DRAMIŃSKI
TECHNOLOGY

Ultrasound Scanner
BLUE

USER MANUAL

www.medical.draminski.com

ISO 9001 | CE

Version EN 1.8 092022_10477

Produced by:

DRAMIŃSKI S.A.
Wiktora Steffena 21
11-036 Sząbruk
Poland

phone: +48 89 675 26 00
e–mail: ultrasound@draminski.com
www.medical.draminski.com

The Draminski Company has established and maintains a complete quality control system according to the requirements of **EN ISO 13485:2012/AC:2012.** This system and the technical documentation are periodically revised by notifying unit No. **0197 – TUV Rheinland LGA Products GmbH**, Tillystrasse 2, 90431 Nuremberg, Germany, which takes part in compliance assessment.

Declaration of conformity can be obtained at our Sales Department:
phone: +48 89 675 26 00
e-mail: ultrasound@draminski.com

The product acquired Certificate of Free Sale No. 417/2019 issued by Office for Registration of Medicinal Products, Medical Devices and Biocidal Products.

We wish the users of this product lots of success in taking care of your patients and we are sure by using our product you will provide good service to your patients.

All possible comments and notes of your customers concerning the device and this user manual will be accepted by DRAMINSKI Company with necessary attention.

Please feel free to call us at: **+48 89 675 26 00**
or e-mail us at: ultrasound@draminski.com

Table of contents

1. Introduction 7
1.1. Information about user manual 7
1.2. Warnings and comments used in this user manual 7
1.3. Brief information on ultrasound examination 8
1.4. Basic information about the ultrasound scanner 8

2. User's safety 9

3. The list of DRAMIŃSKI BLUE ultrasound scanner elements and accessories 10

4. Specification 11

5. Construction of DRAMIŃSKI BLUE ultrasound scanner 13
5.1. Body of the scanner 13
5.1.1. Multimedia connectors 13
5.1.2. Elements of the casing 14
5.2. Ultrasound probe 15
5.3. AC Adapter 16
5.4. Support 17

6. Description of the user panel and available functions 18
6.1. Basic user panel (B, B+B, B+M modes) 18
6.2. Active fields 20
6.3. Panel in Color Doppler and Power Doppler mode 21
6.4. Panel in Pulse Wave Doppler 22

7. Preliminary starting procedure 23
7.1. General principles of using the touch panel 23
7.2. Support installation 23
7.3. Connecting the probe 24
7.3.1. Switching probes 24
7.4. Battery charge status check 25
7.5. Starting the device using the mains supply 25
7.6. Starting the device using the battery power supply 25
7.7. Finishing work 26
7.8. Transportation of the device 26

8. Preparation to perform ultrasound examination 27
8.1. Patient data 27
8.1.1. Data input 27
8.1.2. Selection of a patient from the database 28
8.1.3. Ending examination 28

9. Imaging modes 29
9.1. Choosing the imaging mode 29
9.1.1. B, B+B and 4B modes 29
9.1.1.1. Switching windows between B+B and 4B modes 29
9.1.2. M and B+M modes 29
9.1.3. Doppler modes: Color Doppler, Power Doppler and Pulse Wave Doppler 30
9.1.3.1. Switching between Color Doppler, Power Doppler and Pulse Wave Doppler modes 30

9.1.4. Vi–Probe . . . 30

10. Description of the ultrasound scanner functions . . . 31
10.1. Optimizing the image parameters . . . 31
10.1.1. Gain control . . . 31
10.1.2. Time Gain Control (TGC) . . . 31
10.1.3. Frequency . . . 31
10.1.4. Depth . . . 31
10.1.5. Focus . . . 32
10.1.6. Zoom . . . 32
10.1.7. Dynamic range . . . 32
10.1.8. Gamma . . . 32
10.1.9. D–Curve . . . 33
10.2. Freeze . . . 33
10.3. Cine loop – continuous and frame-by-frame replay . . . 33
10.4. Measurements . . . 33
10.4.1. Length . . . 34
10.4.2. Grid . . . 34
10.4.3. Stenosis . . . 34
10.4.4. Volume . . . 35
10.4.5. Area . . . 35
10.4.6. The area of ellipse . . . 35
10.4.7. Orthopedics . . . 35
10.4.7.1. α and β angle . . . 35
10.4.8. Gynecological and obstetric measurements . . . 35
10.4.8.1. [HC] – head circumference . . . 36
10.4.8.2. [BPD] – biparietal diameter . . . 36
10.4.8.3. [AC] - abdominal circumference . . . 36
10.4.8.4. [FL] - femur length . . . 36
10.4.8.5. [NT] - neck translucency . . . 36
10.4.8.6. [HL] - humerus length . . . 36
10.4.8.7. [AFI] - amniotic fluid index . . . 36
10.4.8.8. [Growth curves] . . . 36
10.4.8.9. [Aging tables] . . . 37
10.4.8.10. [Estimated fetus weight] . . . 37
10.4.9. Cardiology . . . 38
10.4.9.1. HR (Heart rate) . . . 38
10.4.9.2. LA/Ao (Left Atrium to Aorta diameter ratio) . . . 38
10.4.9.3. LV (Left Ventricle function) . . . 38
10.4.9.4. Left Ventricle Volume – Simpson's LVAM-LVAP method . . . 39
10.4.9.5. Left Ventricle Volume - Simpson's single plane method . . . 39
10.4.9.6. Left Ventricle Volume – Bullet's method . . . 39
10.4.10. Edition of the measurements . . . 39
10.4.11. Deleting all the measurements . . . 40
10.5. Annotations . . . 40
10.6. Optimization of B+M and M modes . . . 41
10.6.1. Graph drawing speed selection in M mode . . . 41
10.6.2. Setting the sampling line in B+M / M modes . . . 41

10.6.3. Switching between M and B+M modes . . . 41
10.7. Imaging with the function of color Doppler . . . 41
10.7.1. Starting Color Doppler imaging . . . 41
10.7.2. Switching between the Doppler modes: Color, Power, Pulse Wave; Doppler mode OFF . . . 41
10.7.3. Doppler frame settings . . . 42
10.7.3.1. Repositioning of color box . . . 42
10.7.3.2. Resizing of color box . . . 42
10.7.3.3. Steering angle of the color box . . . 42
10.7.4. Setting parameters for Doppler mode . . . 42
10.7.4.1. [PRF] - Pulse Repetition Frequency . . . 42
10.7.4.2. Doppler Frequency . . . 42
10.7.4.3. Color gain adjustment . . . 43
10.7.4.4. Frames averaging . . . 43
10.7.4.5. Wall filter . . . 43
10.7.4.6. FPS/Quality . . . 43
10.7.4.7. Color invert . . . 43
10.7.4.8. Color Threshold . . . 43
10.7.4.9. Color Range . . . 43
10.7.5. Blood surface measurement . . . 43
10.8. Power Doppler . . . 44
10.8.1. Power Doppler settings . . . 44
10.8.1.1. Postprocessing . . . 44
10.8.1.2. Frame Averaging for Power Doppler (Averaged Filter / Non-Averaged Filter) . . . 44
10.9. Pulse Wave Doppler . . . 44
10.9.1. Pulse Wave Doppler settings . . . 44
10.9.1.1. Sampling gate depth . . . 44
10.9.1.2. Insonation Angle . . . 44
10.9.1.3. Sampling gate width . . . 44
10.9.2. Registration of blood flow spectrum . . . 45
10.9.3. Modification of the spectral graph . . . 45
10.9.4. Measurement in Pulse Wave Doppler mode . . . 45
10.9.4.1. [HR] - Heart Rate . . . 45
10.9.4.2. [AT] - acceleration time . . . 45
10.9.4.3. [RI PI PSV EDV] . . . 45
10.9.4.4. [Doppler Point] . . . 45
10.10. Saving and loading the images and cine loops . . . 46
10.10.1. Saving the image . . . 46
10.10.2. Saving the Cine loop . . . 46
10.10.3. Restoring patient examination . . . 46
10.10.4. Loading cine loops . . . 47
10.10.5. Edition of stored images and cine loops . . . 47
10.11. Data export to external storage medium . . . 47
10.12. Data export in DICOM format . . . 47
10.13. Image printing . . . 48
10.13.1. Printing during examination . . . 48
10.13.2. Printing of stored images . . . 48
10.13.3. Printing multiple images on one sheet . . . 48
10.14. Full screen function . . . 48

10.15. Presets 49
10.15.1. Presets activation 49
10.15.2. Presets saving 49

11. Advanced settings 50
11.1. Default 50
11.2. Clinic 50
11.3. System information and update 50
11.3.1. Software update 51
11.3.1.1. On-line update 51
11.3.1.2. Update using USB flash drive 51
11.3.2. Choosing printer 51
11.3.3. Remote access 51
11.3.3.1. Setting up a remote access 51
11.3.3.2. Disabling remote access 52
11.3.4. Security lock in the operation system 52
11.4. Date and time settings 52
11.5. Display 52
11.5.1. Touch screen calibration 52
11.6. Audio 53
11.6.1. Silent mode 53
11.7. Measurement settings 53
11.8. DICOM settings 53
11.8.1. DICOM servers configuration 53
11.8.2. Editing DICOM server settings 54
11.8.3. Data export in DICOM format onto an external USB device 54
11.9. WiFi 54
11.9.1. Installation of WiFi antenna drivers 54
11.9.2. Internet connection via WiFi antenna 54
11.10. Loop 55
11.10.1. Maximum video loop length 55
11.10.2. Choice of a style for creating file names exported to external storage 55
11.10.3. Selecting the extension of exported video loops 55

12. Charging and exploitation of the batteries 56
12.1. Checking the battery charge status before turning on the scanner 56
12.2. Checking the battery charge status during operation 56
12.3. Battery charging 57

13. Maintenance of the device 58

14. Troubleshooting 59

15. Symbols and marks used on the labels 60

16. Warranty 61

1. Introduction

1.1. Information about user manual

Individual chapters of the manual describe construction and accessories, as well as preparation for work, functions and operation of the BLUE ultrasound scanner.

In no way this manual will substitute even a basic ultrasonography course. It is recommended that the user of the device attend an ultrasonography course organized by the authorized training unit.

1.2. Warnings and comments used in this user manual

Due to the need of emphasizing important content in this manual, the following ways of highlighting are used:

Warning! - when it is necessary to draw special attention due to safety of the patient or the user of the device.

Attention! – when it is necessary to draw attention due to protection of the device against damage or due to its proper operation.

Bold text – to draw attention to more important parts in the manual or to make them more distinct or visible.

Descriptions of the schemes and figures – to make recognition of some details easier.

Symbols used in the user manual do not fully inform about the safety instructions and that is why it is important to read the instructions (Chapter 2) and follow them!

Symbols used in the manual:

[text] – means name of a button

<x.x.x> – link to Chapter x.x.x

1.3. Brief information on ultrasound examination

Ultrasound devices are widely used in medicine. Particularly useful and commonly used is the method of real-time imaging which enables two-dimension graphic presentation of a tissue cross-section in the 256 greyscale, the so called B-Mode (Brightness Mode). Additionally, Color Doppler ultrasonography used to evaluate the vascular flows is becoming more and more significant.

Diagnostic effectiveness of ultrasonography is considered to be high, but effects of working with this method are significantly impacted by the quality of the device, individual experience, the user's individual knowledge, as well as observing the ultrasound scanning standards and familiarization with the user manual.

1.4. Basic information about the ultrasound scanner

BLUE is a modern device which can be powered from a built-in battery pack or directly from the mains (110-230 V). The ultrasound scanner is built based on a small-size computer system. The special features of the device are: touch operation, small size and weight as well as a strong aluminium casing which hides technically advanced electronics which guarantees top quality imaging.

BLUE is a unique diagnostic device. Its small size and a built-in battery power supply make this ultrasound scanner a modern and ergonomic tool. It can be used as a desktop or portable device. It has a flat high quality LCD LED monitor which guarantees bright and high resolution image, which makes the work easier in almost any conditions.

BLUE is an ultrasound scanner designed for diagnostic purposes, to monitor the progression of the disease and to evaluate the condition of the organs. Its main applications are:

- abdominal cavity,
- gynaecology and obstetrics,
- vascular flow,
- musculoskeletal system,
- heart,
- lungs imaging.

Operator can use black and white real time imaging modes as well as Color, Power and Pulse Wave Doppler.

2. User's safety

Warning!
The user's and the patient's safety depends on observing the below mentioned instructions!

1. DRAMIŃSKI BLUE should be used for diagnostic purposes and by the trained staff only – erinarians proficient in ultrasound diagnostics.
2. It is necessary to disinfect the probe before each use. Other elements of the ultrasound scanner should be disinfected in reasonable situations in which they could have a contact with infectious substances.
3. It is forbidden to use the ultrasound scanner with high frequency (HF) devices at the same time.
4. The ultrasound scanner cannot be used for transesophageal echocardiography (TEE) examinations.
5. In the places where explosive and anaesthetic gases are used, the use of the ultrasound scanner is prohibited for safety reasons.
6. The device is suitable for indoor use.
7. It is recommended the user of the ultrasound scanner perform regular technical inspections every two years at the manufacturer's facility or approved service point. It will guarantee the highest level of the patient's safety.
8. It is forbidden to carry out ultrasound diagnostics when carrying out defibrillation.
9. It is forbidden to disassembly the device, repair and adjust it by the user except for the procedures stated in this manual.
10. It is recommended the users of ultrasound scanner check before the examination the condition of the probe, cable and the connector. Do not use the probe if any of these elements is damaged.
11. If mechanical damages of the probe, cable or connector are noticed it is necessary to send the device to the service point authorised by DRAMINSKI.
12. Even though the ultrasound scanner has a strong construction in order to avoid mechanical damages it is recommended to follow the instructions presented in this manual.
13. Exposing this device to strong solar radiation should be avoided. Regarding working, storage and transport conditions, it is advised to follow the instructions on the labels of the device and its parts.
14. It is forbidden to modify the device by the user.
15. DRAMIŃSKI BLUE is an electric device which can be a source of electromagnetic radiation. Other electric devices can interfere with its work, which is why it is recommended to limit the number of other electric devices working nearby.
16. When its service life expires in order to avoid risk to the environment, the device and the accessories should be disposed of by specially trained units according to the applicable regulations or sent back to the manufacturer.
17. During the ultrasound examination the device cannot be connected to the ETHERNET (via LAN connector).
18. It is recommended to connect medical grade external monitors and printers.
19. In order to avoid electric shock the device should be connected to a grounded outlet.

3. The list of DRAMIŃSKI BLUE ultrasound scanner elements and accessories

#	Name and description	Quantity
1	BLUE Body with built-in battery	1
2	Ultrasound probe	1
3	AC adapter	1
4	Support	1
5	User manual and warranty card	1
6	Transport case	1
7	Stand on wheels	optional
8	Carrying belt loops	optional
9	USB WiFi antenna	optional

4. Specification

Application	Ultrasound diagnostics
Imaging Modes	B Mode B+B Mode 4B Mode M Mode B+M Mode Color Doppler Power Doppler Pulse Wave Doppler
Frequency of the system	1-14 MHz (depends on the probe)
Dynamic focus	Yes
Beam control	Vi-probe (virtual phased array on convex probes and virtual convex on linear probes)
Image managing	Freeze Zoom 60 - 300% of the initial image, 20%/step Full screen Saving of images and cine loops (128 – 512 frames) Data export to the DICOM server
Presets	Large vessels, Small vessels, Baby Abdomen, Baby Cardiology, Baby Lungs, Baby Thyroid, MSK, Superficial organs, Kidney, Finger, Lungs, Rheumatology, Thyroid, Liver
Greyscale	256 shades of grey D-Curve (grayscale optimised for human's eye perception)
Image postproessing	LuciD (contrast enhancement, sharpening, better tissue differentiation)
User interface	Menu in languages: Polish, English, Arabic, Croatian, French, Spanish, Korean, German and Russian. Imaging parameters adjustments
Measurements	Basic: Area, Distance, Ellipse, Grid, Stenosis, Volume Obstetric package: AC, AFI, BPD, CRL, FL, GS, HL, NT, Aging tables, Estimated fetal weight, Growth curves Doppler: Doppler Point, PSV, EDV, AVG, RI, PI, AT Orthopedics: α and β angle measurement
System	Integrated with PC
Screen	LCD LED, 12″
Functions control	Capacitive touch panel
Images and cine loops memory	30 GB images and cine loops with description, patient data and date
Data transfer standard	DICOM 3.0
Data transmission for the external storage	Via USB

Exported data file format	PNG for images, AVI, MP4, MOV for cine loops
Probe ports	One port, automatic probe detection
Multimedia connectors	2 x USB, 2 x LAN, 1 x HDMI
Medical Device Class	Class I
Type of applying part	BF type
Power supply	1. AC adapter, Model XP Power AHM100PS19 Output: 19V 5,26A 2. Li-ion built-in battery 14,4V 6,8Ah
Continuous work on battery power supply	Up to 2,5 hours
Battery charging time	4 hours
Battery charge indicator	Low battery graphic indicator Acoustic signal to indicate the charge level when the device is turned off Acoustic signal informing about low battery when the device is switched on
Boot up time	Approx. 25s. (cold start)
Housing	Metal: duralumin
External dimensions	width 31.0 cm, height 28.0 cm, depth 6.5 cm
Weight	4 kg with the support
Working temperature	+ 10°C to + 40°C
Storage temperature	+ 5°C to + 40°C
Transport temperature	- 10°C to + 40°C
Working humidity	>90% without condensation
Storage humidity	>90% without condensation
Transport humidity	>90% without condensation
Working pressure	From 700 to 1060 hPa
Storage pressure	From 700 to 1060 hPa
Transport pressure	From 700 to 1060 hPa
International protection rating	IP30
Power consumption	2.5A
Optional accessiories	Stand on wheels

5. Construction of DRAMIŃSKI BLUE ultrasound scanner

The device consist of:

1. Body of the scanner
2. Ultrasound probe
3. AC adapter
4. Support

5.1. Body of the scanner

On the front of the body there is a high quality 12" LCD LED display with a touch screen. It has wide viewing angle and high resolution which guarantees high quality of an ultrasound image. The touch panel is dedicated to control the system.

The user panel and its features are described and shown on figures in further parts of this manual.

On the back side of the body there are: port for connecting probes with a latch, port locking lever, loudspeaker, ventilation inlets and outlet, system for mounting the support or attaching the scanner to the wheel stand.

On the right side of the body there are ON/OFF button and power supply socket.

On the left side of the body there is a set of a multimedia connectors: 2xUSB 3.0, HDMI, 2xLAN - located under a sliding cover.

5.1.1. Multimedia connectors

The intended use of multimedia connectors is:

- 2x USB – exporting data to an external flash drive, updating the software,

- 2 x LAN – connecting to a Dicom Network, updating the software,

- HDMI – connecting the external display.

Warning!
It is advised to connect only madical grade peripherals to the mulitmedia connectors!

Warning!
During the ultrasound examination the device cannot be connected to the ETHERNET (via LAN connector).

Warning!
It is forbidden to connect any peripherals to the HDMI and USB connectors during an ultrasound examination!

Attention!
The ultrasound scanner has a strong construction, however it should be operated and transported with due care in order not to expose the device to strong impacts to avoid potential damage.

Protect the device from foreign objects getting inside the casing through the ventilation holes.

5.1.2. Elements of the casing

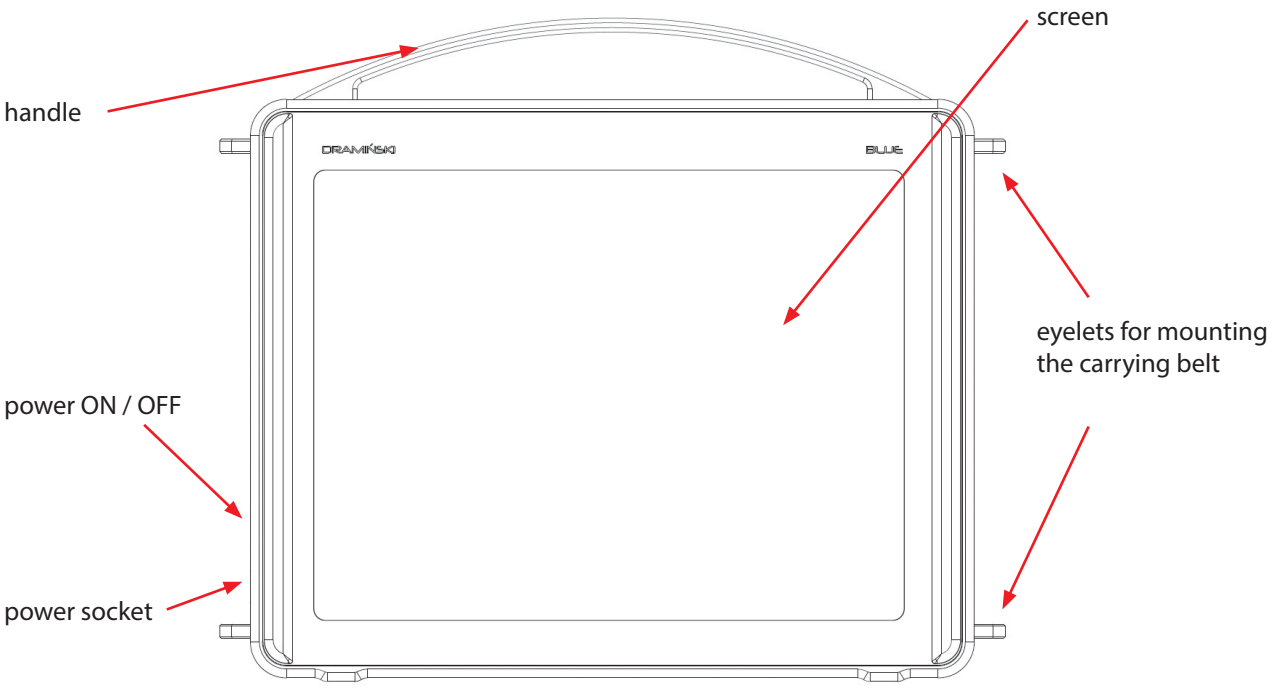


Fig. Elements of the casing. Front view.

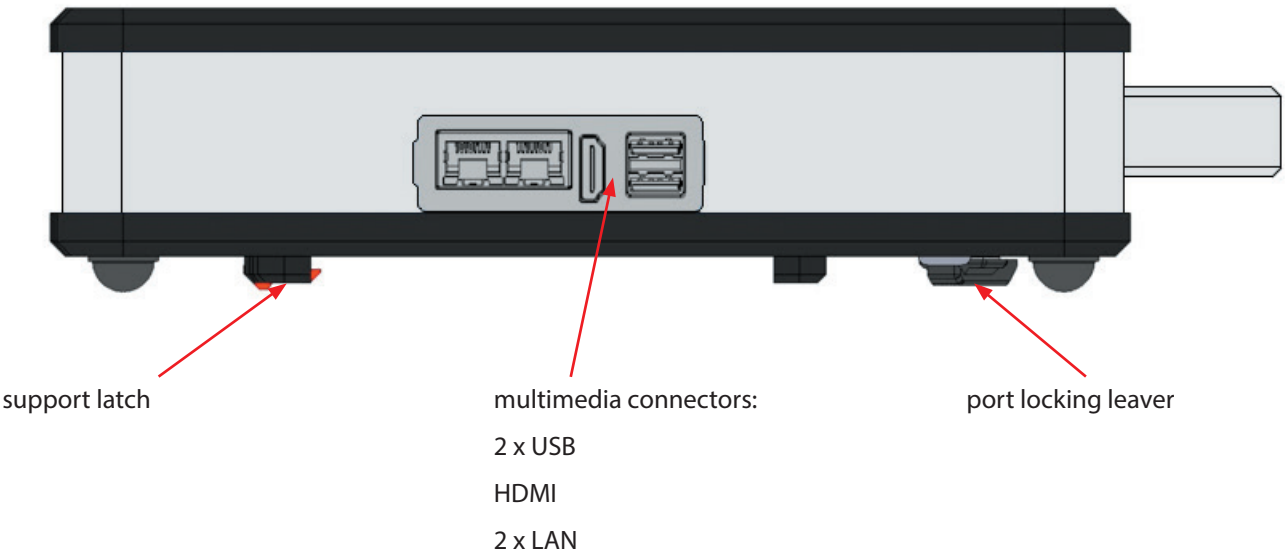


Fig. Elements of the casing. Right side view.

Attention!
It is recommended to connect medical grade external monitors and printers.

Warning!
For safety reasons external devices should not be connected to the ultrasound scanner when examination is in progress.
During the examination the ultrasound scanner must not be connected to the ETHERNET network via LAN.

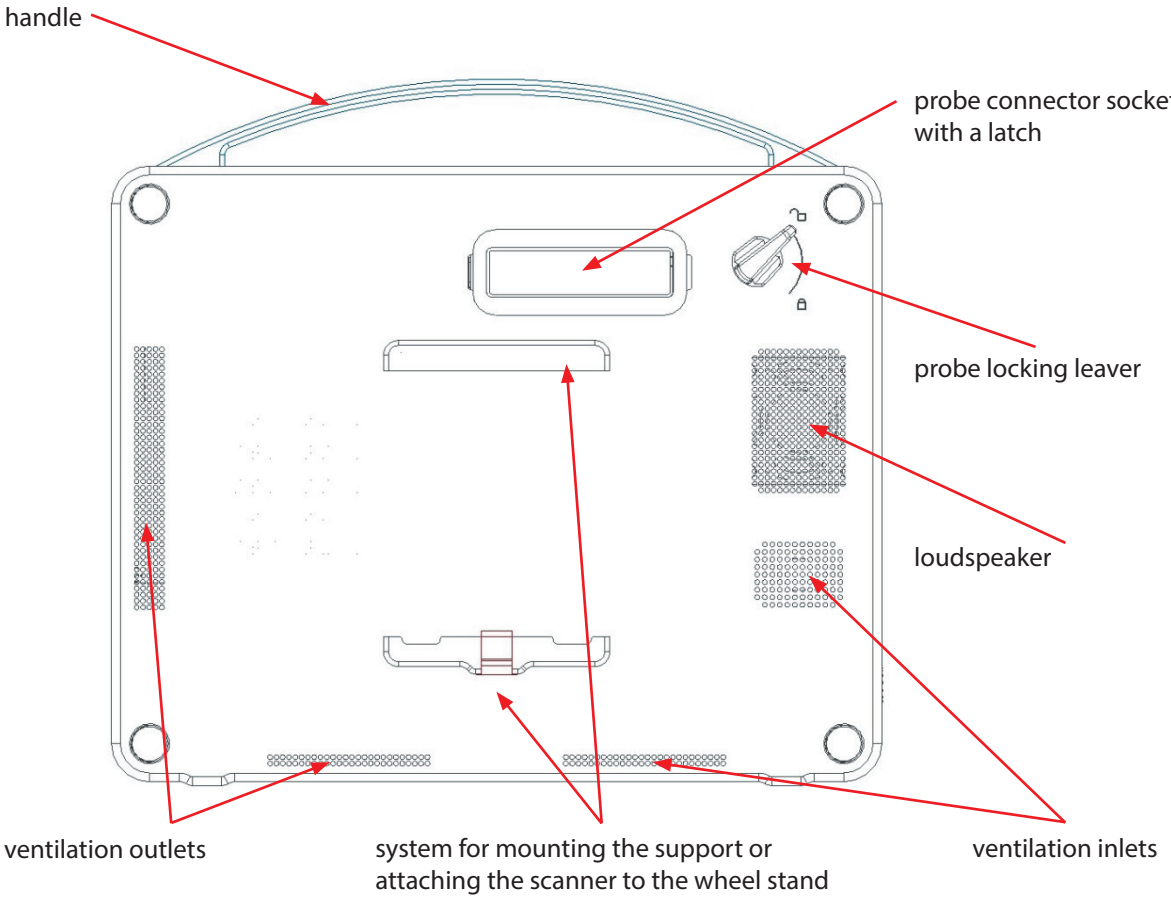


Fig. Elements of the casing. Rear view.

5.2. Ultrasound probe

List of DRAMIŃSKI ultrasound probes compatible with BLUE:

CONVEX 3,5 MHz R50

CONVEX 3,5 MHz R60

LINEAR 10 MHz 40 mm

ENDOCAVITY 6,5 MHz 10 mm

MICROCONVEX 6,5 MHz 15 mm

Protection levels for the probes:

– IPX1 for socket, cable and housing,

– IPX7 for head of the probe.

Attention!
It is possible to use other types of electronic probes. Users interested in other types of ultrasound probes should contact the manufacturer of the DRAMIŃSKI BLUE ultrasound scanner.

5.3. AC Adapter

Class I Medical Device

Input: 100-240V ~ 1.2A, 50/60Hz

Output: 19V 5,26A

The adapter is used to power the DRAMINSKI BLUE device only.

The parameters of the adapter guarantee safe operation for the user, the patient and for the device itself.

Warning!
The device can be powered from the mains only by using attached certified adapter. The use of another adapter can cause damage to the user and can permanently damage the device.

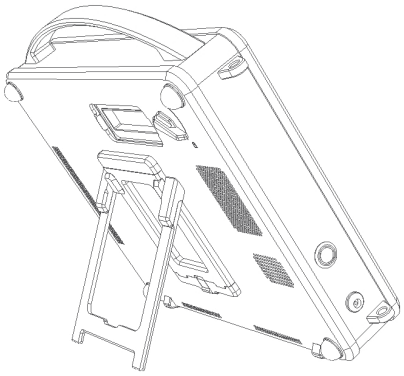
Warning!
All service repairs must be performed with the power off.

If there is necessary to stop the work of the device the power button should be pressed and held for approximately 4 seconds.

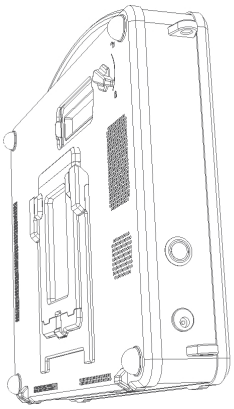
Warning!
In order to avoid electric shock the device should be connected to the grounded mains.

5.4. Support

The support can be mounted on the rear side of the scanner. It has two fixed-tilt angles – 30° and 60°.



After setting up device is positioned at 60o angle to the floor When moving the ultrasound scanner, it is recommended to fold the stand flat.



6. Description of the user panel and available functions

6.1. Basic user panel (B, B+B, B+M modes)

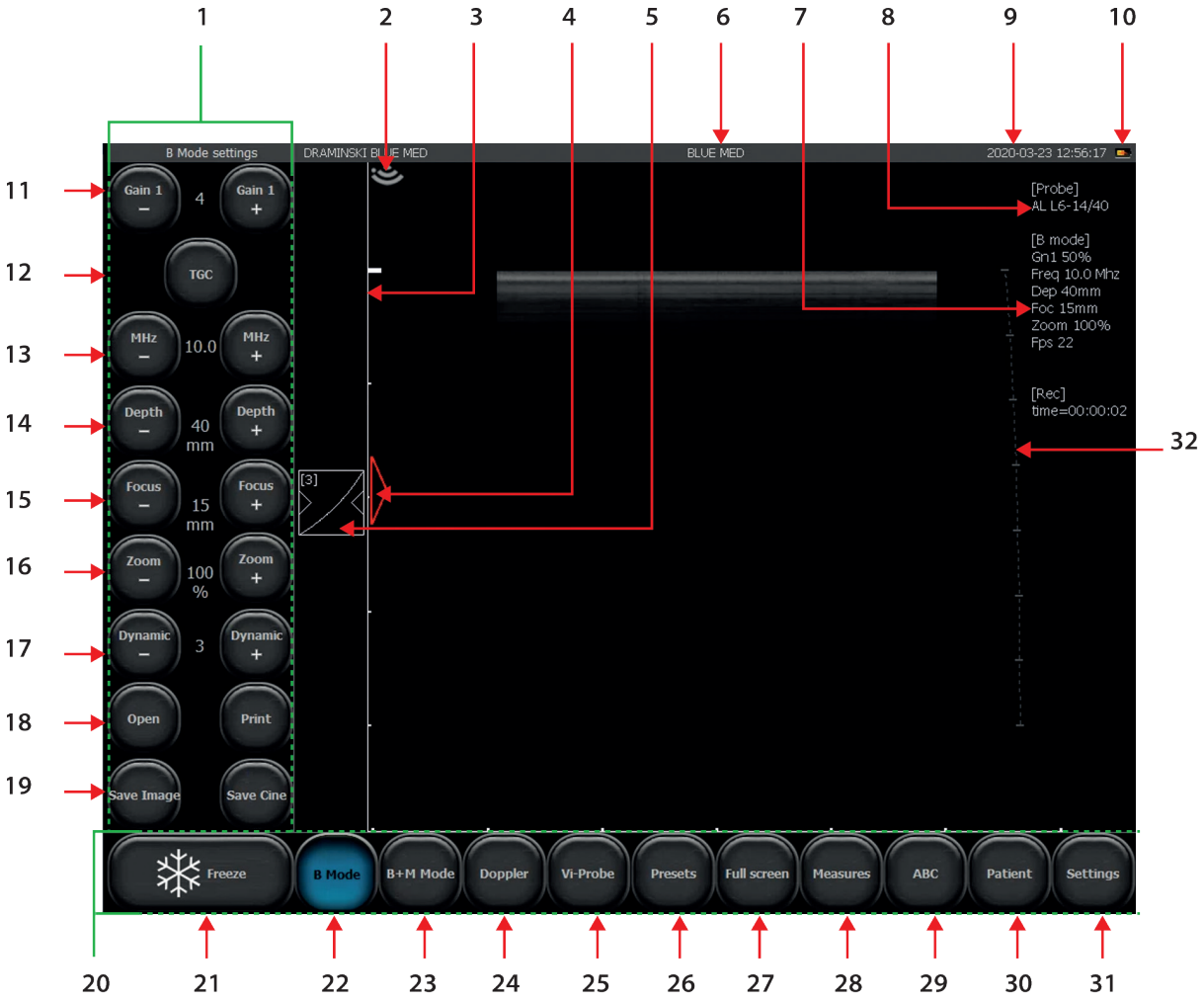


Fig. User panel elements.

1. Tool panel
2. Probe indicator
3. Scale
4. Focus position
5. Gamma setting
6. Clinic name / Preset name
7. Current working parameters
8. Probe's symbol
9. Date and time
10. Battery indicator
11. Gain control
12. TGC control
13. Frequency control
14. Depth control
15. Focus control
16. Zoom control
17. Dynamic range
18. Open database / Print
19. Save image / save cine
20. Mode panel
21. Freeze
22. Imaging mode: B, B+B, 4B; Vi-Probe, D-Curve
23. Imaging mode: M, B+M
24. Imaging mode: Doppler
25. Vi–Probe
26. Presets
27. Full Screen
28. Measurements
29. Annotations
30. The function to enter patient's data before the treatment
31. The button to access additional settings
32. TGC configuration

6.2. Active fields

Active fields are zones in the image which serve to change some parameters skipping the buttons on the tool panel.

In the image sector there are four periphery active zones which are used to change:

– gain setting,

– focusing level,

– depth of scanning.

The central active field enables moving the image in the zoom mode.

In B+B and 4B modes active fields are placed alike in each separate window.

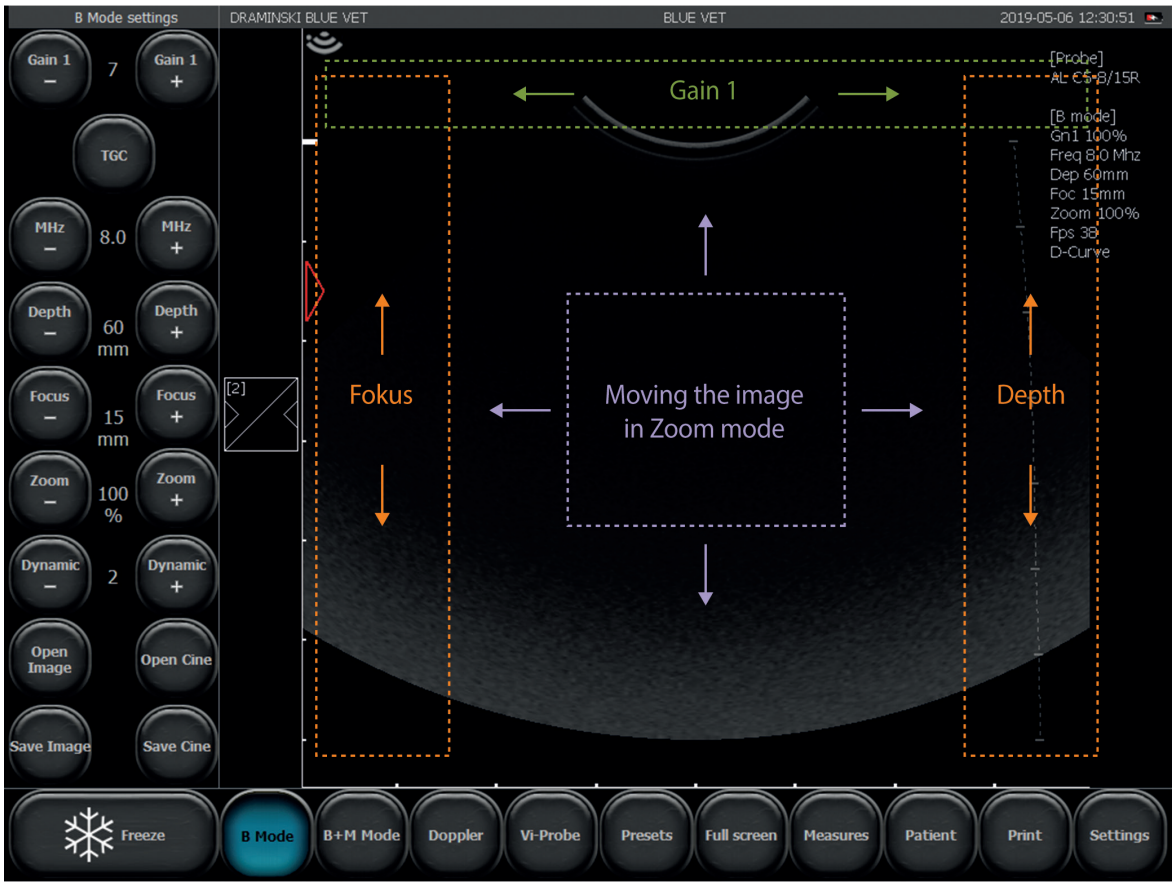


Fig. Active fields

6.3. Panel in Color Doppler and Power Doppler mode

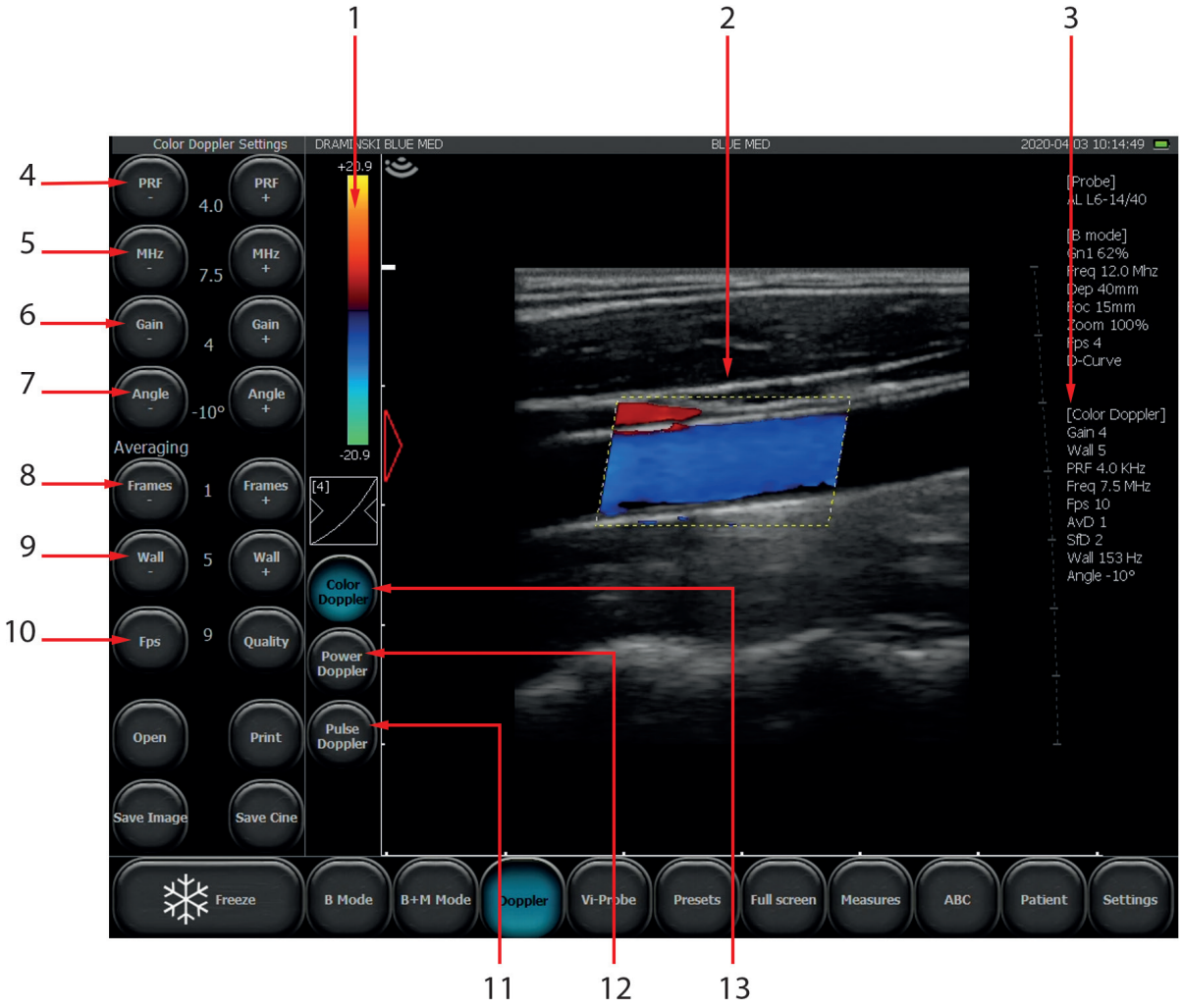


Fig. User panel elements in Color Doppler mode

1. Color map / color invert, Color treshold, Color range
2. Doppler frame
3. Current Color Doppler settings information
4. PRF – Pulse Repetition Frequency
5. Doppler frequency control
6. Doppler gain control
7. Steer (for linear probes only)
8. Frame averaging
9. Wall filter
10. FPS: Quality
11. Pulse Wave Doppler
12. Power Doppler
13. Color Doppler

Other buttons and information displayed on the screen are the same as for mode B.

6.4. Panel in Pulse Wave Doppler

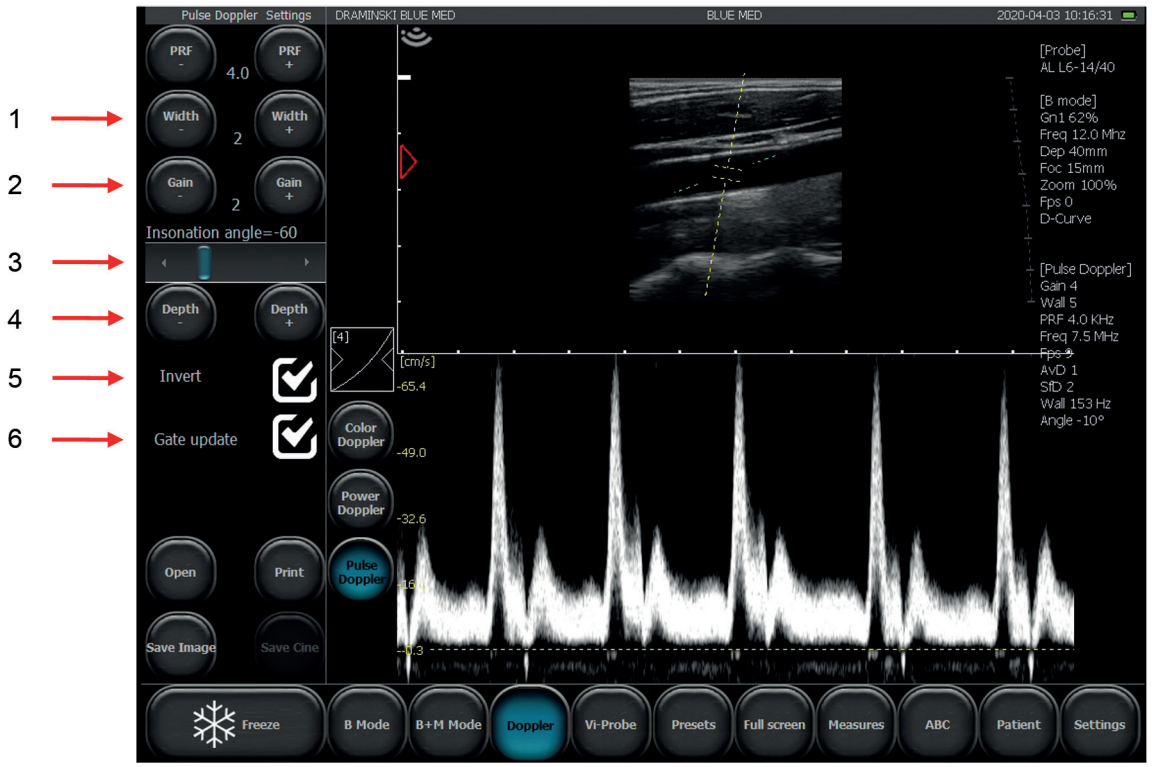


Fig. User Panel in Pulse Wave Doppler Mode

1. Gate width
2. Gain
3. Insonation angle
4. Gate depth control
5. Invert
6. Update. Switching between B and Pulse Wave Doppler window

Warning!
Only qualified and specially trained personnel can operate the system and carry out ultrasound examinations.

7. Preliminary starting procedure

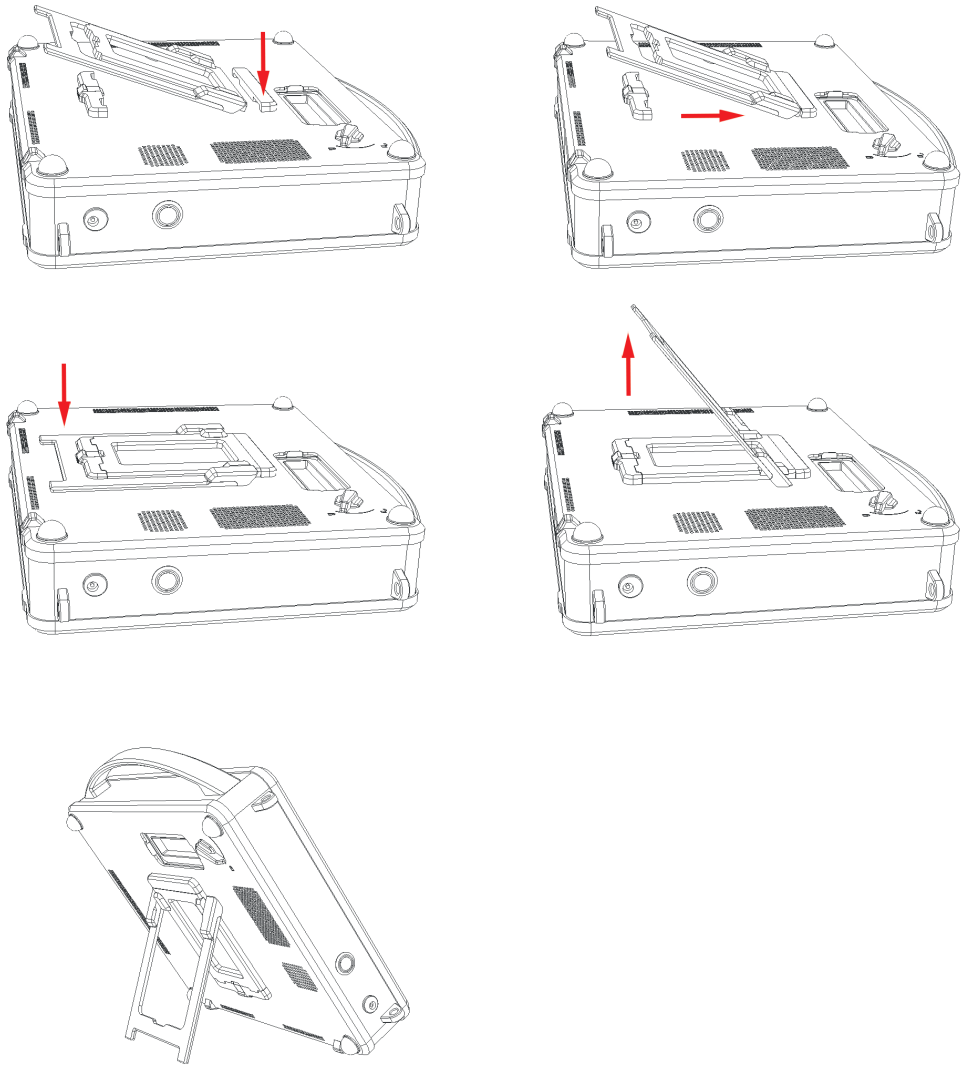
Attention!
Function control of the ultrasound scanner is performed via the touch panel. Only turning ON and OFF is done by use of the button on the right side of the device.

7.1. General principles of using the touch panel

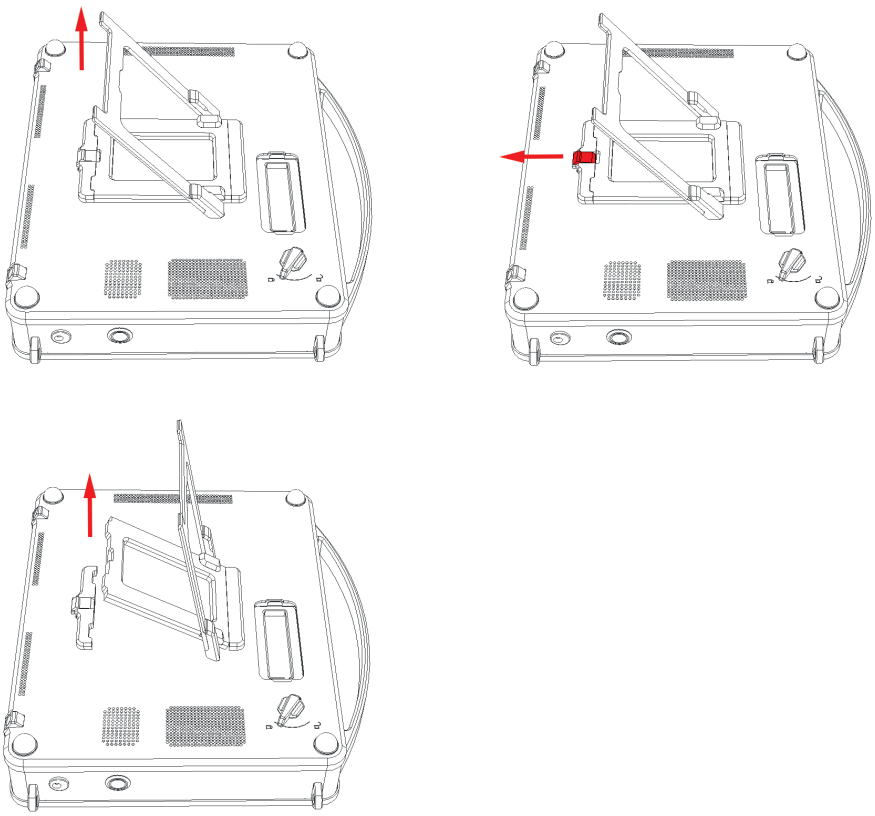
1. Capacitive touch panel can be operated by a hand in a glove.
2. The panel should be wet-cleaned and disinfected with the help of special sprays or foams.
3. Dry-cleaning of the panel is recommended with the help of soft dusters.
4. Thorough cleaning of the panel should be carried out when the device is switched off.

7.2. Support installation

Press the scanner stand against the upper bar of the mounting system and press the bottom of the stand towards the scanner body until you hear the lock click.



Support installation



Support deinstallation

7.3. Connecting the probe

Attention!
The probe connector is a technologically advanced mechanism. It should be protected against mechanical damage, dirt and moisture. The probe cable should be protected from excessive loads, strong and repeated bending and shaking.

Slide the probe slot latch.

Before connecting the probe make sure that the probe locking leaver is in position.

After fitting the probe connector tightly in the socket, switch the probe locking leaver to position, to prevent the connector from disconnecting and provide proper contact between the connector and port.

7.3.1. Switching probes

BLUE ultrasound scanner has only one probe port. You do not have to turn the scanner off, if you want to switch between the probes. Turn the probe locking leaver to position and disconnect the connector from the port. The image will be frozen. Fit the connector of the second probe tightly in the port and switch the probe locking leaver to position. The image will be unfrozen and the probe will be recognized automatically.

When this operation is being performed the screen will show the following messages:

„Probe OFF" – probe is unlocked,

„Probe ON" – probe is locked, image unfreeze.

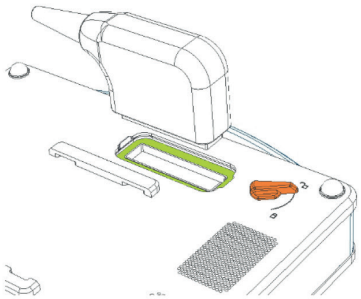


Fig. Probe port on the rear side of the scanner. The probe locking leaver is in position.

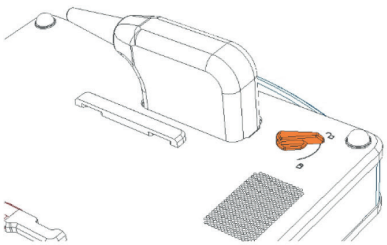


Fig. Connector is correctly fitted in the port. The probe locking leaver is in position.

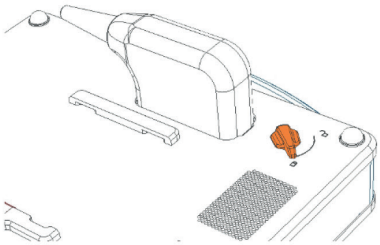


Fig. Connector is correctly fitted in the port. The probe locking leaver is in position.

Warning!
Regarding the complicated construction of probes it is necessary to use them with due caution and protect against falls or damage. The active surface (lens of the probe) should be protected against mechanical damage, for example, do not scrub it during cleaning.

The probe is the element of the ultrasound scanner which should be disinfected before each use.

7.4. Battery charge status check.

To check the battery charge status when the device is turned off, press the power button briefly If the battery is charged, the device will emit 1 to 4 acoustic signals*, with one signal corresponding to 25% battery charge. <12.1.>

*) No signal means the battery is deeply discharged or this function has been disabled after activating the silent mode in the Audio tab of the Settings menu.

7.5. Starting the device using the mains supply

1. Connect the adapter to the 110-230 V / 50-60 Hz grounded outlet.
2. Connect the adapter's connector to the socket on the device casing.
3. Turn on the device by pressing the power button on the right wall of the housing for 1 second.
4. Wait for the system of the ultrasound scanner to upload and the user panel to appear on the screen.
5. Check if the connected probe is adequate with the symbol on the screen and if there is a response on the image when you touch the head of the probe.

7.6. Starting the device using the battery power supply

1. Make sure the battery is charged by briefly pressing the power button. <7.4.>
2. Switch on the device pressing the power button which is on the right side of the casing.
3. Wait for the system of the ultrasound scanner to upload and the user panel to appear on the screen.

4. Check if the connected probe is adequate with the symbol on the screen and if there is a response on the image when you touch the head of the probe.

7.7. Finishing work

In order to finish work press the power button. When the monitor blanks out it is necessary to carry out cleaning and disinfection of the device according to the recommendations given in the chapter "Maintenance of the device".

If you would like to the device working immediately, press and hold the power button until the device turns off.

To protect the probe against damages it should preserved from falling on the floor.

7.8. Transportation of the device

The aluminum casing of the device is very strong. However, when transporting the device it is necessary to handle it with due care; especially protect the probe and the screen against an impact. It is recommended to fold the stand flat before transport.

The shipment of the device should be prioritized by thorough protection of the device and its accessories against damage by proper packing of particular elements. The producer recommends shipping the scanner in dedicated case in which it was delivered.

8. Preparation to perform ultrasound examination

Before starting work it is necessary to prepare the device and the accessories.

If you do not have access to electricity, check the battery charge status. Turn on the device. Prepare the patient's skin in which you want to perform the examination. It is recommended to wipe the skin with a disinfectant – it guarantees antiseptic conditions and degreases the skin.

To perform the examination it is necessary to use a special gel – it is recommended to use medical grade gels dedicated for an ultrasound examination. Put the gel on patient's skin before attaching the probe.

Warning!
The use of other substances can be dangerous for the patient and may cause adverse effects. It can also have a negative impact on the elements of the probe. Proper use of gel will definitely increase penetration of the beam and will allow obtaining correct and clearer images.

During the examinatio the buttons described below on the user panel are used to set the best working parameters in particular conditions.

In order to limit the impact of the acoustic energy, emitted by the ultrasound probe, on the operator and on the patient, recommended standards of ultrasound examinations should be followed.

Attention!
Even though ultrasound diagnostics is thought to be a safe method of diagnostic imaging, a harmful level of the working parameters should be avoided. Exceeding the margin of safety can present risk for the operator and the patient.

In this device the range of the parameters regulation is limited by the manufacturer in order to guarantee safety of the user and the patient.

Attention!
Examinations should be performed by qualified and specially trained personnel. It is recommended that the user of the device take part in advanced and specialized courses. Having read the user manual is not enough to diagnose correctly.

8.1. Patient data

8.1.1. Data input

Before starting the examination, enter patient data into the database. Each patient is assigned an individual ID, which, in combination with patient data, allows subsequent studies to be assigned only to them. The user can give a different ID to the patient - in accordance with the rules prevailing in the workplace.

To enter a new patient into the database press [Patient] and select [Browse database].

Complete the [Patient Name] field and press [Add Patient]. Fill in the [Patient Name] field and press [Add Patient]. The patient card will be highlighted in green.

To start the examination press OK.

8.1.2. Selection of a patient from the database

To start examining a patient who already exists in the database, press [Patient] and select [Browse database].

Enter partial data in the [Patient Name] field. The system will filter the patient database as you type. As soon as the patient appears on the list, select his card and press [Use selected patient] to start the examination.

8.1.3. Ending examination

To end the examination, press [Patient] and select [End test]. The system will display the patient database.

9. Imaging modes

This chapter describes basic steps on how to switch between imaging modes. Change of each imaging mode settings is described in Chapter 10.

9.1. Choosing the imaging mode

9.1.1. B, B+B and 4B modes

Tap B Mode and choose:

[B] – turns B mode on,

[BB] – turns B+B mode on with windows horizontally adjacent,

[$\frac{B}{B}$] – turns B+B mode on with windows vertically adjacent,

[$\frac{BB}{BB}$] – turns 4B mode on.

9.1.1.1. Switching windows between B+B and 4B modes

Each window has its own number. To activate another window, click on its number. If this procedure will be done during the examination, the image in first window will be frozen.

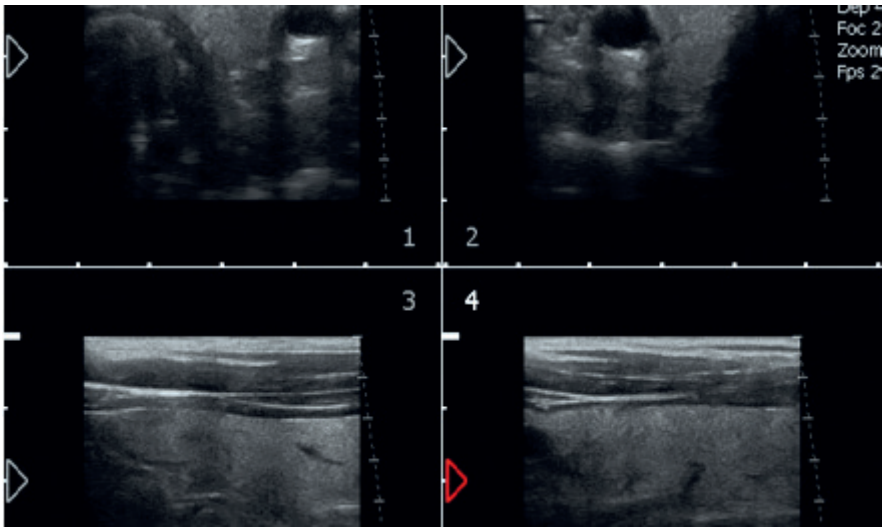


Fig. Split the screen in 4B mode

When the image is frozen in both windows, switching the window will cause moving frozen image from currently active window to the activated window.

9.1.2. M and B+M modes

In order to start B+M mode tap the [B+M mode] button on the mode panel.

In order to switch between B+M and M modes tap [B+M Mode] button and choose [M/B+M] from submenu.

9.1.3. Doppler modes: Color Doppler, Power Doppler and Pulse Wave Doppler

To start the Doppler mode tap the [Doppler] button on the mode panel. The Color Doppler mode turns on automatically. To turn Doppler off, press the [Doppler] again.

9.1.3.1. Switching between Color Doppler, Power Doppler and Pulse Wave Doppler modes

After starting Doppler modes additional buttons will appear on the screen (see chapter "User Panel in Color Doppler"). These are used to switch between the modes:

[Color Doppler] – turns Color Doppler mode on,

[Power Doppler] –turns Power Doppler mode on,

[Pulse Doppler] – turns Pulse Wave Doppler mode on.

9.1.4. Vi–Probe

Vi-probe is a beam controlling feature which allows to achieve the virtual convex type image on linear probes and sector type of image on convex probes.

Vi-probe can be turned on together with B, B + M and Doppler modes

Attention! The option is available on probes:

- CONVEX 3,5 MHz R60 mm model AL C1-6/60R,
- CONVEX 3,5 MHz R50 mm model NDK C2-5/R50
- LINEAR 10 MHz 40 mm model AL 6-14/40,
- MICROCONVEX 6,5 MHz 15 mm model AL C6/15R.

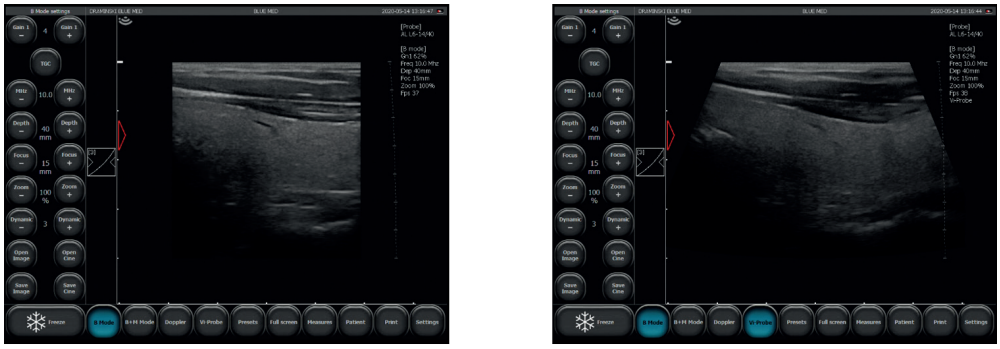
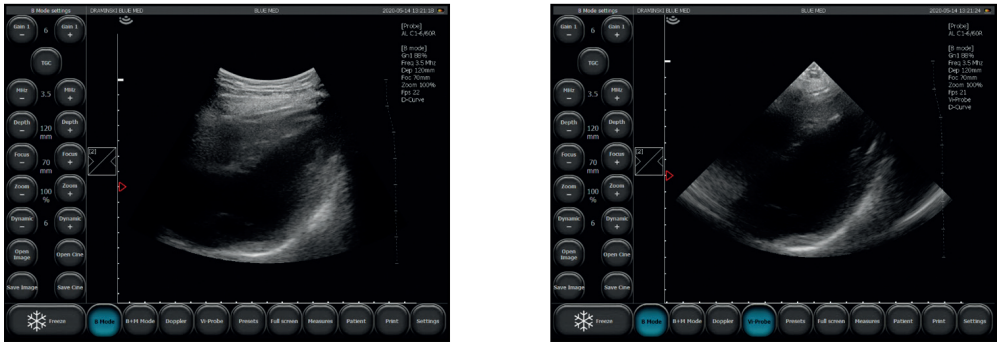


Fig. Vi-probe on linear probe: disabled and enabled.



Vi-probe on convex probe: disabled and enabled.

10. Description of the ultrasound scanner functions

10.1. Optimizing the image parameters

10.1.1. Gain control

[Gain 1] – gain control button

Level of overall gain is indicated by the digit located between the buttons. There is 8 steps of adjustment. 1 = low gain; 8 = high gain value.

An increase of the gain value results in a brighter image. The gains are changed depending on the user's preference, the kind of examination, the penetration depth and external light conditions.

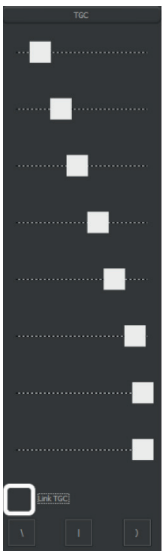
[Gain 1] can also be adjusted by swiping the finger in the active field which is located at the top of the scanning sector.

10.1.2. Time Gain Control (TGC)

[TGC] – Time Gain Control

TGC allows adjusting gain in 8 equal horizontal sections of imaging sector. You can adjust each section separately or choose one of predefined setting.

Marking [Link TGC] bracket causes all the knobs moving together not changing the shape of a TGC curve.



10.1.3. Frequency

The wideband probes which work with the BLUE can emit beam of different frequencies. Thanks to this function the probes guarantee a wide range of diagnostic capabilities. The higher the ultrasound frequency, the higher the resolution of an image.

The range of frequency depends on the probe type and is available in its technical documentation.

In order to change the frequency you should use the [MHz -] and [MHz +] buttons in the tool panel.

10.1.4. Depth

The depth of scanning is set with the use of the [Depth -] and [Depth +] buttons. The scanning depth is set depending on the position of the examined organs. The penetration range of the beam depends on its frequency – the higher frequency the less depth of penetration.

Additionally, it is possible to change the depth by swiping the finger in the active field at the right edge of the scanning sector.

10.1.5. Focus

These buttons are used to set the focus of the ultrasound beam. The image presented on the screen is the clearest at the level where the beam focuses. The focus level is indicated by a red triangle on the left side of the sector. In order to obtain the best effects it is necessary to set the focus on the depth corresponding to the position of the examined object.

It is possible to adjust the focus using the vertical active field on the left side of the sector.

Additionally the device has an automatic dynamic focus, thanks to which the image is clear in the full range of scanning.

10.1.6. Zoom

This function is used to magnify the image in real time and after freezing. The user has the following zoom levels: 120, 140, 160, 180, 200, 220, 240, 260, 280, 300%. It is also possible to minimize the sector to 60% and 80% of the standard size.

It is possible to set 120% zoom as a default setting. To activate, enter Settings and mark "Enlarged image" bracket in the Look tab.

10.1.7. Dynamic range

[Dynamic] – Dynamic range control

It allows to adjust how many shades of a greyscale is displayed on an image. Level 1 means the highest dynamic (256 shades of grey), level 10 means the dynamic decreases.

10.1.8. Gamma

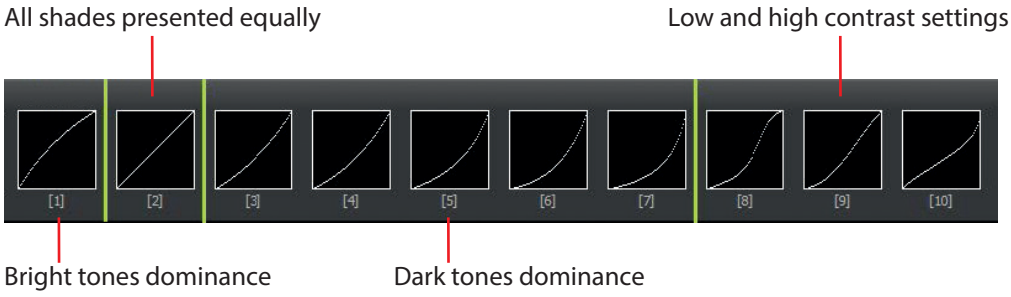


Fig. Available Gamma settings

Gamma adjustment allows you to change the gray level of the image in real time, as well as after freezing or loading the saved image and cine-loop on the screen.

After tapping [Gamma], a list of available gray scale settings will appear. Select a desired level by tapping on the corresponding icon. The currently used gray scale is shown in the form of a black and white bar above the [Gamma] button.

10.1.9. D–Curve

D-Curve is a greyscale curve perfectly matched to the human eye perception.

To enable tap [B Mode] and mark D-Curve bracket.

To disable tap [B Mode] and unmark the D-Curve bracket.

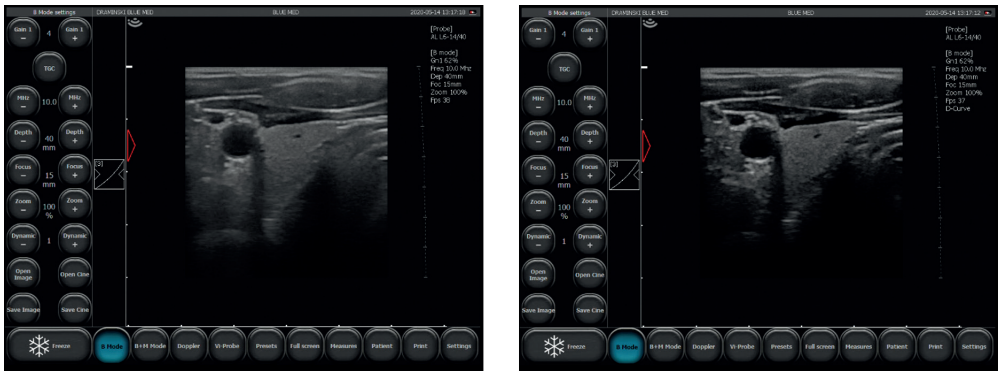


Fig. D-Curve disabled and enabled.

10.2. Freeze

To freeze the image, use the [Freeze] button. When you press this button the image immediately freezes and the button changes its color. In order to unfreeze the image and return to scanning mode you should press the [Freeze] button again.

10.3. Cine loop – continuous and frame-by-frame replay

When the image is frozen a set of buttons appears in the right bottom corner of the screen. These buttons are dedicated to manage the cine loop. Each loop can consist of 512 frames maximum (frame limit can be changed, see <11.10.1.>).

In order to play the cine loop press and hold the [I>] button. Viewing the cine loop frame by frame is possible by pressing the [I>] button shortly.

In order to playback or rewind the cine loop by frame, press [<I].

10.4. Measurements

Attention! The rules for dimensioning in Pulse Wave Doppler mode are described in section <10.9.4.>.

On the left side of the imaging sector there is a scale with 1 cm calibration which enables understanding the dimensions of the examined structures in real time.

When you freeze the image the distance measurement is enabled automatically.

The presented object can be measured by other methods as well. They are available when you click the [Measure] button on the mode panel.

Measuring options:

1. [Grid] – approximate measuring on the basis of the grid placed on the object (its resolution is 1 cm).

2. [Stenosis] – measuring which determines the stenosis given in percent

3. [Volume] – measuring of the volume (calculated from 3 measures)

4. [Length] – measuring the distance between the indicators

5. [Area] – measuring the area of the examined object of any shape

6. [Ellipse area] – measuring the area by laying the ellipse

7. [Clear] – clears the screen from the measuring elements

8. [OB/GYN] – set of biometric measurements for pregnancy monitoring

9. [Orthopedics] – alfa and beta angle

10. [Cardiology] – set of measurements used to assess the heart function

10.4.1. Length

It is the most frequently used method of measuring. When you freeze the image, the distance measuring option switches on automatically. You can perform 5 different measures on one image.

When you press point A and then point B the ruler appears which connects both points and the number determining this measuring.

You can use a magnifier to make measuring of small structures easier, it appears when you press and hold the finger longer on the screen. This function enables a precise location of the measuring point without getting the finger off from the screen. When you get the finger off the magnifier disappears, this enables marking the second point.

Results are shown in sequence in the left bottom corner of image. The measures are given in mm with the precision of up to 0.1 mm.

10.4.2. Grid

It is necessary to select Grid from the Measure menu. The window appears in which you can select the grid. When you select this option on the imaging sector the grid will be placed on the image (the scale is 1 cm).

10.4.3. Stenosis

In order to determine the stenosis it is necessary to obtain the lengthwise section of the narrowing object. Then you should take two measures in its diametrical planes. The result is given automatically in percent. This option is used, for example, when evaluating blood vessels.

10.4.4. Volume

In order to measure the volume correctly it is necessary to measure the length, depth and width of the object. For this purpose you should obtain sections in horizontal and vertical planes. In order to obtain two planes in one image you can use B+B mode. The device automatically calculates the volume of the object taking into account the performed measuring. The result is presented in cm^3.

10.4.5. Area

To measure the area you should outline the object on the touch panel without taking off the stylus or the finger until you finish the loop. In order to finish the outline you should click into the point from which you started drawing the line. The result is given in sq. cm and is shown below the image sector.

10.4.6. The area of ellipse

Mark long axis of ellipse by applying two points on an image. Third one apply on one of the poles of short axis of the measured object. The result is given in sq. cm and is shown below the image sector.

10.4.7. Orthopedics

10.4.7.1. α and β angle

Apply three lines on an image the same way as you mark a distance measurement:

1. Basal line
2. Bony roof line
3. Cartilage roof line

System calculates α and β angle automatically.

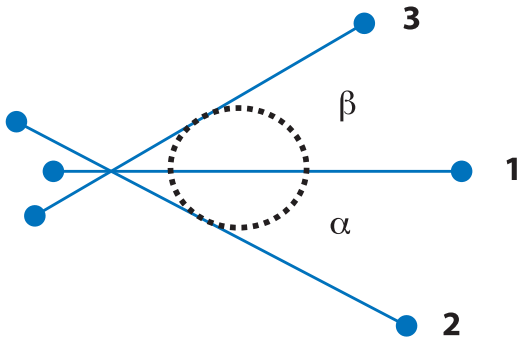


Fig. α and β angles measurement

10.4.8. Gynecological and obstetric measurements

In order to perform Gynecological and obstetric measurements choose [Measurements] button, click [OB./GYN] and select measurement from the list.

10.4.8.1. [HC] – head circumference

Place the diameter where cross-section of head is at its widest. On this basis the system will calculate the circumference of the head. Result given in mm.

Interpretation of the result is possible based on growth curves <10.4.9.>

10.4.8.2. [BPD] – biparietal diameter

Result given in mm.

Interpretation of the result is possible based on growth curves <10.4.9.>

10.4.8.3. [AC] - abdominal circumference

Place the diameter where cross-section of abdomen is at its widest. On this basis the system will calculate the circumference of the abdomen. Result given in mm.

Interpretation of the result is possible based on growth curves <10.4.9.>

10.4.8.4. [FL] - femur length

Result given in mm.

Interpretation of the result is possible based on growth curves <10.4.9.>

10.4.8.5. [NT] - neck translucency

Result given in mm.

10.4.8.6. [HL] - humerus length

Result given in mm.

10.4.8.7. [AFI] - amniotic fluid index

Result given in g.

10.4.8.8. [Growth curves]

This tool helps to estimate fetal age using abdominal circumference [AC], biparietal diameter [BPD], femur length [FL], head circumference [HC] measurements.

Example of use:

In order to estimate fetal age based on head circumference [HC] measure the object. Then press [Measurements] button, select [OB.GYN] and click [Growth curves].

Four graphs with curves will appear on the screen. Type of each curve is marked on the top of each graph. You can select the curve by clicking on it: (HC)Hansmann86, (HC)Jeanty82, (HC)Mers88, (HC)Mers96.

The HC result is automatically marked on the curve with a purple line. The place where it intersects with a green line means fetus age in weeks (readout from X axis). The orange line marks the limits of measurement error.

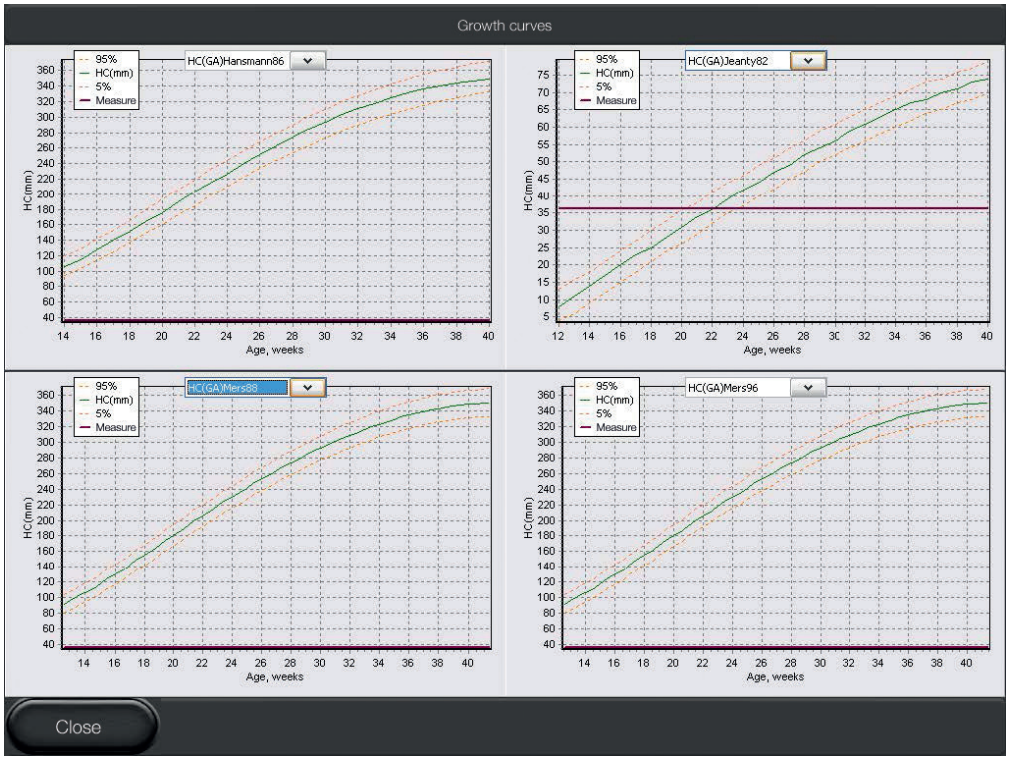


Fig. Growth curves based on HC measurement.

Double click on the graph maximizes it to the full screen. Another double click minimizes the graph to the original size.

Moving the finger on the graph marks the area and maximizes it to the window size.

In order to return to the main view mark area out of X/Y axis.

Same procedure applies for (AC)Jeanty84, (BPD)Jeanty84, (FL)Jeanty84 curves.

10.4.8.9. [Aging tables]

This function allows estimating the fetus age based on following measures: neck translucency **NT**, femur length **FL**, biparietal diameter **BPD**, crown-rump length **CRL**.

In order to estimate fetus age choose [Measurements] button, select [Ob./GYN]. Next click [Aging tables], select measurement and mark the points on the screen. The device will automatically estimate fetus age. Result is given in days.

10.4.8.10. [Estimated fetus weight]

This tool helps to estimate fetus weight based on following measurements: **AC**, **HC**, **FL**, **BPD**.

For more precise data you can use different measurements configurations (measurement type are marked in parenthesis.

In order to estimate fetus age choose [Measurements] button, select [Ob./GYN].Next click [Estimated fetus weight], select measurement and mark the points on the screen. The device will automatically estimate fetus weight. Result is given in grams.

10.4.9. Cardiology

10.4.9.1. HR (Heart rate)

Measurement to be performed in M Mode.

Put the distance between the two full cycles of heart function.

Hear beat per minute will be calculated automatically. Result is given in b/min.

10.4.9.2. LA/Ao (Left Atrium to Aorta diameter ratio)

Apply two distance on an image:

1. Left Atrium diameter (in systole)
2. Aorta diameter (in systole)

LA/Ao ratio is calculated automatically. Result is given in %.

10.4.9.3. LV (Left Ventricle function)

This measurement allows to calculate:

– EDV (end-diastolic left ventricle volume),

– ESV (end-systolic left ventricle volume),

– SF (Shortening Fraction),

– EF (Ejection Fraction),.

Measurement to be performed in M Mode.

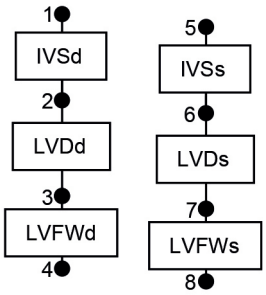


Fig. The order in which the measuring points are applied when measuring left ventricular parameters

Freeze an image showing full heart function cycle and follow the steps below:

1. Find the place in which the diameter of the left ventricle is largest in diastole.
2. Apply the measuring points :
   - at the border between right ventricle and the septum,
   - at the border between left ventricle and the septum,
   - at the border between left ventricle and the left ventricle free wall,
   - at the outer edge of the left ventricle free wall.
3. Next, find the place in which the diameter of the left ventricle is smallest in systole.
4. Apply the measuring points marking the same structures as in step 2.

System will automatically measure: Inter-Ventricular Septum in diastole and systole (IVSd, IVSs), Left Ventricle Diameter in Diastole and systole (LVDd, LVDs), Left Ventricle Free Wall in diastole and systole (LVFWd, LVFWs), and calculate EDV, ESV, SF and EF.

Formula for EDV: $EDV = (7 \times LVIDd^3)/(2{,}4 + LVIDd)$.

Formula for ESV: $ESV = (7 \times LVIDs^3)/(2{,}4 + LVIDs)$.

Result is given in ml.

10.4.9.4. Left Ventricle Volume – Simpson's LVAM-LVAP method

Measurement to be performed in 4B Mode.

Get three views in three different windows in 4B Mode:

1. Left Ventricle in long axis,
2. Left Ventricle in short axis at the level of Mitral Valve,
3. Left Ventricle in short axis at the level of Papillary Muscles.

Apply distance measurement on an image of left ventricle in long axis (LVL). Apply area ellipse measurement on ventricle image at the level of Mitral Valve (LVAM) and at the level of Papillary Muscles (LVAP).

Result is calculated on basis of formula: V = (LVL / 3) x (LVAM + (LVAM+LVAP)/2 + LVAP/3); and given in ml.

10.4.9.5. Left Ventricle Volume - Simpson's single plane method

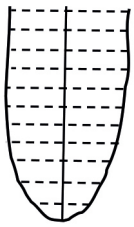


Fig. Outlined area of the left ventricle

Get the left side four chamber view.

Outline the left ventricle beginning and finishing at the mitral valve level.

System will automatically mark long axis and lines parallel to the base of a left ventricle.

The Result is given in ml.

10.4.9.6. Left Ventricle Volume – Bullet's method

Measurement to be performed in 2B Mode.

Get two views in three different windows in 2B Mode:

1. Left Ventricle in long axis,
2. Left Ventricle in short axis at the level of Mitral Valve.

Apply distance measurement on an image of left ventricle in long axis (LVL) and area ellipse measurement on ventricle image at the level of Mitral Valve (LVAM).

Result is calculated on basis of formula: V = (5 / 6) x LVL x LVAM; and given in ml.

10.4.10. Edition of the measurements

The user can change the positions of the measuring points.

While marking the points the window with navigation buttons appears in the top left corner of the screen. Editable measuring line is marked with yellow color.

Using the direction buttons it is possible to change the position of the point marked by a red cross. In order to change to the other measuring point it is necessary to use A/B keys.

If you would like to switch on the magnifier, press [Magn.].

In order to delete one measurement you should use the [Del.] key. After performing this operation the previously made measurement becomes active.

If you would like to deactivate the navigation buttons, click [X].

The measurement editing panel can be moved at any position on the screen by "catching" its middle with the finger.

10.4.11. Deleting all the measurements

When you press the [Clear] button in [Measurements], all the elements of the measuring and the results will be deleted from the screen.

Deleting the elements of the measuring also takes place after unfreezing the image in B mode or switching to B mode from other modes.

10.5. Annotations

In order to add an annotation, freeze the image and press [ABC].

A point will appear on the image with the description "desc ....", as well as a field to enter / select from the annotation list and a keyboard.

Enter the annotation text in the Edit ABC field.

To change the position of the annotation, switch on the magnifying glass in the measurement editing window [Magnifier]. Catch and drag to the right place, then turn off the magnifier [Magnifier].

If you want to change the point to an arrow, expand the list to the left of the annotation line.

If you want to add the entered annotation to the list of ready annotations, press +.

If you want to select an annotation from the list, expand the list at the edit line and select.

If you want to remove an annotation from the list of ready annotations, select it and press "-".

To save the annotated image, turn off the keyboard with the "x" button in the upper right corner and press Save Image.

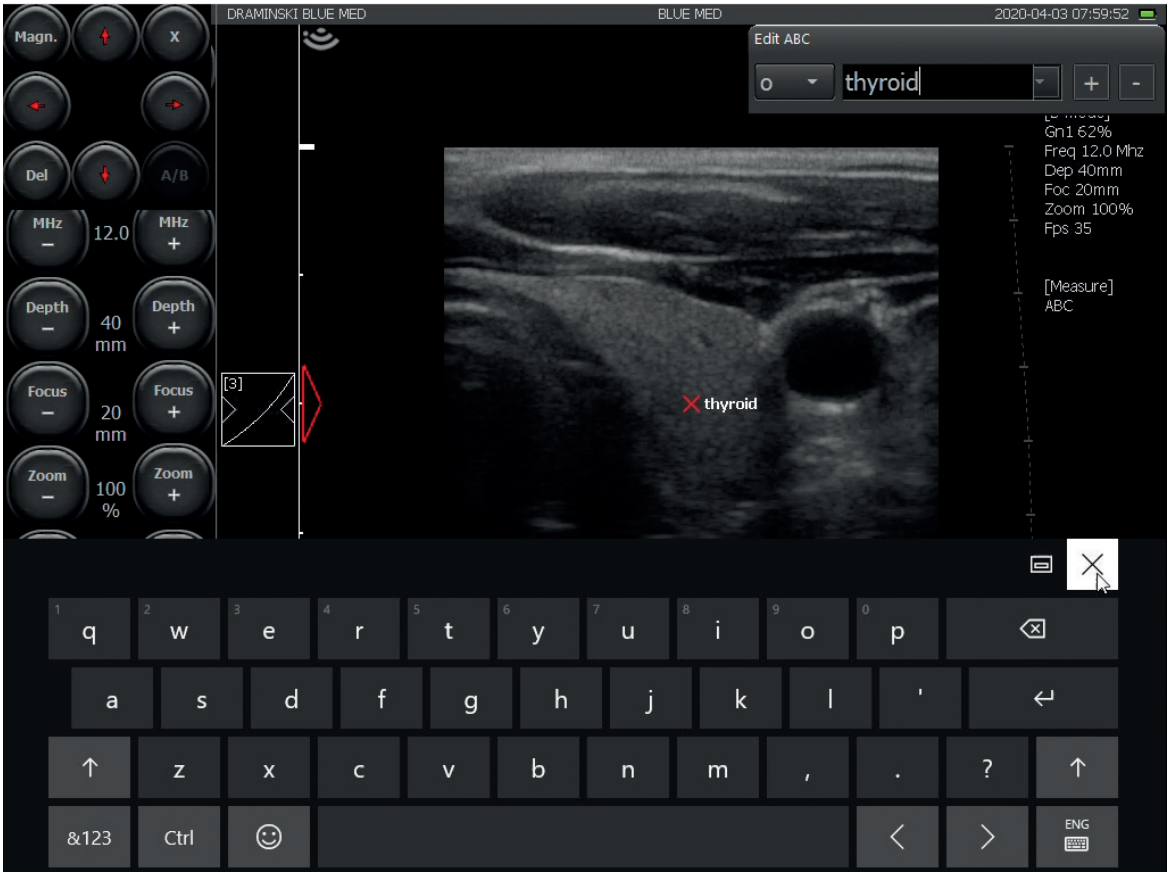


Fig. Annotation adding window

10.6. Optimization of B+M and M modes

10.6.1. Graph drawing speed selection in M mode

In order to activate B+M mode press [B+M Mode] button. The submenu will appear over the button, where you can select graph drawing speed in M mode. Available values: 1s, 2s, 3s, 4s.

10.6.2. Setting the sampling line in B+M / M modes

Setting the sampling line is based on B mode image. In order to change its position drag and drop it with your finger.

10.6.3. Switching between M and B+M modes

After pressing [B+M mode] button new submenu will appear, where on the top there is [M/B+M] button. It is used for switching between B+M and M modes.

10.7. Imaging with the function of color Doppler

The Color Doppler functions allow viewing a blood flow in a real time together with B Mode image in the background. The blood flow is coded by the color depending on its direction. The red color corresponds to the stream flowing to the head of the probe. Blue color means the reverse direction.

Attention! By double click on color bar reverse colors option is activated (stream flowing to the head of the probe will be coded with blue color, red color means the reverse direction).

10.7.1. Starting Color Doppler imaging

Remember that preparing patient to examination has great influence on results. Use of an appropriate amount of gel is essential for obtaining a good result.

Before starting Doppler function you should find the clearest image of the organ in B-Mode, showing the vessels. Too high Gamma and Gain setting the image in B-Mode will have a negative influence on the quality of the Doppler image.

In order to start this mode you should click [Doppler] button in the mode panel.

The screen will show the active panel managing the Color Doppler function and Doppler frame.

10.7.2. Switching between the Doppler modes: Color, Power, Pulse Wave; Doppler mode OFF

To switch between Doppler modes use [Color Doppler], [Power Doppler] and [Pulse Doppler] buttons. Theyare visible under the [Gamma] button after pressing [Doppler] button.

In order to finish work in Doppler mode press [Doppler] button again. The device will automatically return to the B Mode.

Color Doppler = Doppler with color coding of the blood vessel flow

Power Doppler = Doppler with coding the power of the flow

Pulse Doppler = Doppler used to measure the flow speed

10.7.3. Doppler frame settings

The frame superimposed on the test sector will have a shape depending on the probe used:

– convex – the frame resembles a trapezoid ,

– linear – the frame has a rectangular shape (rhombus for an angle of inclination different from 0 °).

10.7.3.1. Repositioning of color box

When you touch the color box is changes its color to green and the navigation icon appears in the middle. To move the color box, touch the navigation icon and drag it with your finger.

10.7.3.2. Resizing of color box

After you touch the color box, the 4 knobs appear on each corner. Drag one of the knobs to change the size of the box.

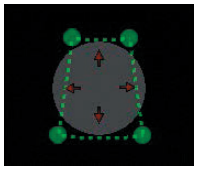


Fig. Resizing the color box.

10.7.3.3. Steering angle of the color box

In the case of using linear probes it is important to apply the probe at the angle towards the vessel. The flows in the vessels perpendicular to the ultrasound beam would not be registered (it follows from Doppler effect –> cos 90° = 0). In order to facilitate the imaging of the flow in the examined vessel the user can correct the steering angle of the color box in the range of +/- 15°. For beginners the recommended angle is max. 10°. This function is used in long axis views.

In order to do it use [Angle -] / [Angle +] buttons in color doppler mode.

10.7.4. Setting parameters for Doppler mode

10.7.4.1. [PRF] - Pulse Repetition Frequency

The PRF setting depends on the speed of the flow. In order to depict fast flows you should set a higher PRF value. When the PRF increases the refresh rate also increases.

In order to depict the blood which flows with a slow speed you should set a lower PRF value. The refresh rate in this case decreases – black-and-white clear motion rate can also decrease.

Thus, when you examine small vessels with low flow rates you should minimize the PRF value. Otherwise it will not be possible to depict the flow in these vessels.

10.7.4.2. Doppler Frequency

It is set alike to the MHz frequency of the black-and-white image. The deeper the examined structure is the lower frequency you should set.

Attention! Doppler frequency settings do not influence on probe frequency settings in B mode.

10.7.4.3. Color gain adjustment

It is necessary to set so high level that there are no "holes" in the colors filling the vessel, and at the same time so low that the color does not "overflows" the vessels.

The range is from 1 to 10 steps.

10.7.4.4. Frames averaging

This function allows averaging the number of the depicted frames coded by the color. The increase of the value causes the decrease of the number of artifacts, but can cause worse vessels filling.

When you examine small vessels the parameter of frame averaging should be set to 1. It will make watching the flow easier. At higher values the imaging in these vessels would be limited.

10.7.4.5. Wall filter

This is a high pass filter which removes the artifacts caused by tissue movement.

Attention! High values of the Wall Filter may cause that the low velocity blood flow will be removed from an image.

10.7.4.6. FPS/Quality

This setting allows to set the priority for the sensitivity of Color Doppler or frame rate of B Mode image.

By tapping [Quality] button you increase the sensitivity of Color Dopple imaging. The frame rate decreases.

By tapping the [FPS] button you increase frame rate of the B Mode image. The sensitivity of the Color Doppler decreases.

10.7.4.7. Color invert

Double click on color bar (Fig 13, no. 1) activates the function of color reversal (the flow towards the head will be coded by blue color and in the reverse direction by red color).

10.7.4.8. Color Threshold

Press on color bar (color threshold modification window appears). This function enables ignoring the small speed flows in the depicted image (coded with a darker color). When the color threshold increases, the image will depict only the flows coded by the color typical for the higher speeds.

10.7.4.9. Color Range

Press on color bar (color range modification window appears). This function enables imaging a specified range of speeds in a wider color range. The maximal speed is determined (depends on probe type) which will be coded by the brightest color.

It should be remembered that the preparing of the patient has a huge impact on the test response. A too thin layer of ultrasound gel on the skin can make the test difficult.

10.7.5. Blood surface measurement

The measurement is available in the Color Doppler and Power Doppler modes.

It allows you to estimate the ratio of a color-coded image area to a black-and-white image area within a Doppler frame. The tool helps to assess the degree of blood supply to the organ.

Freeze the image in the Color Doppler mode. Select [Measurements] -> [Flow Area]. The software will calculate the color-coded surface area and give the result in% relative to the black-and-white image surface area.

10.8. Power Doppler

In the Power Doppler mode the device sums the flows in a particular place and shows in the picture general vascularization of the organ without showing the speed and direction of the flow. Thanks to this function it is possible to show the vascularization of the organ depicting even very slow flows.

10.8.1. Power Doppler settings

Basic operating parameters (PRF, frequency, gain, frame angle, color threshold, color range and high-pass filter) are set in the same way as for Color Doppler <10.7.4.>

10.8.1.1. Postprocessing

This function is used for smoothing map of colors for Power Doppler mode.

[Mode -] button disables image processing, whereas [Mode +] button enables it.

10.8.1.2. Frame Averaging for Power Doppler (Averaged Filter / Non-Averaged Filter)

This function allows for averaging data collected from previous frames, for enabled and disabled postprocessing respectively <10.8.1.1.>.

Other keys as for the Color Doppler

10.9. Pulse Wave Doppler

The Pulse Doppler function allows you to measure blood flow rate at a specific depth.

To enable this function, switch to Doppler mode and press [Pulse Doppler].

10.9.1. Pulse Wave Doppler settings

For the best results it is necessary to obtain the sharpest angle to the vessel.

In Color Doppler mode set the test parameters so that to obtain the optimal Doppler spectrum. The examined vessel should be visible in a large part of the screen.

10.9.1.1. Sampling gate depth

The sampling gate should be set to coincide with the flow spectrum.

[Depth -] and [Depth +] buttons can be used to move the gate up and down along sampling line of color box. You can also drag whole color box with your finger and the sampling gate will follow.

10.9.1.2. Insonation Angle

Set insonation angle using a slider possibly in parallel to the direction of blood flow. Insonation angle is marked with green line.

Remember that exceeding 60° will significantly increase possibility of wrong result!

10.9.1.3. Sampling gate width

Set the gate's width using the [Width +] and [Width -] buttons. Better if it is 50% of the blood vessel diameter.

10.9.2. Registration of blood flow spectrum

To start recording the blood flow spectrum, select the [Gate Update] check box.

A leading line will appear at the bottom window, and then a diagram of hemodynamic blood parameters will appear. At this stage it is important to hold the probe in the initial position.

10.9.3. Modification of the spectral graph

The user can modify the graph after measuring the flow spectrum.

To change the position of the baseline of the chart, hold your finger on it until its color turns green, and then move it on the screen up or down.

[Range] - allows correcting the depth of the sampling gate in the event that the probe position changed during the measurement. After changing the depth, the software will calculate the parameters depending on the previously recorded spectrum, and the lead line will create a new graph;

[Gain] – to enable signal amplification;

[Reverse] – to change the orientation of the spectral plot in relation to the baseline;

10.9.4. Measurement in Pulse Wave Doppler mode

10.9.4.1. [HR] - Heart Rate

Put two markers on the spectrum graph selecting two full heart cycles.

Results given in bpm.

10.9.4.2. [AT] - acceleration time

Put two markers on the spectrum graph:

– first one in the place where blood flow velocity value in final phase of diastole is the lowest,

– second one in the place where blood flow velocity is the highest.

Results given in seconds.

10.9.4.3. [RI PI PSV EDV]

Calculate PSV (peak systolic velocity), end-diastolic velocity (EDV), average velocity (AVG), pulsation index (PI), resistance index (RI) at a particular section.

Put two markers on the spectrum graph:

– first one in the place where blood flow velocity is the highest,

– second one in the place where blood flow velocity value in final phase of diastole is the lowest.

The device will automatically calculate above values.

10.9.4.4. [Doppler Point]

Calculates the flow velocity at any point.

10.10. Saving and loading the images and cine loops

The ultrasound scanner is equipped with 60GB memory, of which 30GB is intended for archiving patient data - video loops and images with measurements and annotations.

Warning!
Remember to systematically backup saved images and loops to external media and clean the camera's memory.

10.10.1. Saving the image

Freeze the image with the [Freeze] button. After freezing the image in the camera cache is the last 128-512 frames of examination. Use the arrows in the lower right corner to select a frame to save and press [Save Image]. Defreeze the image with [Freeze] to continue the examination.

If you did not enter patient data into the database before the examination, the system will ask you to create a new patient card. You can enter patient data or create a card only with ID by pressing [Add Patient] and confirming [OK].

To enter patient data prior to testing, use the Patient function.

When saving the image to the machine's memory, you can print it at the same time using the [Print] function. Printing is possible after downloading the drivers and connecting the printer.

10.10.2. Saving the Cine loop

After freezing the image, the ultrasound scanner has a cache loop consisting of 128-512 last frames of the examination (see <11.10.1.>). To save it, press [Save Cine]. Defreeze the image with [Freeze] to continue the test.

10.10.3. Restoring patient examination

In order to load the image saved in the device click [Open Image] button. The screen will show a list of the saved images. Select particular image by clicking on it (it becomes highlighted) and then click [Load].

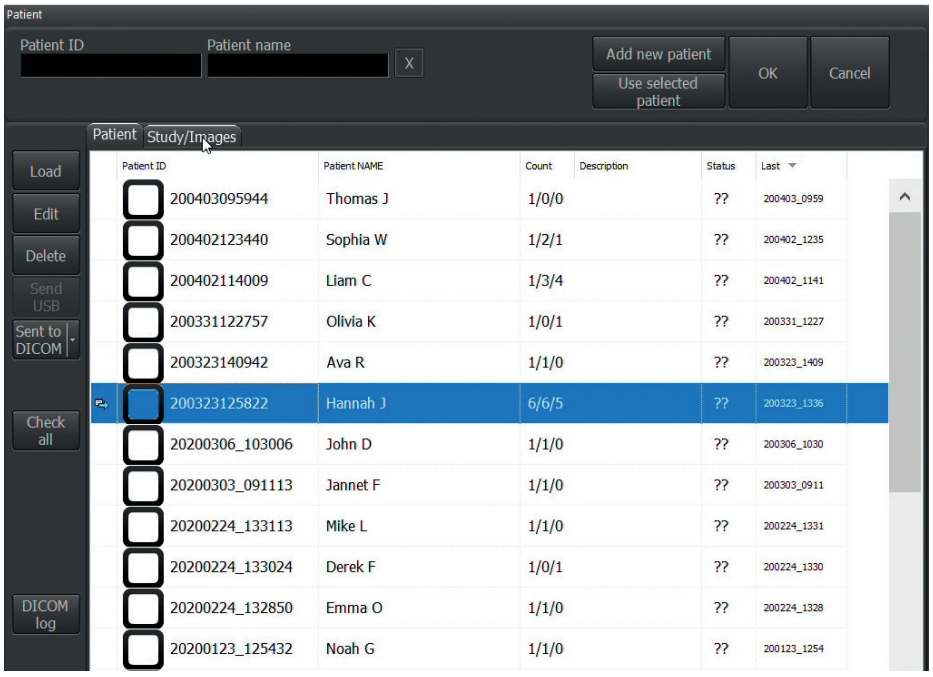


Fig. Data base.

In order to display saved cine loops on the same list click [Cine] button on the top of the list.

10.10.4. Loading cine loops

You can edit the patient's name and ID, as well as add the date of birth and description to the entire examination or individual images / video loops.

To edit data, select chosen examination, image / video loop and click [Edit]. Fill in the appropriate fields and click [Save] to save or [Cancel] to discard changes.

10.10.5. Edition of stored images and cine loops

This tool allows editing patient's data and description related with the image / cine loop.

In order to edit saved images / cine loops open the list of saved files, select chosen file and click [Edit] button. New window will open where you can enter patient's data and description. Click [Save] when finish.

10.11. Data export to external storage medium

You can export data to external storage devices. Images are exported in PNG format, and video loops in AVI, MOV or MP4. In addition, all data can be exported to storage device in a format compatible with the DICOM 3.0 standard. <11.8.3.>

To transfer data, connect the storage device to the USB socket. Then click [Open] to display the database. Input patient data to filter his card from the list.

- if you want to export all patient examinations, select the checkbox on the patient card.

- if you want to export a single examination, go to the [Examinations and images] tab and select them on the list.

- if you want to export selected images / video loops from a given exmaination, go to the [Examinations and images] tab, double-click the examination to expand the list of files, and select the appropriate images / video loops.

To export the marked data, press [Send USB]. A window will appear showing the progress of the process.

The system during files export creates new folder BF32_save on external storage medium, and subfolder named with export date. Separate folders for images and cine loops will be created as well.

10.12. Data export in DICOM format

Warning!
Make sure the ultrasound scanner is properly connected to the facility's internal network or the Internet using a LAN cable or an external WiFi antenna (accessory).

Warning!
Make sure the data server is properly configured <11.8.1. >

Send data in DICOM format to the server, click [Open] to display the database. Input patient data to filter his card from the list.

– if you want to export all patient examinations, select the checkbox on the patient card.

– if you want to export a single examination, go to the [Examinations and images] tab and select them on the list.

– if you want to export selected images / video loops from a given exmaination, go to the [Examinations and images] tab, double-click the examination to expand the list of files, and select the appropriate images / video loops.

To export the marked data, press [Send DICOM]. The screen will show the progress of the process.

If more servers are configured in the system, expand the list by pressing the arrow on the [Send DICOM] key and select the appropriate server.

Due to the large amount of data sent, we suggest that you plan this activity at the end of your work day.

10.13. Image printing

In order to print images it is necessary to install printer drivers.

There are drivers for Mitshubishi P95D printer already installed.

In the case of more printers compatible with the camera, before starting work select the printer from the list <11.3.2.>.

10.13.1. Printing during examination

In order to print an image during examination, press [Freeze] to freeze it and then click [Print].

In the right bottom corner print preview window will appear with image miniature and [Print] and [Clear] buttons.

Press [Print] button in print preview window to print the image or [Clear]button to exit.

10.13.2. Printing of stored images

In order to print images stored in internal memory, load it to the screen and press [Print].

In the right bottom corner print preview window will appear with image miniature and [Print] and [Clear] buttons.

Press [Print] button in print preview window to print the image or [Clear] button to exit.

10.13.3. Printing multiple images on one sheet

The user can print up to 4 images on one sheet.

In order to print more than one image follow the steps:

Freeze the image -> press [Print] -> unfreeze the image and continue examination -> freeze image -> press [Print].

Repeat this sequence of steps until proper image quantity appears in print preview window. Next press [Print] button in print preview window.

10.14. Full screen function

Activating it will hide the user panel and the mode panel expanding the examination window to the entire screen.

In the full-screen mode, the user can still control:

– active fields of gain, focus and scanning depth,

– gamma settings,

– freezing of the image,

– saving images and cine-loops,

– measurements

10.15. Presets

Presets are predefined settings of the scanning parameters dedicated to different kinds of examinations.

10.15.1. Presets activation

Standard presets are:

In order to activate preset, click [Presets]. The list of available presets will appear. Select preset name to activate it.

It is possible to activate preset from Manage Presets window by clicking [Load preset] button.

10.15.2. Presets saving

This option allows you to save the camera settings under any name.

Parameters which may be saved in preset are: Liver, Kidney, Bladder, Thyroid, MSK, Finger:

1. For black and white imaging – Gain, TGC, Frequency, Depth, Focus, Zoom, Gamma, Dynamic Range, LuciD, Vi-Probe,
2. For Doppler imaging – PRF, Frequency, Gain, Frames averaging, Wall Filter, FPS / Quality,
3. For additional settings – Frames averaging, image invert(right/left, up/down).

To create a preset, select [New preset]. A window will appear for entering the preset name. After entering the name, press [OK]. The preset will be saved and will appear on the list in the preset management window. Remember that the preset will be assigned to the head with which it was created.

In order to delete the preset, open the preset managing box and select the preset by clicking its name. The name highlights. Then select the [Delete preset] option.

11. Advanced settings

In order to enter the advanced settings menu you should click the [Settings] button. The advanced settings consist of tabs described below.

11.1. Default

In the [Default] tab there are tools for modifying the user panel.

The options available:

– enabling frame averaging,

– changing the position of the tool panel from left to right of the screen,

– up-down, right-left image orientation changes. Change of image orientation is signaled by moving the indicator corresponding to the marker on the probe.

– showing / hiding the mouse cursor,

– beamformer, processor and motherboard temperature display in the information window,

– larger image - setting a larger sector size as the default,

– system language changes,

– probe selection,

– switching on and setting the LuciD level - a system that improves contrast, sharpness and tissue representation. When LuciD is turned on, the boundaries of the structures become clearer and the parenchymal nature of the organs is better mapped in the image. The user has a choice of 10 different LuciD settings.

– scanning angle settings for convex probes,

– enabling digital image processing,

– background color changes,

– skin selection.

11.2. Clinic

In the section /Clinic/ the user can type the name of their clinic or doctor's name. The name will appear on the upper information bar above the sector of examination.

11.3. System information and update

In the /Info/ section the user can check the software and device version, software license number, scanners IP and battery information.

Beside this the user can:

– update the software,

– choose printer from the list of available printers,

– restore the factory settings,

– turn on and off the operating system protection,

– restart ultrasound scanner system.

11.3.1. Software update

There are two ways to update the software:

– On–line,

– Via USB flash drive.

Attention! Always check the hardware version (FPGA version) before updating the software. This information can be found in /Information/ section on the right. Each new software version is strictly correlated with device version. You should make sure that a new software version is compatible with your device version.

11.3.1.1. On-line update

To update the software via the Internet, connect the LAN cable to the camera socket or the WiFi antenna to the USB Socket<11.9.1.>.

Next enter [Settings] and choose [Info] tab.

Press [Update over Internet]. New message box will appear. Click [Next]. The update will start. New software will install automatically. Wait until system restart.

If the device doesn't start to download update files, please check Internet connection.

11.3.1.2. Update using USB flash drive

In order to update software via USB flash drive please contact DRAMINSKI Representative to acquire file with-newest software version.

Create "update_blue" folder on flash drive. Copy received software update file to this folder.

Next, connect flash drive to the USB socket in the scanner. A pop-up message „Update over USB?" will appear on the screen. Press [Yes]. The update will start automatically. Wait until system restart.

11.3.2. Choosing printer

If there are more than one printer drivers installed in the device, the user has to choose the connected printer before printing. In order to do that enter [Settings], choose /Info/ tab, find and select connected printer in the „Set printer" field.

You can set the scanner to ask for a printer selection before printing.

In order to do that select 'Choose printer during printing' in "Set printer" field.

11.3.3. Remote access

Remote access allows the consultant to connect with the ultrasound machine for training and service purposes. The consultant may control camera settings and draw directions on the screen. The system does not provide an audio connection with the consultant - to do this, connect using a communicator suggested by the consultant.

11.3.3.1. Setting up a remote access

To run remote access it is necessary to connect the ultrasound scanner to the Internet. In order to do this, connect a LAN cable or WiFi antenna to the camera <11.9.1>

To enable remote access, go to [Settings] and select the [Information] tab.

Press [Remote Access START].

The AnyDesk window with the customer number will appear on the screen. Provide consultant with this number.

Wait for the consultant to take over the ultrasound scanner control. It should take several seconds.

Warning! Remember not to turn off the camera, router and Internet connection while the consultant is carrying out service work using remote access. This may result in system malfunction!

11.3.3.2. Disabling remote access

To disable remote access, go to [Settings] and select the [Information] tab.

Press [Remote Access STOP].

You can also disable remote access by interrupting the ultrasound machine's connection to the Internet.

11.3.4. Security lock in the operation system

To unlock the possibility of introducing changes to the system, go to Settings-> Information and uncheck the "Secure operating system" box. Confirm the system restart in the dialog box

11.4. Date and time settings

Enter [Settings]. /Time/ tab is used to update system date and time.

Enter actual date and time. Next click [Save date and time] button.

11.5. Display

In section /Display/ brightness and touch panel calibration options are available.

11.5.1. Touch screen calibration

BLUE Ultrasound scanner is calibrated.

In case of system breakdown, it may be necessary to calibrate the touch panel again. It is when the sensitivity and accuracy of the panel is lower.

To calibrate the touch panel got to [Settings] -> [Display]. Next tap [Touch panel calibration].

1. eGalaxTouch settings window will appear.
2. Go to [Tools] tab.
3. Perform the "Draw Test". Try to draw with your finger the lines overlaying the grid and assess the accuracy of the panel.
4. If the touch panel reacts incorrectly, choose one of the options – 4 – and 9-points calibration.
5. Follow the tips displayed on the screen.

If you can not use the touch screen to enter the calibration mode, connect and use mouse to do that.

11.6. Audio

You can adjust the volume of sound in Audio tab.

To check the sound volume, use the [Test sound] option.

11.6.1. Silent mode

Activating silent mode will mute all message sounds.

To activate silent mode, go to [Settings] and select the [Audio] tab.

Select the [Silent Mode] check box.

Uncheck the box to deactivate it.

Warning! In the silent mode, the system does not emit any acoustic signals, including information on the state of battery charge or its deep discharge.

11.7. Measurement settings

The [Measures] tab is used to modify the list of displayed measurements in the age tables.

To turn off displaying of the measurements clear the check box situated next to its name.

11.8. DICOM settings

The DICOM settings window can be accessed in two ways:

1. Press [Settings] -> [DICOM], or
2. In the patient database, expand the list [Send DICOM] -> [DICOM Settings]

11.8.1. DICOM servers configuration

Warning! Make sure the ultrasound scanner is properly connected to the facility's internal network or the Internet using a LAN cable or an external WiFi antenna (accessory).

To configure data export to the DICOM server, go to [Settings] and select the [DICOM] tab.

In the DICOM Record field, press [Add].

Fill in the fields according to the information from the server provider.

Specify whether the server should be treated as default using the [Default] check box.

Select the encoding method appropriate for the server from the [Encoding] list.

In the [Transfer syntax] list, specify the compression method for the server.

From the [Transfer syntax conversion] list, select the allowable server conversion option.

To check if the connection with the server is correct press [Echo]. The Echo OK message means that the ultrasound machine has connected to the server.

To finish the configuration press [Save]. The server will appear in the list in the DICOM Write field.

11.8.2. Editing DICOM server settings

To edit the DICOM server settings, go to [Settings] and select the [DICOM] tab.

In the DICOM Record field, select the desired server and press [Edit].

Complete the fields as desired and press [Save].

11.8.3. Data export in DICOM format onto an external USB device

To be able to export data to an external USB device in addition to the DICOM format, select the [Save USB in DICOM] check box on the [DICOM] tab in the [Settings] menu. From now on, the files will be exported to external memory in standard formats and additionally in a format compatible with the DICOM 3.0 standard.

11.9. WiFi

The ultrasound scanner can be connected to the Internet using an external Netgear A6100 WiFi antenna.

Warning! If you have an ultrasound scanner with firmware version 10460 or earlier, you must first update the software and then install the drivers.

11.9.1. Installation of WiFi antenna drivers

Warning! Driver installation is only required for customers with software version 10460 or older. The ultrasound software must be updated before installation. <11.3.1.>

Do not connect the WiFi antenna to the ultrasound scanner before installing the drivers.

Disable edit lock in the operating system. <11.3.4.>

Go to [Settings] and select the [WiFi] tab.

Press WiFi Connect - the system will display information about no drivers or antenna, and then the [Install A6100 Driver] button will appear below.

Press [Install A6100 Driver] and follow the instructions of the Installer.

After installing the driver, enable the edit lock in the operating system. <11.3.4.>

Warning! If you want the ultrasound scanner to remember the network and connect to it automatically, configure the connection before enabling the edit lock in the operating system.

11.9.2. Internet connection via WiFi antenna

Warning! If you want the system to remember the network and connect to it automatically, disable operating system security before configuring the connection! <11.3.4.>

Connect the Netgear A6100 antenna to the USB socket.

To establish a connection, press [Settings] and go to the [WiFi] tab.

Press Wi-Fi Connect. The system will display available WiFi networks. Select the network you want to connect to and press [Connect].

11.10. Loop

11.10.1. Maximum video loop length

To set the maximum number of frames for a video loop, go to [Settings] and select [Loop]

In the Maximum Cine Length field you can specify whether one video loop should contain a maximum of 128, 256 or 512 frames.

Remember that the duration of one video loop depends on the maximum number of frames and the number of frames per second (FPS) when recording the loop. This means that, e.g. a loop with the maximum frame length set to 256, with a refresh rate of 24 FPS it will last about 11 seconds. The FPS value is displayed in the information window during the test.

11.10.2. Choice of a style for creating file names exported to external storage

By default, the files are named according to the date of the examination, e.g. *20200112_14081415837*, where *20200112* is the date and *14081415837* is the time.

File names can be generated in the following styles:

- <Date_Time>,

- <Date_Time> <Surname> <Name>,

- <Date_Time><Name> <Surname>

- <Data_Czas><Nazwisko><Imię><Opis>,

<Date_time> <Name> <Surame> <Description>.

To choose the style for creating names of exported files, go to Settings and select the Information tab.

In the "File name style" field, select the style name. The scanner saves the style settings automatically.

11.10.3. Selecting the extension of exported video loops

By default, video loops can be exported to external memory in the following formats: AVI, MOV, MP4.

To select the file type, go to [Settings] and select the [Information] tab. Expand the Format Cine list and select an extension. Close the settings.

To additionally export data in the DICOM format, see <11.8.3.>

12. Charging and exploitation of the batteries

DRAMIŃSKI battery pack is an efficient Li-Ion pack for multiple charging.

The lifetime of the battery pack depends on the way it is used. It is best when it works full cycles, i.e. full charging – full discharging. The battery is charging while the scanner is plugged to the mains. The blue diode around ON/OFF button is twinkling during charging process.

BLUE ultrasound scanner has an indicator which shows a battery level. In the top right corner of the screen there is a graphic indicator of the battery. A fully charged battery guarantees 2,5-hour of work of the ultrasound scanner.

Monitoring the graphic indicator helps to assess the battery operating time:

1. When the color of the indicator changes from green to yellow it means that the battery will continue its work for about 45 minutes.
2. When the color changes from yellow to red it means that the battery will work for about 10 minutes.

The "Low battery" message in the middle of the screen means that you have to charge the batteries. If the device is still turned on, a full discharge takes place and the device turns off automatically.

12.1. Checking the battery charge status before turning on the scanner

To check the battery charge status when the device is turned off, press the power button briefly If the battery is charged, the device will emit 1 to 4 acoustic signals *:

1 signal= 25% charged battery

2 signal= 50% charged battery

3 signal= 75% charged battery

4 signal= 100% charged battery

* No signal means the battery is deeply discharged or this function has been disabled after activating the silent mode in the Audio tab of the Settings menu.

12.2. Checking the battery charge status during operation

In the upper right corner of the screen there is a graphic indicator of the battery charge status.

A fully charged packet (green indicator) powers the ultrasound scanner for an average of 2 hours 30 minutes.

Change of the color of the indicator from green to yellow indicates that the battery will work for about 45 minutes.

Change of the color from yellow to red indicates that the battery will last for about 10 minutes.

The message "Low battery" in the center of the screen means the battery must be charged. If you leave the scanner turned on, after a short time it will emit a long beep and it will automatically turn off to protect against system damage.

12.3. Battery charging

Warning! The battery can be charged only with a power supply the compliant electrical parameters. Use only the XP Power AHM100PS19 power supply.

To charge the battery, connect the ultrasound scanner to the power supply using the XP Power AHM100PS19 power supply. While the battery is being charged, the LED around the ON / OFF button on the housing flashes. Charging a fully exhausted battery takes approx. 4 hours. The internal charger automatically stops charging when the battery is fully charged – the LED around the ON / OFF button goes out when the device is turned off, and lights steadily during operation. The battery life is expected for approx. 500 charging cycles. A clear reduction in battery life will mean a high degree of wear and the battery will have to be replaced with a new one.

13. Maintenance of the device

When the device is used it becomes dirty, including different infective factors. Directly after work, the device should be cleaned with a damp, wet cloth or paper towel, using a mild detergent. When cleaning, protect slots in the casing from moisture.

The surface of the device should be disinfected with a special agent for disinfecting medical equipment. It is recommended to use foam or spray agents or tissues moisturized with disinfecting agent.

Attention! Ultrasonic probes must be carefully disinfected after each use.

After cleaning with a damp cloth, the ultrasound scanner should be wiped dry with a paper towel, if necessary.

While cleaning the personnel performing these tasks should wear protective clothing.

The touch panel requires regular cleaning. For this purpose use relevant agents (foams, aerosols, cleaning tissues for touch screens) which guarantee thorough cleaning and at the same time protect the surface of the panel against mechanical damage.

Warning! – It is forbidden to use highly concentrated, aggressive agents and abrasives. These agents can damage the surface of the panel or the casing. When cleaning, protect all the slots, sockets and holes in the casing from moisture.

The life expectancy of the device is about 10 years, but it can be prolonged by the manufacturer after a periodic technical inspection and making a special decision.

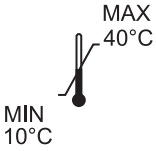
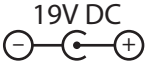
It is recommended the user of the ultrasound scanner perform regular technical inspections every two years at the manufacturer's facility. It will guarantee the highest level of safety of the patients.

14. Troubleshooting

Symptoms	Action
The device will not turn on	1. Press and hold the power buttons. 2. Check if the power supply cable is properly connected. 3. When battery supply - it may be a symptom of a full discharge of the battery.
The device switches on but the operation system will not start	1. Check it an external medium is connected to the USB port. If yes, disconnect it and then turn off and turn on the device again.
Improper image or lack of image	1. Check if the probe is properly connected - disconnect and connect the probe again. 2. Check is the probe is locked properly 3. Check if the symbol displayed in the information bar corresponds to the symbol of the connected probe. 4. Check if the slots in connector and probe port are dirty. If yes, use a compressed air to remove the dirt.
Image is too dark or too bright	1. Check if gain and gamma levels are set correctly.
There are fringes in the image	Probably there are interferences from the power supply network. 1. Use the battery power supply 2. Plug in the AC adaptor to another mains socket.
No charging signal	1. Check connections of all cables and their condition. 2. Check power supply 110-240 V / 60Hz
Short battery operating time	1. Battery is not charged 2. Low ambient temperature 3. Battery is worn (a normal symptom resulting from the battery's construction and rules of using the battery)
Message on the screen "Probe OFF" disabling examination	1. Check if the ultrasound probe is properly connected. Disconnect and connect the probe again. Make sure that the probe is properly connected (the "Probe ON" message will appear which will automatically disappear and enable performing the examination).
Messages on the screen disable performing examination	1. Turn off and turn on the device again. If the symptoms continue contact the producer or authorized service centre.
Mechanical damage of the casing, its elements of cables	1. Examine the device and after having contacted the authorized service centre or the producer follow their recommendations.

If any of the basic activities do not help or other problems appear contact DRAMINSKI service, call +48 89 675 26 00 or e-mail: ultrasound@draminski.com

15. Symbols and marks used on the labels

CE 0197	CE means that the product complies with the valid Directives.
	Attention, familiarize yourself with the user manual
	Warnings regarding user safety
 2013	Production date
 DRAMIŃSKI	Producer name and address
	Dispose of separately from other domestic wastes in accordance with Directive of the EU Committee UE 93/86/EEC or local regulations.
IP30	Level of casing resistance to external factors – penetration of solid bodies and dust, level of water resistance.
SN-	Serial number
	Storage temperature
	Careful, fragile
	BF type for parts applied directly to the patient's body. B – body, F – Floating applied part.
IP30	International protection rating
	Information about voltage and polarity of the AC Adaptor
	Information about the correct direction of the connector fitting in the probe port

16. Warranty

The manufacturer hereby grants the buyer a 24-month warranty for a trouble-free operation of the product (body of scanner and probe) if it is used in accordance with the attached user manual.

The battery for the device has a 6-month warranty.

In case of any failure occurring at no fault of the user, the manufacturer undertakes to repair the product not later than within working 14 days from the date of receiving the device at the service centre (ul. Wiktora Steffena 21, 11-036 Sząbruk, Poland) and to return the device in good working order at the manufacturer's cost.

The warranty excludes mechanical damage, damage resulting from improper operation, storage and inde-pendent repairs.

The warranty is processed based on a proof of purchase (invoice). To make a complaint, the user should inform the Dramiński Company immediately of any suspected fault.

To make a complaint on account of warranty the user should show:

1. The product
2. A copy of the purchasing document which states the name and address of the seller, date and place of purchase, kind of product and series number of the product.

The warrant is:
DRAMIŃSKI S.A.
Wiktora Steffena 21
11-036 Sząbruk, Poland
phone + 48 89 675 26 00
e-mail: serwis@draminski.com
www.draminski.com

DRAMIŃSKI S.A.

Wiktora Steffena 21, 11-036 Sząbruk, POLAND
tel. +48 89 675 26 00

e-mail: ultrasound@draminski.com

www.medical.draminski.pl