



Seed Treater
METRA STM-200
USER MANUAL



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1. GENERAL INFORMATION

- 1.1. This operational manual is intended for familiarization with the construction and operational rules of the fixed seed treater Metra STM-200 (hereafter referred to as the "treater"). It contains a brief description, mode of operation, technical specifications, and other relevant information about the treater.
- 1.2. The treater is designed for chemical plant protection, specifically for treating seeds of agricultural crops with water-based solutions or suspensions of approved substances.
- 1.3. The water used to prepare the working fluid (solution of treater and water) must be clean, free of mechanical inclusions, and close to a neutral pH.
- 1.4. Seeds to be treated must be free from impurities and dust and must comply with DSTU 2240-93 standards for size, uniformity, germination, and sowing properties.
- 1.5. Seed treatment must be carried out at temperatures above freezing.

2. SAFETY REQUIREMENTS

ATTENTION! *This section contains essential safety rules that must be followed during the operation of the treater.*

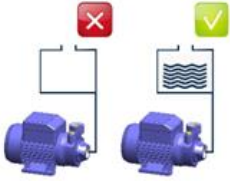
The manufacturer is not liable for any damage to life, health, or property, loss of income, or production downtime resulting from accidents caused by failure to follow the instructions and regulations in this manual.

- 2.1. Before operating the treater, read these safety rules and operational instructions carefully.
- 2.2. Modification or disconnection of the protective device (PZV) is not permitted.
- 2.3. Observe all occupational safety regulations.
- 2.4. The room where the treater is installed must meet current hygienic standards for the design, setup, and operation of centralized treatment units as officially approved (a closed room equipped with water supply, water disposal system, special water disposal if necessary, supply and exhaust ventilation, and aspiration, with a guaranteed air temperature of at least +4°C or +39.2°F).
- 2.5. Mechanized treatment stations (rooms) must be located outside inhabited areas, at least 200 meters from them, downwind, and with mandatory approval from the local sanitary and epidemiological authority.
- 2.6. Operation of the treater is permitted only after all assembly work is complete.
- 2.7. To maintain the product warranty and ensure long-term, reliable, and safe operation of the equipment, it is strictly prohibited to make any modifications to the machine's design.
- 2.8. Only personnel who have passed a medical examination, received special training, and possess the required documentation, permissions, and authorizations to work with pesticides may work with pesticides.
- 2.9. During operation of the treater, the following persons are prohibited from working: individuals under 18 years, pregnant women, nursing mothers, women over 50, and men over 55.
- 2.10. When handling pesticides, be sure to use personal protective equipment: coveralls, safety shoes, a respirator, protective goggles, and rubber gloves.
- 2.11. Repair and maintenance of electrical equipment, on-the-spot switches, and adjustment tasks may only be performed by specially trained electro-technical staff.
- 2.12. Inspection, maintenance, and repair of the treater should be carried out only after disconnecting it from the electrical network.
- 2.13. During maintenance and repair of the treater, only reliable tools must be used.
- 2.14. After completing operations with the treater, disconnect it from the power network.
- 2.15. Figure 2.1 indicates the location of hazardous zones during operation of the treater.
- 2.16. Safety information is also displayed on the machine with special signs, as shown in Table 2.1.

Figure 2.1



Table 2.1

	Sign indicating rotation of the screw and danger of a trauma.
	Sign indicating high voltage. Can cause shock, burn or death. Work is to be carried out only by qualified specialists.
	Signs of labor protection which warn about the necessity to use individual means of protection during treatment.
	Sign indicating the presence of toxic chemicals. Can cause intoxication.
	Sign indicating the necessity to perform actions to avoid breakdown of the machine, prohibits turning on the treater without fluid in the tank.
	Sign of emergency turn-off of the treater.
	Turn-on button of the starter.
	Turn-off button of the starter.
	Information Sign for Network Power Connection Point

3. TECHNICAL CHARACTERISTICS

3.1 Technical specifications for the treater are provided in Table 3.1.

Table 3.1: Treater Specifications

Parameter	Value	Value
Type	Mobile	
Production Capacity (with wheat seeds)	40 to 200 bu/h	1 to 5 t/h
Dry Mass (constructional), max	607 lbs	275 kg
Operating Fluid Tank Volume, max	26 gal	100 dm ³
Operating Fluid Supply Rate by Dispenser	0.02 – 0.9 gpm	0.1 - 3.3 dm ³ /min
Power Supply (AC)	380 ± 19 V	
Power Rating	2.15 HP	1.6 kW
Pump: - type - frequency of wheel rotation - supply	Centered	
	1900 rot./min	
		40 dm ³ /min
Seed Hopper Loading Height	102 in	2600 mm
Seed Hopper Volume	2.7 bushels	95 dm ³
Seed Unloading Height	49 – 57 in	1250 - 1450 mm
Overall Dimensions (L × W × H), max	85x76.8x102 in	2160x1950x2600 mm
Workmanship between failures	20 000 000 bu/h	500 000 kg
Service life, not less than	5 years	

4. TREATER STRUCTURE AND PERFORMANCE

4.1 Treater Structure

The treater (see Figures 4.1 and 4.2) is a mobile, four-wheeled unit that consists of the following components:

- Mixing and unloading (10) screw the drive of which is performed from the electrical motor.
- Seed hopper (4).
- Tank (1) with hydraulic mixer (2).
- Control console (5).
- Control console of the frequency converter (7).
- Pump-dispenser of the operating fluid (13).

- Seed dosimeter (16) which consists of a gate valve with draft and a scale.
- Pump unit (3).
- Two unloading necks (12) with a lever of the deflecting gate.
- Power cable (30) with a fixed seat (29).

4.2 The treater performs the following technological operations

- Preparation of the Operating Fluid
- Application of the Operating Fluid onto the Surface of Seeds
- Unloading of Treated Seeds into Sacks (Big Bags)

4.3 Treater Performance

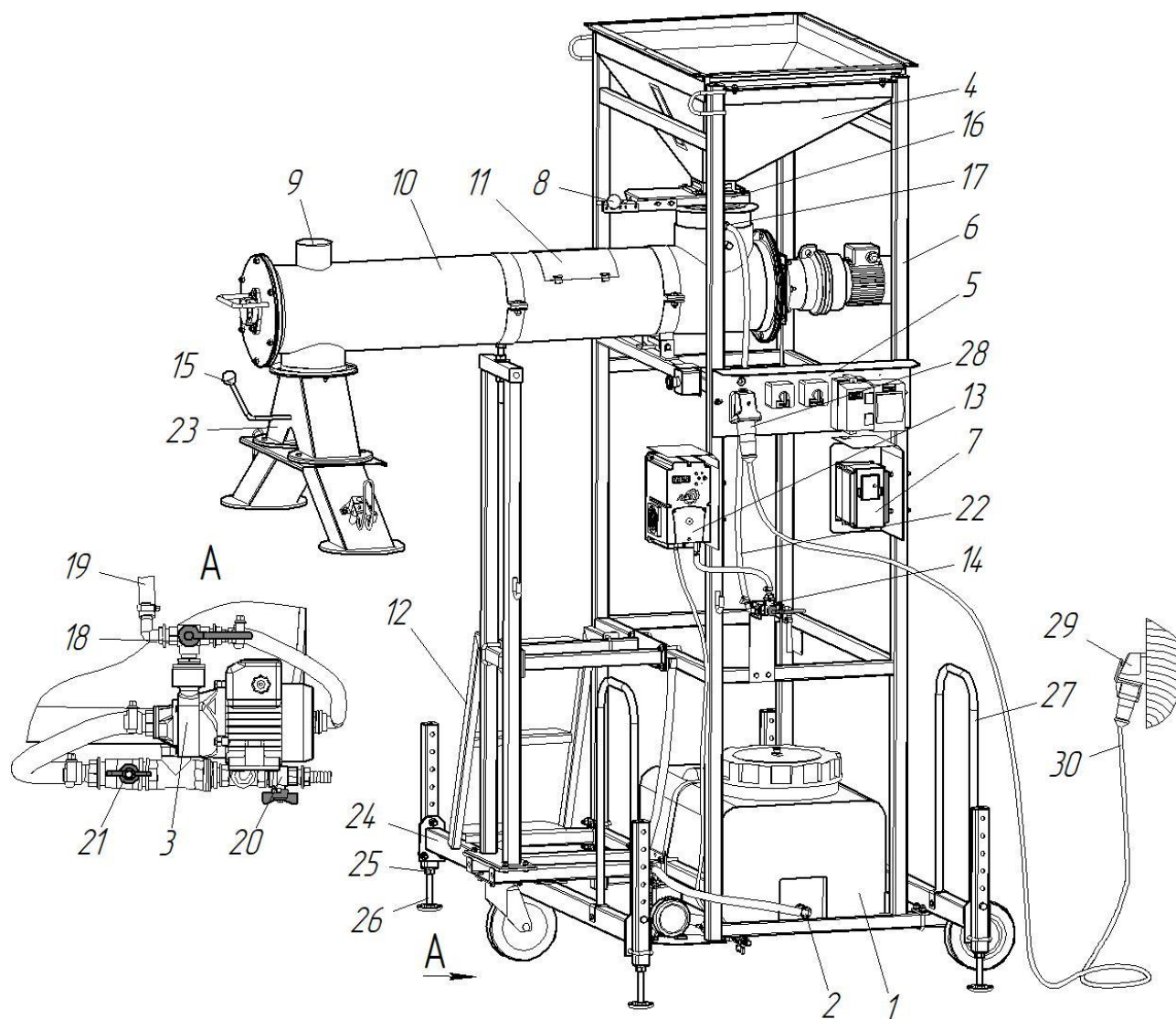
4.3.1. The treater operates on a 380 V network.

4.3.2. The operating fluid is prepared in the tank, where the preparations are mixed with water by a hydraulic mixer.

4.3.3. Dosage of the operating fluid is controlled by a peristaltic pump-dispenser (hereafter referred to as the fluid dispenser).

4.3.4. The treatment process proceeds as follows: seeds are loaded into the hopper (4) (figure 4.1) by mechanized means, and the electrical motor for the mixing and unloading screw (10), pump unit (3), and fluid dispenser (13) is activated via the control console (5). The operating fluid in the tank (1) is mixed by the hydraulic mixer (2) and then supplied through the distributor cock (14) and tube (17) into the mixing and unloading screw (hereafter referred to as the screw) by the fluid pump-dispenser (13). Simultaneously, a corresponding quantity of seeds is supplied to the screw through the seed dosimeter (16).

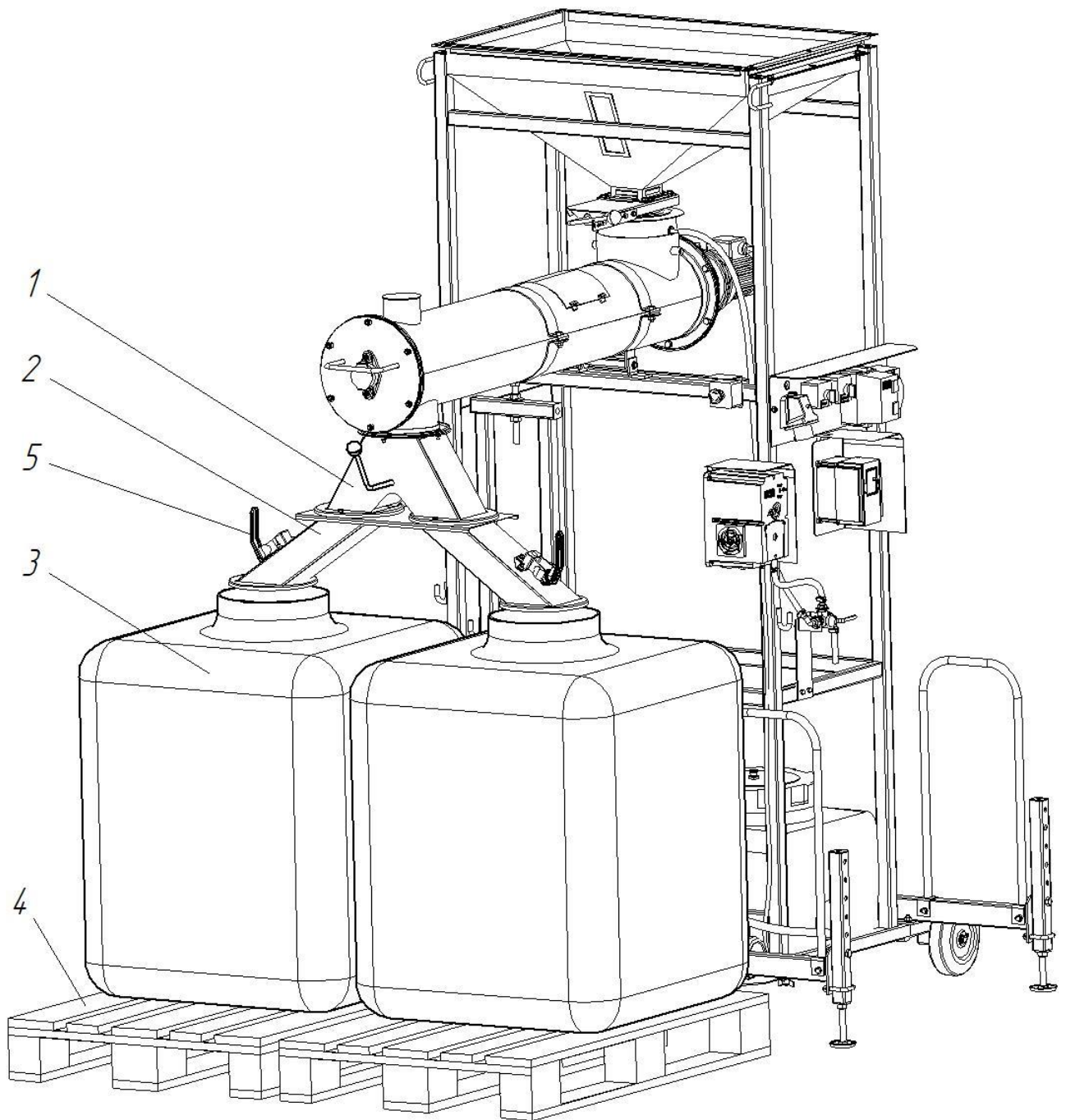
The screw ensures even distribution of the operating fluid on the surface of the seeds, facilitating the transition of processed seeds to the seed distributor (23). Using the lever on the deflecting gate (15), seeds from the screw are alternately directed into one of the two sacks ('big bags') (figure 4.2), which are secured by spring clamps (5) (figure 4.2) at the unloading necks of the seed distributor.



- | | |
|--|---------------------------------------|
| 1 - tank | 16 - seed dosimeter |
| 2 - hydraulic mixer | 17 - tube |
| 3 - pump unit | 18 - cock of the pump unit |
| 4 - seed hopper | 19 - discharge hose |
| 5 - control console | 20 - discharge cock of fluid residues |
| 6 - frame | 21 - tank cock |
| 7 - frequency converter | 22 - hose |
| 8 - lever of the seed dosimeter | 23 - seed distributor |
| 9 - nozzle of connection to the exhaust system | 24 - support |
| 10 - mixing and unloading screw | 25 - nut M12 |
| 11 - quickly removable inspection cover | 26 - block stop |
| 12 - gully | 27 - railing |
| 13 - fluid pump-dispenser | 28 - fixed fork VS-16 A |
| 14 - three-way cock of the fluid distributor | 29 - fixed seat HS-16 A |
| 15 - lever of the deflecting gate | 30 - power cable |

Figure 4.1

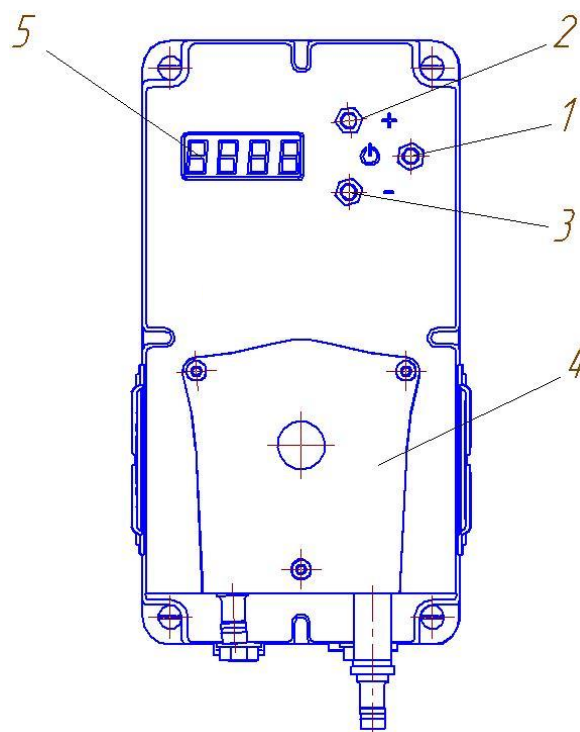
UNLOADING INTO SACKS 'BIG BAGS'



1 - reversing valve; 2 - seed distributor; 3 - sack 'big bag'; 4 - tray;
5 - spring clamp

Figure 4.2

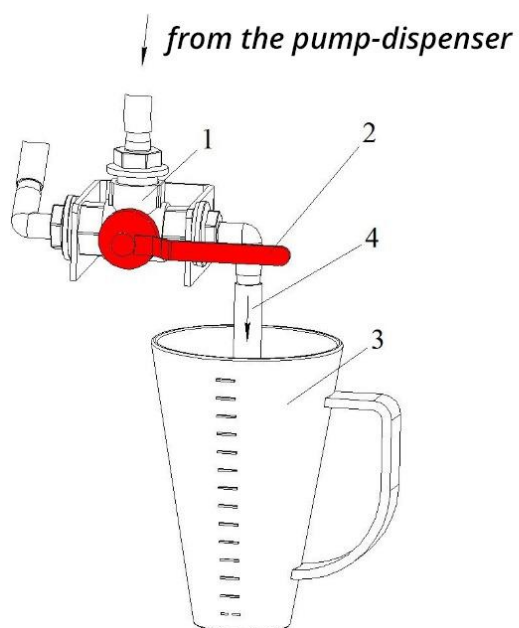
PUMP-DISPENSER OF THE OPERATING FLUID



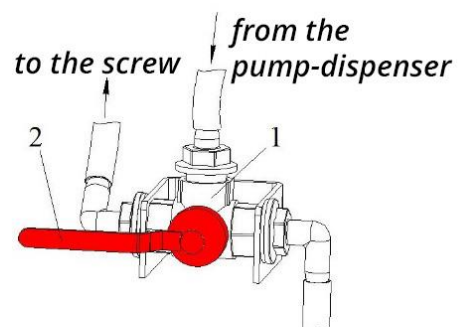
1 - button «On/Off»; 2 - button «+»; 3 - button «-»; 4 - dosage chamber; 5 – display
Figure 4.3

FLUID DISTRIBUTOR

«TRIAL»

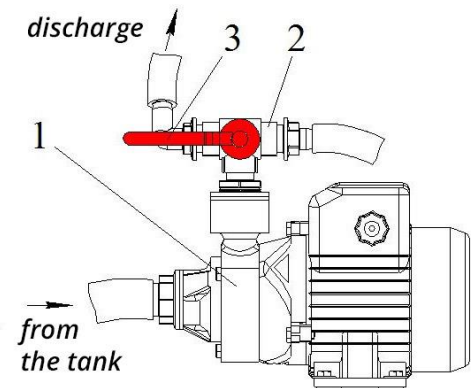
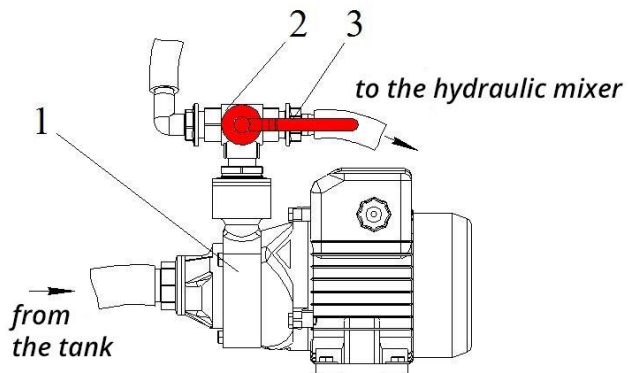


«OPERATION»



1 - three-way cock; 2 - cock handle; 3 - measuring container; 4 – hose

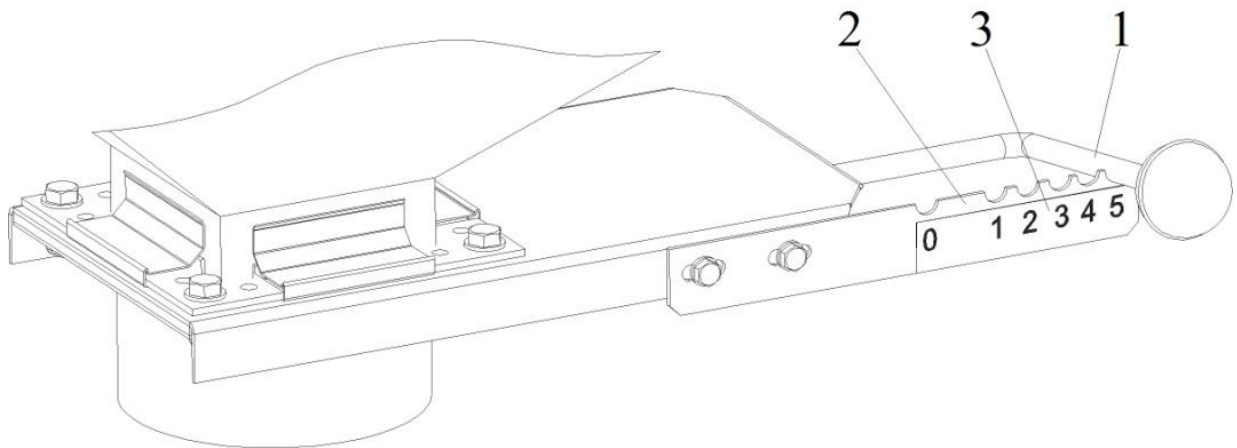
Figure 4.4
PUMP UNIT



1 - pump RK-60; 2 - three-way cock; 3 - cock handle

Figure 4.5

SEED DOSIMETER



1 - lever; 2 - bracket; 3 – scale

Figure 4.6

5. PREPARATION FOR OPERATION

5.1. Verify the treater's completeness according to Annex A of this manual.

5.2. Check the fastening of the main assembly units, components, and hose connections.

5.3. Visually inspect for any damage to electrical cables and ensure there are no foreign objects in the hopper or tank.

5.4. Place the treater on four adjustable block stops (26) (figure 4.1) and secure it with retaining nuts (25).

IMPORTANT: During both operation and transport, the treater must rest on the surface of the area or vehicle only with the block stops.

5.5. Connect the power cable (30) (figure 4.1) and the fixed HS-16 A receptacle (29) to the machine and the power source as follows:

- Install the fixed seat at the designated location and connect it to a 380 V network through safety stops or a circuit breaker with a current rating not exceeding 16 A.
- Connect the end of the cable with the portable plug to the fixed VS-16 A receptacle (28) installed on the machine.
- Connect the other end of the cable with a portable plug to the fixed seat.

5.6. The locations of the treater's electrical drive control elements are shown in figure 5.1.

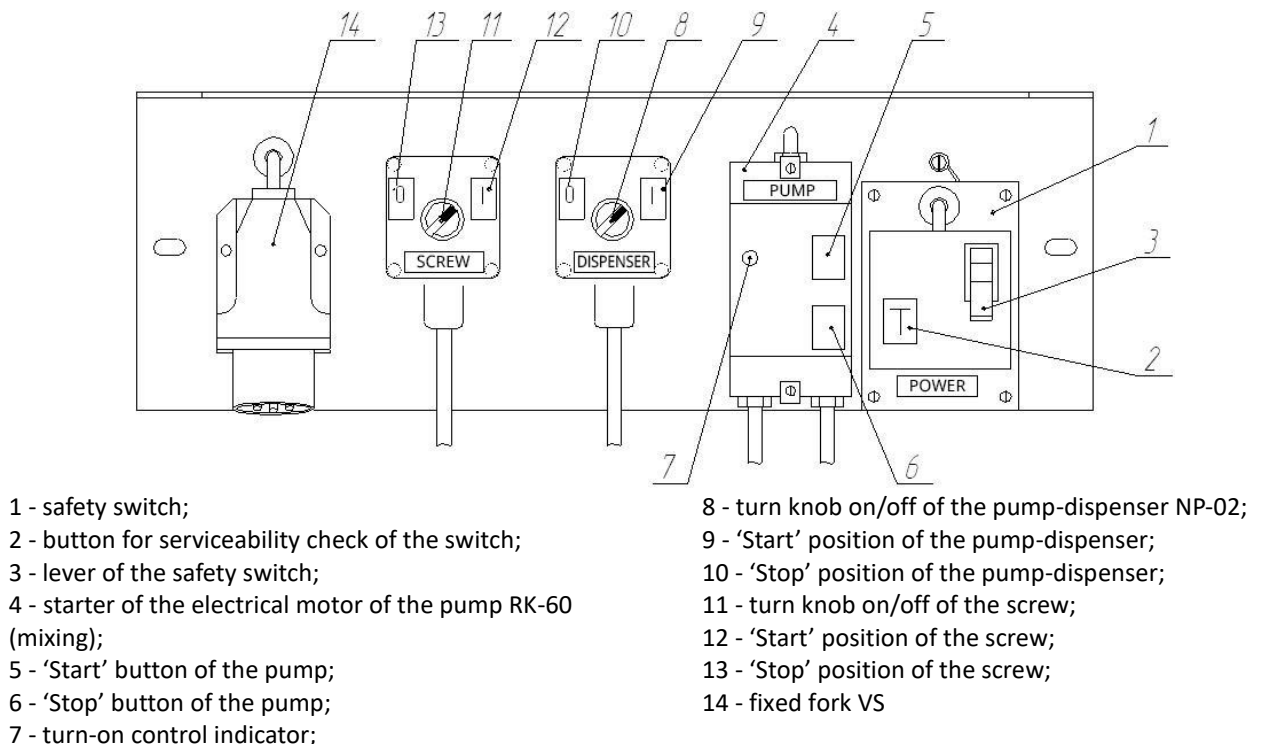
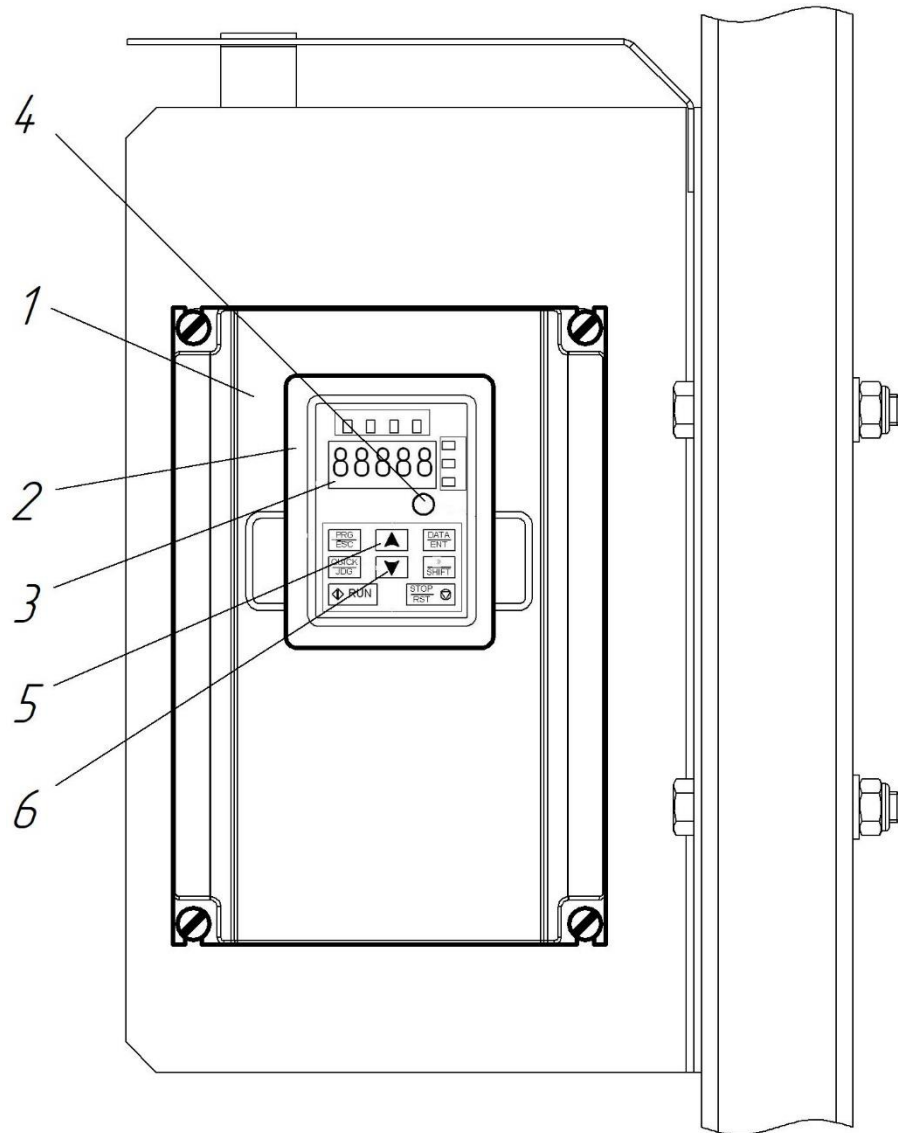


Figure 5.1

CONSOLE OF THE FREQUENCY CONVERTER (FC)



1 - frequency converter (FC); 2 - control panel of the converter; 3 - seven-segment LED display;
4 - digital potentiometer; 5 - button for increase of the number of rotations of the screw; 6 - button for
decrease of the number of rotations of the screw

Figure 5.2

To turn on the screw, one needs to put the turn knob (11) in the start position (12) in the panel of the control console (figure 5.1). Adjustment of rotations of the screw is carried out by means of the frequency converter (FC) (figure 5.2), to increase the number of rotations - press the button (5), to decrease - press the button (6). On the display (3), the number of rotations of the screw per one minute is shown. During the adjustment, first the display shows the value of the initial frequency in Hz, and then - the number of rotations of the screw per minute.

5.6. The electrical circuit of the electrical drive of the treater is shown in figure 5.3

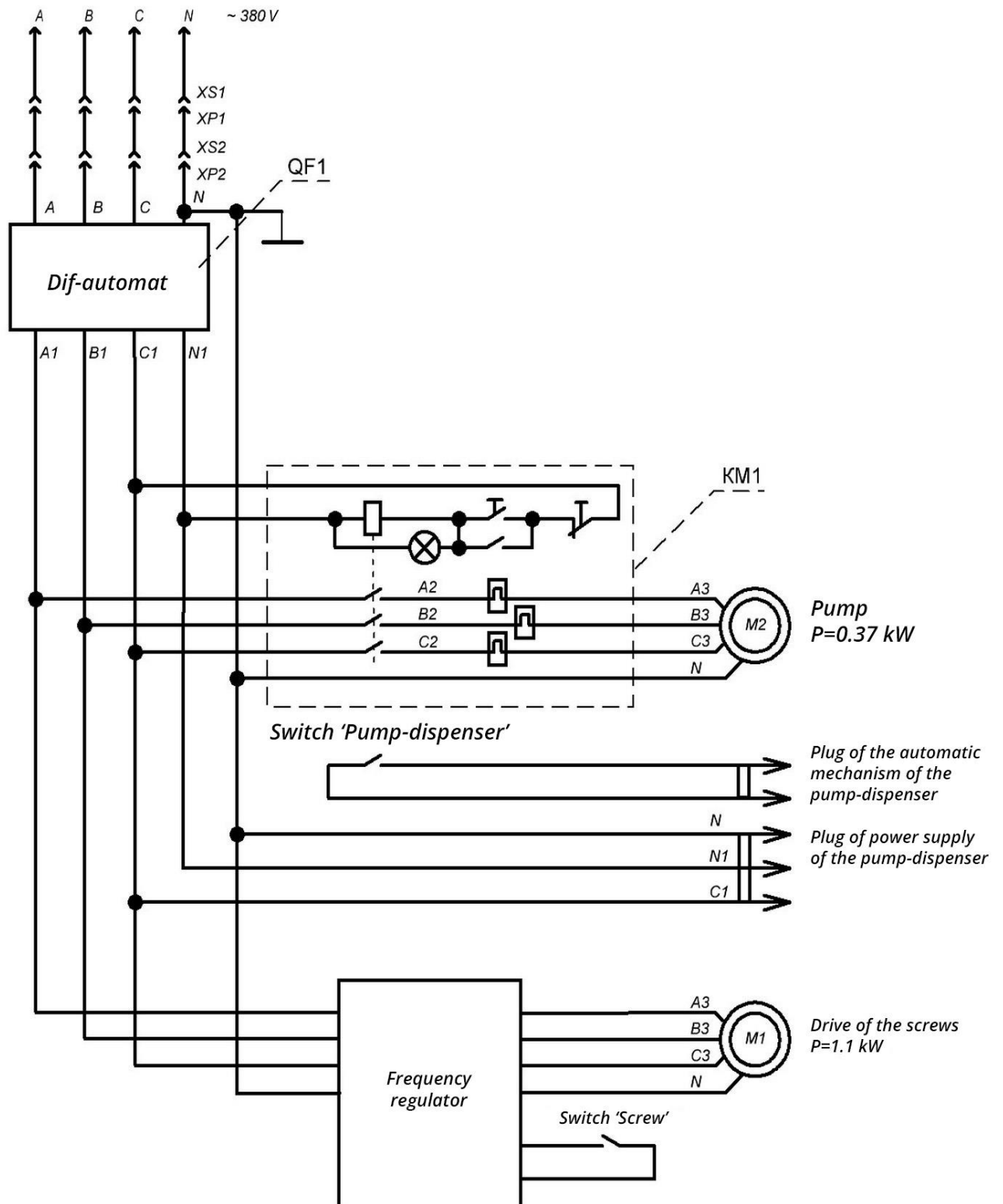


Figure 5.3

Table 5.3

Indication	Name	Quantity
KM1	Starter PML 1230, ~ 380V, 50 Hz ($I_{t.e.} = 2.4...4.0$ A, TU 16.644.001-83)	1
M1	Electrical Motor of the screw AIR71V2UZ, M300 (Flange) N = 1.1 kW (1.48 hp); n = 3000 rpm; $I_n = 4.0$ A GOST 19523-74 (gear motor)	1
M2	Electrical Motor of the Pump Drive RKm-60 (N = 0.37 kW (0.5 hp); n = 3000 rpm; $I_n = 2.5$ A)	1
	Pump-dispenser NP-02	
QF1	Safety Cutout Device (PZV) EF1-4, 25 A, $I_{AM} = 0.03$ A	1
XS1	Fixed Seat HS-16A	1
XP1	Portable Fork VP-16A	1
XS2	Portable Socket RP-16A, 380V, IR44	1
XP2	Fixed Fork VS-16A-6h/400 V, IR54	1
FC	Frequency converter GD10-1R5G-4-V 1.5kWt, 380V, 3F	1
	Button XB2-BD21 (turn 2-way) Switches 'Screw' and 'Pump-dispenser'	2

6. BREAK-IN AND ADJUSTMENT

6.1. Before starting operation, the break-in and adjustment of the treater must be carried out in the specified order:

ATTENTION! For a short-term shutdown of the treater, turn off the drive of the screws and the pump by pressing the corresponding buttons.

ATTENTION! For a long-term shutdown of the treater, turn off the safety cutout device and disconnect the treater from the power supply.

ATTENTION! In the event of an emergency, turn off the treater using the emergency stop button.

6.1.1. Install cock handles:

- pump unit (3) (figure 4.4) to the position 'for hydraulic mixer';
- fluid distributor (14) (figure 4.1) to the position 'Trial', remove the cover of the tank, insert the hose (4) into the neck of the tank;
- tank (21) (figure 4.1) - to the position 'open';
- discharge of fluid residues (20) - to the position 'closed';

6.1.2. Pour at least 20 l of water into the tank.

6.1.3. Turn on the power supply (3) (figure 5.1) in the safety cutout device (PZV), to check its serviceability, press the button 'T'. The safety cutout device must turn off.

6.1.4. Turn on again the SCD and press the button (5) 'Start' of the pump, and the turn knob (11) to the position 'on' - the electrical motors of the screw (10) (figure 4.1) and the pump unit (3) will turn on. The direction of rotation of the motor shafts must correspond to the direction of the arrows indicated on the protective cases of the motors, in case of unconformity, one needs to switch places of the two-phase conductors in the chain of power supply of the treater **(the procedure must be performed by qualified staff)**.

6.1.5. Turn on the drive of the screw with the button (11) (figure 5.1), the direction of rotation of the motor shaft must correspond to the direction of the arrow indicated on the protective case of the pulleys of the drive of the screw.

6.1.6. Turn on the fluid dispenser with the turn knob (8) (figure 5.1). Buttons (2) or (3) (figure 4.3) regulate discharge of the increase operating fluid of the dosimeter, when increasing the rotation frequency with button (2), the supply is increased, with button (3) - decreased

6.1.7. Carry out the break-in of the treater at idle speed during 5 ... 7 min.

6.1.8. Make sure there are no strange noises and water leaks, the temperature of motor heating must not exceed 85°C or 185°F

6.1.9. Turn off the drive of the screw.

6.2. Perform rough calibration of the fluid dispenser

- Set the three-way cock in the position for discharge of fluid from the dispenser (figure 4.4 'Trial') and bring up a measuring container. Make sure the hose for fluid supply to the dispenser is fully filled with fluid. If the hose is not filled, one should carry out manual pumping of the dispenser, for that purpose one may use the function of averse and reverse:

Turn off the fluid dispenser by pressing the button «  », the following will be shown on the display:



To pass to the menu of the function of averse and reverse, one needs to press simultaneously the buttons '+' and '-', the following inscription will be shown on the display:



When pressing and retaining the button '+', the pump will start pumping the fluid, and while the button is retained, the following will be shown on the display:



When pressing and retaining the button '-', the pump will start pumping the fluid in the reverse direction, and while the button is retained, the following will be shown on the display:



- Turn off the fluid dispenser by pressing «  », the following will be shown on the display:



- By pressing and retaining the button «-» press the button «  ». The following will be shown on the display:



- Press the button '+', the following will be shown on the display:



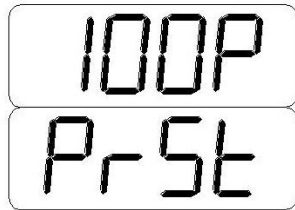
- Press «  ».

After the dosimeter completes 100 rotations, it will stop automatically, measure the amount of pumped fluid (for example, 1.230).

A four-digit number and the inscription 'dPS_' will be shown on the display. With buttons '+' or '-', introduce the value of the volume of fluid in liters received after pumping fluid in 100 rotations. Press «  ».

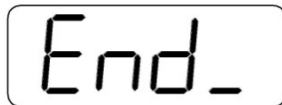


- A three-digit number with P index and the inscription 'PrSt' will be shown on the display. With button '+', set the value - 100P. Press the button '+' and confirm the value of the number shown on the display.



This point must be obligatorily set to the value of 100P.

- Press «», the following will be shown on the display



- Press «», the following will be shown on the display



- Press «», a four-digit number that indicates the established supply of the dosimeter will be shown on the display (For example)



7 SETUP AND REGULATION RECOMMENDATIONS

7.1 Preparation of the Operating Fluid

7.1.1 The composition of the operating fluid must adhere to the recommendations provided by the manufacturers of the preparations.

7.1.2 The preparation of the operating fluid should be performed in the following sequence:

- Pour the required amount of water and preparation into the tank.
- Set the position of the handle of the three-way cock (figure 4.5) to the position 'for hydraulic mixer'.
- Turn on the pump unit with the button (5) (figure 5.1).
- Turn off the pump unit with the button (6).
- After mixing, the operating solution is ready for use.

7.1.3 During seed treatment, the recommended discharge of the operating fluid is **10 liters (2.64 gallons) per 1 metric ton (1.1 short tons) of seeds**. A decrease in discharge may lead to a deterioration in treatment quality.

7.1.4. In case of preparation of the necessary amount of the operating fluid from powder-type treaters, preparation of the operating fluid is to be carried out with at least 5 liter (1.3 gal) of water solution per 1 kg (2.2 lbs) of a powder-type preparation.

$$Q = \frac{100 * q}{Qp}$$

Where:

- Q = required supply of the operating fluid dispenser (in l/min (gal/min)). **Q1: in gallons per minute (gpm) = (Q1 in liters per minute) × 0.264172**
- Qp = discharge norm of the operating fluid per 1 metric ton of seeds (in l/t). **Qp: in gallons per ton (g/t) = (Qp in liters per ton) × 0.264172**
- q = discharge norm of preparation per 1 metric ton of seeds, l (kg)/t. **q: in short tons (t) = (q in metric tons) × 1.10231**

7.2. Selection and checking the productivity of the treater depending on the seeds.

7.2.1 After preparing the operating fluid, use **Table 7.1** to select the desired operating productivity of the treater.

Table 7.1 Scale division of the seed dosimeter

	Estimated productivity of the treater		
	Wheat	Barley	Oat
1	1.0 metric ton/h 37 bushels/hour	-	-
2	2.0 metric ton/h 73 bushels/hour	1.5 metric ton/h 69 bushels/hour	1.0 metric ton/h 69 bushels/hour
3	3.0 metric ton/h 110 bushels/hour	2.5 metric ton/h 115 bushels/hour	1.5 metric ton/h 103 bushels/hour
4	4.0 metric ton/h 147 bushels/hour	3.0 metric ton/h 138 bushels/hour	2.0 metric ton/h 138 bushels/hour
5	5.0 metric ton/h 184 bushels/hour	3.5 metric ton/h 161 bushels/hour	3.0 metric ton/h 207 bushels/hour

7.2.2 Actual productivity is to be determined by means of taking samples (at least three) and their further weighing. For that purpose, one needs to perform the following operations.

- Fix the draft of the seed dosimeter on the bracket of the scale in the position '0';
- Load the seeds into the hopper.
- Prepare containers for collection and weighing of seeds.
- Turn off the fluid dispenser ('OFF' must be shown on the display).
- Turn on the drive of the screw with the turn knob (11) (figure 5.1).
- Set the lever of the seed dosimeter (1) (figure 4.6) to the corresponding scale division and measure the filling time of containers from the moment of stable filling.
- Weigh the seeds.
- Calculate the actual productivity according to the formula:

$$Pf = 3.6 * \frac{m1+m2+m3}{t1+t2+t3}, \text{ t/h}$$

Where:

- Pf = actual arithmetic mean productivity of the treater at the chosen division of the seed dosimeter (in t/h) **Pf: in short tons per hour = (Pf in metric tons) × 1.10231**
- $m1, m2, m3$ = weights of seed samples (in kg) **m1, m2, m3: in pounds (lbs) = (m1, m2, m3 in kg) × 2.20462**
- $t1, t2, t3$ = times of sample collection (in s)

Determine Sample Duration: The duration of sample-taking should be based on how quickly the containers fill.

End of Sample Taking: After sampling, set the lever of the seed dosimeter back to position '0' and turn off the drive of the screws.

Table 7.2

Productivity of the treater P, (wheat)	Screw rotations n, rot./min
1 metric ton/h 36 bushels/hour	20
2 metric ton/h 73 bushels/hour	20
3 metric ton/h 110 bushels/hour	25
4 metric ton/h 147 bushels/hour	35
5 metric ton/h 185 bushels/hour	45

7.2.3. By table 7.3, to determine the actual productivity Pa, type of the treater and discharge norm of the operating fluid, choose the necessary supply of the pump-dispenser of the operating fluid q1

Table 7.3

Preparatory form	Discharge norm of the operating fluid per 1t (36.7bu) of seeds Qp,	Productivity of the treater P								
		1 t 37 bu	1.5 t 55 bu	2 t 73 bu	2.5 t 92 bu	3 t 110 bu	3.5 t 129 bu	4 t 147 bu	4.5 t 165 bu	5 t 184 bu
		Discharge of the operating fluid (dosimeter supply) q1								
Fluid	10 l/t 0.7 gal/bu	0.17 l/min 0.045 gal/min	0.25 l/min 0.066 gal/min	0.33 l/min 0.087 gal/min	0.42 l/min 0.11 gal/min	0.50 l/min 0.13 gal/min	0.58 l/min 0.15 gal/min	0.67 l/min 0.18 gal/min	0.75 l/min 0.20 gal/min	0.83 l/min 0.22 gal/min

7.3.1. Calculate the required supply of the fluid dispenser according to the formula:

$$Q1 = \frac{Pf * Qp}{60}, \text{ l/min (gal/min)}.$$

Where:

- $Q1$ = required supply of the operating fluid dispenser (in l/min (gal/min)). **Q1: in gallons per minute (gpm) = (Q1 in liters per minute) × 0.264172**
- Qp = discharge norm of the operating fluid per 1 ton of seeds (in l/t). **Qp: in gallons per ton (g/t) = (Qp in liters per ton) × 0.264172**
- Pf = actual productivity of the treater (in t/h). **Pf: in short tons per hour (tons/h) = (Pf in metric tons per hour) × 1.10231**

- 7.3.2 **Turn On the Fluid Dispenser** Activate the fluid dispenser by pressing the designated button . The current established supply will appear on the display. Use the '+' or '-' buttons to set the calculated value of supply $Q1$ (for example, $Q1 = 1.230 \text{ l/min (gal/min)}$).

1.230

7.4. Precise calibration of the fluid dispenser:

- Set the three-way cock in the position for discharge of fluid from the dispenser and bring up a measuring container. Make sure the hose for fluid supply to the dispenser is fully filled with fluid, if no, repeat the operation described in p.6.2.
- Turn off the fluid dispenser by pressing «» the following will be shown on the display:

OFF_

- Retaining the button «-», press the button «» the following will be shown on the display:

End_

- Press the button '-', the following will be shown on the display:

P 100

- Press the button «», a four-digit number and the inscription «dOSE» will be shown on the display: By pressing the buttons '+' and '-', set the calculated value of supply $Q1$.

1.230
dOSE

- Press «». After the dosimeter completes one hundred rotations, it will stop automatically, measure the pumped amount of fluid.

1.230
dPS_

- A four-digit number and the inscription 'dPS_' will be shown on the display. With the buttons '+' and '-', introduce the volume measured by the measuring container in liters or gallons.

End_

- Press «», the following will be shown on the display:

OFF _

- Press «», the following will be shown on the display:

1.230

- Press «», a four-digit number that indicates the established supply of the dosimeter in l/min (gal/min). will be shown on the display

In case of significant (> 20%) change of productivity of the treater, it is recommended to repeat points from 7.2. to 7.4.

THE TREATER IS READY FOR OPERATION.

8 SEED TREATMENT

8.1. Seed treatment is performed in the following sequence:

Load the hopper with seeds (set the lever of the seed dosimeter to the position '0' (closed)).

- Connect two sacks ('big bags') to the seed distributor (2) (figure 4.2).
- Set the cock handle (2) (figure 4.4) of the fluid distributor to the position 'Operation'
- With the lever (3), turn on the safety cutout device (PZV) (figure 5.1).
- Activate mechanisms of the treater: pump - button (5), dosimeter - button (8), screw - button (11).
- Set rotations of the screw on the panel of the frequency converter (figure 5.2) according to the chosen (tried) productivity.
- Set the lever of the seed dosimeter (1) (figure 4.6) on the bracket of the scale (3) according to the chosen productivity.

The flow of seeds that passes through the seed dosimeter will start mixing with the operating fluid in the mixing and unloading screw and being supplied to the sacks ('big bags') connected to the seed distributor.

8.2. In the process of treatment, one need to load the hopper timely with seeds, change from time to time the sacks filled with seeds for empty ones, while regulating the flow of seeds with the deflecting gate (6).

ATTENTION! Do not allow overfilling of the unloading containers with seeds as it can lead to stoppage of the screw, overload of the electrical motor and its getting out of service.

In the process of treatment, one needs to load the hopper timely with seeds, change from time to time the sacks filled with seeds for empty ones, while controlling the flow of seeds by means of the lever of the deflecting valve.

8.3 In case of stoppage of the process of treatment or the end of operation, one must close the deflecting gate of the seed dosimeter and turn off the treater.

When there are 5-10 l of fluid left in the tank, one needs to close the cock of the mixer, excluding possible foaming of the fluid and air suction by the fluid dispenser.

8.4. Upon completion of treatment or with passage to treatment of seeds of other crops, the treater must be totally cleaned from seeds and operating fluid.

ATTENTION! To avoid possible freezing of the operating fluid upon completion of works, one needs to drain all the fluid out of the hydraulic system of the treater by undoing the dummy plug on the pump unit.

- open the quickly removable cover (11) (figure 4.1) of the mixing and unloading screw and undo six winged nuts of the end cover, remove the bladed screw out of its body
- free the hoses of the dispenser from fluid by using the function of averse and reverse (see p. 6.2.)
- pour the residues of the operating fluid from the tank into the prepared reservoir by means of the pump unit, for which one needs to set the handle of the three-way cock (2) (figure 4.5.) to the position 'discharge', and turn on the pump with the button (5) (figure 5.1), pour out the residues by opening the cock (20) (figure 4.1) in the pump unit
- wash the hydraulic system with clean water and pour it into a specially allocated place, wipe the external surfaces of the treater with a damp rag.

9 TECHNICAL MAINTENANCE

External manifestations of defects, methods of their elimination and necessary tools are indicated in table 9.1.

Table 9.1

Defect, external manifestation	Method of elimination. Necessary regulations and trials	Necessary tool and devices	Notes
1 The safety switch does not turn on, or turns off	remove the source of short-circuit failure	Megohmmeter or multimeter	Megohmmeter is not added
2 The motor does not turn on: a) the thermal relay is off; b) the spool of the magnetic starter does not function; c) there is no contact in the buttons of control; d) the assembly in the console of electrical equipment is faulty	a) turn on the thermal relay; b) replace the spool of the magnetic starter; c) clean the contacts; d) check assembly	Screwdriver, lead-free petrol, rag	
3 The motor does not rotate and hoots: a) there is no voltage in one of the conductors; b) the shaft of the motor is braked	a) check the contacts in the magnetic starter and automatic switch; b) release the brake of the shaft	Megohmmeter or multimeter	
4 End seal lets operating fluid in	replace the end seal	Set of wrenches, screwdriver	
5 Untreated seeds fall out of the unloading neck, there is operating fluid in the tank: a) the pump-dispenser does not supply fluid b) clogged are the apertures of $\varnothing 3,2$ mm tube of water supply to the mixing and unloading screw	Check the tightness of the places of connection of the hoses with the collars, if necessary, replace the collars. Wash the hoses of the suction and pressure communications. Dismantle the tube, clean (wash) the hoses of the hydraulic communications	Wrench 17x19	
6 The pump-dispenser does not supply fluid. The shaft (crosspiece) rotates	Insufficient tightness of connections and clogged hoses. Check the tightness of the places of connection of the hoses with the collars, wash the hoses of the suction and pressurizing communications	Screwdriver	
7 With a new turn-on of the treater after a technological stoppage, seeds do not fall out	Set the lever of the seed dosimeter to the position 'closed' (0), turn off the electrical motor of the screw, open the quickly		

of the neck of the screw (the motor functions)	removable covers of the mixing and unloading screw, clean the screw from seeds, shut the covers and turn on the treater. Set the lever of the seed dosimeter to the previous position		
8 Quality of seed treatment has changed: uneven coloring of seeds is observed during visual inspection	Check the actual fluid supply of the dispenser and the actual productivity of the seed dosimeter	Measuring container, seeds	
The pump-dispenser does not turn on, or doses fluid incorrectly:	Turn off the current of the machine and check the connection of the cables to the pump-dispenser		
a) one of the plugs of the pump is disconnected;			
b) the parameter 'Fluid dosage in one hundred rotations' is not set correctly	Carry out setup of the pump-dispenser. See Annex B	Measuring container	

9.1. Importance of Maintenance

Timely and quality maintenance of the treater is essential for identifying and addressing issues that could lead to premature activation and breakdown throughout its service life.

9.2. Maintenance Schedule

The types and frequency of technical maintenance are detailed in Table 9.1.

Table 9.1

Types of technical maintenance	Periodicity or term of setting for TM, h
1 Every-shift technical maintenance (ETM)	6 - 12
2 First technical maintenance (TM-1)	60
3 Technical maintenance in case of storage	once a season

9.3. List of works performed during technical maintenance, indicated in the corresponding tables:

ETM

Table 9.2

FM-1

Table 9.3

Preparation for long-term storage

Table 9.4

Withdrawal from long-term storage

Table 9.5

Table 9.2 - List of works performed during ETM

Content of works and methodology of their conduct	Technical requirements	Appliances, tools, devices and materials	Note
Drain the residues of fluid from the tank. Pour at least 10 liters (2.6 gal) of water into the tank, turn on the mixer and the working fluid dispenser for 3-5 minutes and flush the hydraulic communication. Drain water from the tank and hoses of the dosimeter. Turn off the pump and the dosimeter	Residues of operating fluid are not permitted	Tight containers with the inscription 'Toxic'	Draining is to be performed in a specially allocated place

Table 9.3 - List of works performed during FM -1

Content of works and methodology of their conduct	Technical requirements	Appliances, tools, devices and materials	Note
1. Clean the assembly units of the machine from the residues of seeds, dust, dirt and preparations 2. Remove the cover of the peristaltic pump and lubricate the hose pressed by the rollers with silicone oil 3. Check completeness, technical condition, security of the connections of nodes and details of the machine	The machine must be clean - Bolts and nuts are to be securely tightened	Rag, water, bucket Screwdriver Wrenches 12x13, 14x17	Cleaning is to be performed with a wet rag. Use of solvents of paint and varnish materials is not permitted
4. Check the tension of the wedge-and-passing gear by pulling the branch of the pass by means of the force meter	The value of pulling the branch of the pass with force of 25 N must not exceed 4 mm (0.15 in)	Force meter, ruler, wrenches 13x14, 14x17	
5. Check, and, if necessary, perform isolation of the damaged places of the wires of power supply	Presence of wires with damaged isolation is not permitted	Electrician's tape	

Table 9.4 - List of works performed during preparation for long-term storage

Content of works and methodology of their conduct	Technical requirements	Appliances, tools, devices and materials	Note
1. Wash the surfaces of the machine contaminated with the operating fluid with a 5-10% solution of synthetic or technical detergents heated to 50-80 °C (122- 176 °F), and then wash with tepid water, wipe the dirty places with a wet rag	Presence of dust, dirt, residues of preparations is not permitted	Rag, water, lime, chromium-sulphurous sodium	Use of solvents is not permitted
2. Pour out the residues of the operating fluid from the tank by opening the cock in the lower part of the tank. Turn on the pump for some time until complete pump-out of water from it. Pour out the residues of fluid from hoses and the dispenser of the operating fluid. For that purpose, turn on the fluid dispenser (1) (figure 4.3) and pour out the residues of the fluid through the hose (19) (figure 2.1) into the measuring container. Wash the hydraulic communication with water and drain it	Residues of operating fluid are not permitted	Wrenches 13x14, 17x19, pliers, rag, soap, talc TRPV (for supporting purposes)	Drain water in a specially allocated place
3. Open the cover of the peristaltic pump, remove the hose pressed by the rollers, disconnect it from the pressure and suction hoses, lubricate with silicone oil and send it to the storeroom	-	Screwdriver	
4. Remove the drive wedge pass. Wash it with tepid water, dry, sprinkle with talc and send it to the storeroom	The pass must be clean and dry	Wrenches 13x14, 17x19, pliers, rag, soap, talc TRPV (for supporting purposes)	
5. Clean the electrical motor and blow it with compressed air, if necessary, isolate the damaged places of the electrical wires, clean and lubricate with protective oil	Presence of damages is not permitted	Compressor, electrician's tape, solid oil (synthetic or grease), rag.	
6. Wash, dry and lubricate unpainted threaded surfaces	Put oil in thin layers.	Rag, washing fluid, gun oil, NT-203A or wax mixture ZVVD	
7. Clean the places of damaged paint, degrease and paint	The paint must correspond to the color of the machine	Coated abrasive, enamel, solvent, brush	
8. Send the machine for storage	-		

Table 9.5 - List of works performed in case of withdrawal from long-term storage

Content of works and methodology of their conduct	Technical requirements	Appliances, tools, devices and materials
1. Install the drive pass and adjust its tension.	Fulfill p.4 of table B.3	Wrench 17x19
2. Check, and, if necessary, tighten the loosened braces.	The components and details must be securely fixed	Wrenches 12x13, 14x17
3. Lubricate the hose of the peristaltic pump with silicone lubricant, set it between the rollers and the body. Set the cover of the pump to its place. Connect the suction and pressure hoses of the pump to the nozzles and fix them with collars.	-	Screwdriver
4. Clean the parts of the treater lubricated with conservation materials.	-	Rag
5. Prepare the treater for operation.	According to the requirements of section 5	-

10 POSSIBLE DEFECTS AND METHODS OF THEIR ELIMINATION

External manifestations of defects, methods of their elimination and necessary tools are indicated in table 10.1.

Table 10.1

Defect, external manifestation	Method of elimination. Necessary regulations and trials	Necessary tool and devices	Notes
1 The motor does not turn on	Check the presence of voltage in three phases. Repair or replace the switch	Voltamperemet er, screwdriver	
2 The motor hoots and does not rotate	The same	The same	
3 Absence of indication on the display of the fluid dispenser	Check the presence of the 'operating zero' in the chain of power supply of the treater	Voltamperemet er, screwdriver	
4 Untreated seeds fall out of the unloading neck, there is operating fluid in the tank: a) the line of fluid supply to the screw is clogged; b) the fluid dispenser rotates but does not supply fluid	Clean (wash) the nozzles and hoses of the hydraulic communication; check the places of connection of hoses with the collars, if necessary, replace the collars; wash the hoses of suction and pressurizing communication of the dosimeter	Set of wrenches, screwdriver	

11 RULES OF STORAGE

11.1. After the end of works, the treater must be prepared for storage.

11.2. Preparation is to be carried out observing the instructions on the conduct of technical maintenance described in Annex B.

11.3. Storage of the machine is carried out in closed facilities or under a lean-to.

11.4. Before putting to storage, inspection of the technical condition of the machine is to be performed.

12 TRANSPORTATION

12.1. The treater is shipped to the customer in one cargo item without package (the control console and the electrical motor are covered with film).

12.2. Loading and unloading of the treater is to be performed with a crane or automatic loader with lifting capacity of at least 1 t.

12.3. During transportation, the treater must be securely fast, moving along the platform or body of vehicles is not permitted.

13 DISPOSAL

13.1. The used equipment of the treater belongs to low-hazard wastes and can be stored openly at the industrial facility. These wastes without negative ecological consequences can be disposed according to the accepted conditions of this or that enterprise.

14 MANUFACTURER'S WARRANTIES

15.1. The manufacturing enterprise guarantees serviceability of the treater during 12 months from the date of putting the machine into operation.

15.2. Once the treater has arrived at the destination point, the consignee must check:

- Number of the treater on the table.
- Number of cargo items.
- Completeness of the treater.

15.3. In case of incompleteness of the treater, one needs to prepare an act signed by the representatives of the organization that receives the treater and the transport organization. By virtue of that act, the consignee can report a claim to the transport organization.

15.4. The manufacturing enterprise is not liable for damage or loss of details during transportation.

If the package is not damaged, and the actual quantity of details, assembly units and tools does not correspond to the Packaging list - one need to prepare a shortage report and submit it to the BTC of the enterprise. Upon consideration of the report, the manufacturing enterprise urgently delivers the lacking components.

15.5. The warranty can be annulled for any of the following reasons:

- Wrong operation of the treater (failure to observe the rules provided in this 'Operational manual').
- Violation of operating modes, exceeding allowed load, repair or disassembly by specialists who are not authorized to perform such works.
- Clogging of the flow circuits with impurities of the used substance.
- Use for preparation of the operating fluid of treaters (fungicides) which are not recommended for use on the territory of the country-consumer.
- Use of other substances, apart from treaters, for preparation of the operating fluid.
- Operation of the treater by unqualified staff, irresponsible attitude towards technical maintenance, unauthorized implementation of modifications that impacts operation of the treater, stability and safety of its operation.
- Use of assembly units, details and spare parts of other manufacturers.
- Modification of the treater as a result of which change of any of its functions has occurred.
- Loss, damage to the mark plate of the treater or making changes to it.
- Operation of the treater under unfavorable conditions, different from the recommended ones (overload, emergency situations etc.).
- The warranty does not cover the screws.
- The warranty does not cover filter elements, drive braces, elements of electrical equipment.

15.6. Any expenses for delivery, postal transmission, time compensations, material losses in business are not subject to reimbursement.