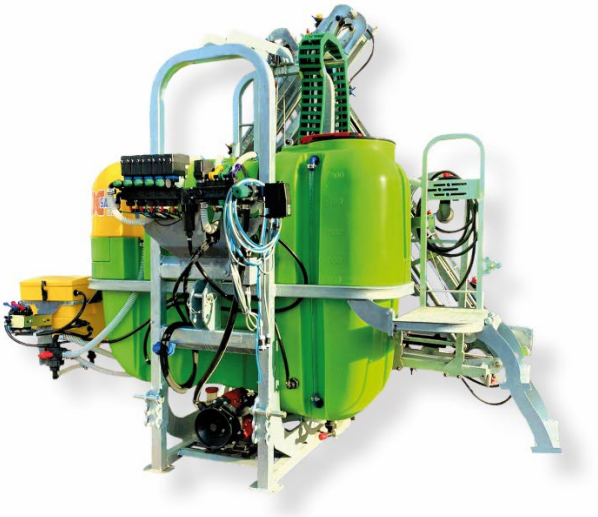
TOLMET

dobrze przemyślany wybór



MOUNTED SPRAYER XSARA
Manual

IDENTIFICATION DATA:

Manufacturer: TOLMET
Production, Service and Trade Company
Piotr Wawrzyniak
Address: ul. Dworcowa 3,
99-140 Świnice Warckie

Owner:

Piotr Wawrzyniak
+48 63 288 10 18
piotr@tolmet.pl

Sales Department	**Spare Parts Department**
Przemysław Wolak	***Joanna Jaśkiewicz***
+ 48 607 667 111	+ 48 725 264 000
sklep@tolmet.pl	sklep@tolmet.pl

TOLMET
Piotr Wawrzyniak
3 Dworcowa Street, 99-140 Świnice Warckie
Tel./fax. (63) 288 10 18

EC DECLARATION OF CONFORMITY
for the machine:
In accordance with the Regulation of the Minister of Economy of 21 October 2008
(Journal of Laws No. 199, item 1228)
and European Union Directive 2006/42/EC of 17 May 2006
In accordance with the Regulation of the Minister of Economy of 21 October 2009
(Journal of Laws No. 124, item 701)
and European Union Directive 2009/127/EC of 17 May 2006

We declare with full responsibility that the machine:

Machine: SUSPENDED SPRAYER

Type/model: XSARA ..... Serial number: .....

Year of manufacture: .....

to which this declaration refers meets the requirements of:

Regulation of the Minister of Economy of 21 October 2008 on the essential requirements for machinery (Journal of Laws No. 199, item 1228)
European Union Directive 2006/42/EC of 17 May 2006
Regulation of the Minister of Economy of 21 October 2009 on the essential requirements for machinery for pesticide application (Journal of Laws No. 199, item 1228)
I European Union Directive 2006/42/EC of 17 May 2006

Person responsible for the technical documentation of the machine: Piotr Wawrzyniak

In order to supplement the relevant safety, health and environmental protection requirements contained in Directive 2006/42/EC, the following harmonised standards are taken into account:

PN–EN ISO 12100 :2012 PN–EN ISO 4254-6:2011
PN–EN ISO 4254-1 :2013 PN-EN ISO 11684:1998

This EC declaration of conformity shall become invalid if the machine is modified or rebuilt without our consent.

Świnice Warckie .....
Place and date of issue

..... Name and surname of the person authorised to sign

MACHINE IDENTIFICATION

Field sprayer

The data on the nameplate is used to identify the machine
and should correspond to the following data entered at the time of sale.

Symbol -.....

Year of manufacture.....

Serial number-.....

The sprayer has a nameplate located on the frame at the front of the machine.

The nameplate contains basic information for identifying the machine.

Fig. 1. Location of the nameplate on the machine.

When corresponding, asking questions or reporting warranty issues, please provide the type and identification number of the machine. The machine identification data can be found on the plate located on the frame on the left-hand side.

The operating manual is part of the basic equipment of the sprayer.

PRODUCTION, SERVICE AND TRADE COMPANY
TOLMET
Piotr Wawrzyniak
Ul. Dworcowa 3, 99-140 Świnice Warckie
Tel./fax. (63) 288 10 18

EC DECLARATION OF CONFORMITY
for the machine:
In accordance with the Regulation of the Minister of Economy of 21 October 2008
(Journal of Laws No. 199, item 1228)
and European Union Directive 2006/42/EC of 17 May 2006
In accordance with the Regulation of the Minister of Economy of 21 October 2009
(Journal of Laws No. 124, item 701)
and European Union Directive 2009/127/EC of 17 May 2006

We declare with full responsibility that the machine:

Machine: SUSPENDED SPRAYER

Type/model: XSARA ..... Serial number: .....

Year of manufacture: .....

to which this declaration refers meets the requirements of:

Regulation of the Minister of Economy of 21 October 2008 on the essential requirements for machinery (Journal of Laws No. 199, item 1228)
European Union Directive 2006/42/EC of 17 May 2006
Regulation of the Minister of Economy of 21 October 2009 on the essential requirements for machinery for pesticide application (Journal of Laws No. 199, item 1228)
I European Union Directive 2006/42/EC of 17 May 2006

Person responsible for the technical documentation of the machine: Piotr Wawrzyniak

In order to supplement the relevant safety, health and environmental protection requirements contained in Directive 2006/42/EC, the following harmonised standards are taken into account:

PN–EN ISO 12100 :2012 PN–EN ISO 4254-6:2011
PN–EN ISO 4254-1 :2013 PN-EN ISO 11684:1998

This EC declaration of conformity shall become invalid if the machine is modified or rebuilt without our consent.

Świnice Warckie .....
Place and date of issue

.....
Name and surname of the person authorised to sign

Table of contents

1. Introduction

This manual describes the operation and maintenance of a mounted field sprayer. If specific problems arise during operation that are not sufficiently covered in the enclosed operating manual, you can request additional information from the manufacturer or dealer. The manufacturer's relevant obligations are set out in the warranty card, which contains the complete and binding warranty provisions. The machine is designed to ensure safe operation when used in accordance with the operating instructions. Therefore, before starting the machine for the first time, please read this manual carefully to familiarise yourself with the conditions for proper operation of the machine.

This is to familiarise you with the principles of correct operation of the sprayer and to ensure safe use. It also determines the correct use of warranty rights.

2.

Every user should read this manual thoroughly before starting work.

The operating manual is part of the basic equipment of the machine.

The mounted field sprayer is designed for agricultural agrotechnical treatments in the field of plant protection and foliar fertilisation. Using the sprayer for purposes other than those mentioned above will be considered misuse of the machine and will result in the loss of the warranty. The machine may only be operated by persons familiar with the operating instructions. Familiarisation with the design of the sprayer, careful reading of the operating instructions and compliance with them will ensure safe operation of the sprayer.

2.1. Intended use of the

The mounted field sprayer may only be started, used and repaired by persons familiar with the operation of the device and the cooperating tractor, as well as with the rules for safe operation and maintenance of the machine. The manufacturer is not responsible for unauthorised modifications to the sprayer's design. During operation, only use factory parts manufactured by TOLMET.

REMEMBER

The sprayer is intended for agricultural use only. Use for purposes other than those specified in point 2 shall be considered misuse. Failure to comply with the manufacturer's recommendations regarding operation, maintenance and upkeep of the machine shall also be considered misuse. The manufacturer shall not be liable for any damage resulting from the use of the sprayer for purposes other than those for which it is intended.

REMEMBER

Before operating and using the sprayer, read this operating manual, familiarise yourself with the design of its components, their operation, ranges and adjustment methods, paying particular attention to the information on work safety. It will be too late to do so during operation.

3. Safety of use

3.1. Intended use of the sprayer.

The mounted field sprayer is intended for use in agricultural production only. The sprayer may only be used for plant protection and foliar fertilisation. The machine can only be used with agricultural tractors and must use the tractor's drive via a power take-off shaft, thanks to the use of an articulated telescopic shaft. When lending the sprayer to another person, the operating instructions must be attached to the machine to ensure the safety of the person using the sprayer.

3.2. Potential hazards associated with the operation of the sprayer.

When operating the sprayer in accordance with its intended use, certain hazards to human life and health may arise. In order to avoid them, follow the instructions in the machine's operating manual. Hazards that may endanger the health and life of the operator include:

- rotating articulated telescopic shaft;
- the boom during lifting and lowering;
- field beam during unfolding and folding;
- failure to secure the field beam during transport;
- field beam unfolded while driving;
- suspension of the field beam;
- edges of the boom;
- pressure in the sprayer system;
- sprayer supports;
- risk resulting from loss of stability;
- risk resulting from contact with chemicals used in agricultural treatments;
- risk resulting from negligence in the use of plant protection products;
- hydraulic pressure lines.

3.3. Technical maintenance and safety.

Technical maintenance can be performed when the sprayer is lowered to the ground. If the tractor is connected to the machine, it must be switched off and braked. Use serviceable tools and instruments as well as original materials and parts for maintenance. Use standard safety devices and pins to secure the pins that are part of the machine. Do not use substitute safety devices such as screws, rods, wires, etc., which may cause damage to the tractor or sprayer during operation or transport, posing a safety hazard.

3.4. Transport on public roads

In accordance with road safety regulations (Regulation of the Minister of Infrastructure of 31 December 2002, Journal of Laws No. 32 of 2002, item 262)

A combination consisting of an agricultural tractor and an agricultural machine attached to it must meet the same requirements as those imposed on the tractor itself.

WARNING!
The combination (tractor + machine), as a part of the vehicle protruding beyond the rear side outline of the tractor and obscuring the rear lights of the tractor, poses a danger to other vehicles on the road.

REMEMBER!
It is prohibited to drive the unit (tractor + machine) on public roads without appropriate markings. When driving a tractor with a sprayer on public roads, comply with all traffic regulations applicable to this type of vehicle.

ATTENTION!
The boom must be folded into the transport position before driving on public roads.

Sprayers connected to agricultural tractors require the following when transported on public roads:

- marking with warning signs with white and red stripes;
- equipment with lights;
- marking of the machine protruding from the sides of the tractor (white front position lights);
- repeated rear lights of the tractor (combined lights and red reflective lights);
- marking with a triangular sign distinguishing slow-moving vehicles;
- do not exceed the speed limit during transport, which is:

- on smooth (asphalt) roads up to 20 km/h,
- on dirt or cobbled roads 6-10 km/h
- on bumpy roads no more than 5 km/h

ATTENTION!

The speed must be adjusted to the condition of the road and the prevailing conditions.

CAUTION!

Be particularly careful when passing, overtaking and on bends.

CAUTION!

The maximum width of a machine that can travel on a public road is 3.0 m.

3.5. Working with plant protection products.

Special precautions must be taken when working with plant protection products. The greatest risk associated with working with plant protection products and fertilisers occurs:

- when filling the tank;
- adding and preparing substances;
- when performing the treatment
- during adjustment;
- when rinsing and drying the tank;
- when replacing plant protection products;
- during operation;
- during the destruction of packaging.

In order to maintain safety when working with plant protection products, you should:

- always wear protective clothing (the choice of appropriate protective clothing depends on the toxicity class of the preparation) protective clothing should include:
  - rubber boots
  - gloves
  - a coat
  - hat
  - mask or half mask
- do not work with plant protection products on an empty stomach;

- do not eat or drink while filling, preparing substances or performing the treatment;
- do not fill the tank with water-contaminating devices;
- do not perform the treatment under the influence of alcohol or consume alcohol while operating the sprayer;
- residual liquid must not be discharged into open waters or biological sewage treatment plants;
- residual working liquid should be diluted and sprayed on farmland or poured from the tank into a sealed container and taken to a point that deals with the disposal of this type of substance;
- the working solution may be prepared at a distance of at least 50 metres from wells or water reservoirs from which water is used for consumption;
- only adults familiar with the instructions for use may work with plant protection products;
- in case of poisoning, immediately contact a doctor, specifying which agent has been absorbed (provide the active substance);
- the sprayer operator must strictly follow the instructions on the plant protection product packaging;
- After treatment, wash your hands, face and entire body, rinse your mouth and change your clothes.

Handling plant protection products before preparing the working solution:
- when purchasing plant protection products, make sure that the packaging is undamaged and that the label is legible;
- during transport, secure the product with additional packaging;
- plant protection products must not be transported with foodstuffs, agricultural produce or animals;
- use the product in accordance with the instructions;
- check the expiry date of the product;
- check the prevention period (the period during which contact with plants on which the product has been applied is prohibited);
- check the toxicity class;
- check the active substance in case of poisoning.

Environmental protection:
- spraying may only be carried out in appropriate weather conditions, when the wind speed does not exceed 3 m/s;
- do not spray flowering plants when using a substance that is toxic to bees;
- always observe the protection periods for bees and other living organisms;
- always work with an efficient sprayer without defects;
- dispose of any remaining working liquid at collection points or dilute and spray it on farmland;
- do not use plant protection products within 50 metres of water intakes;
- do not discharge residual working fluid into water reservoirs;
- do not contaminate nearby plantations as a result of the working liquid being carried by the wind;
- do not use plant protection products within 20 metres of apiaries, nature reserves, herb plantations, allotments or sites where protected plant species are found.

3.6.

The mounted field sprayer may only be operated by persons authorised to drive an agricultural tractor and by persons who have read the operating instructions.

It is forbidden for unauthorised persons, especially children, to be present while the machine is in operation.

In order to carry out any repairs or adjustments, switch off the engine, remove the key from the tractor ignition, lower the sprayer and apply the tractor handbrake.

Before starting work, carefully check the technical condition of the machine and the tractor.

Check the sprayer for leaks.

Spraying should be carried out in appropriate weather conditions recommended by the manufacturer of the plant protection product. It is recommended that the wind speed does not exceed 3 m/s.

Comply with the regulations governing the use of plant protection products, which stipulate that spraying must be carried out 5 metres away from public roads, excluding municipal roads. It is prohibited to spray at a distance of less than 20 metres from residential buildings or livestock buildings.

In the event of a leak in the sprayer during operation, the treatment should be stopped immediately and the fault rectified.

No unauthorised persons may be present in the work area during the treatment.

After each treatment, the sprayer must be washed and rinsed; this must also be done when changing the plant protection product.

It is forbidden to transport people on the sprayer.

It is forbidden to enter the sprayer tank.

It is forbidden to operate the sprayer at an angle exceeding 8.5 degrees.

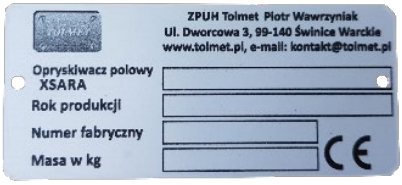
After finishing work, fold and secure the boom.

3.7. Safety when working with a telescopic articulated shaft :

When working with a telescopic articulated shaft, remember to:

- use the roller recommended by the manufacturer;
- only use the shaft with a full set of guards;
- secure the guard against rotation with a chain
- secure the shaft;
- when engaging the drive, check that there are no bystanders nearby;
- before installing the shaft, switch off the tractor engine, remove the key from the ignition and apply the handbrake;
- make sure that the shaft length is appropriate (no less than 25 cm or 1/3 of the shaft length; the parts must overlap);
- use a PTO shaft with the appropriate torque;
- do not use a shaft that is in poor technical condition;
- do not start the PTO shaft abruptly;
- clean and lubricate the shaft before attaching it;
- after finishing work, put the roller back in its designated place.

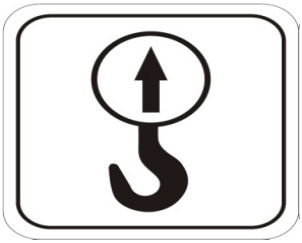
3.8. safety signs

No.	Pictogram	Meaning
1		Nameplate
2		Before starting work, read the operating instructions
3		Caution. Before performing operating the vehicle, switch off the engine and remove the key from the ignition
4		Keep a safe distance from the machine

5		Risk of crushing. Do not reach into the beam folding area
6		Risk of crushing your hands. Do not reach into the crushing area if parts may move.
7		Danger of high-pressure liquid ingress. Refer to the operating instructions for maintenance work.

8		Read the instructions for use of the agents.
9		Do not enter the tank
10		Rotating shaft

11		No eating, drinking or smoking during work
12		Danger of arms or upper body being pulled in or caught by driven, unprotected machine parts!
13		It is forbidden to enter the interior of the sprayer.
14		No drinking water

15		Hands must be washed
16		CE safety mark
17		Permissible transport speed symbol
18		It is prohibited to drive on public roads with a tractor with a machine exceeding 3 m in transport width.
19		Pictogram of places for loading the machine onto means of transport.

20		Sticker with the name and model of the sprayer
21		Put on a protective mask!
22		Wear protective clothing!
23		Wear safety goggles!

24		Wear protective footwear!
25		Wear protective gloves!

Table 1. Table of pictograms.

4. Residual risk

4.1. Description of residual risk

Residual risk most often results from incorrect behaviour on the part of the sprayer operator due to carelessness or ignorance. The greatest danger occurs in the following situations:

- operation of the sprayer by minors and persons unfamiliar with the operating instructions;
- operation of the machine by persons under the influence of alcohol or other intoxicating substances;
- using the sprayer for purposes other than those described in the operating instructions;
- standing between the tractor and the machine while the tractor engine is running;
- bystanders, especially children, standing near the sprayer while it is in operation;
- cleaning the sprayer during operation;
- manipulating moving parts of the machine during operation;
- checking the technical condition of the sprayer.

When presenting the residual risk of the sprayer, it is treated as a machine that was designed and manufactured according to the state of the art in the year of its manufacture, in compliance with basic health and safety principles.

WARNING!
There is a residual risk if the specified recommendations and instructions are not followed.

4.2. residual risk assessment.

By following the recommendations below, you can minimise the occurrence of residual risk:

- following the safety rules described in the operating instructions;
- read the operating instructions carefully;
- do not put your hands in dangerous and prohibited areas;
- do not operate the sprayer in the presence of bystanders, especially children;
- maintenance and repair of the sprayer only by appropriately trained persons;
- operate the sprayer only by persons who have been previously trained and familiarised with the operating instructions;
- securing the sprayer against access by children;
- the sprayer should only be operated by able-bodied persons who are not under the influence of intoxicants.

5. How to order spare parts

Spare parts for mounted field sprayers can be ordered by telephone or post, providing the following information:

1. The exact address of the person placing the order.
2. The name, symbol and serial number of the machine, year of manufacture.
3. The exact name of the part.
4. The number of items.
5. Payment terms.
   Parts are shipped by courier or collected in person by the customer from the manufacturer or the nearest TOLMET representative.

All spare parts are available on the website

www.tolmet.pl

6. Light signalling (optional)

Before driving on public roads, a warning sign with red and white stripes, signal lamps and a holder for a sign distinguishing slow-moving vehicles must be attached to the beam frame. The power cable must be connected to the tractor's electrical system, and a triangular distinguishing sign must be mounted in the holder. The warning sign with marking lights is an optional extra for the sprayer and is supplied on request.

7. Construction of the mounted field sprayer

Xsara sprayer – hydraulically extendable boom

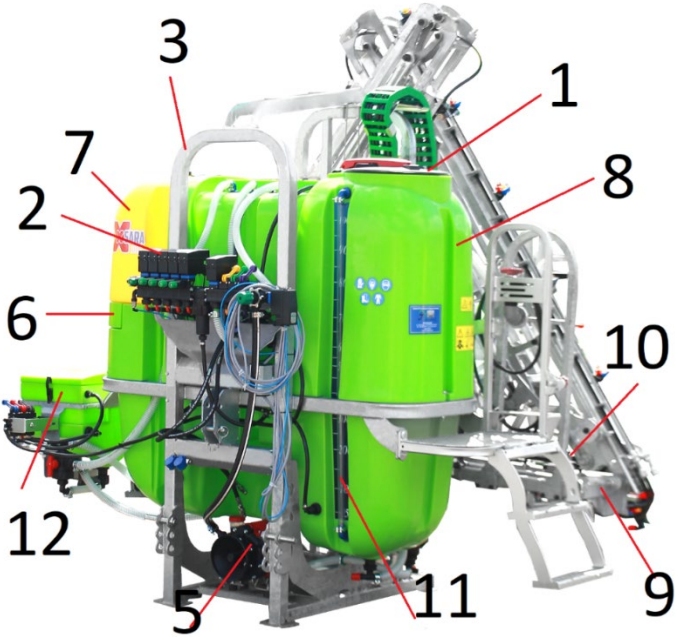


Fig. 2. Construction of the Xsara mounted sprayer.

1- Inlet, **2 –** control distributor, **3 –** frame, **4 –** electro-hydraulic block, **5 –** pump, **6 –** hand washing water tank, 7 – system washing tank, **8 –** main tank, 9 – boom, 10 – hydraulic cylinder, 11- working fluid level indicator, **12-** side diluter (optional)

The XSARA sprayer consists of the following components:

- Three-point suspension system;
- Frame;
- Tank;
- Pump;
- Valve section;
- Hydraulic boom with hydraulic cylinders and electro-hydraulic block;
- Hydraulic stabilisation of the field boom;

- System washing tank (optional 400 l, 600 l, standard 800 l, 1000 l, 1200 l);
- Hydrant.

Fig. 3. Three-point suspension system

7.1. three-point suspension system

The three-point suspension system consists of lower hitches and a stand. This system allows for easy and quick connection of the machine to any agricultural tractor equipped with a three-point suspension system. Thanks to this solution, the sprayer can be lifted with a tractor lift for transport and working height adjustment.

7.2. Frame

The frame is designed to ensure the sprayer's strength and lightness. The main elements of the frame are bent profiles and metal sheets. The entire frame of the sprayer has been hot-dip galvanised, which ensures its durability and corrosion resistance.

7.3. Tank

The tank is one of the main parts of the sprayer and can be selected in size according to the customer's needs. The tank is made of plastic, which makes it lightweight and durable at the same time. The tank also has a measuring cup, which allows you to check the amount of working fluid in the tank.

Fig. 4. Tank

7.4. Hand washing tank

Each sprayer is equipped with an additional tank (with a plastic tap) for clean water for hand washing.

Fig. 11. Hand washing water tank

7.5. Tank for washing the system

The tank for clean water for washing the system is used as standard in sprayers with a capacity of 800 litres and above, and optionally in tanks with a capacity of 400 litres and 600 litres. It allows for partial and complete washing of the sprayer system after work is completed.

Fig. 4.2. Tank for system washing water

7.6. Operation of the solid fertiliser diluter

Fill the main tank with running water, checking its level using the red ball on the gauge (Fig. 5) located on the right side of the tank. When the water reaches the desired level, disconnect the water source. Next, pour the appropriate amount of solid fertiliser into the sieve located in the filling opening (a larger diameter opening with a dilution nozzle) in the main tank. Then close the lid tightly. To dilute the fertiliser, use the yellow lever (Fig. 6) located on the control distributor. The liquid that will flow through the nozzle will dilute the solid fertiliser poured into the sieve. This process should take a few minutes, and its duration depends on the composition of the diluted chemicals.

Finally, switch off the lever.

Fig. 6. Distributor functions

Fig. 5. Water meter of the main tank

NOTE: Check that the solid fertiliser has been thoroughly dissolved by the diluter and that there are no residues in the sieve. Incomplete dissolution will affect the proportions of the working fluid.

Fig. 7. Functions of the side diluter

7.7. Side diluter (optional)

The side dilution tank is available as an optional component of the sprayer. It facilitates work as chemicals can be added from ground level. To open the dilution tank cover, unlock the cover lock. Inside the diluter there is a drain with a sieve (Fig. 8, item 3) and a rotating nozzle (Fig. 8, item 4) for washing fertiliser bottles. Inside, at the rear of the wall, there is a multi- e hydraulic agitator (Fig. 8, point 2) and a liquid inlet (Fig. 8, point 1). Add the measured amount of fertiliser or plant protection products to the diluter. Then use the purple lever (Fig. 9) to supply the side diluter and the blue lever (Fig. 7) to fill the side diluter with liquid from the main tank, turn on the red lever (Fig. 7) so that the mixer mixes the resulting substance. If using solid fertilisers, wait until they dissolve. Then move the four-way valve down (Fig. 10). In this position, the pump draws liquid from the side diluter. To wash the bottle after using chemicals, place it on the nozzles (Fig. 8, point 4) located in the central part of the side diluter and then use the silver lever (Fig. 7). Do not fill the side diluter with too much chemical.

*Fig. 8. Side diluter **1**- liquid inlet, **2**- hydraulic agitator, **3**- drain with sieve, **4**- rotary nozzle*

Fig. 9. Distributor func-

Finally, turn off all levers. If a large dose of the chemical is to be used, the process should be divided into a suitable number of stages.

Four-way valve arrow set:

- Downwards – liquid intake from the side diluter
- Up - liquid intake from the main tank
- Right - liquid intake from the clean water tank for washing the sprayer system.

Fig. 10. Operation of the four-way valve

7.8. pump

The sprayer uses either a PU2/120 diaphragm pump or a PU-3/130 diaphragm pump. The choice of pump used in the sprayer depends on the customer's preferences. These pumps have been specially designed and manufactured for use in field sprayers. These pumps guarantee the correct working pressure of the liquid, and thus the performance of a precise agrotechnical operation such as spraying. The operation and construction of the pump are described in more detail in the diaphragm pump operating manual.

Fig. 11. PU-2/120 diaphragm pump

Fig. 12. PU-3/130 diaphragm pump

Fig. 13. PU-3/140 diaphragm pump

7.9. Valve section – distributors

A valve section is used to control the operation of the sprayer, allowing for precise control of the amount of substance to be sprayed on a given area, as well as switching the appropriate section of the boom on and off. The valve section also allows you to control additional functions such as the agitator, diluter or tank rinsing. Depending on your preferences , the sprayer can be equipped with a basic Gran distributor, an

expandable Duro distributor, or a constant pressure Fermo distributor with the option of using coils for control via controllers.

Fig. 14. GRAN 3 distributor

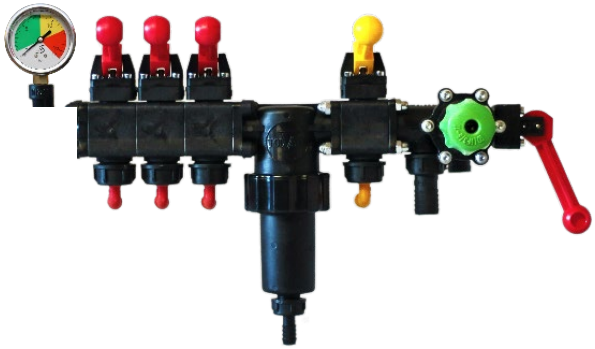


Fig. 15. DURO 3 distributor

Fig. 16. FERMO 3 constant pressure distributor

7.10. Calibration of the FERMO constant pressure valve

Use clean water for calibration!

Adjusting pressure compensation in the FERMO constant pressure distributor

1. Tighten all pressure compensation knobs (4) clockwise.
2. Open the levers for each section (2) (upper position).
3. Open the main valve (1) (upper position)
4. Close the diluter valve (5).
5. Switch on the PTO (constant speed, the same as will be used for spraying).
6. Adjust the pressure using the knob (3) so that the pressure gauge reads 3 bar.
7. Close one section with the lever (2) and set the pressure to 3 bar using the small pressure compensation knob located under the lever. Then open this section and proceed to set the next one in the same way.
8. The distributor is correctly adjusted if the pressure gauge shows 3 bar regardless of the number of sections open.

Fig. 17. QR code

7.11. Controls

Control Panel 1 – functions: on/off
Control Panel 2 – functions: on/off; pressure adjustment, built-in pressure gauge and panel backlight
Control Panel 4 – functions: on/off; on/off extreme sections; pressure adjustment; built-in pressure gauge and panel backlight
Control Panel 7 – functions: on/off; on/off individual sections; pressure adjustment; built-in pressure gauge and panel backlight
Hydro Panel – controller for extending the hydraulic boom. It is connected to CP2, CP4 and CP7 panels when using a hydraulic boom.
Hydro Panel 1 – functions: on/off; full control of the field boom.

	Name	Turn on/Turn on distributor	Switch on/off outer sections	Switch individual sections on/off	Pressure gauge + pressure adjustment	Field bar control	Indicator light
	**Control Panel 1**	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**

	Control Panel 2	YES	NO	NO	YES	NO	YES
	Control Panel 4	YES	YES	NO	YES	NO	YES
	Control Panel 7	YES	YES	YES	YES	NO	YES
	Hydro Panel	NO	NO	NO	NO	YES	NO
	Hydro Panel 1	YES	NO	NO	NO	YES	NO
	Alfa 100	YES	YES	YES	YES	YES	NO
	Alfa 200	YES	YES	YES	YES	YES	YES
	Hydro Panel CP 2	YES	NO	NO	YES	YES	YES
	Hydro Panel CP 7	YES	YES	YES	YES	YES	YES

7.12. Hydraulically folding field beam X

The X field boom is unfolded and lifted using the Hydro Panel from the tractor cab. Its functionality is ensured by appropriate hydraulic cylinders and a scissor or manual system that allows the sprayer lance to unfold.

Fig. 17. Hydraulic field boom X - folded

7.13. suction device

The suction device is used to suck liquid plant protection products from large tanks (e.g. Mauzer) or pools when there is no water hydrant nearby. If the sprayer is equipped with a filter or a three-way valve, the suction device is connected in place of the shut-off valve knob (Fig. 19). If the sprayer has a four-way valve, the suction device is connected in place of the upper ø32 elbow, and then the four-way valve knob should be turned upwards.

Fig. 18. Suction device

Fig. 19. Suction filter with shut-off valve

Fig. 18a. Connecting the suction device in place of the shut-off valve knob

7.14. Sprayer system cleaning functions equipped with a side diluter

Fig. 20. Four-way valve operation

To wash the system, close the agitators so that no more water is added to the tank, turn the main valve to the position for drawing water from the main tank - the boom is washed, and the valve coils from the boom on the control panel must be open. However, to wash the main tank, turn off the field boom using the switch on the panel, turn on the purple lever (Fig. 9) supplying the side distributor and the green lever (Fig. 9) responsible for washing the main tank. If you want to wash the entire system at the same time, turn on the coils on the control panel. After completing the rinsing process, drain the remaining water using the drain valve or spray it out using the field bar. Finally, turn off all levers and open the valves shutting off the water supply to the agitators. Switch the valve to draw water from the main tank.

Four-way valve arrow set:
Down - liquid intake from the side diluter
Up – liquid intake from the main tank
Right – liquid intake from the clean water tank for washing the sprayer system

7.15. Sprayer system washing functions

Before cleaning the system, close the agitators to prevent water from being added to the tank. Then turn the main valve to the position for drawing water from the main tank (Fig. 21), which will result in the field boom being washed. If you want to wash the main tank, activate the green lever (Fig. 6) responsible for washing the main tank. After completing the cleaning of the system, turn off the levers and drain the remaining water using the drain valve or spray it out using the field boom. Finally, open the valves that shut off the water supply to the agitators. Switch the valve to draw water from the main tank.

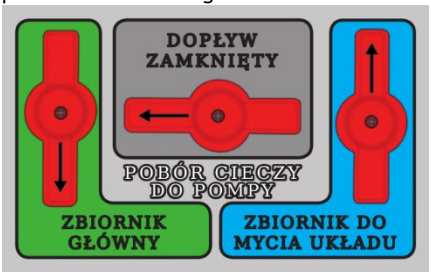


Fig. 21. Operation of the three-way valve.

The arrow on the three-way valve knob is set:

- Upwards – liquid intake from the clean water tank for washing the sprayer system
- Left - liquid intake blocked, impossible
- Down – liquid intake from the main tank.

8. Technical characteristics of the sprayer

Symbol XSARA	Tank capacity	Working width of boom
612	600	12
615	600	15
812	800	12
815	800	15
1012	1000	12
1015	1000	15
1212	1200	12
1215	1200	1215

Table 2. Table for interpreting sprayer symbols

Characteristics of the 600 l sprayer.

Specification	Unit of measu-rement	600 l sprayer	
Symbol	-	612	615
Type	-	Mounted	
Overall dimensions of the sprayer			
Length	mm	1200	1400
Width	mm	2650	2850
Height	mm	1750	2100
Overall dimensions in working position			

Length	mm	1200	1400
Width	m	12	15
Height	mm	1750	2100
Sprayer weight			
Empty weight	kg	250	355
Permissible weight	kg	290	395

Table 6. Characteristics of the 600 l sprayer.

Characteristics of the 800 l sprayer.

Specification	Unit of measu-rement	800-litre sprayer	
Symbol	-	812	815
Type	-	Mounted	
Overall dimensions of the sprayer			
Length	mm	1300	1500
Width	mm	2650	2850
Height	mm	2100	2100
Overall dimensions in working position			
Length	mm	1300	1500
Width	m	12	15
Height	mm	2100	2100
Sprayer weight			
Empty weight	kg	386	477
Permissible we-ight	kg	426	517

Table 7. Characteristics of the 800 l sprayer.

Characteristics of the 1000 l sprayer.

Specification	Unit of measu-rement	1000 l sprayer	
Symbol	-	1012	1015
Type	-	Mounted	
Overall dimensions of the sprayer			
Length	mm	1300	1500
Width	mm	2650	2850
Height	mm	2100	2400
Overall dimensions in working position			
Length	mm	1300	1500
Width	m	12	15
Height	mm	2100	2400
Sprayer weight			
Empty weight	kg	400	491
Permissible weight	kg	450	541

Table 8. Characteristics of the 1000 l sprayer.

Characteristics of the 1200 l sprayer.

Specification	Unit of measu-rement	1200 l sprayer	
Symbol	-	1212	1215
Type	-	Mounted	
Overall dimensions of the sprayer			
Length	mm	1300	1500
Width	mm	2650	2850
Height	mm	2400	2400
Overall dimensions in working position			
Length	mm	1300	1500
Width	m	12	15
Height	mm	2400	2400
Sprayer weight			
Empty weight	kg	443	546
Permissible weight	kg	793	596

Table 9. Characteristics of the 1200 l sprayer.

Characteristics of the diaphragm pump

Specification	Unit of mea-surement	Pump	
Symbol	-	PU2/120	PU3/140
Type	-	Diaphragm	
Overall dimensions of the pump			
Length	mm	400	420
Width	mm	300	420
Height	mm	350	310
Features			
Capacity	l/min	118	134
Maximum pressure	MPa	1.5	15
Direction of rotation	-	any	any
Rotational speed	rpm	540	540
Oil quantity	litres	0.3	1.1
Oil grade	-	CLP 220	LUX 10
Pump weight			
Weight	kg	10.1	15.8

Table 10. Characteristics of PU-2/120 and PU-3/140 diaphragm pumps.

Characteristics of the field boom

Specification	Unit of measurement	Field boom					
Working width	m	6	8	10	12	14	15
Section width	mm	1100-995-1650-995-1110	1880-1850-1650-1850-1880	2080-1850-1650-1850-2080	2350-2240-2560-2240-2350	1355-1954-1830-2560-1830-1954-1355	1855-1954-1830-2560-1830-1954-1855
Sprayer spacing	mm	500					
Height adjustment range	mm	500-1100	500-1100	500-1100	500-1250	500-1600	500-1600
Beam lifting mechanism	Manual winch						

Table 11. Characteristics of the field beam.

9. Delivery and loading onto means of transport

The sprayer is delivered to the user in a partially disassembled state. The degree of disassembly depends on the means of transport used. Use the frame elements as attachment points for loading and unloading.

10. Operation and use

10.1. Preparation for operation

When preparing the sprayer for operation, check its technical condition, the tightness of the system and the efficiency of the pump.

In addition, you should:

- flush the sprayer during the first start-up by unfolding the boom and switching on the pump drive;
- check the condition of the screw connections;
- check the condition of the nozzles;
- check the condition of the hydraulic hoses for visible leaks;
- check the oil level in the pump;

- Check the technical condition of the tractor.
- check the technical condition of the telescopic articulated shaft.

10.2. Attaching the sprayer to the tractor

In order to connect the sprayer to the tractor correctly and safely, it should be placed on a hard and level surface.

When connecting the sprayer to the tractor, perform the following steps:

- reverse the tractor to a distance that allows the sprayer hitch to be connected to the tractor's lower links;
- turn off the tractor engine, remove the key from the ignition and apply the handbrake;
- attach the tractor drawbars to the sprayer hitch;
- tighten the side drawbars to compensate for any swaying;
- connect the hydraulic hoses;
- connect the pump shaft to the tractor's PTO shaft using a telescopic articulated shaft;
- level the sprayer.

10.3. Filling the tank

Before starting work in the field with the sprayer, fill the tank with water containing a diluted plant protection product or fertiliser. To fill the tank:

- unscrew the tank cap;
- pour water only through the sieve;
- do not allow the hose to come into contact with the working fluid.

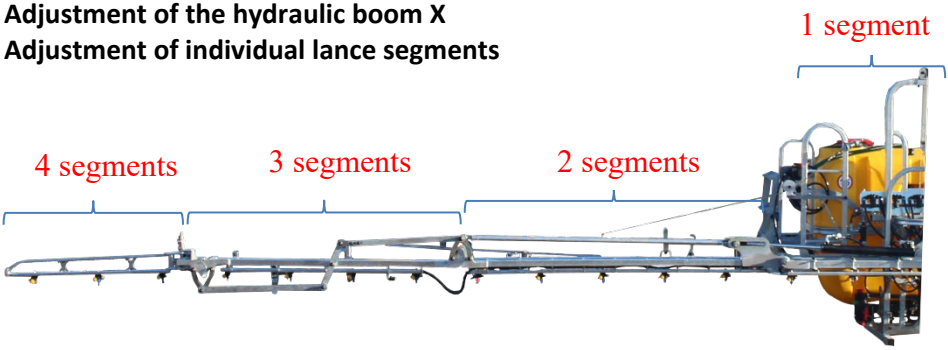
10.4. Longitudinal and transverse levelling

The sprayer should be adjusted in two directions

- longitudinally;
- in the transverse direction.

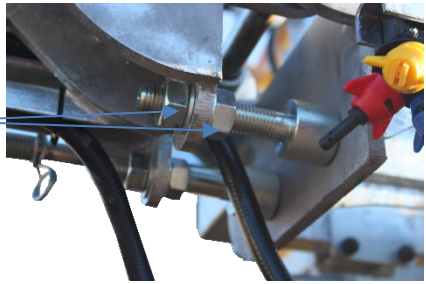
Longitudinal adjustment involves adjusting the lower links of the tractor's three-point hitch system so that the links are at the same distance from the ground. Transverse adjustment of the sprayer is performed using the central bolt. To adjust the sprayer longitudinally, lift the sprayer above the ground and adjust the length of the central screw so that the frame is perpendicular to the ground surface. Adjusting these planes ensures that the nozzles work correctly, and thus that the treatment is performed precisely.

Adjustment of the hydraulic boom X
Adjustment of individual lance segments

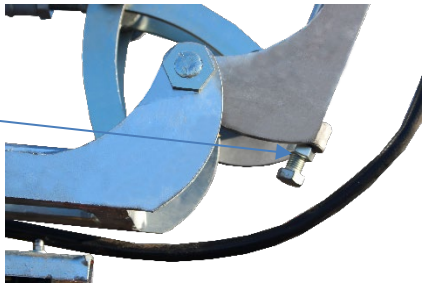


Although the lance has been factory-adjusted, its segments may need to be readjusted in the future. Adjustment is performed in three segments on each side of the field bar by tightening or loosening the levelling screws.

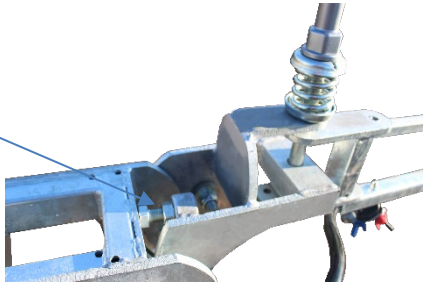
Adjustment of the 2nd segment of the lance



Adjustment of the 3rd segment of the lance



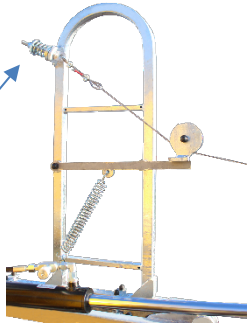
Adjustment of the 4th segment of the lance



Adjustment of the smooth lance unfolding mechanism

The lance is equipped with a fall damping system. To adjust the shock absorber, remove the cover and then tighten or loosen the screw located on the shock absorber.

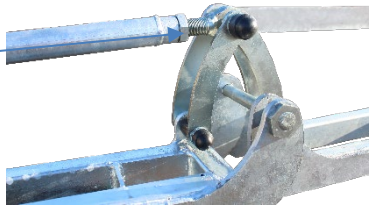
Shock absorber adjustment



Adjustment of the lance scissor mechanism

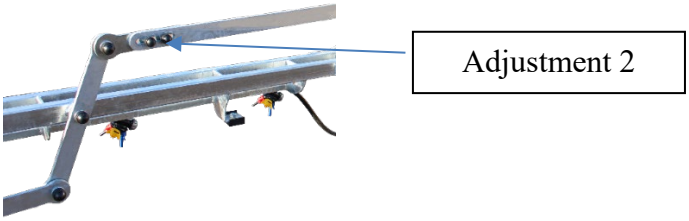
The field lance is unfolded using actuators and a scissor mechanism, which allows the 3rd and 4th segments to be unfolded using one actuator per side. This mechanism requires proper adjustment by tightening the screws accordingly.

Adjustment 1



Adjustment 1.

Turn the screw to level the lance.

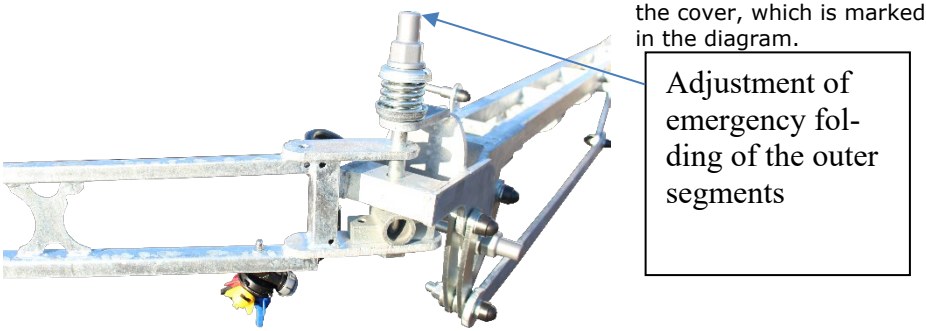


Adjustment 2.

Remove the screw covers and then move them to a position that allows the lance to unfold completely and freely.

Adjustment of the emergency folding force of the outer segments of the boom

When an obstacle is encountered, the outer segments of the field boom can fold. This prevents damage to the field boom in the event of a collision with, for example, a pole or tree. The sensitivity of this system is adjusted using the screw located under the cover, which is marked in the diagram.



Unfolding the hydraulic boom

In order to unfold/fold, raise/lower or adjust the level of the boom, set the appropriate option on the Hydro panel and then move the lever responsible for the operation of the hydraulic pump in the tractor.

CAUTION!

When unfolding and folding the field boom, there is a risk of cutting or crushing parts of the body. Please exercise extreme caution.

CAUTION!

When unfolding and folding the field beam, ensure that there are no bystanders nearby who could be exposed to impact, cuts or crushing.

10.5. Operating the distributor

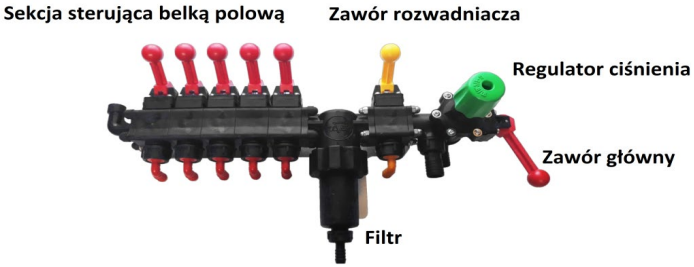


Fig. 22. Distributor design.

The distributor is used to control the operation of the sprayer. The distributor consists of the following components:

- main valve;
- pressure regulator;
- dilution valve;
- control section for the field boom.

The main valve is responsible for cutting off the flow of working fluid and directing it directly to the tank.

The pressure regulator is responsible for regulating the working pressure, which is one of the most important parameters to set when determining the working fluid output.

The diluter valve is used to switch the plant protection product diluter on and off. The boom control section is used to control the operation of the boom. In this section, it is possible to activate a selected section of the boom in order to avoid overlapping of the working fluid.

10.6. Controller operation

HYDRAULICALLY FOLDING BOOM CONTROL

The field boom is controlled from the tractor cab using the Hydro Panel. Use the knob to select the desired function and then activate it using the hydraulic lever in the tractor cab. The LED indicates the selected field boom function

.

1. No function; 2. Unfolding/folding the left lance; 3. Unfolding/folding the right lance;
4. Unfolding/folding both booms; 5. Adjusting the height of the boom; 6. Levelling.

CONTROL OF THE DISTRIBUTOR FROM THE TRACTOR CAB

The distributor control functions are described on the basis of the most advanced Control Panel 7 controller

The distributor control functions are described based on the most advanced Control Panel 7 controller.

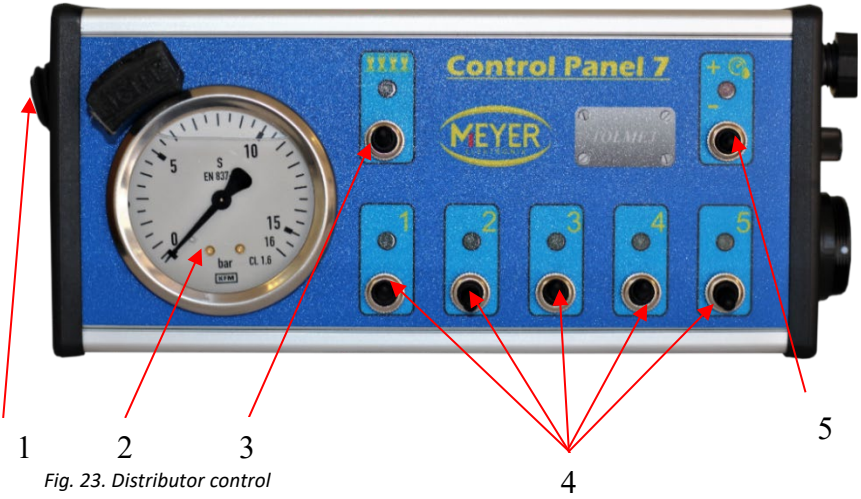


Fig. 23. Distributor control

1. Panel backlight switch; 2. Pressure gauge; 3. Switch all sections on/off;
4. Switch individual sections on/off; 5. Pressure adjustment.

10.7. Pump operation

To ensure proper pump operation, remember to check the oil level in the pump and check the pressure in the air chamber. Too low an oil level in the pump may cause damage to the pump, and too high a level will cause oil to leak through the oil filler. The correct pressure in the air tank ensures stable pump operation. A symptom of too low pressure is a vibrating pressure gauge needle.

Fig. 24. PU-2/120 diaphragm pump

10.8. Filter maintenance

Fig. 25. Suction filter.

Fig. 25a

The filter is responsible for filtering the working fluid and also has the option of draining the working fluid. The filter has a reusable filter cartridge inside. To clean the filter, it is not necessary to empty the sprayer tank of working fluid, as the filter has a shut-off valve. To shut off the flow, turn the shut-off valve according to the markings on the knob, then unscrew the green nut (Fig. 25a) and remove the filter cover. To remove the cartridge, pull it out as it is pressed in. The next step is to clean the filter cartridge and reassemble everything in reverse order.

The filter also has a working fluid drain. To drain the fluid, unscrew the red knob at the bottom of the filter. To close the drain again, turn the knob.

Fig. 26. Line filter

The filter has a reusable filter cartridge inside. To unscrew the filter, unscrew the nut and remove the line filter housing. When cleaning the filter, pour out the water inside the filter. To remove the cartridge, pull it out as it is press-fit. The next step is to clean the filter cartridge and reassemble everything in reverse order.

Fig. 27. Distributor pressure filter

The distributor filters are responsible for cleaning the liquid that is fed to the agitators located at the rear of the main tank. At the distributor filter, unscrew the supply hose, then use a wrench to unscrew the nut. To remove the cartridge, pull it out as it is press-fitted. The next step is to clean the filter cartridge and reassemble everything in reverse order. The final step is to connect the agitator supply hose.

10.9. Sprayer operation

No additional tools are required to operate the heads or individual sprayers, as all components are assembled using caps or nuts that can be unscrewed by hand. One of the possible tasks that may occur during the use of the sprayer is the need to clean the strainers located in the frames. To clean the strainers, unscrew the cap and remove the strainer. The order of assembly of the individual components is shown in the photo above.

Fig. 28. Assembly of individual spray head components.

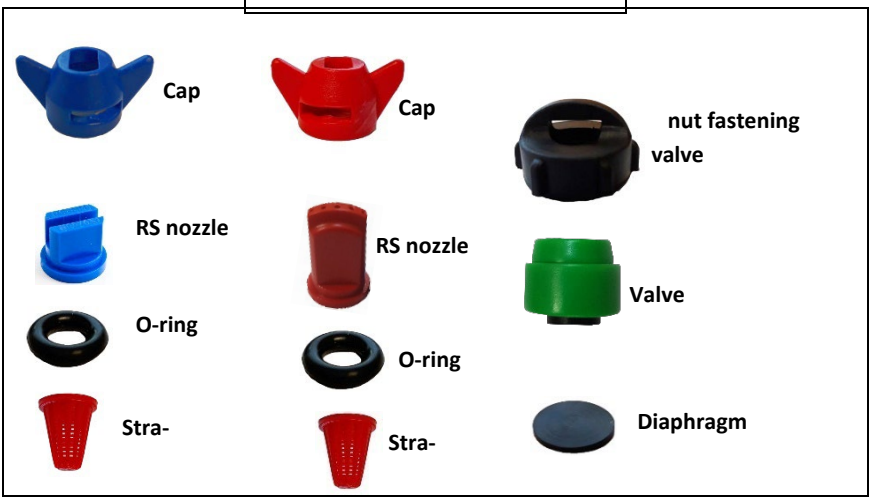


Fig. 29. Assembly sequence of individual nozzle and valve components.

11. Setting the required dose

In order to perform precise and effective spraying, set the dose to be applied to a given area. The dose of is taken as the amount of working fluid used, given in litres [l] per unit of area, i.e. hectare [ha].

There are three ways to set the dose rate:

- changing the spray nozzle;

- changing the driving speed;
- changing the liquid pressure.

The standard equipment includes a single sprayer fitting. The sprayer is replaced by changing the nozzle to another one.

Fig. 30. Single nozzle.

In the triple head, the spray nozzles are changed by turning the head. The head is equipped with two RS nozzles and one RSM nozzle for foliar fertilisers. Setting the head in the intermediate position cuts off the supply of working fluid to the nozzle.

Fig. 31. Triple nozzle head. 1-RS 02 nozzle; 2-RS 03 nozzle; 3-RSM nozzle

11.1. Recommendations for selecting a nozzle for the type of spraying

When selecting the appropriate nozzle, first follow the recommendations on the herbicide label. Failure to follow the recommendations may result in reduced effectiveness of the treatment. If there is no information on the packaging, follow the recommendations in the table below

Type of treatment	Type of spraying	Nozzle type	Type of droplets produced	Comments

Herbicide spraying (soil) and mineral fertilisers	Soil preparations	Sprayers with a flow rate of 1.5 l at a pressure of 3 bar	Large droplets	Even distribution of the preparation over the entire soil surface
Foliar sprays	Foliar preparations	Sprayers with a flow rate of 1.0 l at a pressure of 3 bar	Small droplets that do not run off the leaves	Even distribution of the preparation over the entire surface of the leaves
Insecticide spraying	Insecticides	Sprayers with a flow rate of less than 1.0 l at a pressure of 3 bar	Small droplets	Prevent the working fluid from collecting on the leaves
Fungicide spraying	Fungicides	Swirl nozzles	Small droplets	Working fluid getting under the leaves

To select the appropriate driving speed, pressure and working fluid output, use the table below:

Colour according to ISO	Pressure [bar]	Nozzle output [l/min]	Working fluid quantity [l/ha] at a distance of 50 cm between nozzles for different speeds [km/h]							
			4.0	5.0	6.0	7.0	8.0	9.0	10	12
Yellow	2.0	0.65	195	156	130	111	98	87	78	65
	2.5	0.72	216	173	144	123	108	96	86	72
	3.0	0.79	237	190	158	135	119	105	95	79
	3.5	0.85	255	204	170	146	128	113	102	85
	4.0	0.91	273	218	182	156	137	121	109	91
Blue	2.0	0.96	288	230	192	165	144	128	115	96
	2.5	1.08	324	259,	216	185	162	144	130	108
	3.0	1.18	354	283	236	202	177	157	142	118
	3.5	1.27	381	305	254	218	191	169	152	127
	4.0	1.36	408	326	272	233	204	181	163	136
RSM nozzle Orifice 1	2.0	0.62	186	155	124	108	93	83	74	62
	3.0	0.80	240	200	160	140	120	108	96	80
	4.0	0.95	285	237	190	166	142	128	114	95
	5.0	1.06	318	265	212	185	159	143	127	106

For example, if the recommendations for the product used for agrotechnical treatment say to use a yellow nozzle and the amount of liquid used per hectare should be approximately 200 litres per hectare, set the working pressure to 3.0 bar and maintain a driving speed of 5 km/h. With these settings, we will use 190 litres of liquid per hectare. You can also set the pressure to 3.5 bar, in which case we will use 204 litres of liquid per hectare, but remember about headlands when passes overlap. The example is shown in the table below:

02	80	2	BG	0,65	156	130	111	98	87	78	65	56	49	43	39
		2,5	G	0,73	175	146	125	110	97	88	73	63	55	49	44
		3	G	0,80	192	160	137	120	107	96	80	69	60	53	48
		3,5	G	0,86	206	172	147	129	115	103	86	74	65	57	52
		4	Ś	0,92	221	184	158	138	123	110	92	79	69	61	55
		4,5	Ś	0,98	235	196	168	147	131	118	98	84	74	65	59
		5	Ś	1,03	247	206	177	155	137	124	103	88	77	69	62
		6	Ś	1,13	271	226	194	170	151	136	113	97	85	75	68
03	50	2	BG	0,97	233	194	166	146	129	116	97	83	73	65	58
		2,5	BG	1,08	259	216	185	162	144	130	108	93	81	72	65
		3	G	1,19	286	238	204	179	159	143	119	102	89	79	71
		3,5	G	1,28	307	256	219	192	171	154	128	110	96	85	77
		4	Ś	1,37	329	274	235	206	183	164	137	117	103	91	82
		4,5	Ś	1,46	350	292	250	219	195	175	146	125	110	97	88
		5	Ś	1,53	367	306	262	230	204	184	153	131	115	102	92
		6	Ś	1,68	403	336	288	252	224	202	168	144	126	112	101
04	50	2	BG	1,29	310	258	221	194	172	155	129	111	97	86	77
		2,5	BG	1,44	346	288	247	216	192	173	144	123	108	96	86
		3	G	1,58	379	316	271	237	211	190	158	135	119	105	95
		3,5	G	1,71	410	342	293	257	228	205	171	147	128	114	103
		4	Ś	1,82	437	364	312	276	243	218	182	156	137	121	109
		4,5	Ś	1,94	466	388	333	291	259	233	194	166	146	129	116
		5	Ś	2,04	490	408	350	306	272	245	204	175	153	136	122
		6	Ś	2,23	535	446	382	335	297	268	223	191	167	149	134

11.2. Sprayer calibration

Determining the working speed

If it is not possible to read the driving speed on the agricultural tractor, use the formula provided. To use the formula and calculate the working speed, fill the sprayer tank halfway with water, mark out a 100 m section and drive along it at a constant engine speed while measuring the time.

$$Prędkość\ jazdy\left[\frac{km}{h}\right] = \frac{100[m]}{czas[s]} \times 3{,}6$$

Nozzle and pressure selection

To select the appropriate nozzle and working pressure, use the nozzle selection tables discussed earlier.

Flow rate measurement

To determine the flow rate, fill the sprayer tank, mark the liquid level and set the pressure for the required dose. The next step is to switch on the sprayer pump drive for one minute. After this time, immediately switch off the pump drive and add the missing amount of water (measuring it) to the level before switching on the drive. With this data, use the following formula:

$$Q = \frac{600 \times q_c}{b \times v}$$

You can also perform a simplified test by measuring the amount of liquid escaping from one nozzle in one minute using, for example, a measuring cylinder. In this case, the formula is as follows:

$$Q = \frac{600 \times q \times n}{b \times v}$$

where:
Q - liquid dose per hectare [l/ha],
q_c - amount of water sprayed in one minute [l],
q- amount of water sprayed in one minute by one nozzle [l],
n - number of nozzles,
b - working width of the sprayer [m],
v - driving speed [km/h].

The calculated dose should be equal to the dose recommended for the agrotechnical treatment, but if the dose is lower than required, the working pressure should be increased, or decreased if the dose is too high. After changing the pressure, the test should be repeated until the recommended dose and the calculations are equal.

If it is not possible to adjust the pressure, change the driving speed or the type of nozzle.

12. Possible faults

The quality of cultivation in specific conditions depends on the speed, condition of the working parts and correct adjustments. If any irregularities are found, check the condition of the working parts and adjust the settings to achieve a satisfactory cultivation result. Malfunctions can adversely affect the quality of the sprayer's performance, increase the cost of the treatment and lead to damage to both the sprayer and the tractor.

CAUTION!

Working with a faulty or poorly adjusted tool can lead to serious hazards for the operator and bystanders. Any malfunctions or damage noticed must be rectified immediately.

The most common faults, causes of malfunction and how to remedy them are described in the table below.

Fault, malfunction	Cause	Repair method
The front of the tractor tends to lift	Insufficient front weight. IMPORTANT: the load on the front axle of the tractor must not be less than 0.2 of its weight own	Check whether the tractor class complies with the recommendations in the operating manual. If not, change the tractor. If it is, check the load and, if necessary, add the appropriate number of front axle weights.
The pump does not suck	Clogged suction hose	Clean the hose
	No liquid in the tank	Fill the reservoir
	Leaky suction pipe	Repair the leak
	filter malfunction	Check the cleanliness and settings of the filter
Pump output too low	Stuck or damaged pump valves	Replace or clean the valves
Strong vibration of the pressure gauge pointer	Insufficient pressure in the air chamber	Increase the air pressure in the air chamber
	Air in the system	Check the tightness of connections and pipes
	Damaged diaphragm	Replace the diaphragm
oil and water mixture flowing out of the pump filling hole or oil droplets in the tank	Damaged diaphragm	Replace the diaphragm
No liquid flow to the sprayers when the pump and control valve are switched on	Damaged or incorrectly installed valves in the pump	Check or replace valves in the pump
	Contaminated suction or discharge filter	Clean the filters
	Leak between the pump and the tank	Eliminate the leak
The pressure on the pressure gauge drops and it is impossible to set it to the working pressure working pressure	Contaminated discharge filter	Clean the pressure filter
	Damaged pressure hose ( )	Replace the hose
	Inappropriate or worn nozzles	Replace nozzles
Uneven flow of working fluid from the nozzle nozzle	Insufficient pressure in the air chamber	Check and top up the pressure in the air chamber
	Low oil level in the pump	Check and top up the oil in the pump if necessary
	Pump speed too high	Check the pump speed

13. storage

Before long-term storage, clean the machine and repair any faults found. Protect against weather conditions. Store the sprayer on a level, hard surface. During winter, remove the working fluid from the pump to prevent damage.

14. Disassembly and disposal of the

The sprayer is made of materials that do not pose a threat to the environment. At the end of its service life, when further use is not justified, the sprayer should be dismantled. Due to the heavy weight of the components, lifting equipment such as a crane or forklift should be used during dismantling. Metal parts should be taken to a scrap yard, and rubber and plastic parts should be taken to a disposal site or storage facility for this type of waste. Used oil from the hydraulic system should be collected in sealed containers and taken to a petrol station that collects it.

15. Stability of the tractor-sprayer unit.

The towing vehicle should be loaded with appropriate ballast at the front to ensure proper steering and braking. The axle load of the tractor with the sprayer attached must be at least 20% of the weight of the tractor itself (Fig. 3). It should be remembered that the road surface and the mounted machine affect the driving characteristics. The driving style should be adapted to the terrain and soil type. When cornering with a trailed or semi-mounted machine, the wide reach and buoyancy of the machine must be taken into account.

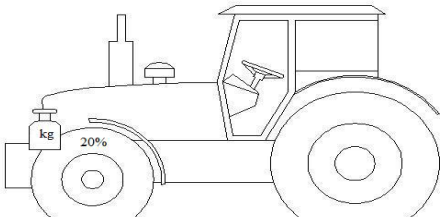


Fig. 32. Minimum pressure on the front axle of the tractor

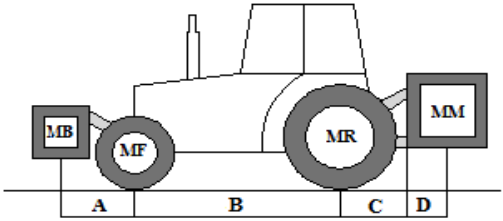


Fig. 33. Determination of static stability

The method for determining the minimum front ballast and increasing the load on the rear axle is described in detail below:

MB=(MM*(C+D)-MF*B+0.2*MC*B)/(A+B)

A [m] - distance between the centre of gravity of the front ballast/front-mounted machine and the centre of the front axle;
B [m] - distance between the tractor wheels;
C [m] - distance between the centre of the rear axle and the centre of the lower drawbar ball;
D [m] - distance between the centre of the lower drawbar ball and the centre of gravity of the rear-mounted machine.
MC [kg] - tractor's own weight;
MF [kg] - front axle load of an empty tractor;
MR [kg] - rear axle load of an empty tractor;
MM [kg] - total weight of the rear-mounted machine;
MB [kg] - total weight of the front ballast/front-mounted machine

The calculation of the required minimum front ballast assumes that all the above dimensions and weights are known. However, if they are not known and cannot be determined, there is only one safe and accurate way to avoid overloading:

Weigh the tractor with the sprayer attached and raised to determine the actual load on the rear axle compared to the loads on the front and rear axles of the tractor without the sprayer with these loads with the sprayer attached.

16. warranty terms and warranty services

Detailed information on the warranty terms and conditions for agricultural equipment is contained in the Civil Code, Section III, Warranties, Articles 577-581. This information should be available at all agricultural equipment sales outlets and at all repair shops for this equipment. The warranty service providers are: (seller/dealer) - entered in the warranty card at the time of sale.

17. Warranty procedure rules

The user should be understood as a natural or legal person purchasing agricultural equipment, the seller - a commercial entity bound by a commercial and service contract, which delivers the equipment to the user, and the manufacturer - the manufacturer of agricultural equipment. When putting a machine/device into operation, the manufacturer provides a warranty according to the following rules:

1. The manufacturer guarantees that the product has no material or manufacturing defects.
2. The warranty services are provided by the manufacturer or a seller authorised to provide maintenance services.
3. Under the warranty, the manufacturer or authorised service provider, if the complaint is accepted, undertakes to:

- repair the equipment free of charge, including replacement of parts;
- supplying the user with new, correctly manufactured parts free of charge;
- replacing the equipment with new equipment if, based on the opinion of an authorised expert, it is determined that repair is not possible.

4. The warranty is granted for a period of 24 months from the date of sale confirmed by the seller with a stamp and an entry in the warranty card.
5. The warranty is extended for the duration of the equipment repair.
6. The manufacturer or a seller authorised to provide servicing shall carry out warranty repairs within 14 days of the date of delivery of the machine for repair.
7. In the case of complex repairs, this period may be extended, subject to prior agreement with the user.
8. The user should report a complaint immediately after discovering a failure or damage.
9. The basis for filing a complaint is a correctly completed warranty card. The warranty card is invalid without dates, signatures and stamps of the point of sale.
10. The user submits a complaint to the seller in writing or by telephone, providing the following information:

- where the machine was purchased (name of the point of sale);
- date of sale;
- year of manufacture of the machine;
- the serial number of the machine;
- their address/contact telephone number;
- who performed the initial start-up;
- type of failure or damage.

11. The warranty does not cover:

- damage caused by random events, unless they resulted from causes inherent in the product;
- accidental damage or consequences resulting from such damage;
- damage resulting from improper storage, use contrary to the intended purpose, improper maintenance of mechanisms (lubrication) and other causes not attributable to the manufacturer. These can only be repaired at the user's expense.

12. Mechanically damaged parts and working elements that wear out naturally, i.e. fluids and lubricants, bulbs, are not covered by the warranty. Replacement of damaged parts is at the user's expense.

13. The warranty does not cover damage to the hydraulic system resulting from contamination of the hydraulic oil. The oil cleanliness class in the tractor's power hydraulics circuit must meet the 20/18/15 requirement according to ISO 4406-1996.
14. For parts not manufactured by us, the warranty is transferred by us to their manufacturer.
15. The warranty is void if the user makes any technical changes, uses the machine for purposes other than those for which it is intended, or uses the machine in a manner that significantly deviates from the instructions for use and operation.
16. The purchase of equipment covered by this warranty is tantamount to acceptance of the above warranty terms and conditions.

18. How to use the parts catalogue

The catalogue should be used as follows:

- determine in which machine assembly the part to be replaced is located;
- find the correct assembly drawing and the serial number of the part you are looking for;
- using this number, find the corresponding drawing number or catalogue number and quantity in the table description.

WARRANTY CARD

Field sprayer

Symbol XSARA-.....

Serial number-.....

Date of manufacture-.....

....

Date of sale, seller's signature seller's stamp

Warranty service on behalf of the manufacturer is provided by:

.....

to be completed by the seller

TOLMET reserves the right to make design changes without prior notice and without assuming any obligations. Unauthorised modifications to the sprayer's design may void the warranty. Only TOLMET parts should be used during operation.

19. Service

No.	Date of report	Date of fault repair	Description of actions taken and parts replaced	Signature

20. Notes

PRODUCTION, SERVICE AND TRADE COMPANY
TOLMET
Piotr Wawrzyniak
ul. Dworcowa 3, 99-140 Świnice Warckie
tel./fax. (63) 288 10 18
www.tolmet.pl