02

ARAG®
A Nordson Company

ELECTRIC CONTROL UNIT FOR ORCHARD SPRAYER APPLICATIONS

SERIE 481

CE

USE AND MAINTENANCE

• LEGEND SYMBOLS

	= **Generic danger**
	= **Warning**

This manual is an integral part of the equipment to which it refers and must accompany the equipment in case of sale or change of ownership. Keep it for future reference; ARAG reserves the right to modify the specifications and instructions regarding the product at any time and without prior notice.

CONTENTS

1 PRODUCT DESCRIPTION

The proportional control units for ARAG 481 series orchard sprayer applications consist of a central body housing: main valve, proportional control valve, filter and maximum pressure valve, as well as 2 or 4 section valves. If installed on orchard sprayers, they allow pesticide adjustable output.

This booklet describes all the various parts that may be included in the unit.
Some of these parts may not be included in your unit.
The illustrations in this booklet are, therefore, provided only as indications.
For detailed information, please refer to the description of the part in question and not of the unit in general.

ARAG is not liable for direct or indirect damage due to the type of product used for treatment with its control units.

The operator has full liability for the use of these products and therefore must verify the safety regulations indicated on the package by the manufacturer of the liquid and must wear suitable protective clothing (gloves, overall, footwear, helmet, etc.) as required by law.
ARAG is therefore not liable for any damage or injury to persons or animals as a result of the incorrect use of the products employed, without protection or contrary to recommendations.

2 INTENDED USE

This device is designed to work on agricultural machinery for crop spraying applications.

The machine is designed and built in compliance with EN ISO 14982 standard (Electromagnetic compatibility - Forestry and farming machines), harmonized with 2014/30/UE Directive.

3 UNIT LAYOUT

3.1 Electric control unit with main control valve of the 481 Series - front view

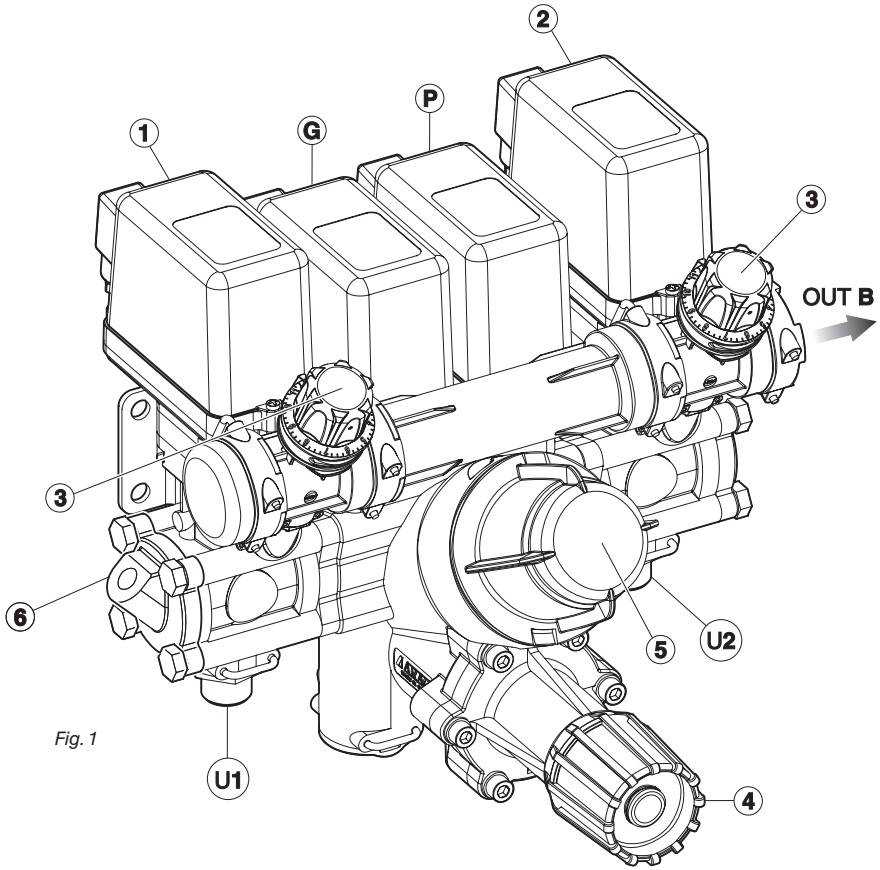


Fig. 1

G Main control solenoid valve
P Proportional electric valve
1-2 Boom section solenoid valves
3 Metered by-passes
4 Maximum pressure valve
5 Filter
6 Pressure gauge adapter or pressure transducer connection

OUT B Outlet for metered by-pass (T4)
U1÷U2 Output to sections

3.2 Electric control unit with main control valve of the 481 Series - rear view

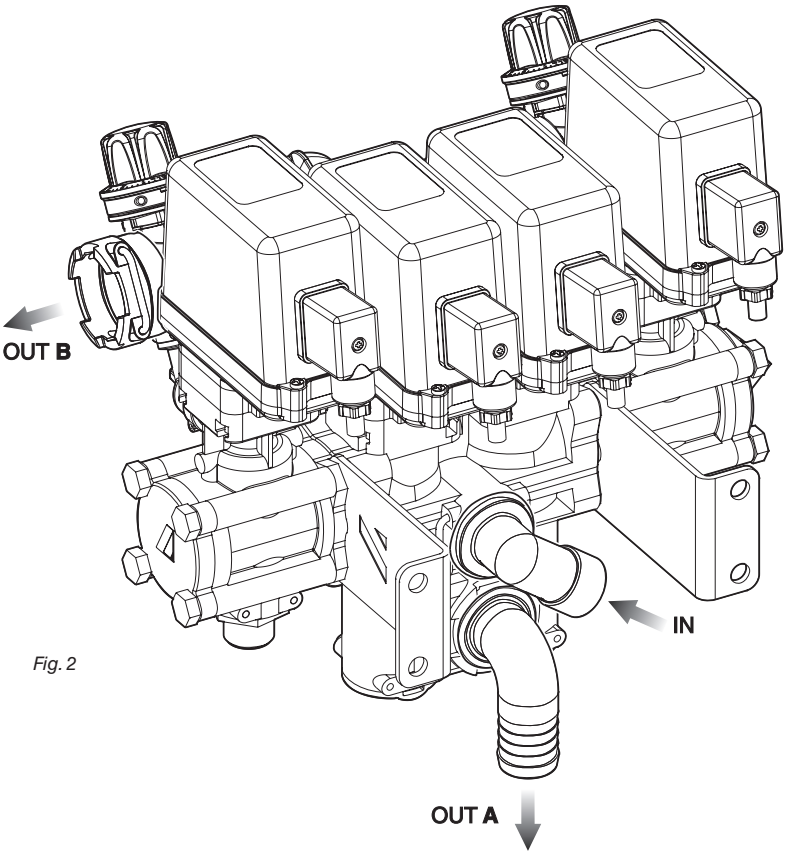


Fig. 2

IN Infeed of fluid to spray
OUT A Maximum pressure valve drain
OUT B Outlet for metered by-pass (T4)

G Main control solenoid valve
It controls product flow through the system.
Controls are taken to gearmotor by means of the relevant switch located on unit control device (e.g.: control box).
• **Discharge valve open:** liquid sent to the tank.

P Proportional electric valve
If duly calibrated by means of the relevant switch located on unit control device (e.g.: control box), it controls spraying pressure; when the vehicle progress speed changes during spraying, the volume of the liquid distributed per surface unit (litres/hectare) remains stable.

1-2 Boom section electric valves
Open/close the corresponding section; for valves with metered by-passes, the valve closed position is the same as the discharge position for the respective metered by-pass.

3 Metered by-passes
These are adjusted so the level of spraying pressure remains steady when one or more sections of the boom are closed.

4 Maximum pressure valve
Eliminates the excess liquid when the set pressure level is reached. It is manually adjusted via the relevant knob.
Knobs are color-coded and color indicates maximum allowed pressure for the valve (for reference pressure values, please see par. 8.2 - Valve parts and the corresponding control unit maximum pressure).

5 Filter
Protects the unit from dirt, which would eventually reduce its performance. Filter is cleaned any time the maximum pressure valve trips.

6 Pressure gauge adapter or pressure transducer connection (supplied on request)
Connector to which the pressure gauge or pressure transducer mounts, for monitoring the operating pressure.

Please find more operation details below. Details of each component's operation will follow: about how to adjust single components, please read sect. 5 - Setting before use and sect. 6 - Use; for information on suitable control devices, please read par. 4.4 - Connection to control devices.

3.4 Fittings

To connect the control unit to the system, use couplings with fork-shaped ends indicated in the table below* (refer to diagrams Fig. 1 and 2 - Output OUT B).

ARAG is not liable for any damage caused directly or indirectly to equipment, machinery or property, or injury to persons or animals caused by unsuitable or unfit connectors/couplings, different from the specified ones.
All forms of warranty are rendered null and void in case of damage to the unit or any of its parts caused by the above.

SELECTING THE DRAIN COUPLING ON CALIBRATED BACKFLOW UNION (OUT B)		
TYPE OF COUPLING T4	**CODE**	**Ø**
male thread male coupling	**249144**	G 1
straight hose tail male coupling	**1091420**	20 mm
	1091425	25 mm
elbow hose tail male coupling	**1191420**	20 mm
	1191425	25 mm
	1190420	20 mm
	1190425	25 mm

Tab. 1

*** The list of all couplings with fork-shaped ends can be found on ARAG general catalogue.**

Maximum pressure valve knob color indicates maximum allowed pressure:

COLOR	MAXIMUM PRESSURE (bar)
black	**10**
green	**20**
light blue	**30**
orange	**40**

Tab. 2

4 INSTALLATION

4.1 Safety regulations

• Do not install the control unit inside the driver's cab.
• Install unit so that manual valves can be easily accessed, but well away from operator's station.
• The unit's input flow rate must be less than the maximum flow rate of the discharge valve.
• The parts and the hoses that are installed on the main pressure line (delivery line) must be capable of withstanding greater levels of pressure than that of the maximum pressure valve (refer to par. 8.2 - Valve parts and the corresponding control unit maximum pressure).
• Commission the drainage system according to the maximum delivery flow rate for the pump. Also install hose whose nominal operating pressure is greater than that of the drain: any bottlenecks in the drainage system could cause abnormally high pressure levels.
• Make sure the hoses used are suitable for the diameters of the chosen hose tails. Use systems to secure the hoses that are suitable for the hoses in question.
It is recommended to install a pressure-relief device (Series 459 on general ARAG catalogue) on the pump to avoid risks caused by a unit malfunction.
This device does not replace a further safety valve, but it can limit unit damages in case of sudden over-pressures.

Have the unit installed by qualified personnel.
ARAG is not liable for any damage to equipment or injury to persons or animals caused by incorrect or unsuitable connection of the unit.
Likewise, ARAG is not liable for any damage caused directly or indirectly to equipment or machinery, or injury to persons or animals caused by unsuitable or unfit hoses, cable grips, wraps or other accessory.
All forms of warranty are rendered null and void in case of damage to the unit caused by the above.

4.2 Installing and connecting the unit

Install the control unit using M8 screws (not supplied) in the relevant holes (**A**) on brackets and by means of the preset fittings set in place by the farming machine's manufacturer in order to ensure correct fastening, as shown in Fig. 3.

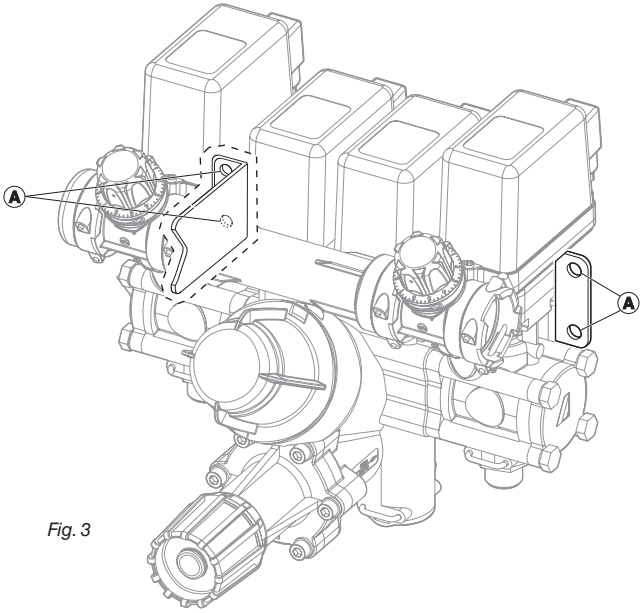


Fig. 3

CAUTION:
The control unit must be installed in a horizontal position, as shown in Fig. 4.

ANY OTHER POSITION IS DEEMED INCORRECT.

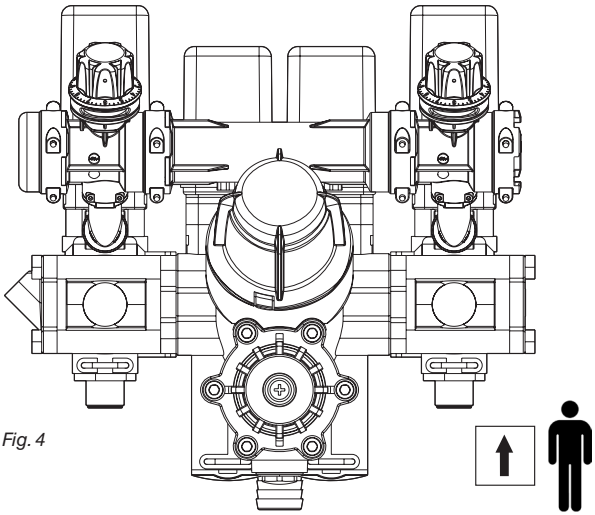


Fig. 4

The control unit is designed for installation on the chassis of a farming machine; it comes with a drilled bracket for proper installation.

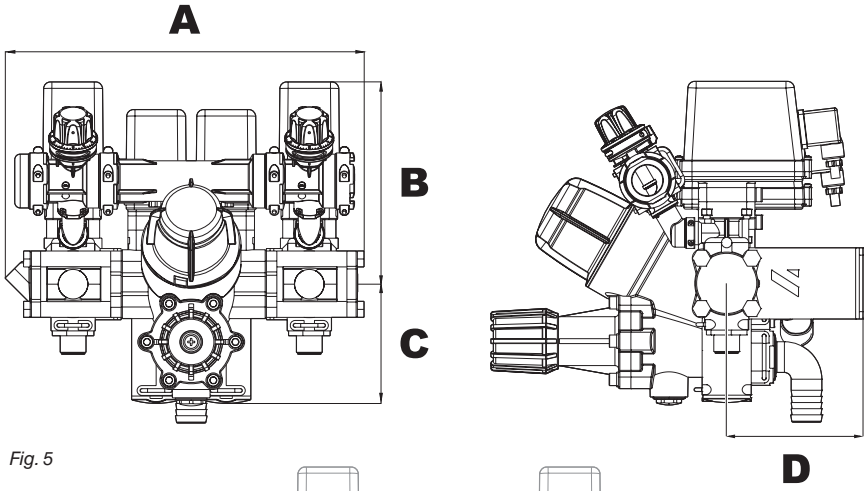


Fig. 5

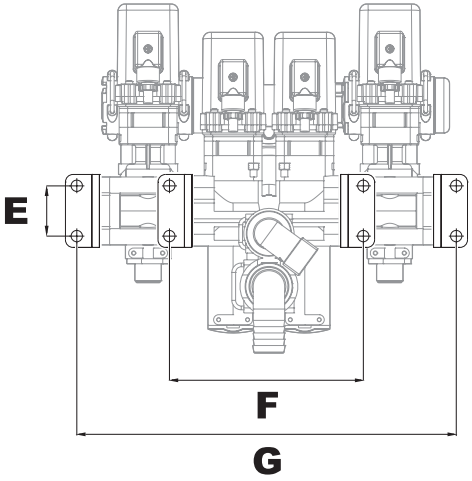


Fig. 6

	Dimensions (mm)				Drill. master (mm)		
Code	**A**	**B**	**C**	**D**	**E**	**F**	**G**
481212242	292	164,5	97	111	40	154	--
481214242	292	164,5	97	111	40	154	--
481212244	391	164,5	97	111	40	154	416
481214244	391	164,5	97	111	40	154	416
481412202	146	142	110	111	40	171	--
481414202	146	142	110	111	40	171	--
481412214	263	142	110	111	40	285	--
481414214	263	142	110	111	40	285	--

4.3 Connecting up the system

Connect the hoses in the system according to the layout shown below.

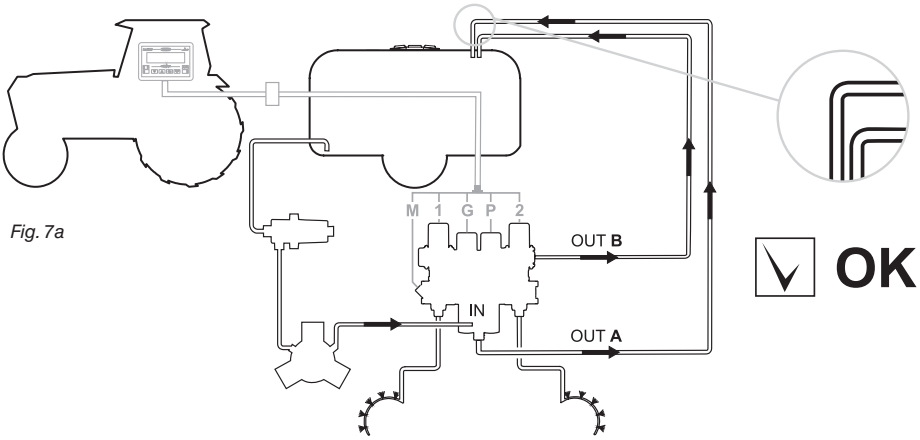


Fig. 7a

Do not connect lower end tank return tubes to obtain a sort of hydraulic agitator, only fit them at the top, so that fluid comes out by gravity (Fig. 7a).

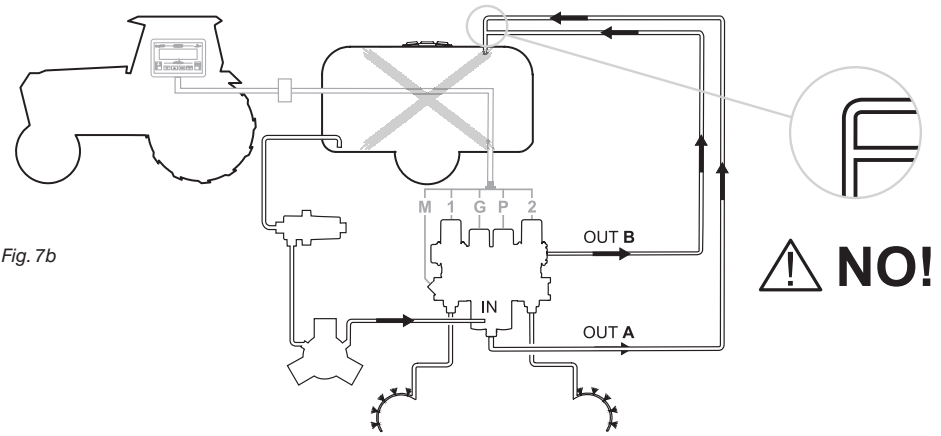


Fig. 7b

Unit return tubes to tank shall not be joined together (Fig. 7b): keep them separate (Fig. 7a).

4.4 Connection to control devices

• The diagram below is for illustrative purposes only; to ensure correct operation, always refer to the installation manual relevant to the control device you are using.
• Connections and setting into operation are best left to qualified personnel.
ARAG disclaims all liabilities for damage to equipment, persons or animals resulting from wrong or improper connection of the unit.
• Any damage to the unit resulting from the above will automatically invalidate any warranty rights.

Electric units are designed for connection to ARAG control devices (computer, monitor, displays). Each control device comes complete with the necessary connection cables and all cables are marked for ease of identification; please see Fig. 8 for a description of cable marks and their meanings.

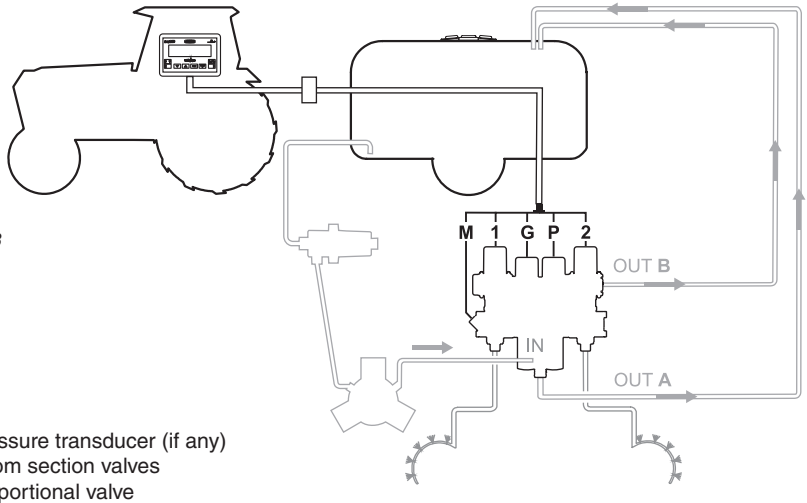


Fig. 8

M Pressure transducer (if any)
1÷2 Boom section valves
P Proportional valve
G Main control solenoid valve

• Use only the cables supplied with ARAG computers or control boxes.
• Do not pull on the cables. Be careful not to break, tear or shear the cables.
• Check wiring and cables for damage from time to time.
Minimum required cross-section area for cables connected to main control valve is 1,5 mm² ; minimum required cross-section area for cables connected to remaining unit components is 0,75 mm².
• Any damage resulting from use of unsuitable cables or anyway other than ARAG cables will automatically invalidate any warranty rights.
ARAG disclaims all liabilities for damage to equipment, persons or animals resulting from the above.

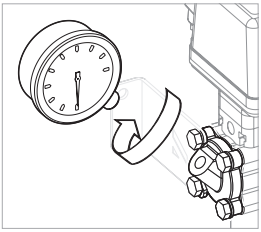
5 SETTING BEFORE USE

• ONLY use clean water for any intervention or adjustment without any chemical additives.
• Observe rated power supply voltage.
• Make sure to disconnect power to the device before arc welding; consider physically disconnecting the power supply cables.

• Connection diagrams (Fig. 1, 2, 7a, 7b) are purely for your information; standard adjustment operations for this unit might hence change according to the control device in use.
• For detailed information on the operation or adjustment of the valves included in the unit, ALWAYS refer to the operating and maintenance instructions manual relevant to your control device.
• All electric valves are internally protected: they automatically turn off in case of overvoltage; to reset the valves, remove power supply to the unit for about 20 seconds.
• Pressure values (if unit fits a pressure transducer) are shown on pressure gauge or control device.

5.1 Electric unit adjustments before operation

1



Install pressure gauge or pressure transducer to the seat in the pressure gauge adapter.

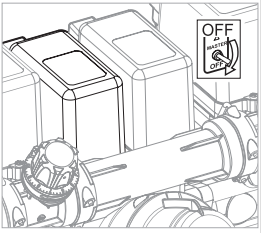
Make sure the flat gaskets supplied with the control unit are correctly positioned in the pressure gauge adapter seat.

• Brass adapter = n°2 gaskets

• Pressure gauge:
Screw into pressure gauge adapter seat until firmly in place; do not overtighten.
Use ARAG pressure gauges with 1/4" M coupling and a suitable end scale for the maximum operating pressure.

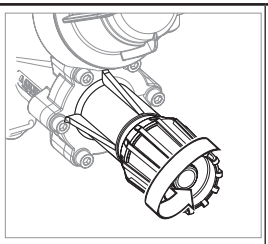
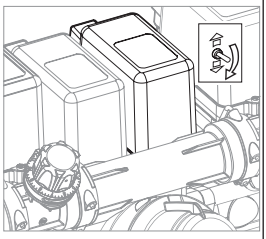
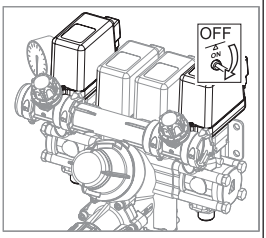
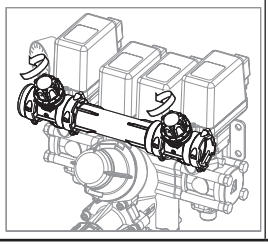
• Pressure transducer:
Use ARAG transducers **(code 466112.x00)**; please read the instructions manual supplied with the device for full installation information.

2



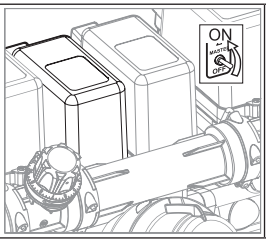
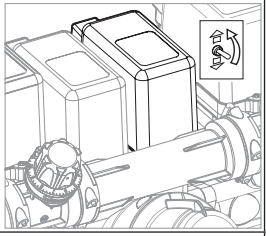
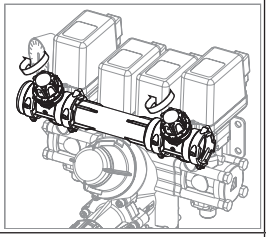
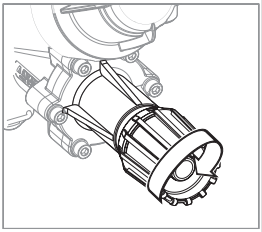
Set the main valve to drain position by working the corresponding switch on control device (**OFF** position).

CONTINUES

3		Fully slacken maximum pressure valve knob by turning it counter clockwise.
4		Fully open the proportional valve, by setting down the relevant switch on control device.
5		Set the relevant switches on the control device to **OFF** to close all section valves.
6		Open all the compensation cocks by turning their knobs anticlockwise.

5.2 Adjustment of maximum operating pressure (only for units equipped with proportional valve)

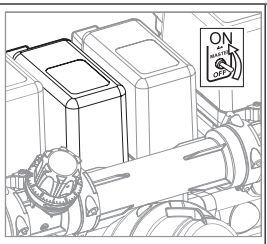
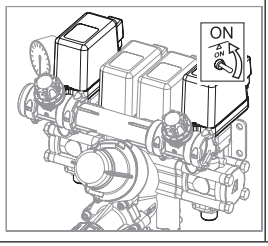
During adjustment, should you find fluid leakage or pressure values exceeding the maximum limit of the system and the safety valve, stop the procedure, switch pump off and make sure that installation and any preliminary operations have been performed properly.

1	Start pump operation.	
2		Set the main control switch to **ON**.
3	Gradually increase the number of revs of the pump until the maximum operating level is reached.	
4		Fully close the proportional valve, by setting up the relevant switch on control device.
5		Close all the compensation cocks by turning their knobs clockwise.
6		Set maximum pressure valve by turning knob clockwise until setting a pressure of about 20% above maximum desired working pressure.

6 USE

For detailed information on operation or adjustment of unit valves, ALWAYS refer to the operating and maintenance instructions manual relevant to your control device.

6.1 Calibration of operating pressure

1	Select type of nozzle and relevant working pressure according to liters/hectare (l/ha) to be sprayed and forward speed.	
2	With the machine OFF, start the pump and take it to its operating level.	
3		Open the main valve, by working the relevant switch on control device (**ON** position).
4		Set the relevant switches on the control device to **ON** to open all section valves.
5	Now set the unit's pressure to the spraying value. According to unit type, you can find: constant-pressure dispensing unit or dispensing unit proportional to engine RPM.	

6.1.1 Constant-pressure dispensing unit (Fig. 9)

This type of unit does not fit any proportional valve, so that adjustment task is fulfilled by the maximum pressure valve (**A**, Fig. 9); once working pressure is set, the unit flow rate stays unvaried. Therefore, to obtain a constant output per surface unit (liters/hectare or GPA) even the vehicle forward speed shall remain the same.

To make this adjustment, turn maximum pressure valve knob until setting desired working pressure: **turn clockwise to increase pressure, or counter clockwise to decrease it.**

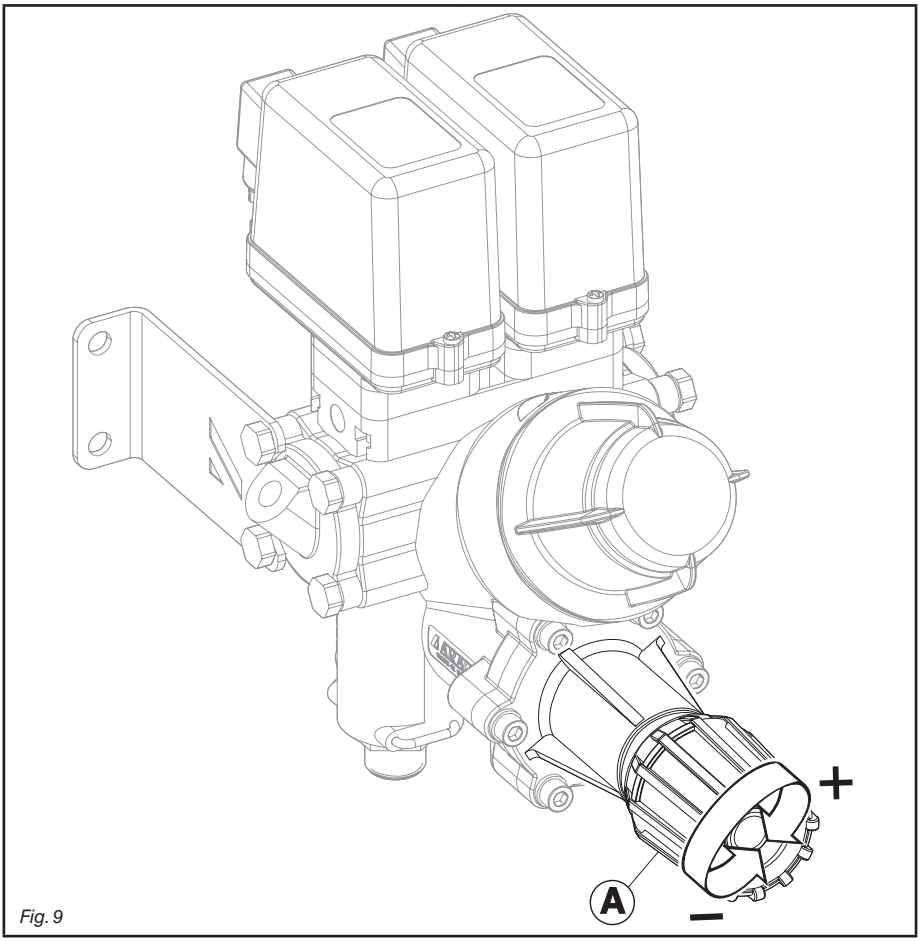


Fig. 9

CODE	WAYS	bar	PSI
481412202	2	20	290
481414202		40	580
481412214	4	20	290
481414214		40	580

6.1.2 Dispensing unit proportional to engine RPM (Fig. 10)

The proportional valve installed on these units ensures constant spraying on the surface unit (liters/hectare or GPA) even when forward speed varies by ±20%, provided that cardan joint rotation is constant.

To adjust, work the corresponding switch on control device until obtaining the required working pressure.

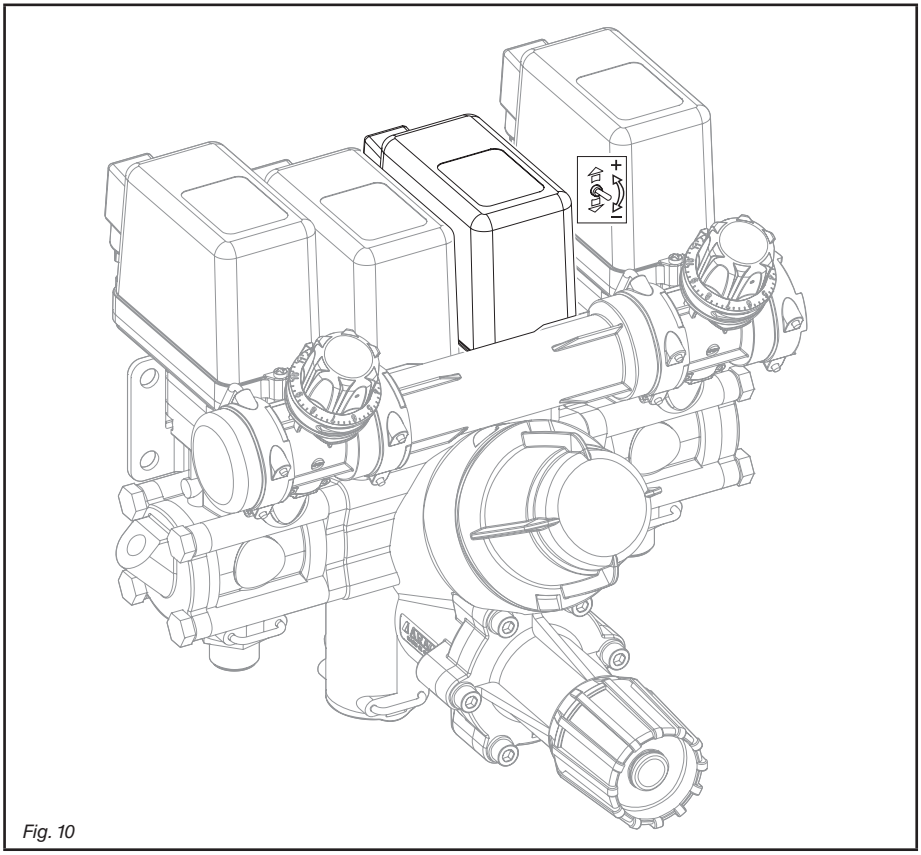


Fig. 10

CODE	WAYS	bar	PSI
481212242	2	20	290
481214242		40	580
481212244	4	20	290
481214244		40	580

- set switch up to increase pressure;
- set switch down to decrease pressure.

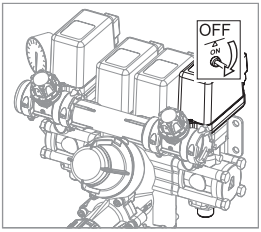
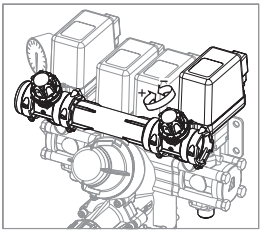
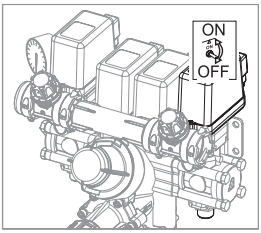
Working pressure shall be adjusted by means of the proportional valve and NOT through the maximum pressure valve.

6.2 Calibrating the metered by-passes

The calibrated backflows guarantee constant fluid spray rate even when working with one or more section valves closed.

Set EACH TIME nozzle type is changed.

The metered by-pass calibration knobs are equipped with a graduated scale. Once each metered by-pass has been calibrated, enter the value of the graduated scale for the type of nozzle in use in the tables on page 22. This means that it will not be necessary to recalibrate a given metered by-pass the next time the same nozzles are used, but simply set it to its value in the tables.

1		Close one section valve by setting its corresponding switch on the control device to **OFF**.
2		Adjust the corresponding compensation cock by turning the knob until the pressure level is restored on the pressure gauge that was previously set with all the section valves open.
3		Open and close the section valve (operate its switch on control device as needed) and make sure that pressure value remains steady. ⚠ **If pressure fluctuates, repeat the operations described at step 2 until no more fluctuation occurs.**

CONTINUES

4 Calibrate ALL section valves before running a treatment; the calibration can be done as follows, depending on the configuration of the control unit:

• EQUAL section valves:
you need only calibrate one single valve, then set the graduated scales of all the others to the same mark.

• DIFFERENT section valves:
each section valve must be calibrated independently.

• MIRRORED section valves (Fig. 11):
you need calibrate only one part of the control unit (right or left boom, valves **A** and **B**): calibrate the other part of the boom by setting the corresponding metered by-passes to match the valve settings on the section of boom already calibrated (Fig. 11).

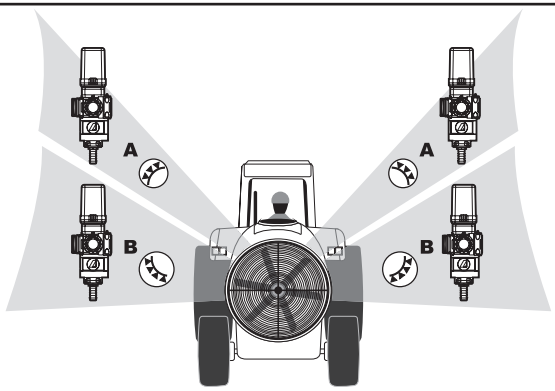


Fig. 11

If the types of nozzle are not changed, the adjustments made will safeguard a uniform distribution of liquid even when spraying needs differing levels of operating pressure.

6.2.1 Metered by-pass calibration tables

NOZZLE TYPE	COLOR	REF.

NOZZLE TYPE	COLOR	REF.

NOZZLE TYPE	COLOR	REF.

NOZZLE TYPE	COLOR	REF.

NOZZLE TYPE	COLOR	REF.

NOZZLE TYPE	COLOR	REF.

NOZZLE TYPE	COLOR	REF.

NOZZLE TYPE	COLOR	REF.

NOZZLE TYPE	COLOR	REF.

7 MAINTENANCE / DIAGNOSTICS / REPAIRS

• Disconnect power to the control unit before washing.
• Wear protective gloves, goggles and clothing.
• Do not use high-pressure water jets to wash the outside of the control units.
• Sponge with neutral detergent and rinse.
• Wait until unit is fully dry before restoring electric connections.
ARAG is not liable for any damage caused to equipment or injury to persons or animals caused by cleaning with unsuitable products. All forms of warranty are rendered null and void in case of damage to the unit caused by the above.

7.1 Flushing the liquid passages of the electric control units

Wash the passages inside the unit thoroughly after each application, with clean water or water and **PULLSPRAY** detergent **(order code 459100)**, if necessary.
Follow the indications in the table below for the frequency of cleaning:

MANUAL CLEANING	FREQUENCY
Clean with clean water	after each use
Clean filter	after each use
Clean with PULLSPRAY	every month or every 100 hours

• Check that gaskets are sealing correctly while washing the unit. Look for abnormal leaks. If any leak is found, have the unit uninstalled by qualified personnel and bring it to the nearest Service Centre.

• Send the unit to your Service Centre to be checked over and for the valve gaskets to be replaced, if necessary, once a year or every 500 hours of operation of the system.

Units must be cleaned thoroughly prior to being sent to a Service Centre for control or repair.
Should the Service Centre receive a dirty unit, it will have the right to refuse delivery and repair of the same even if it is covered by guarantee.

7.2 Filter cleaning

Clean the filter regularly according to the instructions described below:

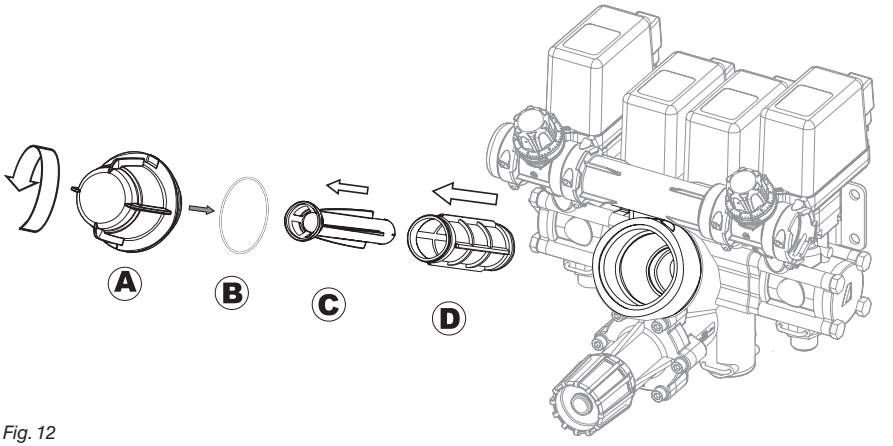


Fig. 12

1 Protective gloves, goggles and clothing must be worn.
2 Stop the machine and disconnect power to the unit.
3 Loosen cover (**A**) by turning it counter clockwise, remove cartridge (**D**) and then the conveyor tube (**C**).
4 Remove the O-Ring (**B**) from cover (**A**), then wash all parts with running water.
5 Remove any trapped items under running water.

Do not use compressed air or sharp objects for cleaning the cartridge.

When reassembling the filter, it is recommended to first fit the cartridge (D) and then the conveyor tube (C).

Take care not to damage the mesh when cleaning the filter: should you notice any damage to the mesh, replace the cartridge with a new one.

Refer to the ARAG spare parts catalogue for references for ordering spare parts.

7.3 Troubleshooting

TROUBLE	CAUSE	REMEDY
The operating pressure cannot be set with the discharge valve switch on the control unit	Discharge valve motor is faulty	• Check the electrical connection.
		• Have gearmotor inspected at the nearest Service Centre.
	Inlet and outlet tubes are not connected correctly	• Check inlet and outlet tubes connections.
	Maximum pressure valve is fully loosened	• Adjust maximum pressure valve.
	Delivery filter clogged	• Clean delivery filter cartridge.
	Suction filter clogged	• Clean suction filter cartridge.
	Insufficient liquid delivery to control unit	• Check pump rate.
		• Increase pump RPM.
		• Check for open branches or drain outlets upstream of control unit.
	Proportional valve fully open	• Operate pressure control switch to close proportional valve.
The pressure cannot be lowered with the proportional valve switch on the control unit	Proportional valve motor not working	• Check the electrical connection.
		• Have gearmotor inspected at the nearest service center.
	Proportional valve drain passage clogged	• Clean drain passage.
	A hydraulic agitator is connected to drain passage of proportional valve	• Remove hydraulic agitator and leave hole open.
	Drain tube of proportional valve undersized	• Change drain tube.
	Proportional valve flow rate lower than desired rate setting	• Change proportional valve.
Adjustment inaccurate: minor movements of switch on proportional valve control device lead to significant change in pressure	Proportional valve not correctly sized for system	• Change proportional valve.
	Insufficient liquid delivery to control unit	• Check pump rate.
		• Increase pump RPM.
		• Check for open branches or drain outlets upstream of control unit.
Large amount of pressure fluctuation when one or two sections are closed	Metered by-passes not adjusted	• Adjust metered by-passes.
The pressure gauge reads a different pressure than the actual one	Pressure gauge malfunctioning	• Change pressure gauge.
	Squashed gasket inside pressure gauge is partially obstructing passage	• Slightly loosen pressure gauge.
	Passages across valve and nozzle undersized, leading to significant pressure drop	• Choose section valve tubes of suitable size.
The pressure transducer reads a different pressure than the actual one	Transducer malfunctioning	• Check settings on the computer: if problem persists, change the transducer.
	Passages across valve and nozzle undersized, leading to significant pressure drop	• Choose section valve tubes of suitable size.
One or more sections not closing correctly	Section valve motor not working	• Check electric connection.
		• Have gearmotor inspected at the nearest Service Centre.
	Section valve plug gasket worn out	• Send in the unit for Servicing.
	Chemical residue on gasket and seat of section valve hose tail	• Clean parts with suitable detergent as indicated in cap. 7 - Maintenance / Diagnostics / Repairs.

8 TECHNICAL DATA

The units described in this manual could use two different dispensing systems, depending on their components (see par. 6).

8.1 Technical features

Code	Power voltage	Absorption	Operating temperature	Weight (Kg) without bracket
481212242	12 Vdc	0,5 A (yellow) 0,7 A (light blue)	-25° C ÷ 60° C +77° F ÷ +140° F	5,71
481214242				
481212244				7,93
481214244				
481412202				3,75
481414202				
481412214				5,37
481414214				

8.2 Valve parts and the corresponding control unit maximum pressure

KNOB COLOR	PRESSURE	
	bar	PSI
green	20	290
orange	40	580

9 DISPOSAL AT THE END OF SERVICE

Dispose of the system in compliance with the established legislation in the country of use.

10 GUARANTEE TERMS

1. ARAG s.r.l. guarantees this apparatus for a period of 360 day (1 year) from the date of sale to the client user (date of the goods delivery note). The components of the apparatus, that in the unappealable opinion of ARAG are faulty due to an original defect in the material or production process, will be repaired or replaced free of charge at the nearest Assistance Centre operating at the moment the request for intervention is made.
   The following costs are excluded:
   - disassembly and reassembly of the apparatus from the original system;
   - transport of the apparatus to the Assistance Centre.
2. The following are not covered by the guarantee:
   - damage caused by transport (scratches, dints and similar);
   - damage due to incorrect installation or to faults originating from insufficient or inadequate characteristics of the electrical system, or to alterations resulting from environmental, climatic or other conditions;
   - damage due to the use of unsuitable chemical products, for spraying, watering, weedkilling or any other crop treatment, that may damage the apparatus;
   - malfunctioning caused by negligence, mishandling, lack of know how, repairs or modifications carried out by unauthorised personnel;
   - incorrect installation and regulation;
   - damage or malfunction caused by the lack of ordinary maintenance, such as cleaning of filters, nozzles, etc.;
   - anything that can be considered to be normal wear and tear.
3. Repairing the apparatus will be carried out within time limits compatible with the organisational needs of the Assistance Centre.
   No guarantee conditions will be recognised for those units or components that have not been previously washed and cleaned to remove residue of the products used.
4. Repairs carried out under guarantee are guaranteed for one year (360 days) from the replacement or repair date.
5. ARAG will not recognise any further expressed or intended guarantees, apart from those listed here.
   No representative or retailer is authorised to take on any other responsibility relative to ARAG products.
   The period of the guarantees recognised by law, including the commercial guarantees and allowances for special purposes are limited, in length of time, to the validities given here.
   In no case will ARAG recognise loss of profits, either direct, indirect, special or subsequent to any damage.
6. The parts replaced under guarantee remain the property of ARAG.
7. All safety information present in the sales documents regarding limits in use, performance and product characteristics must be transferred to the end user as a responsibility of the purchaser.
8. Any controversy must be presented to the Reggio Emilia Law Court.

11 CONFORMITY DECLARATION

The declaration of conformity is available at www.aragnet.com, in the relevant section.

Only use genuine ARAG accessories or spare parts to make sure manufacturer guaranteed safety conditions are maintained in time. Always refer to the internet address www.aragnet.com

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