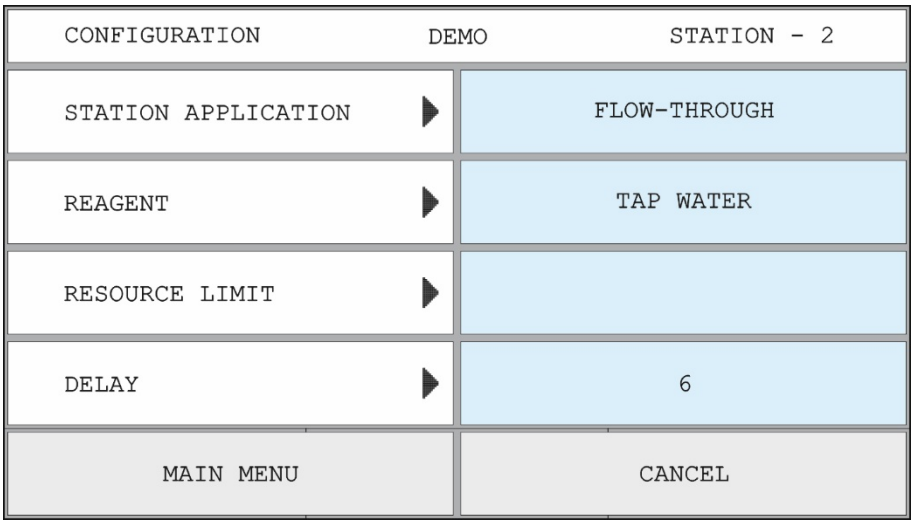


Figure 22. Configuration of station No. 2 <FLOW-THROUGH>.

- < STATION APPLICATION > parameter < FLOW-THROUGH > – not editable.
- <REAGENT> parameter <TAP WATER> – not editable.

- <RESOURCE LIMIT> – not editable (only for station <FLOW-THROUGH>).
- <DELAY> – editable parameter: the duration of a rack's delay in the upper position after rising from a trough (0-99 seconds, default value is 10).

Stations No. 3-8, 9-16 can allocate troughs with reagents or racks, these stations must have respective application values: <TECHNOLOGICAL> or <PARKING>. All parameters of stations designated as <TECHNOLOGICAL>, in contrast to <DRYING> and <FLOW-THROUGH>, are editable (Fig. 23).

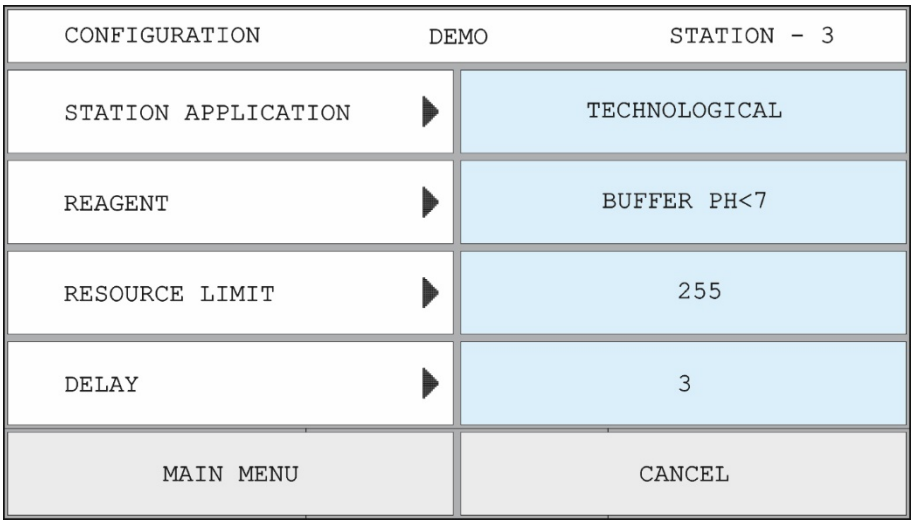


Figure 23. Configuration of station No. 3 with a reagent.

- <STATION APPLICATION> parameter <TECHNOLOGICAL> – editable parameter. The station is reserved for a trough with a reagent. On pressing the button TECHNOLOGICAL, the value is switched to <PARKING>, which means that the station is now designated for placement of racks. The only editable parameter of parking stations is <STATION APPLICATION>.
- <REAGENT> parameter <BUFFER PH<7> (name of reagent) – editable parameter. If necessary, the name of a reagent can be changed by pressing the button with the parameter's name and selecting a needed name from the list. To enter a new reagent, press the button NEW (reagents screen No. 5 or 6). The manufacturer's list of reagents is given in Appendix B.
- <RESOURCE LIMIT> – editable parameter: how many times it is left for the manipulator to use a station with reagent until the exhaustion of its limit (e.g., because of changing properties of reagent). The admissible limit of usages is set by the operator within the interval 0-255; the default value is 255.

CAUTION! WHEN THE VALUE REACHES ZERO, A MESSAGE APPEARS ON THE SCREEN, WARNING ABOUT THE EXHAUSTION OF RESOURCE LIMIT OF A REAGENT:

<RESOURCE LIMIT OF TROUGH # XX IS EXHAUSTED>

It gives the opportunity to duly change reagent in the respective trough. To continue the process, press the button CANCEL. The value is reset after each reloading of the Stainer.

- <DELAY> – editable parameter: the duration of a rack's delay in the upper position after rising from a trough (0-99 seconds, the default value is 10).

The set values are saved at returning to a previous screen after pressing the button CANCEL.

The bottom part of the menu section «CONFIGURATION» (Fig. 20) has the following buttons:

MAIN MENU INTERVAL SERVICE

MAIN MENU – to return to the main menu.

INTERVAL – to set the interval between introductions of racks with slides into the process (see Item 5.3.1).

SERVICE – to switch to the service menu.

5.3.1 Setting the interval of the introduction of racks into the process.

The default duration of the interval is defined automatically, and it is equal to the sum of durations of all technological operations for a certain technological program, not including the time, needed for transferring a rack and for delay of a rack above the trough after its rising.

To process racks in parallel and to increase the performance of the Stainer respectively, the value of the interval can be changed with accuracy of a second. The maximum duration of the interval is 16 hours 00 minutes 00 seconds. Data format is HH:MM:SS. The value of the interval is entered with the digital keyboard (Fig. 22). If you need to erase a wrongly entered value, press the button . To save the entered value of the interval, press the button ENTER.

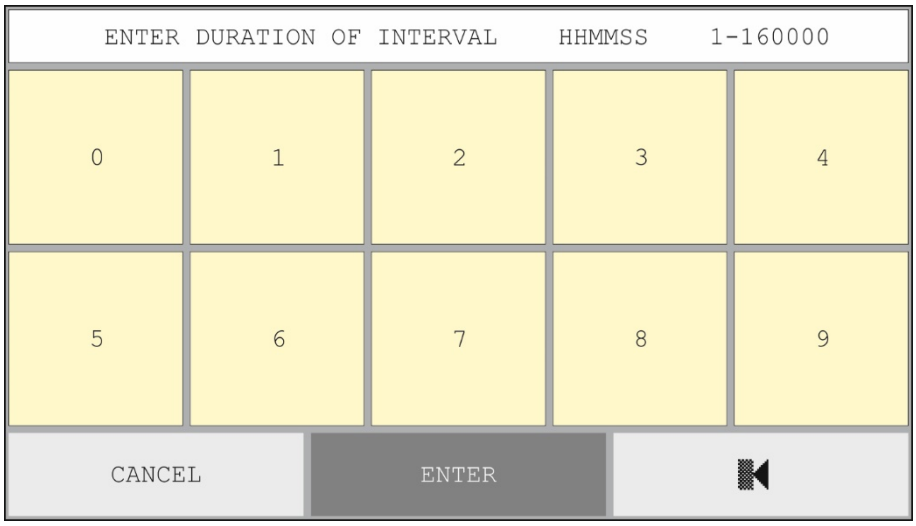


Figure 24. Entering the duration of the interval.

CAUTION! WHEN CALCULATING AN OPTIMAL INTERVAL, IT IS VITAL TO TAKE INTO CONSIDERATION THAT THE TIME, SPENT FOR TRANSFERRING A RACK AND FOR RACK'S DELAY UNDER A TROUGH FOR DRAINING OF LIQUID, IS NOT ADDED TO THE VALUE OF THE INTERVAL BY DEFAULT. Before starting a new program with real reagents, it is necessary to check that the interval has been calculated correctly by running the program with empty racks.

The user calculates the interval's value independently, bearing in mind the fact that when the time of a rack processing in one reagent elapses, the station of the following processing (next reagent) must be unoccupied. If this condition is violated (the set interval is too small), the rack will be transferred back to the initial parking station. The performance of a technological program for this rack will continue when the station with respective reagent gets free.

There is also an opportunity to choose the optimal value of interval with the help of personal computer software «FASTAINER FIRMWARE EDITOR» (Appendix F).

5.3.2 Menu section «SERVICE». Performing of service functions.

To access the menu of service functions, press the button SERVICE (Fig. 25):

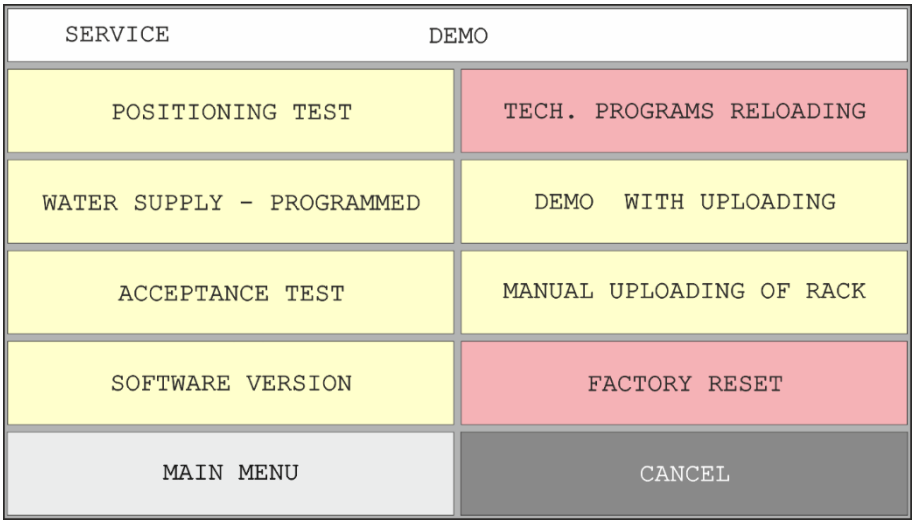


Figure 25. Service functions menu.

POSITIONING TEST – check of the working capacity of the Stainer and its accessories (test positioning program). The program is designed to check the mutual positioning of accessories and the manipulator. The test program is recommended for the commissioning of the Stainer (Item 6.3) and the identification of faulty accessories.

WATER SUPPLY – PROGRAMMED ⇔ WATER SUPPLY – CONTINUOUS – is intended to set the mode of water supply into the flow-through trough.

- <PROGRAMMED> – water supply turns on automatically as soon as the rack is positioned at the flow-through trough,
- <CONTINUOUS> – water supply to the flow-through trough is on all the time.

To switch between modes, press the button.

ACCEPTANCE TEST – service section for acceptance tests, which is protected with a password. The section is used by engineering personnel of the manufacturing company and by personnel of certified testing centers during tests. This mode is unavailable for lab personnel.

SOFTWARE VERSION – version of the software appears on the screen when the button is pressed.

TECH. PROGRAMS RELOADING ⇔ SOFTWARE RELOADING ⇔

⇔ TOTAL FIRMWARE RELOADING - is intended to set the mode of firmware reloading by changing data in SD card. The data in SD card is changed with «FASTAINER firmware editor» PC software. (Appendix F).

DEMO WITH UPLOADING ⇔ DEMO – is intended to set the DEMO program mode: one-time with uploading of rack or cyclic PROGRAM.

RACK INSTALLATION IN GATEWAY ⇔ MANUAL UPLOADING OF RACK is intended to set the mode of uploading rack in the working chamber: through the gateway or directly in the grab of the manipulator.

FACTORY RESET – resetting to the initial configuration of the manufacturer. To perform the factory reset, select this section and press the button YES.

CAUTION! HEREWITH ALL THE PROGRAMS AND NAMES OF REAGENTS, PROGRAMMED BY THE USER WILL BE DELETED.

5.4 Menu section «PROCESS»: loading and unloading of racks. Processing of racks with slides according to a given technological program

After the technological program is selected and the troughs with reagents are properly arranged, press the button START OF PROCESS in the Main menu. After pressing the button START OF PROCESS, the Stainer offers to load racks with slides in Stainer.

5.4.1 Automated system for loading and unloading racks through the gateway

The Stainer is equipped with an automated system for racks loading and unloading through the gateway (used by default), which works when the lid of the machine is closed. This system simplifies the work of laboratory personnel and prevents the possibility of incorrect loading, unloading of racks, and minimize pollution in laboratory air from Stainer working chamber.

Figure 26. Opened gateway.
27 – tray of gateway (parking station №9); 34 –gateway lid.

The gateway system (Fig. 26) consists of the gateway lid (34), and gateway tray (27), which serves for loading and unloading racks. When the gateway closed, the gateway tray is located in station №9. There is a rack presence sensor in the gateway tray with an LED indicator on the gateway lid. When the LED indicator glows green, the station № 9 is free. The automated loading and unloading system is controlled with the sensor screen. By default, parking station # 9 has priority for processing the rack, i.e., the rack from this station is processed first.

5.4.2 Automated loading and unloading of racks through the gateway.

After pressing the button START OF PROCESS, the gateway opens, and the message appears on the screen:

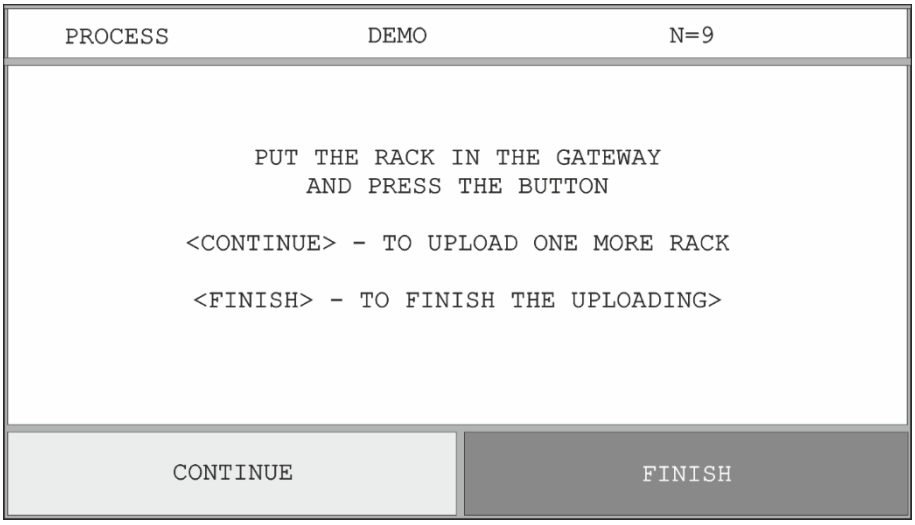


Figure 27. Menu section «PROCESS» – automated loading of racks.

Simultaneously with the message appearing, the manipulator starts moving. The Stainer checks the readiness for the loading of the nearest parking station. Take the rack with the right hand and put it in the tray of the gateway (Fig. 28)

CAUTION! THE HANDLE OF RACK SHOULD BE DIRECTED TO THE CENTER OF THE WORKING CHAMBER (TO THE MANIPULATOR).

Figure 28. Automated loading and unloading of a rack throw the gateway.

Continuation of loading of racks.

Press the button CONTINUE. The gateway places the rack at station #9. The manipulator takes the rack from station #9 and places it at the nearest unoccupied parking station automatically. After loading of the rack is completed, the gateway opens, and a message appears on the screen:

<PUT THE RACK IN THE GATEWAY
AND PRESS THE BUTTON
<CONTINUE> - TO UPLOAD ONE MORE RACK
<FINISH> - TO FINISH THE UPLOADING>

Racks can be loaded to unoccupied parking stations either until the Stainer configuration for the used technological program allows them to do it, or by the need of the user if fewer racks are enough. If there is no unoccupied parking station, the rack will remain at station #9, and the gateway remains closed. Stainer starts to perform the technological program.

Completion of loading of racks.

Press the button FINISH. After that, the Stainer starts to perform the technological program. If the lid is open, a message requiring closing the lid will appear.

5.4.3 Automated loading and unloading of racks through the manipulator.

After pressing the button START OF PROCESS, the Stainer offers to load racks with slides, and a message appears on the screen:

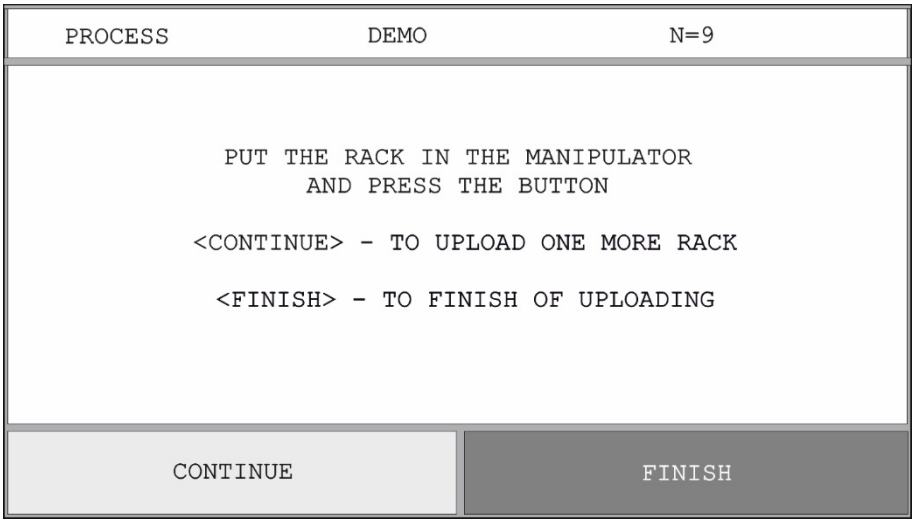


Figure 29 . Menu section «PROCESS» – loading of racks.

Simultaneously with the message, the manipulator starts moving. The Stainer checks the readiness for loading of the nearest parking station and brings the manipulator arm to a halt above station No. 9. Open the lid of the Stainer If the lid is open, a message requiring closing the lid will appear

Figure 30. Loading and unloading of a rack.

15 – arm of the manipulator; 17 – rack; 18 – handle of rack; 24 – grab of the manipulator;

Continuation of loading of racks.

Press the button CONTINUE. The manipulator places the rack at the nearest unoccupied parking station automatically, depending on the technological program (technique), and returns to the loading position above station No. 4, herewith a message appears on the screen again:

<PUT THE RACK IN THE MANIPULATOR
AND PRESS THE BUTTON
<CONTINUE> - TO UPLOAD ONE MORE RACK
<FINISH> - TO FINISH THE UPLOADING>

Racks can be loaded to unoccupied parking stations either until the Stainer configuration for the used technological program allows them to do it, or by the need of the user if fewer racks are enough.

Completion of loading of racks.

CAUTION! CLOSE THE LID OF THE WORKING CHAMBER and press the button FINISH. After that, the Stainer starts to perform the technological program. If the lid is open, a message requiring closing the lid will appear.

When a technological program is in progress, stations and their state are shown on the screen.

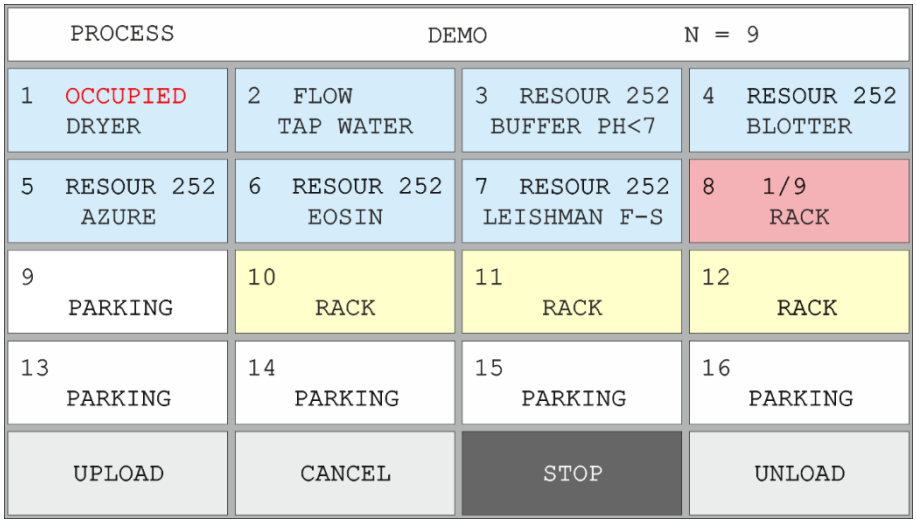


Figure 31. Status screen of the <DEMO> program.

5.4.2 Loading of racks during the performance of a technological program.

To load more racks during an ongoing process, press the button UPLOAD (Fig. 31).

Manipulator is busy. If the manipulator is busy, a message appears on the screen:

AFTER TRANSFER OF THE RACK
DEVICE WILL UPLOAD
NEXT RACK

Manipulator is free. When the manipulator gets free, automated rack uploading will be started.*

---

*Manual Uploading of racks in the grab of the manipulator is fulfilled in the same way.

. The gateway opens, and the message appears on the screen:

<PUT THE RACK IN THE GATEWAY
AND PRESS THE BUTTON
<CONTINUE> - TO UPLOAD ONE MORE RACK
<FINISH> - TO FINISH THE UPLOADING>*

Then the uploading is performed the same way as during the initial uploading.

Racks can be loaded to unoccupied parking stations either until the Stainer configuration for the used technological program allows them to do it, or by the need of the user if fewer racks are enough.

* If the Stainer is set up for uploading throw the grab of the manipulator, the message on the screen will be following

<PUT THE RACK IN THE MANIPULATOR …>

5.5 Status screen during a technological process

The status of the Stainer during a technological process is shown on the screen (Fig, 31, Fig. 32).

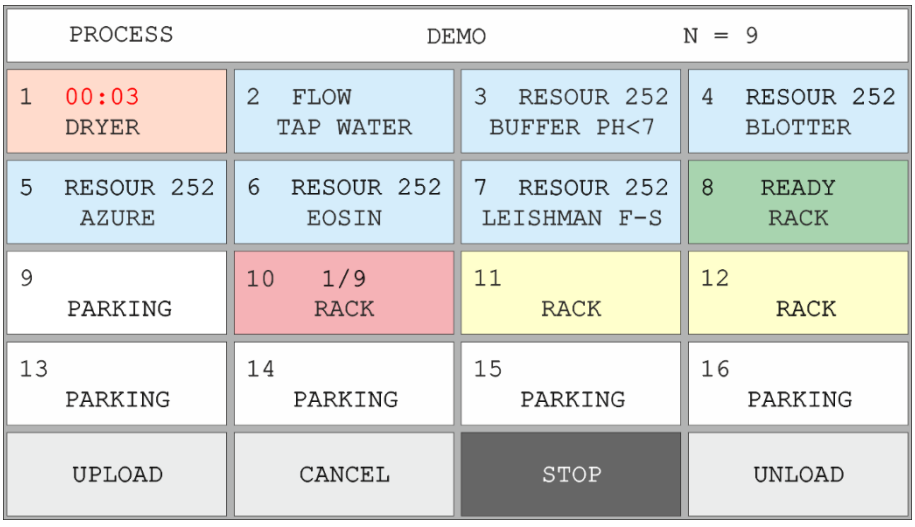


Figure 32. Status screen of the <DEMO> program.

The upper line of the screen contains the name of the chosen (current) program and the number of technological operations (N) in this program.

The bottom part of the screen has the following four control buttons during a technological process (Fig. 31, Fig. 32):

UPLOAD – to upload a new rack.

CANCEL – to return to the status screen, to stop the sound alarm signaling of errors.

STOP/START – to stop the technological process/to start the technological process.

UNLOAD – to unload a ready (processed) rack.

The middle part of the screen allocates 16 inactive buttons with numbers 1-16. The buttons contain information on the status of the technological process in each station.

Buttons for technological stations (BLUE COLOUR) are displayed in the following formats:

Display format of buttons for technological stations during standby:

NN	RESOUR XXX
REAGENT	

where: <NN> – number of station, <REAGENT> – reagent, according to the programmed configuration, <RESOUR XXX> – how many times it is left for the manipulator to revert to a station with reagent until it has to be changed (resource limit of a reagent), (the limit is set by the operator within the interval 0-255, default value is 255).

Display format of buttons for technological stations during technological operation:

NN	MM:SS
REAGENT	

where: < MM:SS > – time value, during which processing at this station will be performed, MM – minutes, SS – seconds. If the rack is not in reagent, but the station is occupied (e.g., the rack is raised, and it is delayed for draining of liquid), an OCCUPIED sign is displayed instead of the time value (Fig. 21, station No. 1).

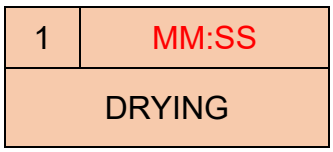
Button 1 – drying station.

Display format during standby (**BLUE COLOUR**):

1	HEATING ++
DRYING	

Value <HEATING ++> designates that a strong heating has been programmed (more than 55°C). Value <HEATING +> designates that a weak heating has been programmed (less than 40°C).

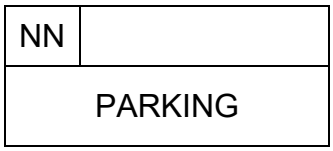
Display format when the heater is on (**ROSE COLOUR**):



where: <MM:SS> – time value, during which processing will be performed.

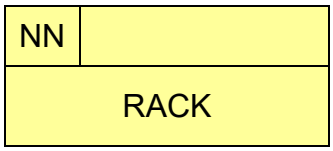
Buttons for parking stations.

Display format of stations reserved for a rack (**WHITE COLOUR**) (Fig. 31, 32, stations No. 9, 13-16):

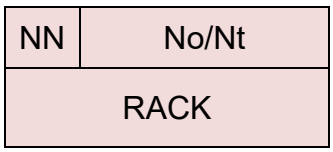


Here and further <NN> – number of stations.

Display format of stations with a loaded unprocessed rack (**YELLOW COLOUR**) (Fig. 32, stations No. 11,12):

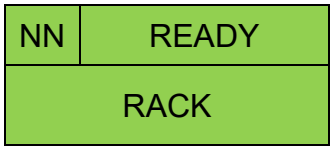


Display format of stations, the rack of which is being processed (**ROSE COLOUR**) (Fig. 32, station No. 10):



where: <No> – number of operation being performed, <Nt> – total number of operations.

Display the format of stations with a processed rack that is ready for unloading (**GREEN COLOUR**) (Fig. 32, station No. 8).



6. Preparing for operation

FORBIDDEN TO SWITCH ON THE STAINER WITHOUT PRIOR READING THE INSTRUCTION FOR USE.

CAUTION! BEFORE SWITCHING ON THE STAINER, MAKE SURE THAT THE WORKING CHAMBER DOES NOT CONTAIN ANY EXTRANEOUS ITEMS, THE TROUGHS ARE ARRANGED IN THEIR PLACES.

6.1 Switching on

Switch on the Stainer with the power switch at the left side panel. After switching on, the backlight of the touch screen on the control unit lights up. A splash screen with a manufacturer's logo appears on the screen. Ten seconds later, the Stainer switches to the main menu with control buttons, and a reminder about the necessity to check the configuration of Stainer and readiness of troughs with reagents appears on the screen. At the same time, the electromagnetic valve is activated, and tap water starts to fill the flow-through trough. The Stainer performs self-test, when it is finished, the manipulator arm positions opposite station No. 1.

6.2 Check of working capacity

Before starting the operation, it is rational to check the working capacity of the Stainer and its accessories. Check of mutual positioning of troughs, parking stations, and manipulator's grab during operation is performed with the help of a positioning test.

6.2.1 Positioning test.

The positioning test helps to detect irregularities in the geometry of Stainer and its accessories during transportation and in case of negligent operation.

Place troughs AT STATIONS 3-8, 10-16 into the Stainer. The positioning elements of the troughs must fit into notches of the positioning disk.

FORBIDDEN TO PUT RACKS INTO THE TROUGHS.

Switch on the Stainer with the power switch at the left side panel.

As soon as the main menu has been loaded, consecutively press the following buttons:

CONFIGURATION ➔ SERVICE ➔ POSITIONING TEST

A message will appear on the touch screen:

PUT THE RACK HANDLE INTO THE GRAB OF
MANIPULATOR AND TOUCH THE SCREEN
TO EXIT, PRESS <CANCEL>

CAUTION! POSITIONING TEST IS PERFORMED WITH AN OPEN LID. NO EXTRANEOUS OBJECTS (INCLUDING OPERATOR'S HANDS) MUST IMPEDE THE MOVING OF MANIPULATOR.

CAUTION! MOVING MANIPULATOR MAY CAUSE HAND INJURIES.

Put the handle of the rack into the manipulator's grab. Remove hands from the working chamber. Touch the screen – the manipulator will start moving from station to station, pausing for 2 seconds at each station. A message on the screen warns:

DO NOT TOUCH MOVING PARTS OF
MANIPULATOR UNTIL FULL STOP

After the Stainer has checked all stations, it will return the rack in reverse order to the initial station No. 1 (drying station). If during lowering, the bottom of a rack touches either a closest to manipulator wall of a trough, or the upper edge of a closest to manipulator wall of a trough, further operation with this rack is prohibited: its geometry has been disrupted, the rack must be repaired at the manufacturing site, or by specialists of an authorized company.

CAUTION! IN CASE OF ERRORS IN THE OPERATION OF STAINER, IMMEDIATELY PRESS THE BUTTON CANCEL, then switch off the device and, if necessary, change the faulty part.

FORBIDDEN TO PUT HANDS AND EXTRANEOUS OBJECTS INTO THE WORKING CHAMBER OF THE STAINER DURING POSITIONING TEST.

When the positioning test is complete, a message about a positioning test for the first rack appears on the screen again.

Check all the other supplied racks with the positioning test.

To exit from the positioning program after all the racks have been checked, press the button CANCEL.

6.2.2 Check of manipulator's movement locking.

Switch on the Stainer, consecutively press the following buttons, starting from the main menu:

TECHNIQUES ➔ DEMO ➔ ENTER ➔ START OF PROCESS

The Stainer will start performing a demonstrational program <DEMO>.

When the manipulator is moving, press the button STOP. The movement must stop. Press the button START – the movement must renew.

Open the lid of the working chamber during the manipulator's movement. The movement must stop with a following message on the screen:

CLOSE THE LID, TO CONTINUE THE PROCESS
PRESS THE BUTTONS <CANCEL> AND THEN <START>.

Close the lid of the working chamber. The movement must renew after consecutive pressing of buttons CANCEL ➔ START.

When the check of the manipulator's movement locking is complete, switch off the Stainer with the power switch on the right panel.

6.2.3 Recommendations on the checking of technological programs.

Before starting to operate the Stainer with real laboratory preparations, it is recommended to check the functioning of chosen or newly programmed technological programs and to perform trial staining with model preparations.

After loading a program, it is necessary to check the configuration of the Stainer, correct position of troughs, absence of lids on troughs, and to control the connection of Stainer to water supply, drain and ventilation systems. It is recommended to perform the first running of a program without reagents. It is rational to perform trial runnings of a program with maximum number of loaded racks, to control visually that there are no errors.

After testing without reagents, perform staining with test preparations. Depending on the technique, blood preparations of appropriate quality, buccal smears, etc. can be used for test staining.

7. Work sequence

7.1 Before operation

Comply with the recommended safety statements (📖 Chapter **2**). Check the connection of Stainer to electrical, ventilation, water supply, and drain systems. Make sure that the Stainer is installed strictly horizontally. Check the arrangement of troughs in the Stainer and that the troughs are not covered with lids.

The Stainer is supplied with a flow-through trough. Turn on the supply of cold running water.

7.2 Switching on

Switch on the Stainer with a power switch at the left panel of the control unit.

Check all the points following the message:

BEFORE YOU START THE PROCESS,
CHECK COMPLIANCE OF THE PROGRAM,
CONFIGURATION OF STAINER,
RESOURCE LIMIT OF REAGENTS

If necessary, load a needed technological program (.📖 5.2) Fill the troughs with reagents following the chosen program and configuration.

CAUTION! TROUGHS MUST BE INSTALLED AT ALL STATIONS: BOTH TECHNOLOGICAL AND PARKING ONES (NO. 3-8, 10-16), IRRESPECTIVE OF THE CHOSEN PROGRAM AND CONFIGURATION (📖 FIG. 4).

FORBIDDEN TO FILL THE TROUGHS DIRECTLY IN THE WORKING CHAMBER OF STAINER. If some liquid has been spilled accidentally, remove it with a wet cloth.

Load the racks (📖 5.4.1)

Close the lid of the working chamber. Press the button START OF PROCESS to launch a programmed staining technique.

Processed racks can be unloaded before all the loaded racks have been processed (📖 5.4.2).

When processing is complete, unload the racks (📖 5.4.3).

Switch off the Stainer.

If a break in operation is not long (several hours), it is acceptable to cover the troughs with lids and to close the lid of the Stainer.

If a break in operation is long, turn over the water supply tap, pour off the reagents, wash the troughs. If necessary, clean the working chamber of the Stainer. Close the lid of the Stainer.

FORBIDDEN TO LEAVE BOTH CLOSED AND OPEN TROUGHS WITH CHEMICALLY ACTIVE, HIGHLY FLAMMABLE, COMBUSTIBLE AND TOXIC REAGENTS (ACID SOLUTIONS, IODINE SOLUTIONS, SPIRITS, XYLENE, ACETONE, METHANOL-BASED FIXATORS, ETC.) IN THE WORKING CHAMBER OF THE STAINER AFTER OPERATION.

If the Stainer has been used with materials that are toxic or contaminated with pathogenic micro-organisms, follow the cleaning instructions given in Chapter 8. The product return disinfection certificate Chapter 11 must be completed if the instrument is to be returned to MLT LLC.

8 Cleaning, disinfection, and maintenance

8.1 Cleaning and disinfection of outer surfaces and the working chamber

Outer surfaces and the working chamber of the Stainer are cleaned and disinfected with a soft cloth and a cleansing disinfecting agent once a week or more often, depending on the pollution intensity.

CAUTION! DO NOT TREAT THE LID OF THE STAINER WITH SOLVENTS.

8.2 Flow-through trough and drain system

Clean the flow-through trough with a lab brush or toothbrush no less than once a week. After cleaning, wash the flow-through trough. The <CONTINUOUS> mode can be used for washing the flow-through trough (set in the menu «SERVICE»):

CONFIGURATION ➔ SERVICE ➔ WATER SUPPLY – PROGRAMMED

To prevent the growth of bacteria, it is necessary to disinfect the flow-through trough and to wash the drain system.

a) Drain the flow-through trough and wipe it with a soft cloth and a disinfecting agent.
b) To wash the drain, cautiously pour 5% sodium hypochlorite solution into the drainage hole of the flow-through trough.
c) When the treatment is complete, thoroughly wash the flow-through trough and the drain with the water, switching on the Stainer for several minutes (for filling and refilling of the flow-through trough). If necessary, repeat the washing.

If the drain hose is clogged, it has to be cleaned or changed to a new one. To clean or change a drain hose:

a) Take off the clamp from the water outlet.
b) Disconnect the hose, clean it with a water stream.
c) After cleaning/changing the drain hose, perform the connection of the hose in reverse order.

8.3 Troughs for reagents

Pour off the reagents from troughs, clean the troughs with a cleansing agent, thoroughly wash the troughs with water and dry them.

8.4 Racks

Remove all stains contaminations from the racks with a cleansing agent, thoroughly wash the racks, and dry them.

8.5 Mesh water filter

Mesh filter of the connection hose prevents the water supply system from gumming up. Mesh filter is cleaned once it gets dirty.

Mesh filter is situated inside the screw part of the tap water inlet (8) (Fig. 3) and can be accessed from the outside of the Stainer for cleaning (a supplemental mesh filter might also be inside the connection hose).

To clean the mesh filter:

a) Turn off the water supply.
b) Unscrew the nut of the connection hose from the Stainer.
c) Carefully take out the mesh filter and wash it. Wash outer and inner parts of the screw joint.
d) Put the filter back into place.
e) Screw the connection hose to the Stainer.
f) Open the water supply tap and check all the joints.

8.6 Air filter

The air filter is located on the bottom panel of the Stainer and is intended for the protection of the inner cavity of the Stainer from dust and dirt.

Air filter must be changed or cleaned once it gets dirty, but no less than once per year.

To change the air filter:

a) Take racks and troughs out of the working chamber, take off the removable working table.
b) Carefully raise the Stainer from the left side.
c) Take off the protective lid and take out the filter element.
d) After cleaning/changing the filter element, perform the installation of filter in reverse order.

9 Troubleshooting

Error	Possible cause	Way of elimination
The Stainer does not switch on.	1 The fuses have blown.	1 Change the fuses. The fuses can be changed only when the Stainer is switched off (plug of the power cord must be disconnected from the socket). Remove lid from the fuses to change them (12) (📖 Fig. 3).
	2 The power cord is faulty.	2 Change the power cord.
Error when the manipulator grabs a rack.	Disruption of geometry of either a rack or a parking station (trough).	Detect the faulty accessory with the help of the 📖 Positioning test. Change the faulty accessory.
Error during the loading of racks.	1 Incorrect placement of troughs (positioning elements do not fit into the notches of the positioning disk).	1 Install the parking stations correctly.
	2 Lids are not removed from troughs.	2 Remove the lids from the troughs.
Overflow of the flow-through trough, actuation of the water level sensor. The Stainer emits an intermittent sound alarm with a message on the screen: <WATER SYSTEM IS CORRUPTED>.	1Incorrect laying of the drain hose.	Check how the drain hose is lain (it must be lain and fixed in such a way that all its sections would be lower than the exhaust water outlet).When laying the hose, make shure there are no revers slopes of hose.
	2 Obstruction of the drain	Clean or change the hose (📖 Item 8.2).

Any problems and queries should be referred to your supplier. In other cases, refer to the manufacturer company for repair of the Stainer.

CAUTION! BEFORE SENDING THE STAINER FOR REPAIR, IT MUST BE APPROPRIATELY CLEANED AND DISINFECTED (📖.Chapter 11).

10 Decommissioning and recycling

CAUTION! BEFORE DECOMMISSIONING AND RECYCLING, THE STAINER MUST BE CLEANED AND DISINFECTED (📖.Chapter 11).

CAUTION! THE STAINER AND ITS PARTS MUST BE RECYCLED UNDER REQUIREMENTS, EXISTING IN THE COUNTRY, WHERE THE RECYCLING TAKES PLACE.

11 Confirmation of performed sanitary treatment

CAUTION! ANY DEVICE, ITS PART, OR ACCESSORY, WHICH IS RETURNED TO MLT LLC, OR WHICH IS IN NEED OF MAINTENANCE AT THE OPERATION SITE, MUST BE APPROPRIATELY CLEANED AND DISINFECTED.

A template of a disinfection certificate is available at the website www.fastainer.com/resources.

When a device, its part, or accessory is returned, a copy of a filled and signed disinfection certificate must be attached or handed over to a specialist of the service department. The responsibility for the products, sent without the said confirmation or with a partially filled certificate, is born by the sender. The products, which are potentially harmful from the point of view of the manufacturer, will be sent back at the expense and under the responsibility of the sender.

APPENDIX A. Instruction on fire safety measures

1 General provisions

1.1 The present instruction has been composed to ensure fire safety when operating the automated slide stainer according to Technical conditions 266012-007-23475651-2018 in the following models: FS-16-25 (further – Stainer).

Some technological operations, executed with the Stainer, require the usage of highly flammable liquids (HFL) and combustible liquids (CL): methanol, ethanol, xylene, etc. The main risks of fire development are connected with HFL.

2 Requirements to the room

2.1 The room where the stainer will be operated must satisfy local fire safety requirements. The room must be equipped with fire-extinguishing means according to the current standards. A free passage to fire-extinguishing appliances and electric gauges, situated in the room, must be provided.

2.2 The ignition source, connected with the Stainer, must be extinguished with either a CO2 or a freon fire extinguisher. A CO2 fire extinguisher is charged with dioxide. A freon fire extinguisher is charged with halogenated extinguishing agent. The volume of a fire extinguisher must be not less than 2 l.

2.3 It is forbidden to leave unattended heating appliances that are switched on, to use appliances with open heating elements, to use defective heating appliances, to smoke in the room where the stainer is operated. It is not allowed to use a naked flame, to carry out hot works, to store combustible materials and waste in volumes excessing the need for a shift.

3 Safety measures when handling HFL and CL

3.1. Highly flammable and combustible liquids can be stored in working rooms in the amount not exceeding the need of a shift, under the approved norms, in either thick-walled glasses or non-breakable vessels with tight corks, placed in a metal case with a lid.

3.2. It is unacceptable to store the substances, chemical interaction of which can cause fire or explosion together.

3.3. The liquids must be delivered in the rooms in closed safe containers.

3.4. The working surfaces of tables and exhaust hoods, intended for working with the stainer and HFL, must have a coating and skirting made of incombustible materials. The skirtings, which prevent liquids from flowing down, must be flawless.

3.5. It is forbidden to carry out any works in the exhaust hoods if there are substances, materials and equipment, not relating to the performed operations, as well as when an exhaust hood is defective, or the ventilation system is switched off.

3.6. At the end of a working day, HFL waste must be collected in a special closed container and removed from the laboratory for further recycling. It is forbidden to discharge HFL and CL into the drain system.

3.7. In the case of spilling HFL in the Stainer or its immediate vicinity, the power supply system of the equipment beyond the room must be preliminary switched off. The spilled HFL must be covered up with dry sand or sawdust, wipe materials, and then the HFL must be gathered and placed into a closeable container. The gathered HFL must be disposed of on the same day. It is forbidden to continue operation in the room until the odor of the spilled liquid vanishes completely.

4 Actions in case of fire

4.1. In case if HFL catches fire in the working chamber, close the lid of the chamber and switch off the power supply system of the Stainer. If the fire does not cease, apply a CO2 fire extinguisher. Initially blow the ventilation grids on the housing of the Stainer. The inflow ventilation grid is situated on the bottom of the Stainer, the exhaust ventilation grid – at the back panel. If possible, it is recommended to take off the air filter from the inflow ventilation grid. If the fire in the working chamber does not cease, cautiously fold the lid of the working chamber back and fill the working chamber with gas from the fire extinguisher. Try to avoid spattering of reagents from the troughs.

4.2. If the flame develops beyond the working chamber of the Stainer, close the lid of the working chamber, switch off the power supply system of the Stainer, put out the fire with a CO2 fire extinguisher. Initially process the ventilation grids on the housing of the Stainer with a jet from the fire extinguisher.

APPENDIX B. List of reagents FS-16-25*

N	REAGENT	N	REAGENT	N	REAGENT	N	REAGENT
1	ACETIC ACID	17	AZURE	33	FLUOROCHROME	49	SAFRANIN
2	ACETONE	18	AZURE-EOSIN	34	FUCHSIN	50	SOLUTION-1
3	ACID SOLUTION	19	BLOTTER	35	GENTIANVIOLET	51	SOLUTION-2
4	ALCOHOL	20	BUFFER	36	GIEMSA SOLN.	52	SOLUTION-3
5	ALCOHOL-1	21	BUFFER PH<7	37	HCL ACID	53	STAIN-1
6	ALCOHOL-2	22	BUFFER PH~7	38	HEMATOXYLIN	54	STAIN-2
7	ALCOHOL-3	23	BUFFER PH>7	39	LEISHMAN F-S	55	STAIN-3
8	ALCOHOL-4	24	BRILL.GREEN	40	LUGOL SOLN.	56	TAP WATER
9	ALCOHOL-5	25	CARB.FUCHSIN	41	M-G FIXATIVE	57	THIONIN
10	ALCOHOL-6	26	CRYST.VIOLET	42	METHANOL	58	WRIGHT F-S
11	ALCOHOL100%	27	DIST.WATER	43	METHYL.BLUE	59	XYLENE-1
12	ALCOHOL100%-1	28	DRYER	44	METH.VIOLET	60	XYLENE-2
13	ALCOHOL100%-2	29	EOSIN	45	NEUTRAL RED	61	XYLENE-3
14	ALCOHOL100%-3	30	ETHANOL	46	PAP-2 (OG)	62	XYLENE-4
15	ALCOHOL SOLN.	31	ETHANOL +HCL	47	PAP-3 (EA)	63	XYLENE-5
16	AURAMINE-RHO.	32	FIXATIVE	48	PAP-MIX	64	XYLENE-E

Notes:

19	BLOTTER

Removal of liquid from a rack and slides' ends, conventionally listed as a reagent. Programmable only in the section «TECHNIQUES». A special part on the working table with a tray (21), which is not a station, is reserved for this "reagent". <BLOTTER> cannot be programmed in the section «CONFIGURATION».

28	DRYER

Drying of slides and racks, conventionally listed as a reagent. Indispensable reagent of station No. 1.

56	TAP WATER

Reagent with particular properties. Indispensable reagent of station No. 2.

64	XYLENE-E

Reagent with particular properties. When this reagent is assigned to a station, where the last operation of a program is performed, the processed rack with slides remains at the last station in <XYLENE-E> and does not return to the parking station.

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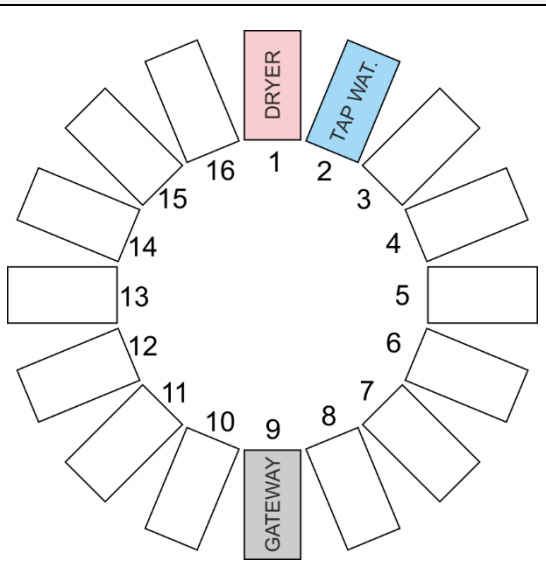
*There is an opportunity to input 32 additional customer reagent names.

APPENDIX C. Example of developing the <DEMO> program

Protocol of the <DEMO> program and its configuration

DEVICE: FS-16-25	NAME OF PROGRAM: DEMO	DATE: 22.06.2020

N	REAGENT	CONFIGURATION FS-12-25 DEMO	N	REAGENT
16	PARKING		1	DRYER
15	PARKING		2	TAP WATER
14	PARKING		3	BUFFER PH<7
13	PARKING		4	BLOTTER
12	PARKING		5	AZURE
11	PARKING		6	EOSIN
10	PARKING		7	LEISHMAN F-S
9	PARKING		8	PARKING

№	REAGENT	REGIME (I, D)	AGITATION SS	TIME MM:SS	DELAY SS	RESOURCE 000
1	DRYER ++	I	-	00:06	0	-
2	LEISHMAN F-S	I	00	00:06	0	255
3	EOSIN	D	00	5	3	255
4	AZURE	D	00	3	3	255
5	TAP WATER	I	01	00:06	6	-
6	BUFFER PH<7	I	01	00:06	3	255
7	TAP WATER	I	01	00:10	6	-
8	BLOTTER	-	-	00:00	0	-
9	DRYER ++	-	-	00:06	0	-

Listing of the <DEMO> program and its configuration

TECHNIQUES	DEMO	N = 9	
N REAGENT	REGIME	AGITATION	TIME
1 DRYER	IMMERSION	00	00:06
2 LEISHMAN F-S	IMMERSION	00	00:06
3 EOSIN	DIPPING	00	5
4 AZURE	DIPPING	00	3
5 TAP WATER	IMMERSION	01	00:06
MAIN MENU	CANCEL	ENTER	▲ ▼

The first screen of the program listing

TECHNIQUES	DEMO	N = 9	
N REAGENT	REGIME	AGITATION	TIME
6 BUFFER PH<7	IMMERSION	01	00:06
7 TAP WATER	IMMERSION	02	00:10
8 BLOTTER	DIPPING	00	00:00
9 DRYER	DIPPING	00	00:06
10			
MAIN MENU	CANCEL	ENTER	▲ ▼

Second screen of the program listing

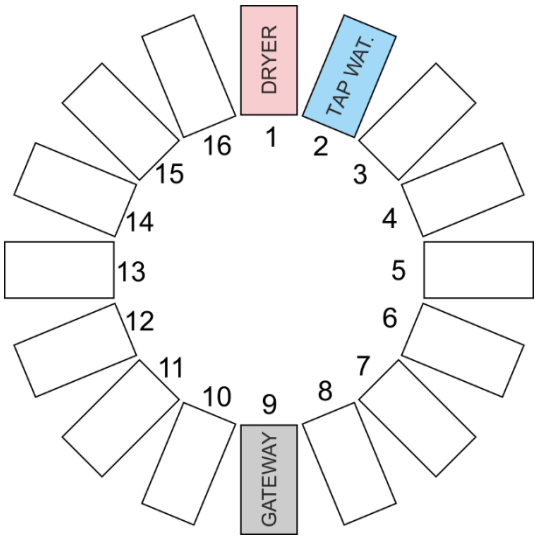
CONFIGURATION	DEMO	INTERVAL : 04:00	
1 HEATING ++ DRYER	2 FLOW TAP WATER	3 RESOUR 253 BUFFER PH<7	4 RESOUR 253 BLOTTER
5 RESOUR 253 AZURE	6 RESOUR 253 EOSIN	7 RESOUR 253 LEISHMAN F-S	8 PARKING
9 PARKING	10 PARKING	11 PARKING	12 PARKING
13 PARKING	14 PARKING	15 PARKING	16 PARKING
UPLOAD	CANCEL	STOP	UNLOAD

Configuration screen

APPENDIX D Template for developing a new technological program

(The file with the Template is available at fastainer.com/resources)

DEVICE: FS-16-25	NAME OF PROGRAM:	DATE:

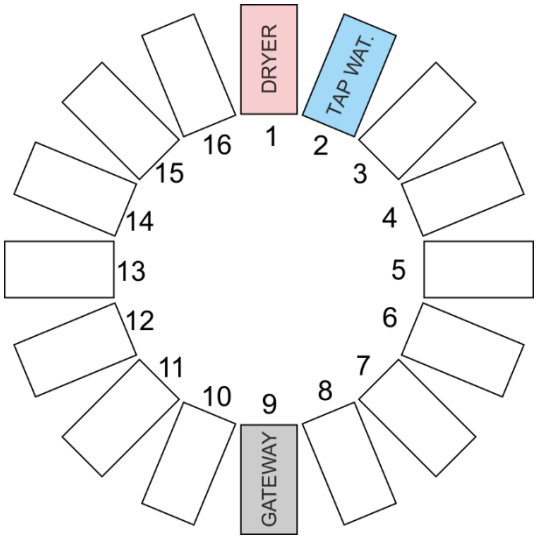
N	REAGENT	CONFIGURATION FS-12-25 DEMO	N	REAGENT
16			1	DRYER
15			2	TAP WATER
14			3	
13			4	
12			5	
11			6	
10			7	
9	PARKING		8	

№	REAGENT	REGIME (I, D)	AGITATION SS	TIME MM:SS	DELAY SS	RESOURCE 000
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

APPENDIX E Recommended protocol of H&E (histology)

(if using reagents of other manufacturers, an adaptation of immersion time intervals might be needed).

DEVICE: FS-16-25	NAME OF PROGRAM: H/E HIST	DATE: 17.06.2020

N	REAGENT	CONFIGURATION FS-12-25 DEMO	N	REAGENT
16	XYLENE-E		1	DRYER
15	XYLENE-3		2	TAP WATER
14	XYLENE-2		3	EOSIN
13	XYLENE-1		4	HEMATOXYLIN
12	ALCOHOL-6		5	ALCOHOL SOLN.
11	ALCOHOL-5		6	ALCOHOL-1
10	ALCOHOL-4		7	ALCOHOL-2
9	PARKING		8	ALCOHOL-3

№	REAGENT	REGIME (I, D)	AGITATION SS	TIME MM:SS	DELAY SS	RESOURCE 000
1	XYLENE-1	I	05	01:00	10	
2	XYLENE-2	I	05	01:00	10	
3	XYLENE-3	I	05	01:00	10	
4	ALCOHOL-1	I	03	00:10	10	
5	ALCOHOL-2	I	03	00:10	10	
6	ALCOHOL-3	I	03	00:10	10	
7	ALCOHOL SOLN.	I	03	00:10	10	
8	HEMATOXYLIN	I	05	00:50	10	
9	TAP WATER	I	05	00:30	10	
10	EOSIN	I	05	00:30	10	
11	TAP WATER	I	03	0002	10	
12	ALCOHOL SOLN.	I	03	00:10	10	
13	ALCOHOL-4	I	03	00:10	10	
14	ALCOHOL-5	I	03	00:10	10	
15	ALCOHOL-6	I	03	00:10	10	
16	XYLENE-E	I	05	00:20	10	

APPENDIX F. List of adopted terms and abbreviations

Combined station – a station that can be used, both as a parking and as a technological one, depending on the configuration of the Stainer. The FS-16-25 has combined stations No. 3 – 8 10-16.

CL - combustible liquids.

Display, control and programming unit (further – **Control unit**) **–** a microprocessor-based device for indication, control, and programming, equipped with a touch screen.

Drying station, Dryer – a station equipped with an air electric heater and a fan. The drying station is intended for the drying of slides while executing a **technological program.**

HFL - highly flammable liquids.

Manipulator – a device in the working chamber of the Stainer intended for moving the racks with slides along a given trajectory and according to a selected technological program. A manipulator includes a circular-motion carriage with a drive; an arm with a drive, which lifts, lowers and tilts the racks; a grab on the arm, which picks up and fixes the handle of the rack.

Parking station – a combined station intended for placing a rack with untreated slides; a rack can temporarily be stationed at the parking station while carrying out a sequence of **technological operations**; a rack is returned to the parking station at the end of a **technological program**.

PIN – personal identification number.

Rack– a stainless steel holder for slides with a handle.

Stainer – an automated programmable slide stainer “Fastainer-16-25” (“FS-16-25”).

Station – a sector on the working table intended for the placement of **troughs** and **racks**.

Station with a flow-through trough – a trough located on the working table, connected to the water supply system to provide washing or time-exposure of slides in tap water.

Trough – a vessel for reagents intended for placement and positioning of the **rack** during the execution of **the technological operation**.

Technological operation - a set of sequential actions with a rack with slides within the same station (lowering, processing slides in the reagent, taking out, time-exposure for reagent drain).

Technological program - a set of sequential **technological operations** that ensure the preparation staining according to a given technique. **The technological program** possesses name and PIN (personal identification number).

Working chamber – a space inside the Stainer, limited by the working table, the walls of the working chamber and the lid of the working chamber, where technological operations are carried out

Working table – a table in the working chamber of the Stainer, on which combined stations, racks, troughs are located.

APPENDIX G. «FASTAINER FIRMWARE EDITOR» PC SOFTWARE

User manual for the program «Fastainer Firmware Editor»

The program «Fastainer Firmware Editor» is designed to edit the firmware file for the automated stainer Fastainer-12-25. The program allows to delete copy and edit technological programs available in the firmware file, create new technological programs, edit the list of user reagents, and select the optimal intervals for launching racks for processing.

System requirements

Microsoft Windows 7,8,8.1,10 x86/x64

1 The main window of the software (Window «Configuration»)

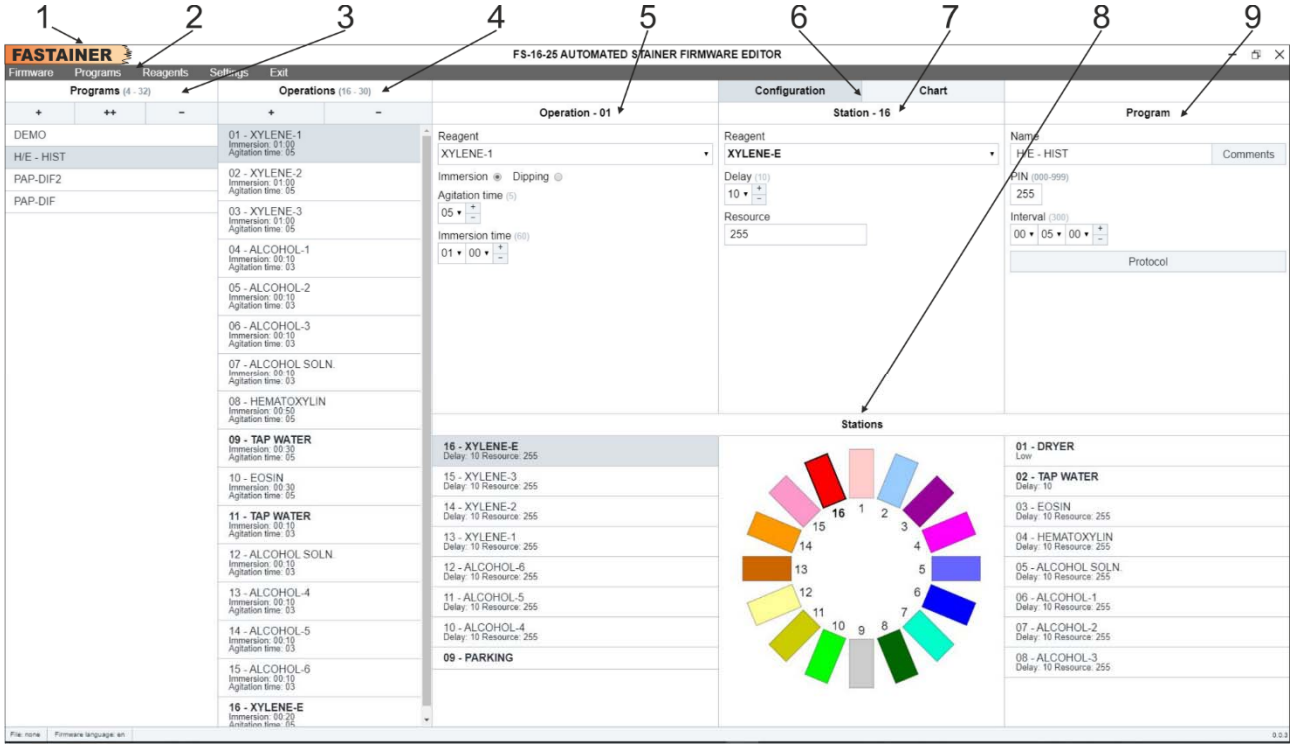


Figure 33. The main window of the software (Window «Configuration»)

1 – Logotype. 2 – Main Menu. 3 – Programs - list of technological programs in the current (opened) firmware. 4 – Operations - list of technological operations in the selected technological program. 5 – Operation - a setting of the selected operation. 6 – Selector of the window: «Configuration» or «Chart». 7 – Station - the setting of the selected station. 8 – Configuration of the Stainer and selection of stations. 9 – Program - the setting of the

selected technology program (name, an interval for the launching of the new rack, and pin code).

1.1 Buttons of the Main Menu (2)

Firmware

- Load defaults – Resets the firmware to the factory state
- Open – Opens the firmware file
- Save – Saves the firmware file to the selected folder
- Undo changes – Cancels all changes to the firmware

Program

- Import – Loading one or more technological programs
- Export – Uploading the selected process program to a file

Reagents – Button for selecting the window for reagents list editing.

Settings – Button for selecting the window for reagents list editing.

Exit – Exit Application

1.2 «Programs» (3) - the list of technological programs in the current (opened) firmware.

Programs (1-32)

- **+** – Button for adding new technological programs.
- **++** – Button for copying the technological program from the list.
- **-** – Button for deleting a technological program from the list.

1.3 «Operations» (4) – the list of technological operations in the selected technological program.

Operations (1-30)

+ – Button for adding of new technological operation.

- – Button for deleting technological operation.

Operations can be swapped using the Drag and Drop method.

1.4 <Operation> (5) - a setting of the selected operation

Operation-01

Selection of a reagent (station). If there is no station with a reagent, the selected reagent will be installed in the first available station (PARKING)

Selection of the type of manipulator action (immersion or dipping)

Depending on the selected reagent and the type of action, you can set the agitation time, the number of dips, or the time of immersion.

1.6 Selector of the window: «CONFIGURATION» or «CHART» (6)

Configuration **Chart**

Going to «CHART» window is fulfiled by clicking on the Chart button.

1.7 «Station» (7) - settings of the selected station.

Station-N

When selecting an operation, the station is selected automatically. **N** is a number of station. Depending on the selected reagent or the type of station, appropriate station settings will be available.

1.8 «Stations» (8) – configuration of the Stainer and selection of stations.

Selection of the configuration of the Stainer. The selection of the station is fulfilled by clicking on the appropriate symbolic rectangle. When writing a new program, it is advisable to create a configuration first.

1.9 – «Program» (9) - setting of the selected technology program.

The setting of the name, launching interval of the racks, and pin code of technological program are fulfilled in this section.

Protocol	– Button for opening the technological program protocol.
Comments	– Button for opening the comments for the technological program.

2 The window «Chart» of the software

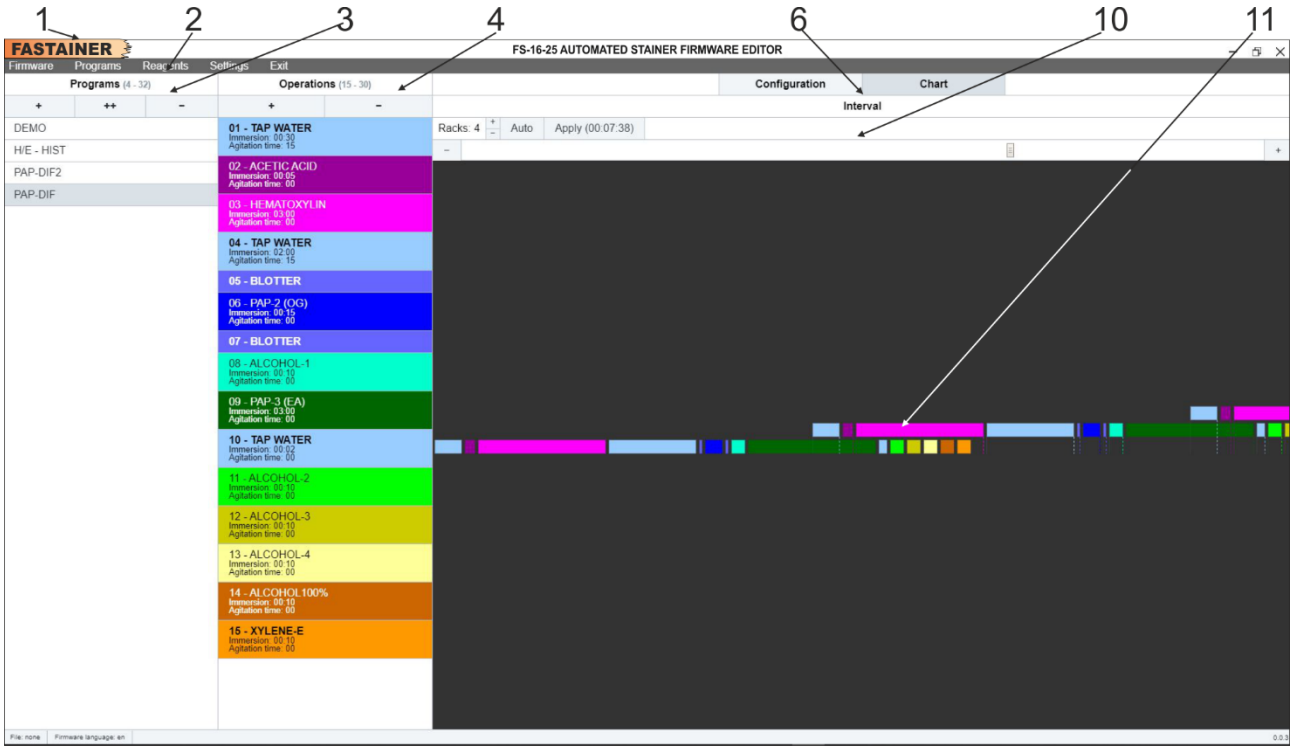


Figure 34. The window «Chart» of the software

1 – Logotype. 2 – Main Menu. 3 – Programs - list of technological programs in the current (opened) firmware. 4 – Operations - list of technological operations in the selected technological program. 6 – Selector of the window: «Configuration» or «Chart». 10 – Interval settings bar. 11 The window of the Gantt chart of technology program output.

Interval

+	-	– Buttons to change the interval value.
		– Slider to change the interval value.
Auto		– Button for automatic setting of interval value.
Apply (00:00:00)		– Button for applying selected settings

3 Window for optional reagents setting

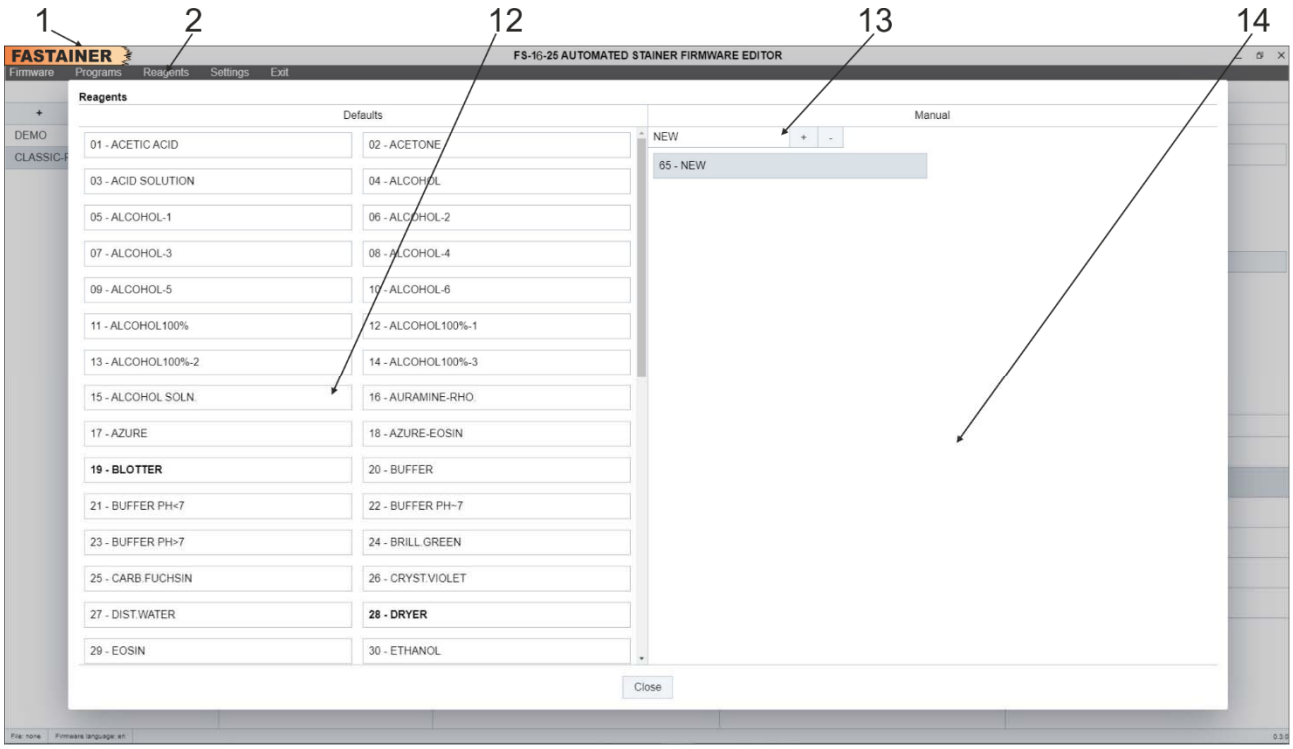


Figure 35. The window «Reagents» of the software

1 – Logotype. 2 – Main Menu. 12 – List of default reagents. 13 – New reagent input bar. 14 - List of optional reagents.

The reagent used in any of the technological programs is undeletable.