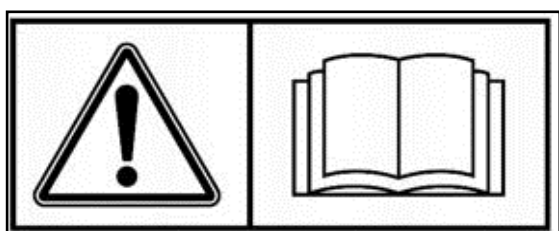
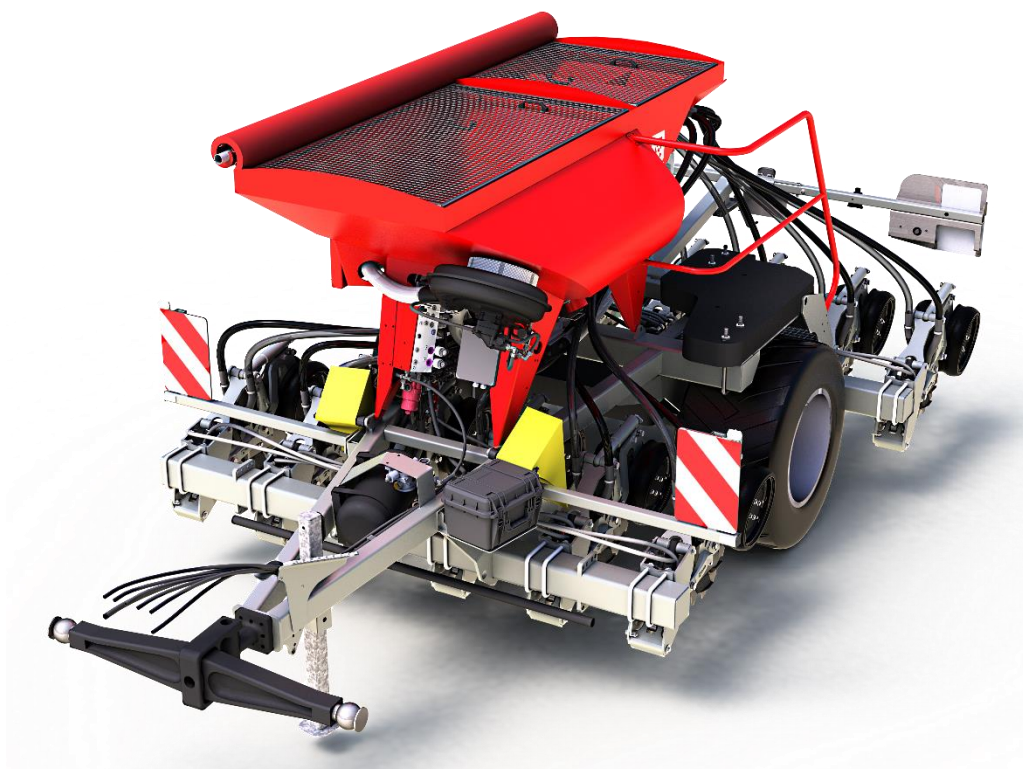




Next Generation
Farming

USER MANUAL

T-FORCEPLUS® SERIES 250



**READ CAREFULLY BEFORE
USING THE MACHINE**

MESSAGE TO THE USER

You have just purchased a NOVAG product. We would like to thank you for the trust you place in our company with your choice.

Years of studies, design engineering and repeated upgrades from field use have allowed the manufacturing of your machine.

This machine is very reliable. Its functioning throughout its life will depend of your care and proper maintenance.

You will find in this user manual all the information required for optimum use of your implement. We strongly recommend that you carefully read this manual and you follow all the instructions.

This implement is of simple design. But, even if they are generally visible, the reasons of its improper functioning would often be neglected.

YOU WILL NOT BE ABLE TO CORRECTLY MAINTAIN AND USE YOUR PRODUCT, if you have not read this user manual

ALWAYS KEEP IT AT HAND.

Your NOVAG dealer will explain to you how to successfully use your implement. His role is to allow you to get the most from it.

Your NOVAG dealer also keeps in stock a full range of NOVAG genuine spare parts.

Meticulously checked, these spare parts are strictly identical to the ones that were fitted on your machine at the factory.

UPGRADES

Constantly improving our products is a major concern for our technicians. Therefore, we reserve the right to apply without notice any modification or upgrades that seems necessary to us, without being compelled to apply them to previously sold machines.

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1 Safety Prescriptions



This symbol is used in the manual every time recommendations are written, relating to your safety or the safety of others, or the proper functioning of the machine.

You must make these recommendations to any operator that will use the machine.

T-FORCEPLUS drills must only be used for the work they have been designed for: drilling of cereals, peas, forage/cover crops and grasses.

In case of damage related to the use of the machine, occurring out of the field specified by the manufacturer, his responsibility will be fully excluded.

The correct use of the machinery also implies:

- Following of the prescription of use and maintenance specified by the manufacturer.
- Exclusive use of spare parts, equipment and accessories preconized by the manufacturer
- **T-FORCEPLUS** drills must only be used, serviced or repaired by skilled personnel, familiar with their specifications and their use. These personnel must be informed of the danger they might be exposed to.

The user must scrupulously comply with regulations in terms of:

- Injury prevention
- Work safety
- Road regulations

He/she must strictly observe the warning signs marked on the machine.

Any modification of the machinery made by the user him/herself or any other person, without written approval from the manufacturer will clear the manufacturer's responsibility for any damage that might result from this.

1.1 General Safety Prescriptions

Before any use of the tractor-implement machinery, its compliance with work safety and road regulations must be checked.

1.1.1 GENERAL PRESCRIPTIONS

1. The warning signs and stickers on the machinery give indications on the safety measures to observe and help to avoid injuries.
2. While driving on public roads, keep in accordance with road regulations.
3. Before starting working with the machine, the user must be familiar with the control panels and operating the machinery. During the work, it will be too late to do so.
4. The user must avoid wearing clothing that could be caught by moving elements.
5. Use a tractor equipped with a safety cab. Leave the windows closed while working with the machine.
6. Before starting work with the machines, check the surroundings (children!).
Make sure to have enough visibility!
Keep people or animals away from the danger zone of the machine (projection!).
7. Transportation of animals or people on the machine while driving or working is strictly forbidden.
8. The machine coupling with the tractor must only be made on towing hitches adapted for this use.
9. Keep caution during the coupling of the machine to the tractor.
10. Keep the machine weight under the maximum total load allowed on the machine and over the axles.
11. Comply with the maximum allowed dimensions of the machine on the road.
12. Before driving on public roads, make sure the road lights are fully working and that the panels required by the law are in place.
13. Before driving on public roads, fold the machine in transport position, according to the manufacturer's instructions.
14. Never leave the driving post while the machine is running.
15. Speed and driving must always be adapted to terrain, roads and tracks. In all circumstances, avoid any sudden direction changes.
16. Be very cautious while turning, taking in account the length, the wheelbase, the height and the weight of the machine or trailer.

17. Before any use of the machine, make sure every protection component is in place and not damaged. Any damaged component protection must be immediately replaced.
18. Before any use of the machine, check the tightening of screws and nuts, the ones that hold the ground engaging parts in particular. Tighten them if necessary.
19. Do not stay in the operating zone of the machine.
20. Careful! Pinching zones may exist between moving parts of the machine, especially the ones controlled by hydraulics, pneumatics, or electrics.
21. Before getting out of the tractor, or before any intervention on the machine, turn the engine off, pull out the contact key, and wait for the complete stop of all moving parts.
22. Do not stand between the tractor and the machine without first setting the parking brakes and/or placing chocks under the wheels.
23. Before any intervention on the machine, make sure it cannot be turned on accidentally.

1.1.2 HYDRAULIC CIRCUIT

1. Careful! The hydraulic circuit is under pressure.
2. When mounting cylinders or hydraulic motors, make sure the wiring is correct, according to the instructions made by the manufacturer.
3. Before plugging any hose to the tractor, make sure that neither the tractor circuit nor the machine circuit are under pressure.
4. It is highly advised to the machine user to install identification marks on the hydraulic couplers between the tractor and the machine to prevent any connection error.
5. Careful! Some functions may be inverted. For example: fold/unfold.
6. Regularly check the hydraulic hoses! Damaged or worn hoses must be immediately replaced.
7. For hydraulic hose replacement, make sure you only use hoses of the same specifications and quality to the ones specified by the machine manufacturer.
8. If a leakage is found, accidents must be prevented by all means.
9. Any pressurized liquid, notably hydraulic oil, can perforate the skin and occasion serious injuries. In case of injury, immediately consult a doctor! There is a risk of infection!
10. Before any intervention on the hydraulic circuit, lower the openers, discharge oil pressure from the hydraulic circuit, turn off the tractor engine and remove the contact key.

1.1.3 MAINTAINANCE

1. Before any maintenance or repair work, and before looking for causes of a break down, the PTO must be unclutched, the motor must be turned off and the contact key removed.
2. Regularly inspect bolts and nut tightening. Tighten them if necessary!
3. Before working on a machine in raised mode, put an appropriate mechanical prop in position.
4. Before replacing any ground engaging part, wear protection gloves and only use correct tooling.
5. To protect the environment, it is forbidden to throw or spill oils, greases and any kind of filters. Give them to companies specialized in their treatment.
6. Before any work on the electric circuit, disconnect the power source.
7. Protection devices subjected to wear must be checked regularly. Immediately replace them if they are damaged.
8. Spare parts must be in conformity with the specifications and norms defined by the manufacturer. Only use genuine NOVAG spare parts!
9. Before undertaking electric welding on the tractor or the machine, disconnect the battery and alternator cables.
10. Repairs of any preloaded device (springs, accumulators...) requires particular skills and involves mandatory tooling. Thus, they may only be performed by qualified workers.
11. The use of lifting tools to raise the machine is only permitted at approved positions. Before doing so, park the machine safely and secure the machine against unintentional lowering and rolling (parking brake, wheel chocks) before carrying out work on and under the machine.
12. Keep people away from the metering units' gears and wheels.
13. Slowly clutch in the tractor PTO.
14. Never leave any object in the hoppers.
15. Do not move your fingers close to the metering roller.
16. Keep a safe distance to electric high voltage power lines with the wings folded and when unfolding or folding the wings. When unfolding or folding the wings, the machine may reach the height of overhead lines. Possible voltage flashover to the machine may cause fatal electric shock or fire.
17. Do not unfold or fold the wings in the vicinity of pylons and power lines.
18. Never leave or access the machine under overhead lines to avoid possible risks of electric shock or voltage flashover.

What to do in case of voltage flashover:

Voltage flashover generates high electric voltages on the outside of the machine. This results in extreme voltage differences at the ground around the machine. Wide strides, laying on the ground or supporting yourself with your hands on the ground can cause life-threatening electric currents (pace voltage). Do not leave the cabin. Do not touch any metal objects. Do not create a conductive connection to ground. Warn persons: DO NOT come near the machine. Electric voltages at the ground can cause severe electric shock. Wait for professional rescuers.

The overhead power line needs to be switched off.

If persons need to leave the cabin despite the voltage flashover, e.g. in case of a potential life threatening risk of fire:

Jump away from the machine. Ensure a safe stand when jumping. Do not touch the outside of the machine. Move away from the machine with short stepping strides.

1.2 In Case of Damage



If it is necessary to recover the machine, slings can be attached to the four corners of the seed drill.

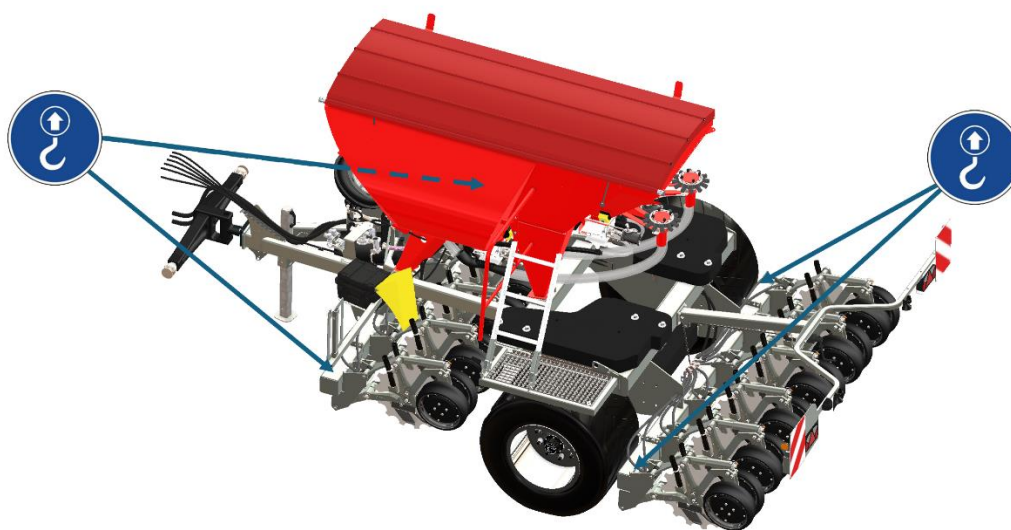


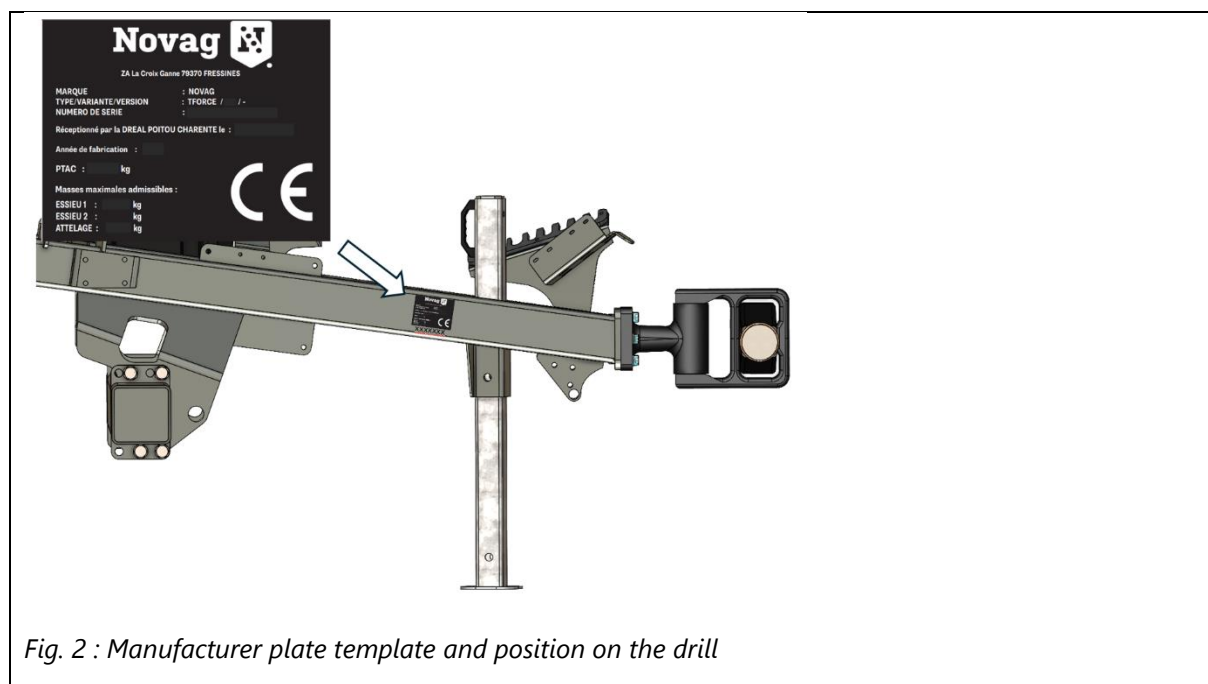
Fig. 1 : Frame lifting point

2 Technical Specifications

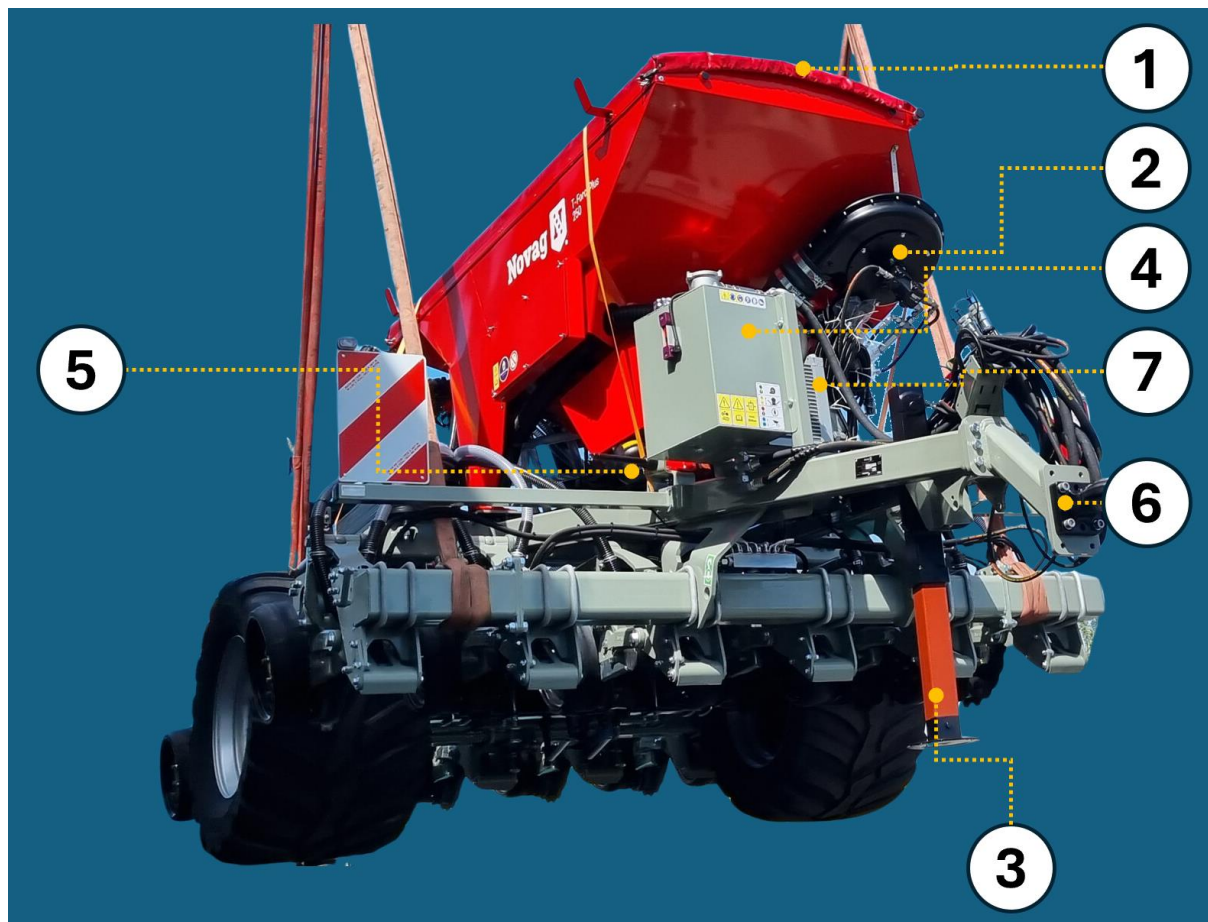
2.1 Main features

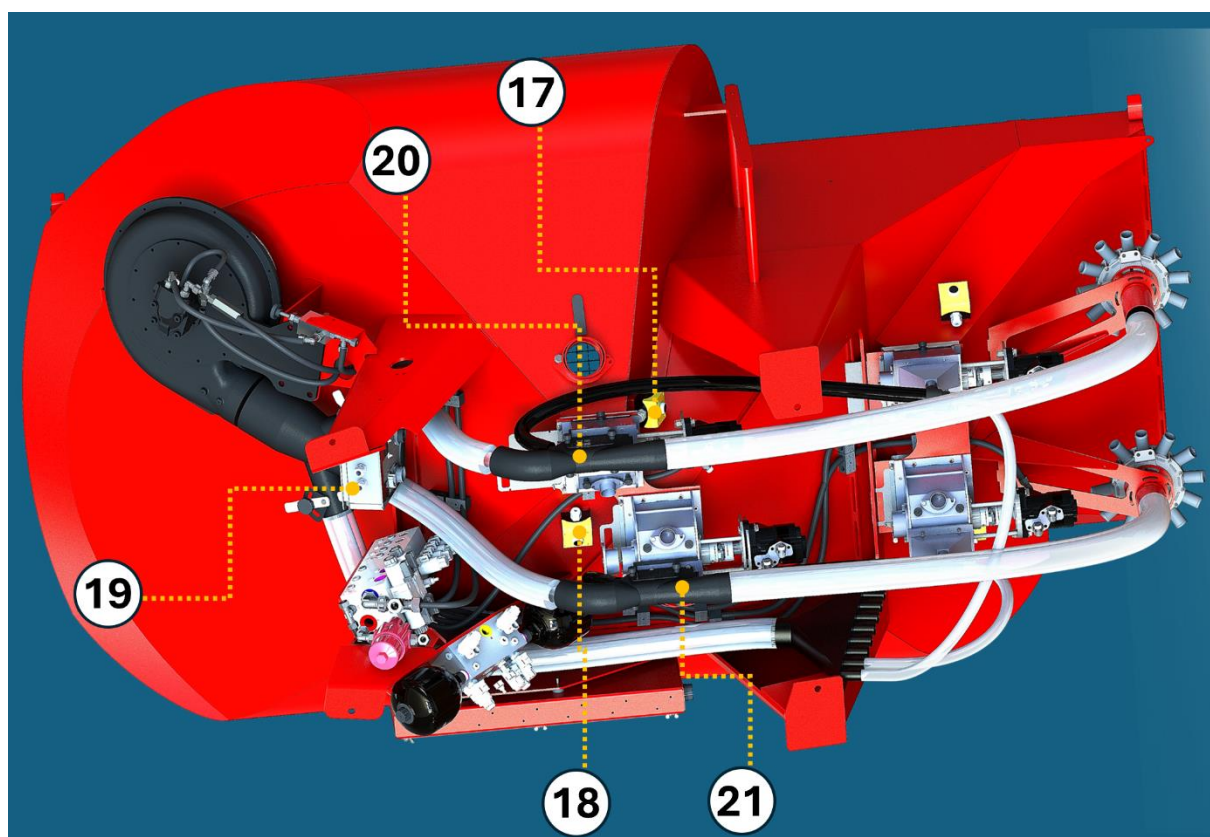
Model	T-ForcePlus 250.2m	T-ForcePlus 250.2.25m	T-ForcePlus 250.2.5m	T-ForcePlus 250.3m				
Work Width	2m	2,25m	2,5m	3m				
Road Width	2,2m	2,35m	2,5m	3m				
Empty weight	From 3.500kg, depending on Ballast configuration and Number of Openers							
Row configuration	Rows	Spacing	Rows	Spacing	Rows	Spacing	Rows	Spacing
	8	25cm	9	25cm	10	25cm	12	25cm
	10	20cm	12	18,75cm				
	12	16,6cm						
Total hopper capacity	2460l (1600/700/80/80)							
Required traction power	From 100 HP							

2.2 Manufacturer identification plate



2.3 General views





1	Hopper cover & screens	9	Controller enclosure	17	Front hopper calibration switch
2	Fan Unit	10	Park brake	18	Rear hopper calibration switch
3	Hydraulic/Manual Jack	11	Rear road lights	19	Power Box
4	Optional oil tank	12	License plate holder	20	Front Metering Unit
5	Opener Pressure block	13	Rear work lights	21	Rear Metering Unit
6	Tractor Coupling	14	Front Hopper Distr. head		
7	Oil cooler / Air warmer	15	Rear Hopper Distr. head		
8	Ballast (Side)	16	Auxiliary metering unit		

2.4 Tires

2.4.1 AUTHORIZED TIRE DIMENSIONS

	Tyre dimension including load capacity index and speed category symbol	Rolling radius (mm)	Rim Size	Offset	Tyre Load rating per tyre [kg] At 40km/h	Maximum permissible mass per axle [kg]	Maximum permissible mass of the vehicle [kg]	Maximum permissible vertical load on the coupling point [kg]	Track width [mm]	
									Max	Min
1	650/40 R22.5 150 D	495	22.5"	0	3280 @2bar	6500	6500	2500	2200	1800
2	560/45 R22.5 152 D	490	22.5"	25	3285 @2,4bar	6500	6500	2500	2200	1800
3	520/45/R17	445	17"	0	3500 @3,2bar	6500	6500	2500	1650	1650

2.4.2 INFLATION PRESSURE.

- Comply with the inflation pressures specified on the rim. If they are not mentioned, never go under 2 bars for road travel at 25km/h.
- On difficult land, increase the minimum pressures by 20%.
- For intensive use on the road, double the minimum pressure to maximize tire life.



With any tire, never inflate at a pressure lower than 1bar or higher than 3.5bar.



With any tire, never inflate at a pressure lower than 1bar or higher than 3.5bar.

3 Coupling to tractor

3.1 Coupling procedure

Three configurations are possible:

- Lower Linkage Cross Bar category II, Maximum permitted vertical load 2500kg.
- Lower Linkage Cross Bar category III, Maximum permitted vertical load 2500kg.

With lower linkage, the drill is equipped with a manual leg

- Ball joint type « K80 ». Maximum permitted vertical load 2500kg.
- Tow eye. Maximum permitted vertical load 2500kg.

In case of this type of coupling, the drill is equipped with a hydraulic jack



Only use certified tow couplings provided by NOVAG. The list of approved couplings can be found on the equipment EU certificate of conformity



Make sure of the compatibility of the tractor linkage arms (Cat II or III), pin or ball coupling diameters, and vertical load

3.1.1 USE OF LOWER LINKAGE

- Install the tractor's suitable ball parts (2) on the drill's cross bar pins (1)
- Approach carefully with the tractor
- Using the tractor's linkage arm controls, collect the drill's cross bar with the hooks and lift the front of the drill off the ground.
- Lock the couplings using the designed system on the tractor arms.

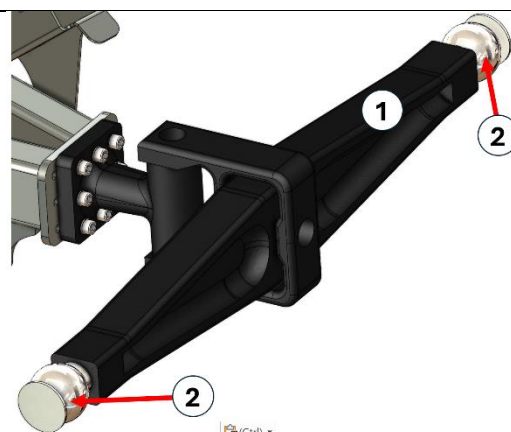
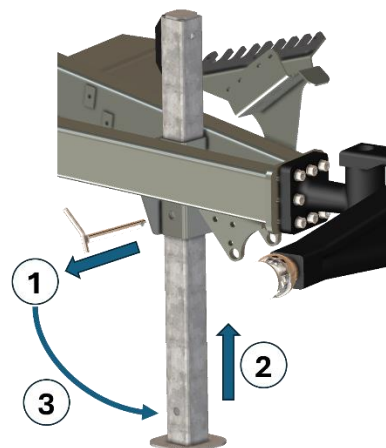


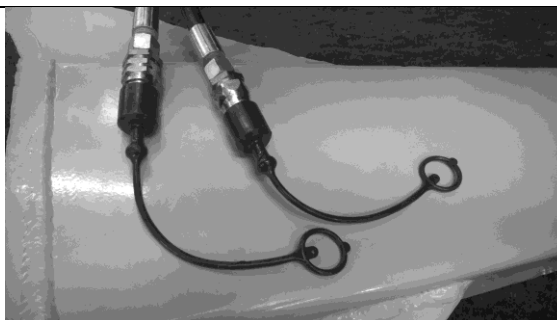
Fig. 3 : Lower Linkage bar

3.1.2 MANUAL LEG FOLDING (WITH LOWER LINKAGE)

- A. Raise the front of the drill, using the lower linkage controls.
- B. Remove the lower pin (1) and push the telescopic crutch (2).
- C. Lock the crutch in short position with the same pin (3).

*Fig. 4 : Folding the crutch***3.1.3 USE OF HYDRAULIC JACK (WITHOUT LOWER LINKAGE)**

1. Plug the two hoses coming from the jack cylinder to a double acting spool valve on the tractor. The hoses can be recognized by their blue caps.

*Fig. 5 : Drawbar hoses*

2. Set the oil flow from the tractor to a low value to avoid sudden movement.
3. To connect the drill, raise or lower the jack to correct position.
4. Put the tractor in place.
5. When the tractor is attached, raise the jack to transfer the weight on the tractor hitch.

3.2 Clip and angle setting



The frame angle has an impact on the the road clearance. Always check the clearance under all discs for road transport.

3.2.1 WITH LOWER LINKAGE

Once the drill is attached to the tractor, the tractor's linkage arms is used for adjusting the frame angle with the ground. The drill is designed to work at a perfectly horizontal angle. It is best to adjust the drill frame to horizontal when the drill is working.

3.2.2 WITH STANDARD COUPLING

In a configuration without lower linkage, the coupling itself shall be adjusted at the suitable hole depending on the tractor's connection point.

Use the series of holes on the drill frame to mount the coupling at the right height.



Torque up the coupling bolts at 300Nm.
The bolts must be of class 12:9

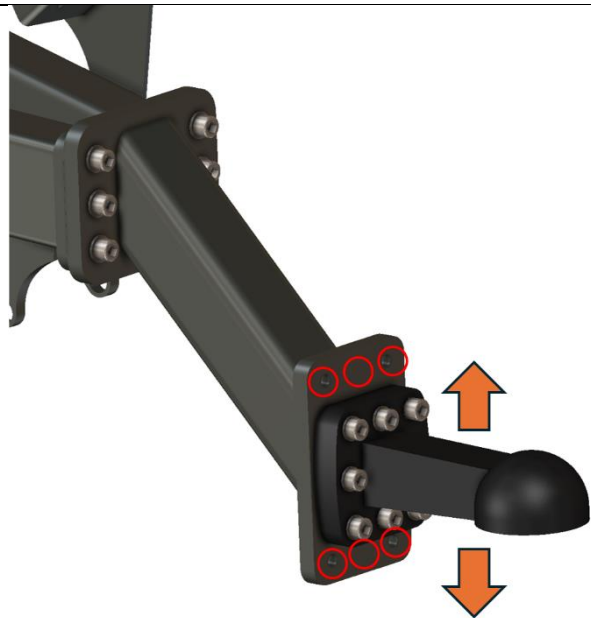


Fig. 6 : Height Adjustment holes for standard coupling

4 Maintenance Program

4.1 Safe Jacking Points

The use of lifting tools to raise the machine is only permitted at approved positions.

- As indicated in the figure below
- Under the axle
- The machine has to be coupled to a tractor

Before doing so, park the machine safely and secure the machine against unintentional lowering and rolling (parking brake, wheel chocks) before carrying out work on and under the machine.

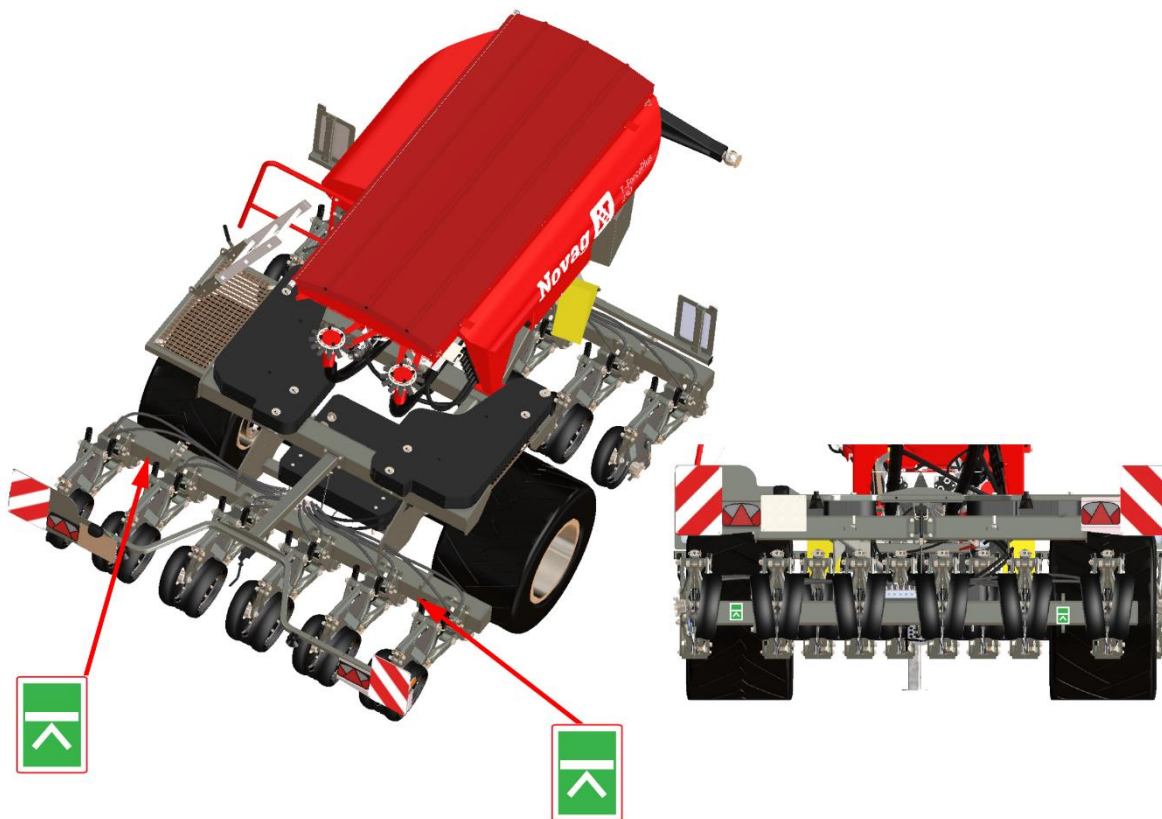
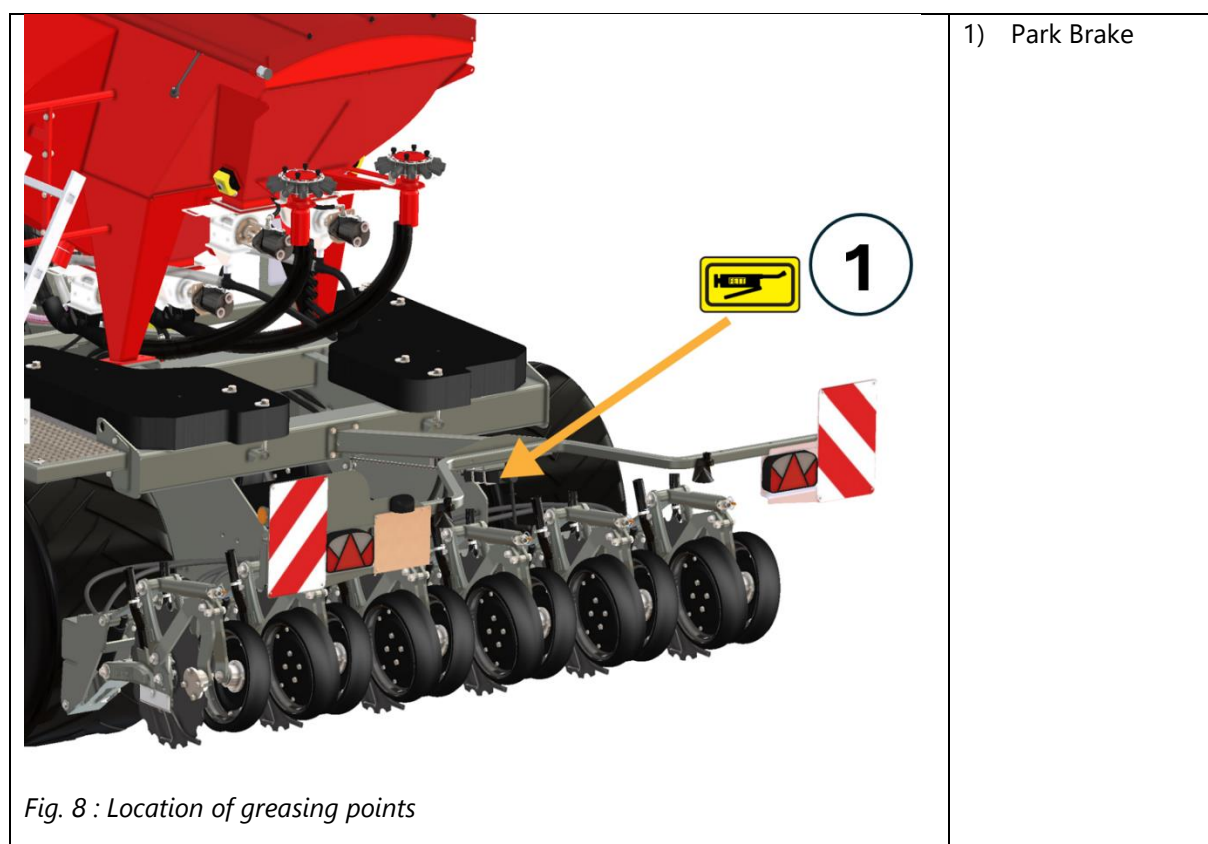


Fig. 7 : Safe jacking point

4.2 Lubrication

The machine should be lubricated regularly and after each pressure wash. This ensures operational readiness and reduces repair costs and downtime. Clean lubrication points and grease gun carefully before greasing so that no dirt is pressed into the bearings.

Lubrication point:	Time interval:		
	Daily	100 hours	
Hitch	X		
Axle wheel bearing			X
Other		X	



4.3 Wheel nut tightening

⚠ Always check the wheel nut tightening before any use of the drill.

Mounting : Rim holes must be chamfered to set the spherical base of the washer. The tightening is getting between spherical base of the nut and the rim chamfering.

The required torque for the wheel nut is 450Nm (nut size M22x1.5).

Retighten the wheel nuts after :

- The first time of use.
- The first laden journey.
- The first 1,000 km.

Every 6 months or 25,000 km

⚠ Never use impact wrenches to tighten the wheel nuts as the impact torque may be excessive.

⚠ Wheel nuts should be tightened diagonally using a torque wrench.

⚠ If power tools are used (for example, pneumatic torque wrench) they must be carefully set to the required torque for tightening. Otherwise, the studs and wheel nuts may be over tightened which may damage or break them.

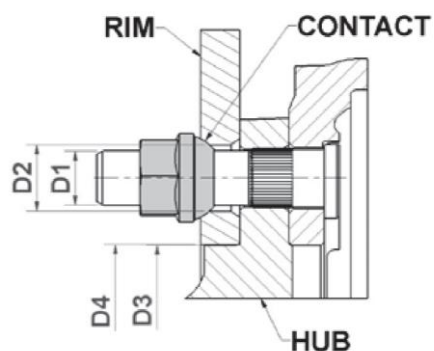
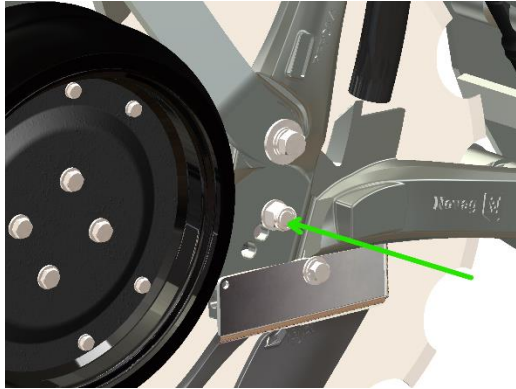


Fig. 9 : Wheel Nut Assembly

4.4 Openers

4.4.1 DAILY MAINTENANCE OR EVERY 10 WORKING HOURS

1. Clean and remove debris from press wheels, discs, blades to ensure a proper start up.
2. Check if the central disc hub bolt appears to be tight



3. Check any play in the disc hub rotation, and if necessary, adjust or replace the disc hub.
4. Check the absence of leakage in the hydraulic cylinders

4.4.2 SCHEDULED MAINTENANCE

After the first 50 hours of use

1. Check the Torque of every opener screws according to the torque charts in section 11

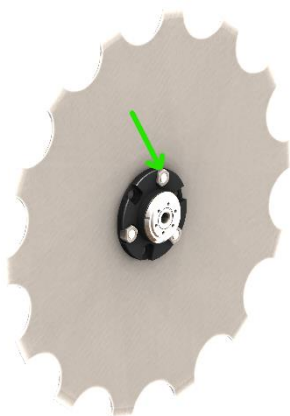
Once per year or every 100ha x working width

1. Check the Torque of every opener screws according to the torque charts in section 11
2. Check the preload applied by the spring plates
3. Check the play in the opener bushes
4. Check the Depth adjuster screw and if necessary, reapply general purpose grease on the thread against dust



5. Dismount the discs and blades
6. Clean the blade holes to remove any dirt, fertilizer, or rust

7. Check the torques on the disc mounting bolts on the hubs



4.4.3 DISC HUB INSPECTION USING HUB TOOL PFX110

Once per year or every 100ha x working width, perform the following check on the hub

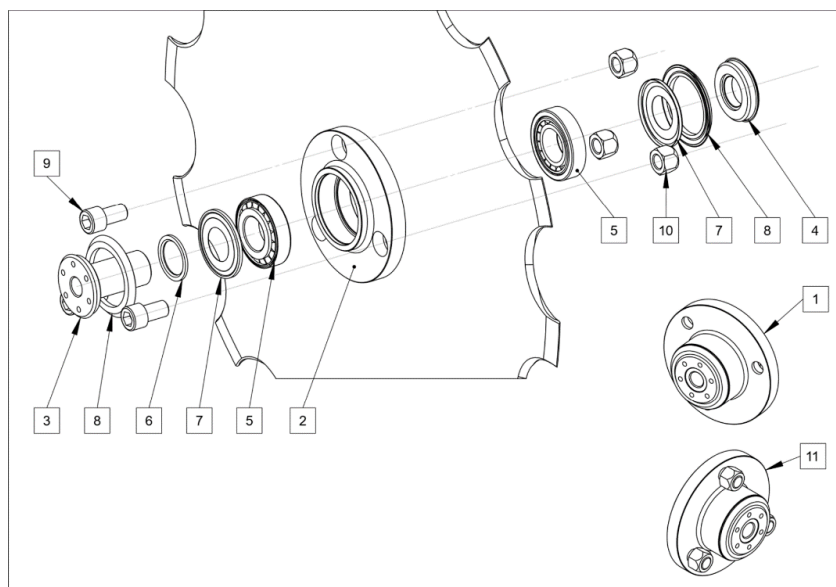


Fig. 10 : Disc Hub exploded view




Fig. 11 : Hub Tool

- 1) Use one of the hub tools to secure one side of the hub into a bench vice
- 2) Untorque the preload nut (4) side of the hub using the other tool of the pair and a suitable wrench.
- 3) Check the status of bearing (5), grease, seals (7,8)
- 4) If necessary, regrease the hub, with High Temperature grease
- 5) Close the hub and torque up the preload nut to 160Nm

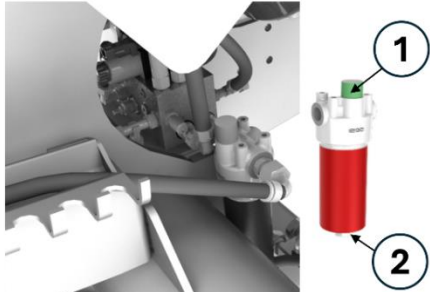
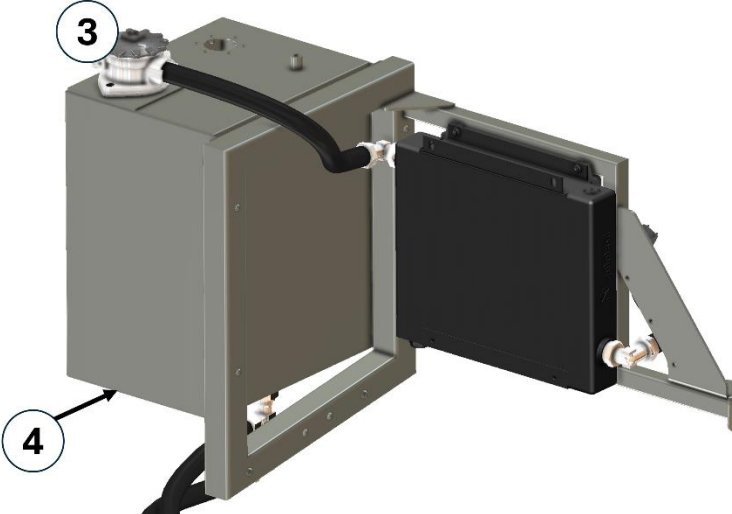
4.5 Hydraulics

4.5.1 HYDRAULIC OIL

Compliance	Mineral oil complying with DIN 51524 (chap. 1 & 2)
Temperature range	Min : -20°C Max : +80°C
Filtering	Maximum pollution permitted according to ISO44 06, class 19/17/14.
 Use the specified oil quality. The use of another type of oil or mixing between them can cause serious damage to the installation.	

4.5.2 LOCATION OF FILTERS

The drill is fitted with:

	<p>An inline high-pressure filter, located before the P line of the main distributor.</p> <ul style="list-style-type: none"> 1) Dirt indicator 2) Dismounting Nut
	<p>Optionnally, a return filter (3) on the reservoir, in case the drill has its own embarked pump</p> <p>A drain port (4) can be used to periodically drain the oil, every 1000hours of use.</p>

4.5.3 FILTER CARTRIDGE REPLACEMENT

Cartridges must be replaced at frequent intervals. Stay in accordance with the following recommendations:

At factory	After filtering and first tests.
After the first uses	After the first 50h
Before each season	Every 200h

How to replace the filter cartridge:

1. Place an oil collect bucket under the filter.
2. Remove the cover bell and remove the used cartridge.
3. Drain the cover and fill it with new oil.
4. Tighten without exaggerating the new cartridge in its seat, and mount the cover back.
5. Check the correct flow of pressured oil.

5 Drill Set Up

5.1 Battery cable mounting

1. Crimp contacts adapted to the tractor battery on the power wires.
2. Install the power wire along the tractor's frame, and secure it cautiously. In particular, keep it away from the tractor wheels and moving parts.
3. Bolt tightly the crimp contacts to the tractor battery, following its polarity.

Wire color	Polarity
RED	(+)
BLACK	(-)

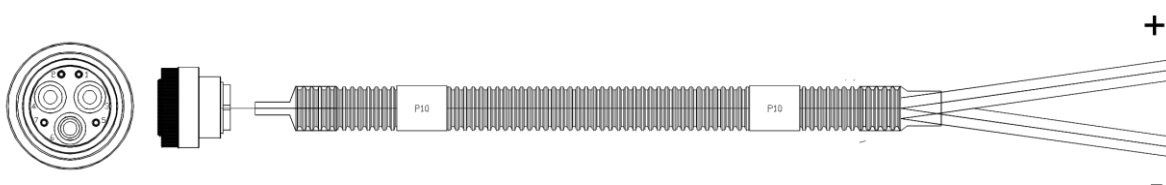


Fig. 12 : Tractor power cable.



Always connect the power cable directly to a 12V battery. And never use a tractor cab socket, or external implement socket. In some conditions, the Isobus Socket can be used if its maximum allowed intensity is over 50A.

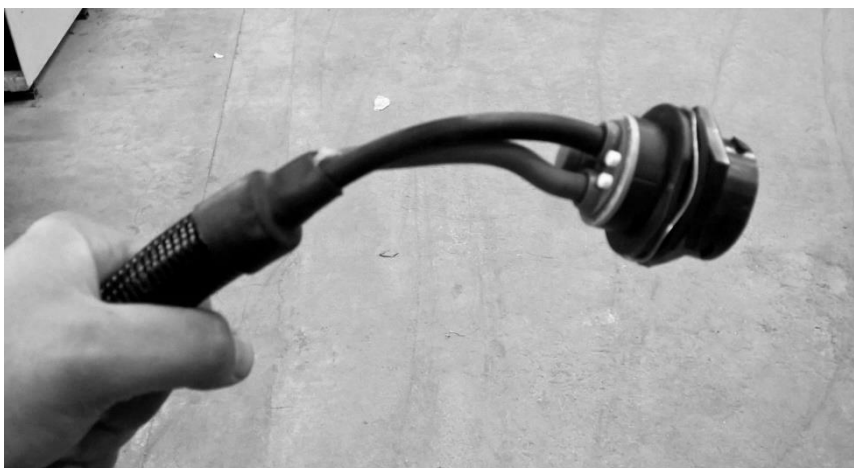


Fig. 13 : Drill power cable

5.2 Legacy Monitor Installation and setup

5.2.1 LEGACY NOVAG MONITOR



Fig. 14 : Monitor ad main socket

1/ Aluminum mount

2/ HMI

3/ Joystick 1, 2 or 3 push button depending on options

4/ USB socket for software upgrades

5/ Joystick socket





6/ Joystick cable

7/ Drill main socket

8/ 3 position switch. From bottom to top: OFF/
Monitor only ON / Monitor + Drill ON



Fig. 15 : RAM ball arm

-  **Do not hang the monitor assembly using the joystick cable.**
-  **Firmly fasten the monitor assembly in the tractor cab using the RAM system provided, or any other appropriate system**
-  **Handle the monitor with caution to avoid scratches.**
-  **Do not attempt welding on the aluminum mount.**

5.2.2 CONNECTION TO THE DRILL CABLE

1. When the monitor assembly is mounted, connect it to the drill cable using the elbow connector.
2. Secure the drill cable at the back of the tractor to prevent it being caught during turns and maneuvers.



Fig. 16 : Elbow connector on the drill cable

5.2.3 ELECTRIC START-UP

The electrics are switched on by the cab switch. This switch has 3 positions.

OFF position

Monitor and controllers are OFF

Intermediate position

Only the monitor is activated. This position is used to upgrade the software.

ON position

The drill is fully activated.

- The monitor is turned on
- The sensors are powered
- The drill controllers are powered

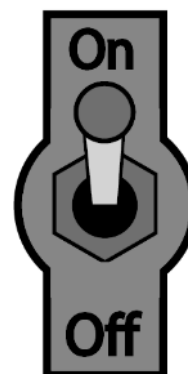


Fig. 17 : Cab switch positions



The drill will not work if the switch is not pushed to 3rd position, (top of its travel).

5.3 Connection to Tractor : Isobus

The ISOBUS standard (defined in the ISO 11783 standard series) has ensured manufacturer-independent compatibility between tractors, accessory equipment, and agricultural software on office PCs

5.3.1 ISOBUS ADAPTER

In general cases, the battery cable is replaced by a « Isobus Adapter »

The Adapter's connector "IBBC" has to be connected to a standard Isobus socket, usually at the rear of the tractor.



Make sure the tractor's Isobus Socket can deliver at least 50A electric current



Fig. 18 : isobus adapter

5.3.2 ISOBUS CONNECTOR PIN-OUT

Nr./No.	Funktion/Function	mm ²	Farbe/Colour
1	GND (Masse / common return POWER)	6 / 10 / 16	schwarz/black
2	ECU_GND (Masse / common return ECU)	2,5	schwarz/black
3	PWR (+12V Stromversorgung / power supply POWER)	6 / 10 / 16	rot/red
4	ECU_PWR (+12V Stromversorgung / power supply ECU)	2,5	rot/red
5	TBC_DIS (Kontaktbrücke auf Pin 4 / connected to pin 4)		
6	TBC_PWR (Power)	0,5	rot/red
7	TBC_RTN (Return)	0,5	schwarz/black
8	CAN_H (High)	0,5	gelb/yellow
9	CAN_L (Low)	0,5	grün/green

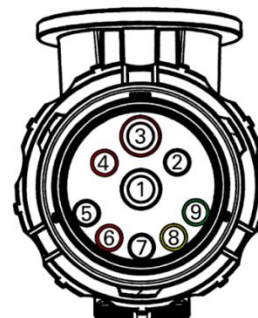


Fig. 19 : IBBC Pin out (isobus connector)

5.3.3 ISOBUS VIRTUAL TERMINAL

According to the Isobus standard, the Novag application can be displayed in an Isobus Virtual Terminal (VT) with a minimum resolution of 600x480px

Various configurations are possible

- Use of a 8,4" VT provided by Novag, the T50i. The VT has to be installed in the tractor cab
- Use of an external VT or the Tractor VT



Fig. 20 : T50i Isobus VT

5.4 Power Box

The power box, located near the front ladder of the drill, allow the use of internal hopper lights, and to activate/deactivate the rear beacon.

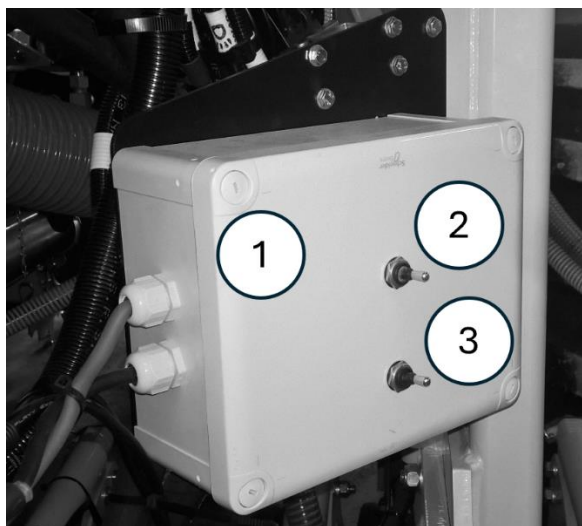


Fig. 21 : Main power box on the drill

1/ Power cabinet

2/ Rotational beacon switch

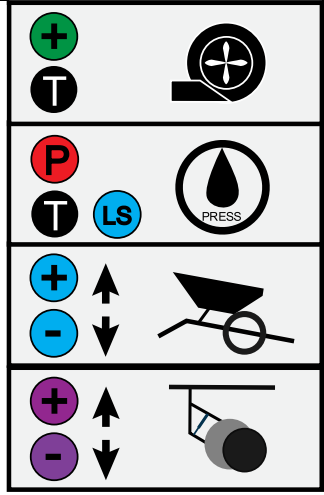
3/ Hopper LED switch



The rotating beacon and hopper internal each draw their current from the tractor road light circuit, therefore the tractor's lights must be switched on for their operation.

5.5 Hydraulic hoses coupling

5.5.1 4-SPOOL VALVE SETUP

Color	Hose designation	Tractor coupling	Hose size	Coupler type	
Green cap	Fan pressure hose	1 hose on 1 spool valve	1 hose 1/2 (DN13)	Male coupler 1/2"	
Black cap	Fan return hose	1 hose on other side of fan spool	1 hose 1/2 (DN13)	Male coupler 1/2"	
Red cap	Main circuit hose	1 hose on 1 spool valve	1 hose 1/2 (DN06)	Male coupler 1/2"*	
Black cap	Tank hose	Direct return to tank	1 fabric hose 3/4 (DN20)	Male or female coupler 3/4"	
Blue cap	Load Sense hose	1 hose on LS spool	1 hose 1/4" (DN06)	Male coupler 1/4"	
Blue cap	Hydraulic jack -opt	2 hoses on double acting spool valve	2 hoses 1/4' (DN06)	Male coupler 1/2"	
Purple Cap**	Openers	2 hoses on double acting spool valve	2 hoses 3/8 (DN10)	Male coupler 1/2"	

*Depending on tractors

** The purple lines availability depends on the drill configuration. In alternative setup, the openers can be controlled through the main circuit (red cap).

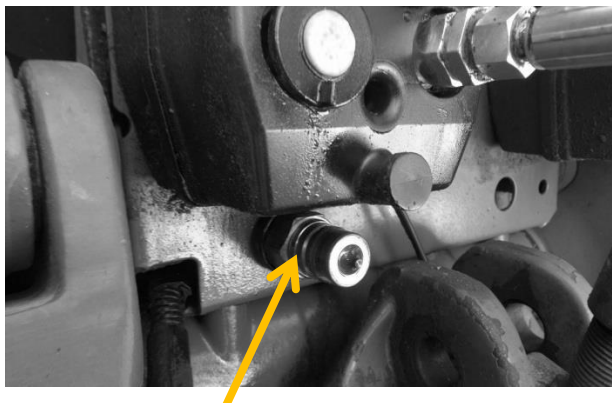


Fig. 22 : Example of return plug on tractor



Fig. 23: Return hose on the drill



The tractor must be fitted with two free returns to tank couplers.



Always plug the return hoses first and unplug it last, to avoid any pressure burst.

5.6 Embarked pump configuration

5.6.1 PUMP INSTALLATION

The embarked pump option features a double pump, mechanically coupled with the tractor Power Take Off (PTO) shaft.

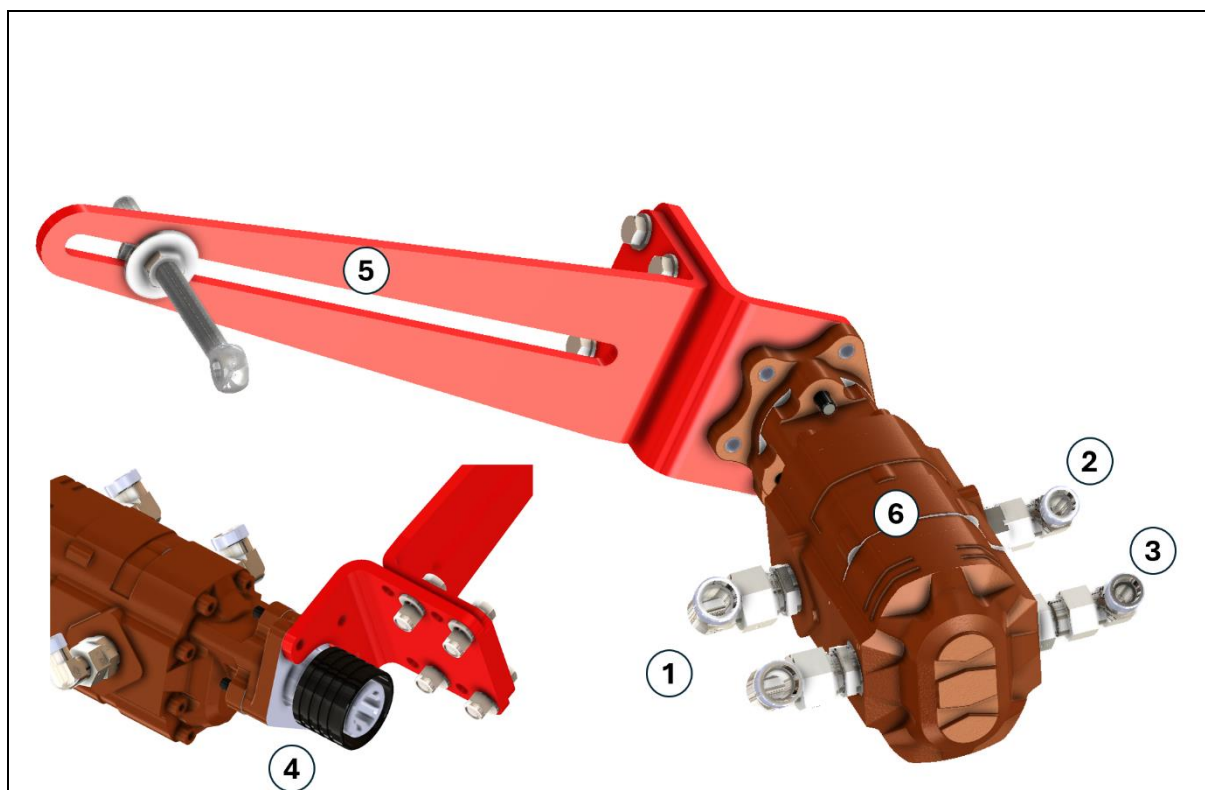
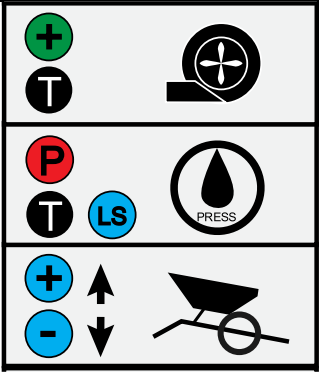


Fig 22: Embarked Pump

1	Tank Suction Ports	4	Coupler
2	Fan Pressure port	5	Stabilizer arm
3	Main Circuit Pressure port	6	Pump body

1. Make sure the the suction ports (1), the fan pressure port (2) and the main pressure port (3) are connected to their respective hose, according to the table in next section.
2. Install the pump at the rear of the tractor and connect the mechanical coupler (4) to the PTO Shaft
3. Make use of the stabilizer arm kit, or any other mean suitable with the tractor, to counter the rotation of the pump that could arise when the PTO shaft is running.

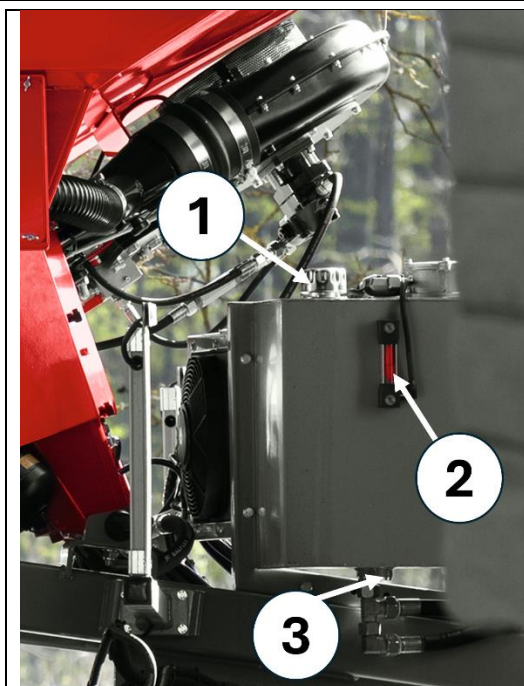
5.6.2 HOSE IDENTIFICATION

Color	Hose designation	Port	Hose size	Coupler type	
Green cap	Fan pressure hose	Pump port 1	1 hose 1/2 (DN13)	Male coupler 1/2"	
Red cap	Main circuit hose	Pump port 2	1 hose 1/2 (DN06)	Male coupler 1/2"*	
Blue cap	Hydraulic jack -opt	2 hoses on double acting tractor spool valve	2 hoses 1/4' (DN06)	Male coupler 1/2"	



Make sure the pump is primed and has access to constant and reliable oil flow from the tank. Running the pump "dry" without sufficient oil supply will cause serious damage to the pump.

5.6.3 OIL TANK FILLING AND LEVEL SENSOR



The tank shall be filled with hydraulic oil suitable to specifications set further in this manual.

Open the cap (1) to refill the tank

Watch the level sensor (2) and fill the tank up to the maximum level. Do not exceed this level!

Excess oil or used oil can be removed through the drain plug (3)

5.7 Oil flow set up

5.7.1 RECOMMENDED OIL FLOW

Oil flows are set from the tractor hydraulic system.



Stay in accordance with the following specifications. An overly low flow will cause irregularity and an overly high one will induce overheating and power loss.



In case of an embarked pump, the optimal oil flows are reached for a PTO frequency of 1000rpm.

Functions	Minimum flow	Maximum flow
Hydraulic jack cylinder	/	15l/min
Main circuit	30l/min	50l/min
Openers	15l/min	100l/min
Fan	30l/min	55l/min
Folding cylinders	20l/min	80l/min

Oil flow output values from the tractor can depend on 2 parameters:

- Engine revolutions: Maximum oil flow is not generally reached under 1500-1700 rpm, even with a load sensing pump. For lower motor speed, the tractor pump cannot deliver enough flow. This can be seen with the fan speed.
- Temperature: On especially older tractors, the hotter the oil is, the higher is the oil flow. This parameter must be taken in account for manual spool valve adjustments.

5.7.2 SPOOL VALVE FOR « MAIN CIRCUIT »

This distributor sends oil for:

- Metering unit's rotation.
- Opener Downforce control.

The oil flow has to be adjusted taking in account the number of rows, because the raising and lowering speed of the openers is directly proportional to this value.

Also, 10l/min has to be allowed for each activated hopper.

The IntelliForce® system only occasionally uses the tractor oil flow.

5.7.3 FAN SPOOL VALVES

Detailed fan adjusting procedure will be presented in section 8.

5.7.4 LOAD SENSING

With this option, the drill can be connected directly to the load-sensing system of the tractor. If the tractor is equipped with a load-sensing pump, the main line (P) can be connected directly to the pump outlet of the tractor. For LS operation, the LS valve must be adjusted. To do this, loosen the union nut (size 13 spanner) and screw the threaded shaft down using an Allen key (size 4). Then secure the union nut. If the drill is operated via the normal control units (scv), make sure that the threaded shaft is completely screwed out.

This pilot hose will send information to the tractor pump which will adapt its flow for:

- Adjusting the opener downforce.
- Making the metering unit(s) turn at the right speed.

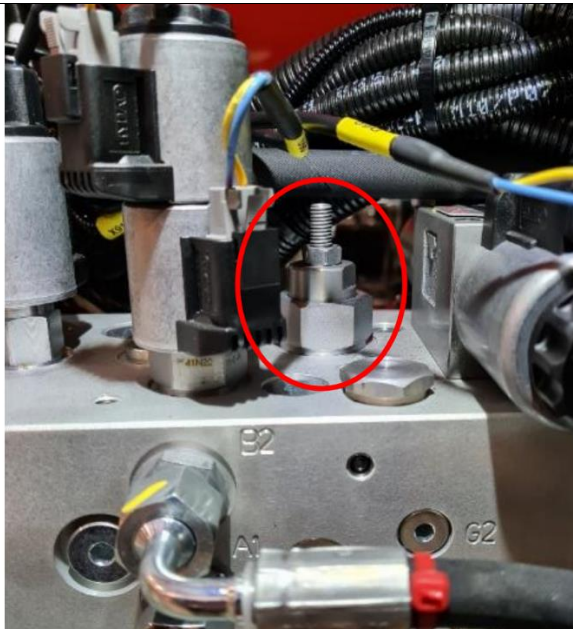


Figure 22: Hydraulic block Principal

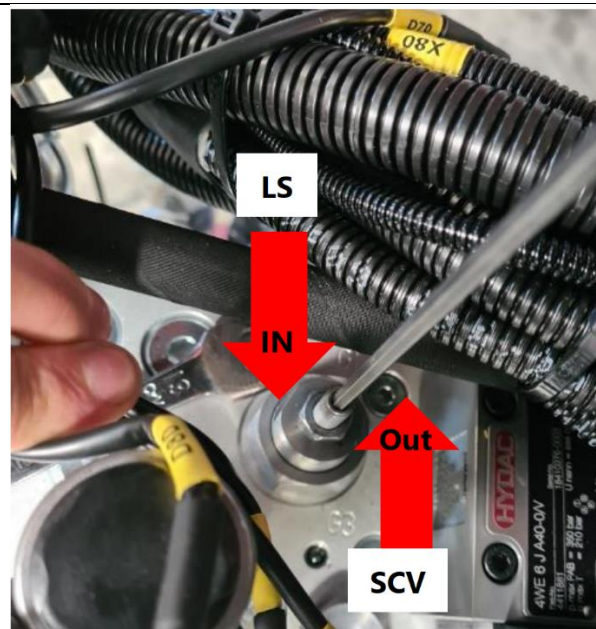


Figure 23: LS-Valve adjustment

5.8 Raising and lowering the openers

5.8.1 JOYSTICK

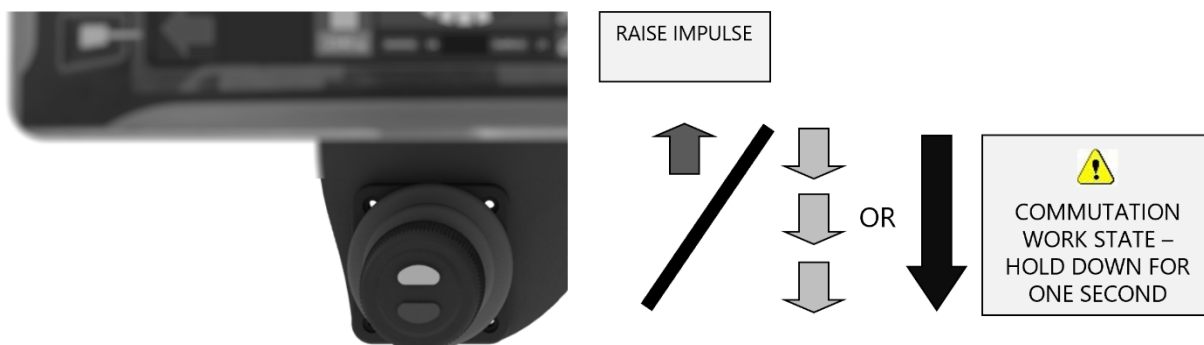


Fig. 24 : Raising and lowering using the joystick



Always checks the surroundings first. In particular, make sure that nobody stands close to the opener prior to any action.

1. Active the main tractor spool valve.
2. Raise: Raising is triggered after a brief impulse on the top arrow button. The openers will raise to their maximum. To stop the raising, a brief impulse on the down arrow button is enough.
3. Lower: Lowering can be controlled:
 - Either, by short and repeated impulse on the down arrow button. The openers stay in place and are moving down every time an impulse is made. Or, by holding approximately 1s the down arrow button. In this case, the drill goes into work state and the **openers immediately fall**. If IForce pressure control is in automatic mode, the hydraulic pressure in the opener cylinder will raise until the openers penetrate the ground. (On a concrete floor, the pressure will raise to its maximum).

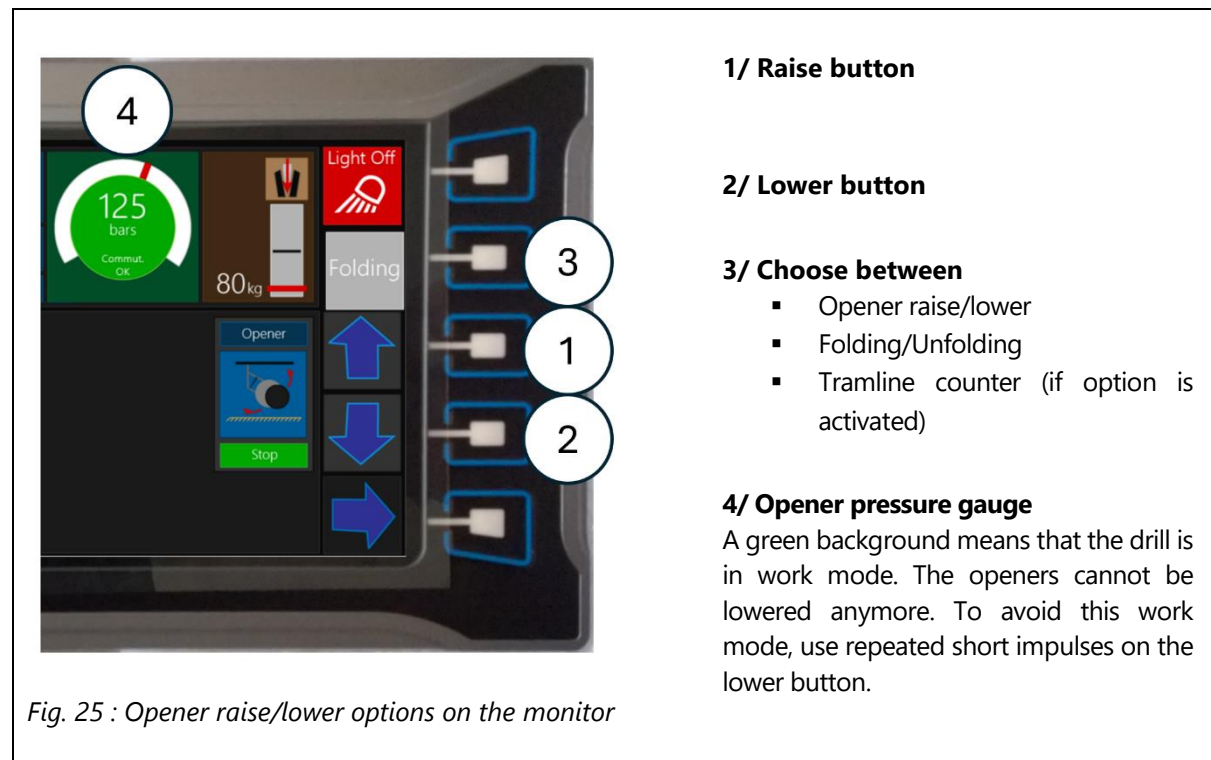


When the drill is put into work state, the openers fall under their own weight even if the tractor hydraulics are not activated.

- To deactivate IForce, press the blue button on the joystick or use the monitor (section 13).
- When the drill has gone into work state, it is no longer possible to lower them more with the joystick.

5.8.2 MONITOR

As a second option, the opener raise and lower function can be commanded from the monitor. See section 14 Monitor for more details.



5.9 Disc adjustments

5.9.1 PURPOSE OF ADJUSTMENT

The openers feature 3 holes for disc mounting.

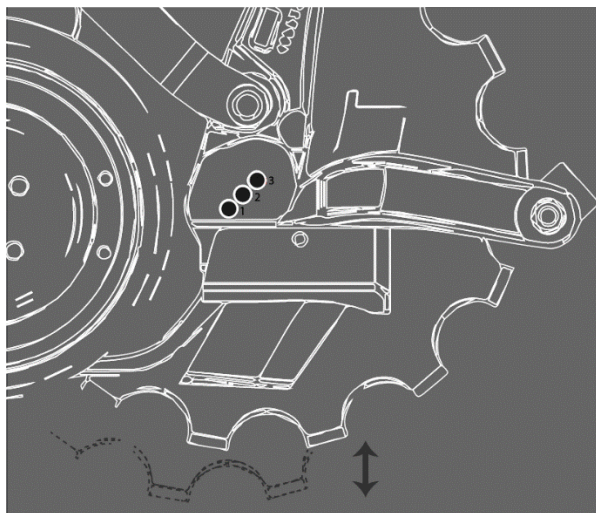


Fig. 26 : Disc mounting holes

Reasons frequently causing change of disc setting mounting positions are the following:

- Compensation for disc wear: with wear, the disc diameter decreases and it is important to mount it to a lower hole to avoid the lower part of the blades being below from the notches.
- Improvement of disc rotation: In wet or very soft soil, moving the disc down gives it more grip.
- Lowering the required downforce: In hard soils, raising the disc to a top hole helps reduce the required weight on the drill.

5.9.2 ADJUSTMENT

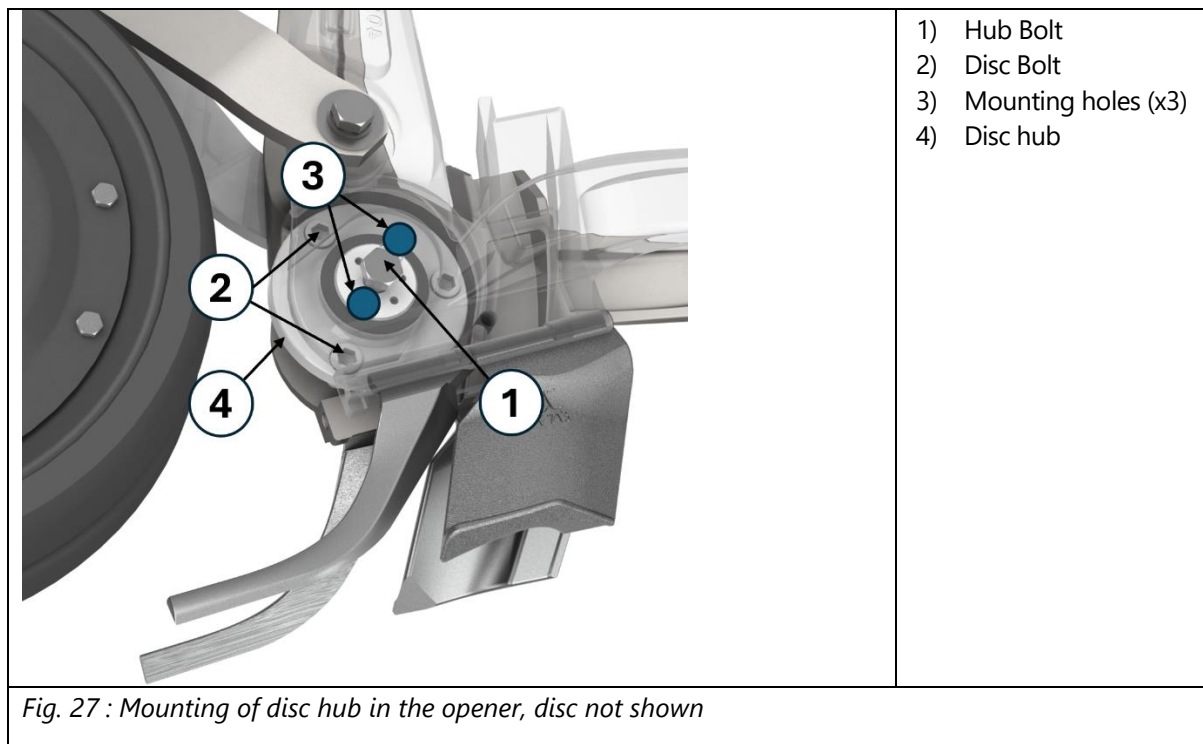


Handle the discs with care because they are very sharp. Wear gloves, long clothing and safety shoes to prevent cuts and injuries.

1. Untighten the 2 Spring Plate screws (Fig.29) to relieve the pressure applied by the blades and the scrapers.
2. Untighten the hub bolt.
3. Remove the hub bolt.
4. The disc hub is now freed and it can be moved to the next hole.
5. Place the hub hole exactly in alignment with the mounting holes.
6. Insert the hub bolt screw and tighten it.
7. Use of a Nylock nut or spring washer is essential to prevent the bolt becoming loose, which would otherwise cause wearing of the bolt and the hub.



Always check the correct rotation of the disc. The disc must easily be turned by foot, in forward direction (at the base of the disc, push from front to rear).



5.9.3 DISC REMOVAL AND REPLACEMENT

The principle is similar to the one for changing holes, but, in addition:

1. First, raise the press wheels to maximum height to give more clearance for disc removal.
2. Using the drawbar cylinder, raise the front or rear toolbar by changing the frame angle.
3. Once the hub bolt is removed, pull the disc from under the opener.
4. Remove the 3 x disc stud bolts.
5. Fit a new disc and refit the disc stud bolts.
6. Replace the disc and mount the hub in place in the opener.

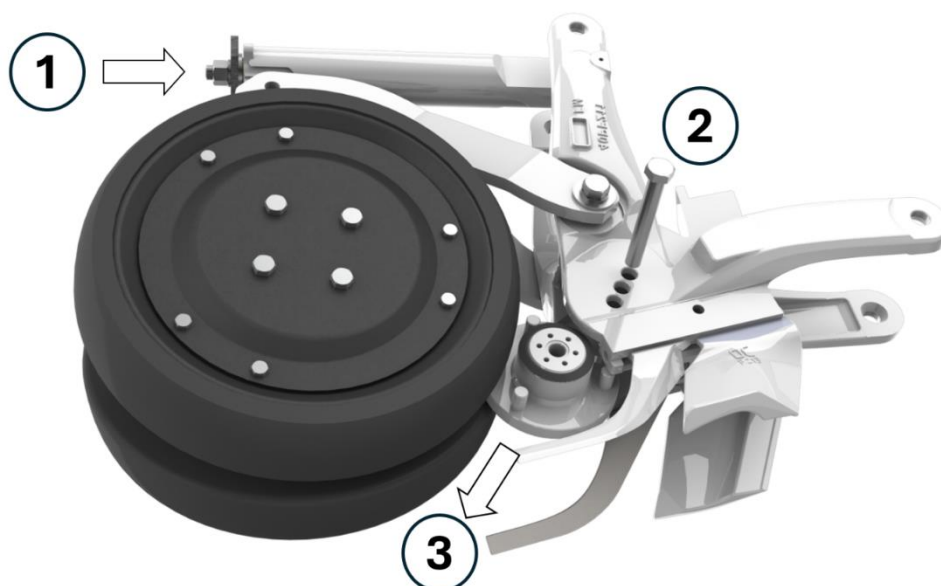

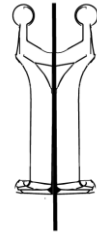
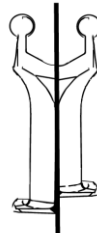


Fig. 28 : Disc hub removal

5.10 Blade and scraper mounting

5.10.1 POSSIBLE CONFIGURATIONS

Configuration	Drawing	Advantages
1x Blade on one side		Low soil disturbance Low traction power required
2x Blades of equal length		Moderate soil disturbance Allows horizontal separation of seeds and fertilizer
2x Blades of unequal length		Moderate soil disturbance Allows diagonal separation of seeds and fertilizer Allow drilling two different seeds at different depths.

5.10.2 MARKING

Blades and Scraper are casted with inscriptions that make their identification easy:

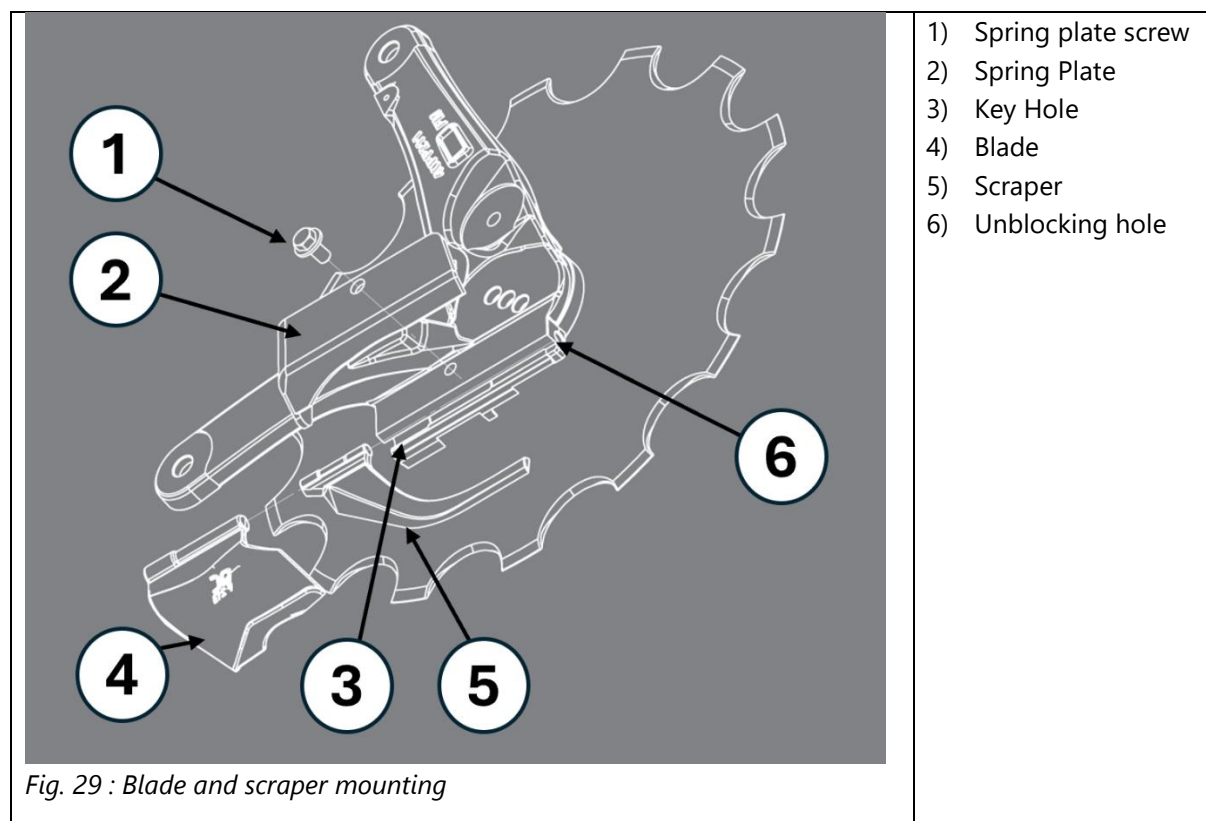
Part	Mark
Long Right hand blade	DL
Long Left hand blade	GL
Right hand scraper	D
Left hand scraper	G

5.10.3 MOUNTING / DISMOUNTING

1. Remove the spring plate screw and remove the spring plate.
2. Slide away the blades, in a forward direction in their keyhole.
3. Remove the scraper after the blade using the same method.



In case of blockage (caused by soil, wear, rust...), a hole is drilled at the back of the key hole. A pin can be inserted through this hole to remove the blade and scraper.




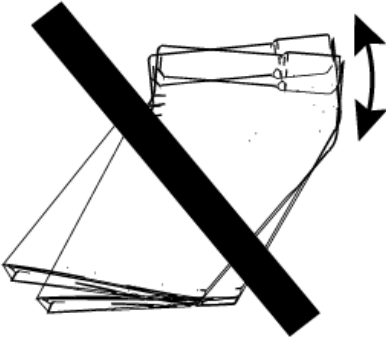
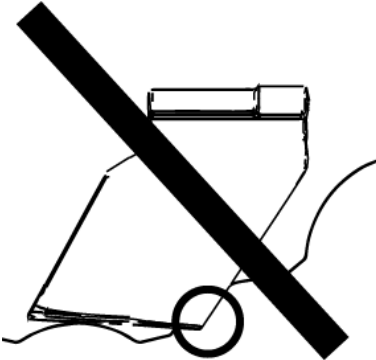
1. Remount in the opposite order.
2. When tightened, the spring plate will retain the blade and the scraper.



In normal working conditions, scrapers can become razor sharp. Always handle them with caution.

5.10.4 IMPORTANT VERIFICATIONS

A correct mounting must not display the following problems:

<p>Bad contact</p> <p>The blade is not in contact with the disc at the bottom of its leading edge.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> - Blade wear - Spring plate wear - Excessive friction in the key hole - Warped disc or abnormal play in the disc hub  <p><i>Fig. 30 : Bad contact with disc</i></p>	<p>Excessive play before mounting the spring plate</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> - Blade wear - Key hole wear  <p><i>Fig. 31 : Excessive play</i></p>	<p>The blade sticks out of the disc notches</p> <p>The leading edge tip is lower (goes deeper) than the disc notches.</p> <p><u>Possible cause:</u></p> <ul style="list-style-type: none"> - Worn out disc. Replace it or change mounting hole  <p><i>Fig. 32 : Disc wear</i></p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

5.10.5 CLEANING



Always make sure the path for seed is clear between the disc and the blade. Residues or dirt can cause blockage of the row.

Blockage of the seed path can occur in case of bad contact (fig. 30), driving rearwards while the openers are in the ground, excessive tractor wheel slippage, or, in general cases, if the soil is too wet to drill.

If a blade is blocked, unmount it and clean it.

5.11 Hopper low level sensors

Low level sensors make the driver aware of an empty hopper. If necessary, height adjustments are possible.

5.11.1 SENSOR ADJUSTMENT

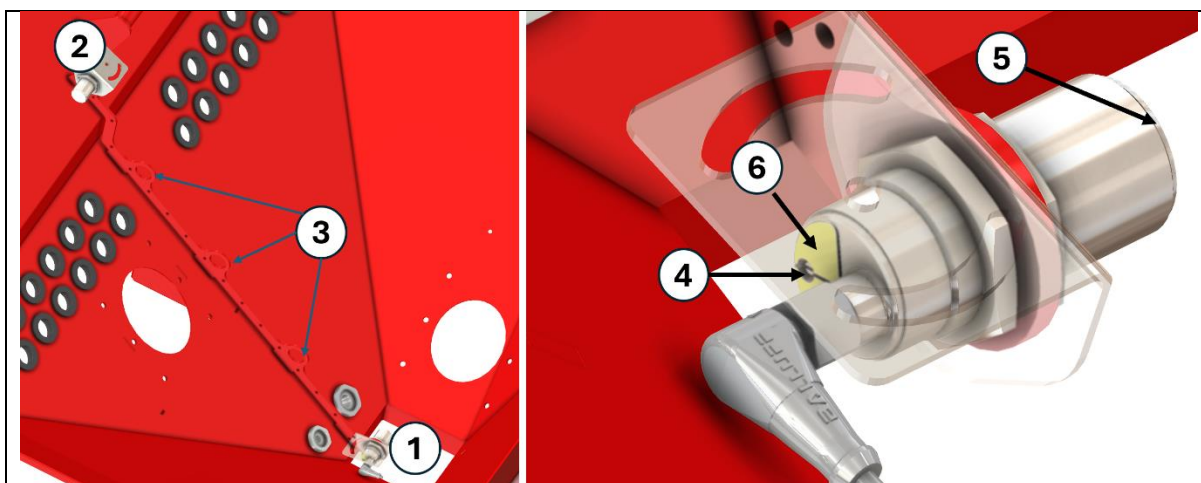


Fig. 33 : Low level capacitive sensor

The main hoppers are equipped with a double low level sensor system. The mid level sensor (2) triggers a first alarm to alert the user of that a reserve level of seed has been reached.

The empty level sensor (1) triggers the alarm for low level.

Nominal sensing range is 1 to 3cm. It can be adjusted using the screw (4).

The sensor themselves can be mounted in different holes inside the hopper. These define the volumes of seed/fertilizer that will trigger the alarms.

The higher it is, the sooner the low level alert will trigger prior to the hopper emptying.

The Auxiliary Hoppers only have one sensor, the empty level sensor

- 1) Empty level sensor
 - 2) Mid-level sensor
 - 3) Adjustment holes
 - 4) Range adjustment screw
 - 5) Sensing head
 - 6) Status Led.
- Green = Power on
Orange = No object detected

5.11.2 GOOD FUNCTIONNING CHECK

This must be performed when the hopper is empty.

1. Activate the electrical system using the cab switch behind the monitor.
2. If the hopper is empty, check the status LEDs. Both of them must be turned on. If only one is on, then the sensor detects the hopper wall or any object in the range, and must be adjusted.
3. If something is placed under the sensor, one LED must switch off.
4. If both LED's are off, check the wiring.

5.12 Seed sensors

As an option, NOVAG electronics can interface with the blockage monitoring system AGTRON[®]

The option features:

- Optical seed sensors, mounted around one or both distributor head.
- An controller, able to interpret the blockage data from the sensors. This controller can manage the two main hoppers.

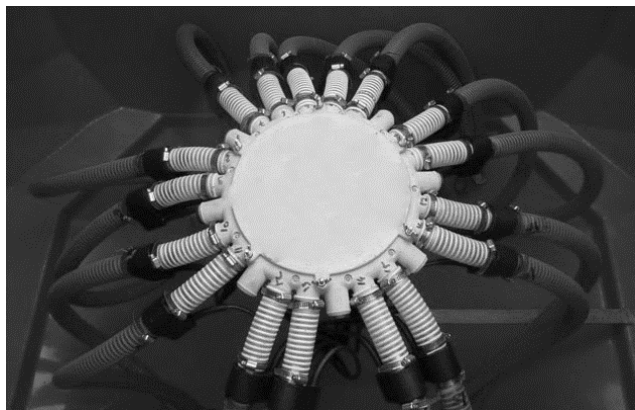
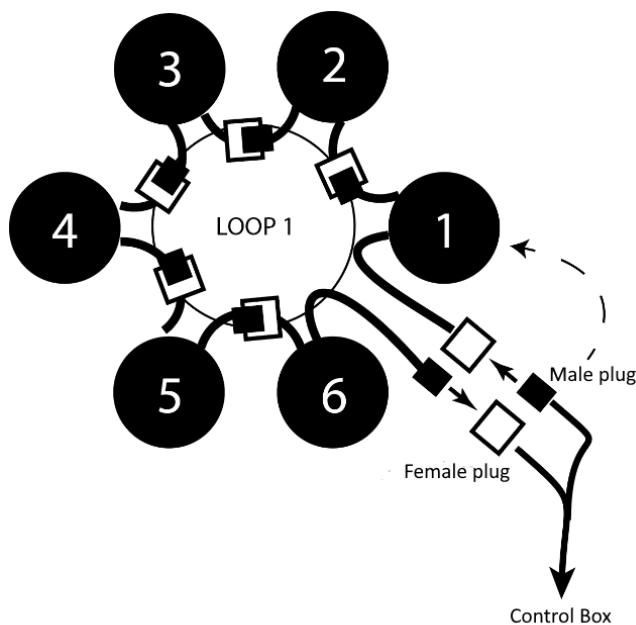


Fig. 34 : Sensors installed around the distribution head.



Fig. 35 : Agtron controller inside the main electrical box



The wiring around the head must be checked on occasions.

The sensors are wired in serial, and they form a loop. There is one loop per hopper.

Sensor auto-numbering is a factor of its position in the loop.

The male plug from the drill main cable system must be connected to sensor n°1 (see section 6.1.3).

5.13 Filling

5.13.1 VOLUME REPARTITION

The hopper is subdivided in 4 compartments with fixed volumes. FRONT, REAR, AUX 1 and AUX 2

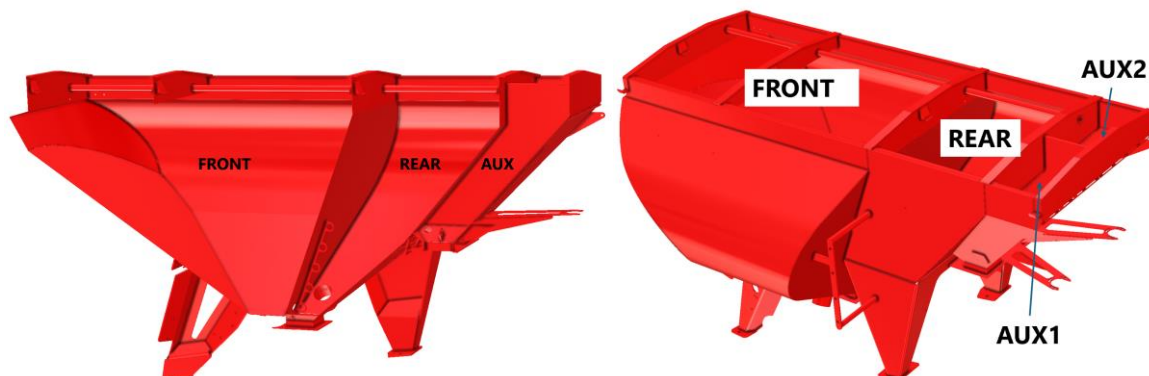


Fig. 36 : Hopper compartments

The volume ratios are set as following:

FRONT (l)	REAR (l)	AUX 1(l)	AUX 2(l)
1600	700	80	80

5.13.2 CAPACITES

Hopper	Use	Volume	Maximum weight of product
Front hopper	Grain, small seeds, big seeds, fertilizer	1600l	1300kg
Rear hopper	Grain, small seeds, big seeds, fertilizer	700l	700kg
Aux. Bin	Slug bait, small seeds starter fertilizer	80l	80kg

5.14 Ballast

For hard soils, two places are designed to host ballast weight on the TF+250 series. Ballast plates of 50kg each can be bolted on the frame. These ballast are available from NOVAG as options.

The ballasts exist in two variants :

- Side ballasts (1), of 50kg each. Maximum permitted count 24, 12 each side
- Axle Ballast (2) of 50kg each. Their lower center of gravity is an advantage for stability in slopes. Maximum count is 15 pieces of 50kg each

Maximum number of ballast permitted on the drill is 39, equivalent to 1.950kg.

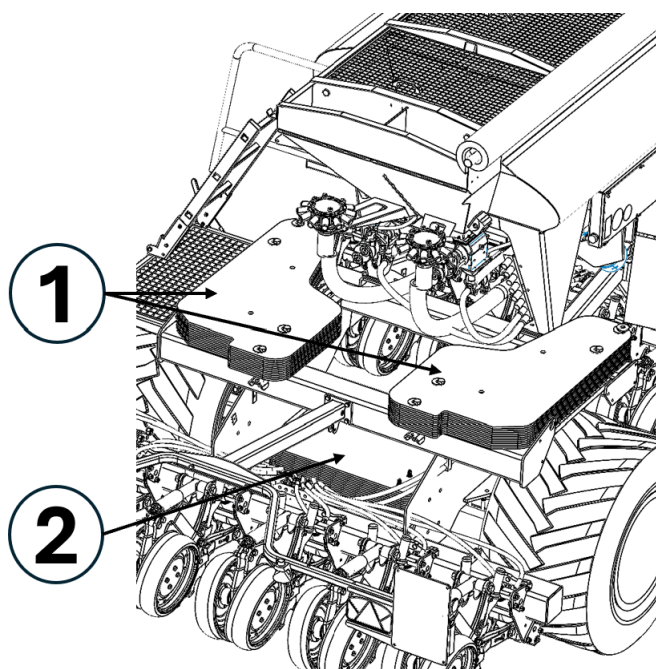


Fig. 37 : Ballast location



When ballast weights are fitted, take extra caution on slopes and turns.



Never drive on public roads if the drill weight is over the maximum permitted weight written on the manufacturer plate.

6 Road driving and brakes



Before going on the road, always check that the drill configuration complies with road regulations.



Make sure that the openers are fully raised.

6.1 Maximum speed and weight

The drill is certified for a maximum road speed of 40km/h and a load of maximum 6,5t under the axle



The drill is certified for a maximum road speed of 40km/h and a load of maximum 6,5t under the axle



Make sure the tyre pressure is sufficient for the road speed. If necessary check the manufacturer's data

6.2 Lightning

6.2.1 REAR LIGHTS

Connect the 7-pin plug to the tractor socket.

Pin	Code	Wire colors	Circuit
1	L	YELLOW	L. Indicator
2	54G	BLUE	Fog light
3	31	WHITE	GND
4	R	GREEN	R. Indicator
5	58R	BROWN	D. Sidelight
6	54	RED	Stop Light
7	58L	BLACK	G Sidelight

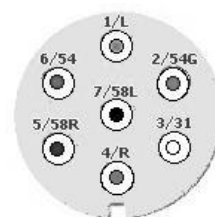


Fig. 38 : 7 pin plug wiring schematics



In case of malfunction of only one sidelight, check the tractor fuses.



Do not drive on any road without connecting this plug first, or in case of malfunction. Make sure the bulbs are working.

6.2.2 ROTATING BEACON

The drill may be fitted with a 12V rotating beacon, depending on the regulation applicable.

The beacon must be activated and deactivated from the main power cabinet on the drill. The Light plugs has to be connected and the road lights have to be activated.

6.3 Brakes



Driving on the road and on the field without brakes is prohibited and may cause serious harm



Never use the drill without connecting the brake system to the tractor.

6.3.1 HYDRAULIC BRAKE

Plug the special coupling of the drill to the tractor brake valve.

If coupling is not possible:

- Check the compatibility between the couplers.
- The hydraulic brake circuit may be under pressure, due to the emergency brake accumulator. Use the decompression push button described in 4.4.2.



Fig. 39 : Brake hose with special coupler



Remove the coupler if necessary, taking all safety precautions.



Always use the coupler that was factory fitted on the drill. The coupler must be in accordance with ISO 5576.1983.

6.3.2 PNEUMATIC BRAKE SYSTEM

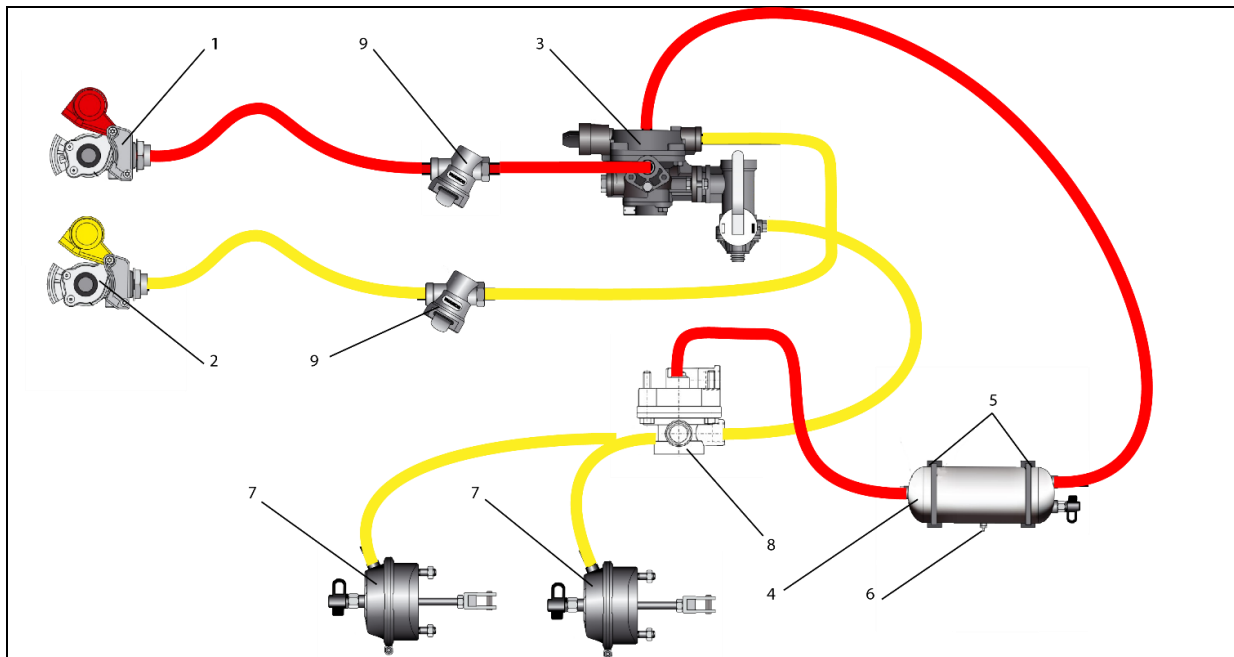


Fig. 40 : Pneumatic Brake Circuit Schematics

1. Coupling head "supply" (red)
2. Coupling head "brake" (yellow)
3. Trailer Relay Emergency Valve with manual release and load adjustment (dual line)
4. Air reservoir
5. Clamp band
6. Drain valve
7. Diaphragm brake cylinder
8. Relay Valve
9. Air Filter
10. Park brake screw lever
11. Handlebar for park brake cable

Hitching-Up:

1. Brake coupling – yellow
2. Pressure coupling - red
3. Release the parking brake

When unhooking, proceed in reverse order.

Unhitching:

1. Apply parking brake
2. Disconnect provision coupling - red
3. Disconnect brake coupling - yellow

6.3.3 AIR PRESSURE RESERVOIR

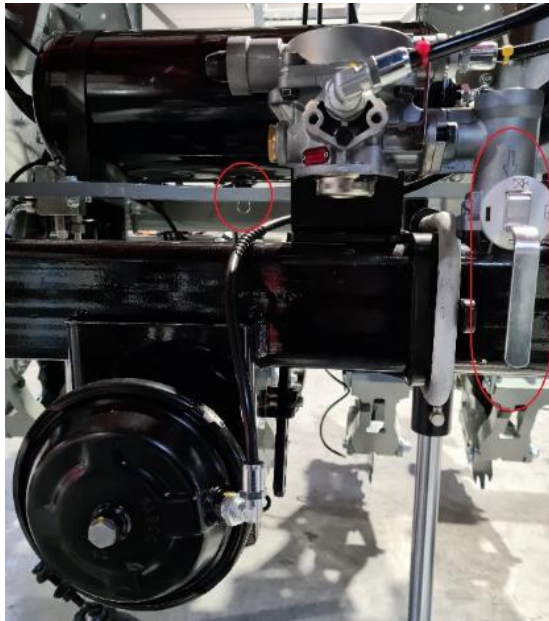


Fig. 41 : Air Reservoir

Drain the air reservoir at frequent intervals using the drain valve.

Brake force regulator must be adjusted according to the loading condition of the seed drill.

Before coupling the machine, clean any dirt on the sealing rings on the hose couplings of the supply and brake lines. Only move off with the machine connected when the pressure gauge on the tractor shows 5.0 bar. Drain the air tank every day. Before driving without the machine, lock the hose couplings on the tractor. Hang the hose couplings of the machine supply and brake lines in the appropriate empty couplings. When filling up or replacing the brake fluid, use the prescribed fluid. When replacing the brake fluid, comply with the appropriate regulations. Do not make any changes to the specified settings on the brake valves.

Replace the air tank if:

- o The air tank can be moved in the tensioning belts
- o The air tank is damaged
- o the rating plate on the air reservoir is rusty, loose or missing.

6.3.4 EMERGENCY BRAKE (HYDRAULIC BRAKE ONLY)

Using a chain or rope, connect the pin to a static point at the back of the tractor.

1/ Trigger pin.

If, while on the road, the drawbar connection breaks, the chain will pull the trigger out and will activate the emergency brakes.

2/ Decompression pushbutton

This button can be used to relieve the pressure in the brake hose after a long period without being used.

3/ Brake accumulator

This accumulator charges itself when the driver uses the tractor brakes. It will send the oil flow back to the drill brakes when the trigger pin is activated.

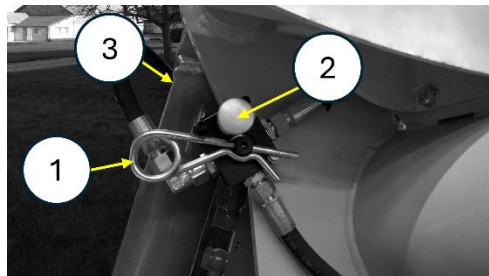


Fig. 42 : Brake valve in braking position)

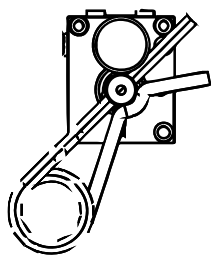


Fig. 43 : Brake valve in free position

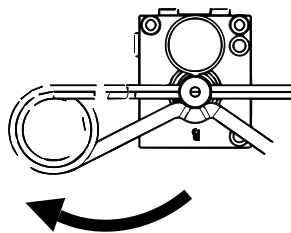


Fig. 44 : Brake valve activated



This system is an emergency brake only and it is not designed to be used as a parking brake.



Make sure that the trigger is deactivated before moving the drill on the road as well as on the fields.

6.3.5 PARKING BRAKE

The parking brake is used to immobilize the drill in position.



Make sure the parking brakes are untightened before moving the drill. A permanent braking load, even light, will induce heat and wear on the brake components and the axle.

7 Seeding rate – Calibration

7.1 Main hoppers

7.1.1 AIR SYSTEM SCHEMATICS

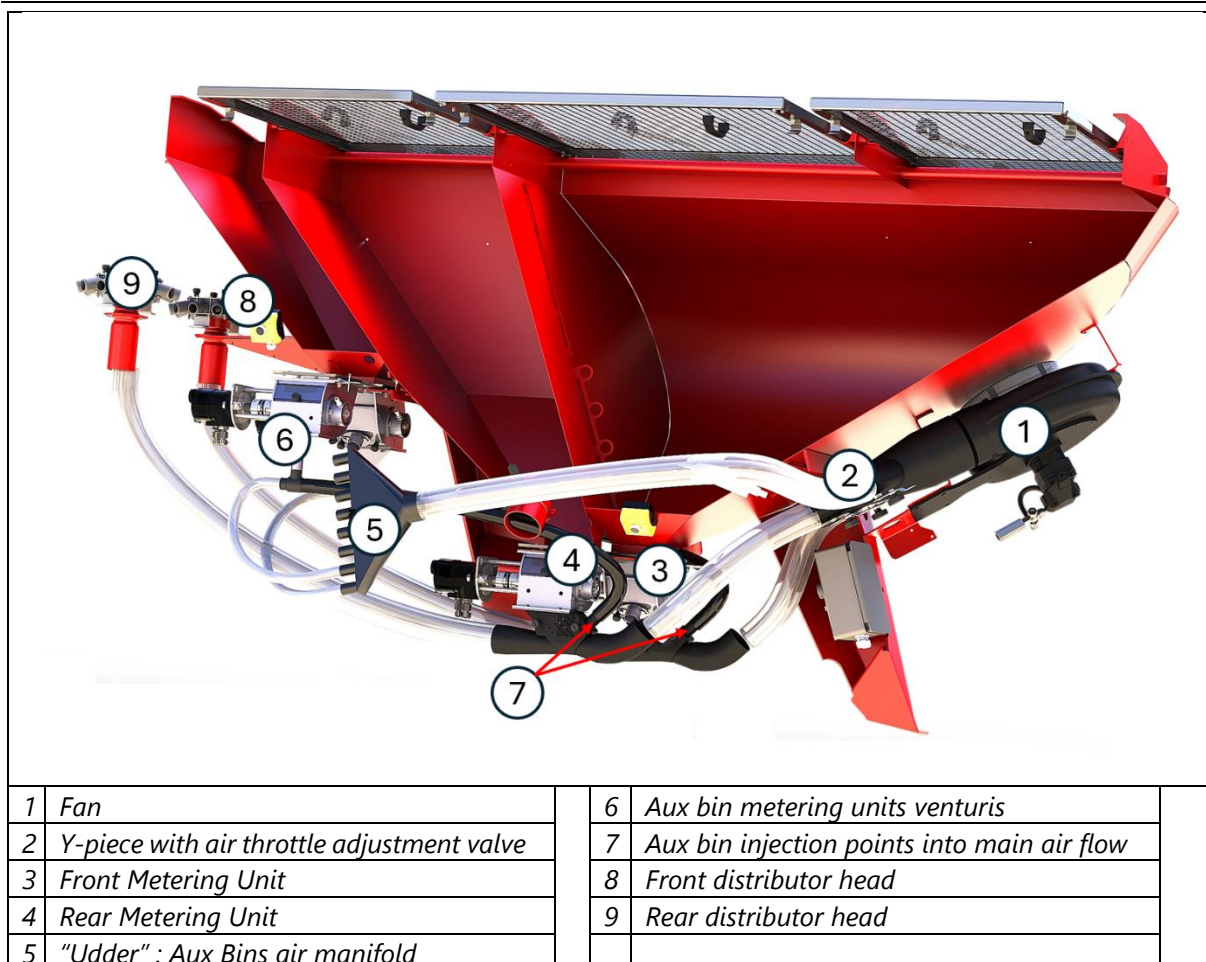


Fig. 45 : Pneumatic circuit

7.1.2 PRINCIPLES

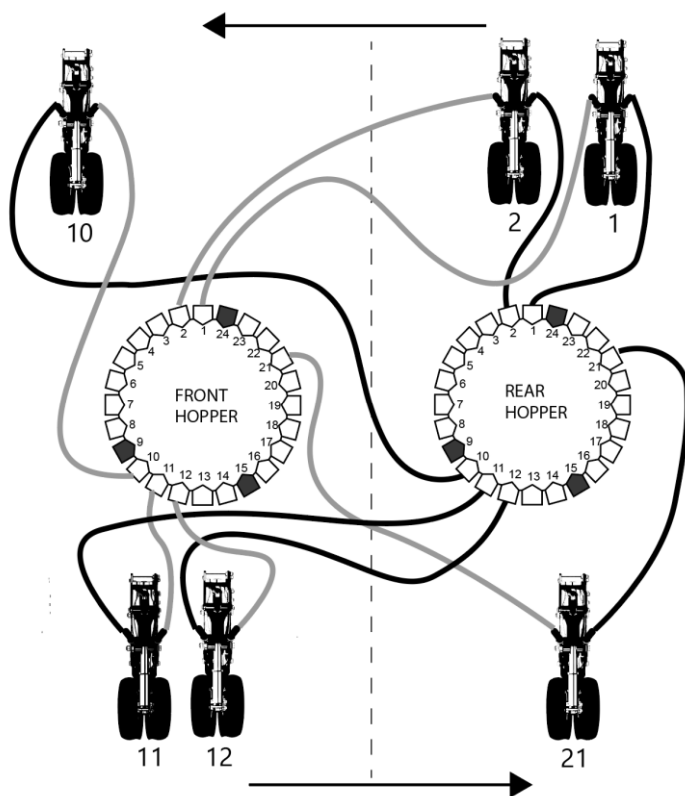
1. Airflow from the fan (1) is separated in three in the Y-Piece (2) with the provision to independently adjust the flow in each branch by throttle valves. One part of the flow goes to the front metering unit (3), another to the rear metering unit (4), the other is dedicated to the auxiliary bins metering units and goes to the "Udder manifold" (5)
2. The flow for each main hoppers is conducted to a suction venturi located at the output of the metering unit, below each hopper.
3. Seeds/fertilizer are blown until they reach the distributor heads at the top of the towers, located inside the rear hopper. The flow coming out the front hopper can be diverted out through a drain valve.
4. Distributor heads (8) and (9) at the top of the towers divide the flow into as many pipes as there are seeding rows.

5. Each distributor head is connected to all the openers, on both toolbars.
 When operating the machine with only one hopper, it is essential to ensure that the machine does not drift sideways. To prevent this, the hose layout follows a special logic.
 The front hopper always connects to the outer side of the openers, while the rear hopper connects to the inner side of the openers. This arrangement ensures that the front hopper supplies the right side of the openers mounted on the right half of the machine, while for the openers on the left half of the machine, the front hopper supplies the left side on the openers. For the rear hopper, it's the opposite: it supplies the left side of the right half openers and the right side of the left half openers.
 When searching for fertilizer (Front Hopper) or seeds (Rear Hopper) in the T-Slot, the fertilizer can be found on the left side of the T-Slot on the left half of the drill, and on the right side of the T-Slot on the right half of the drill. Similarly, the seeds can be found on the right side of the T-Slot on the left half of the drill, and on the left side of the T-Slot on the right half of the drill.
6. The auxiliary bins venturis (6) take their airflow from the “udder” (5) deliver their products into the main airflow of either the front or rear tower at the injection points (7) so the products are mixed with the rear hopper product inside the slot.
7. Optional configuration includes different outlets for the auxiliary hoppers products, for example front or rear spreader system or semi-precision directly into selected openers.

7.1.3 ROW NUMBERING

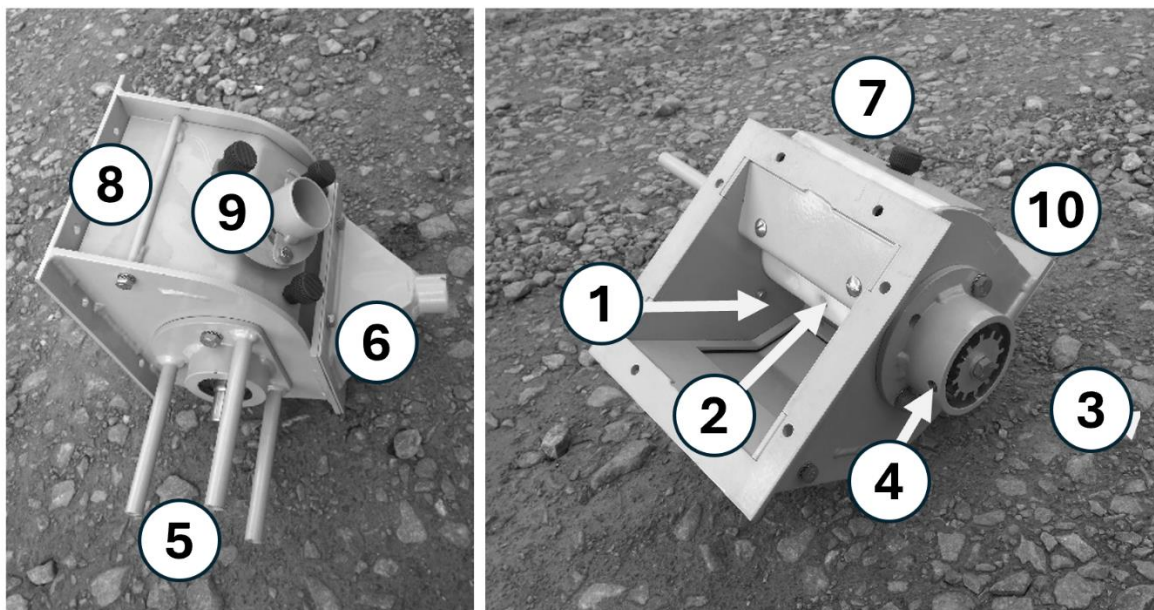
Distributor heads come with a standard of 12 outlets

Numbering follows the example of the drawing below. The logic stays the same for any row count on the machine



7.1.4 METERING UNITS

The hoppers are fitted with POLYDOSER metering units. They are well suited to metering of all kind of seeds, fertilizer, slug bait, micro-granular fertilizer, and small cover crop seeds. Products are placed in the slot.



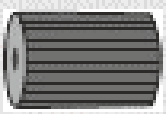
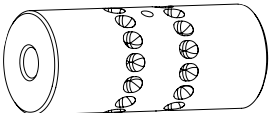
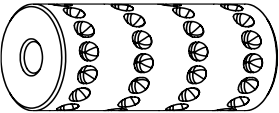
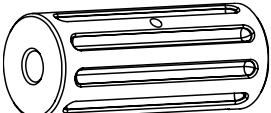
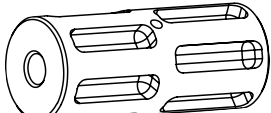
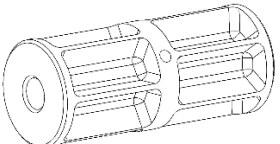
- 1/ Rotor
- 2/ Unlocking screw
- 3/ Encoder
- 4/ Sensor hole
- 5/ Motor bracket
- 6/ Product outlet
- 7/ Inspection flap
- 8/ Full drain flap
- 9/ Drain cover
- 10/ Removable hub

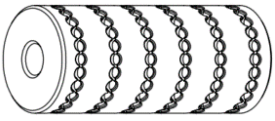
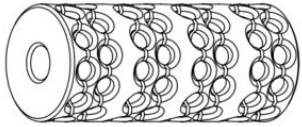
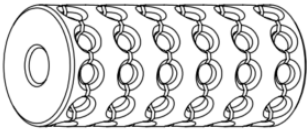
Metering makes use of a HVRC system (Hydraulic Variable Rate from the Cab system).

The rotor (1) has to be changed to adapt to different products. A T-shaped venturi is fitted after the outlet (6). This venturi gets air flow from the fan, product is sucked in, and blown at the entrance of the rear hopper tower.

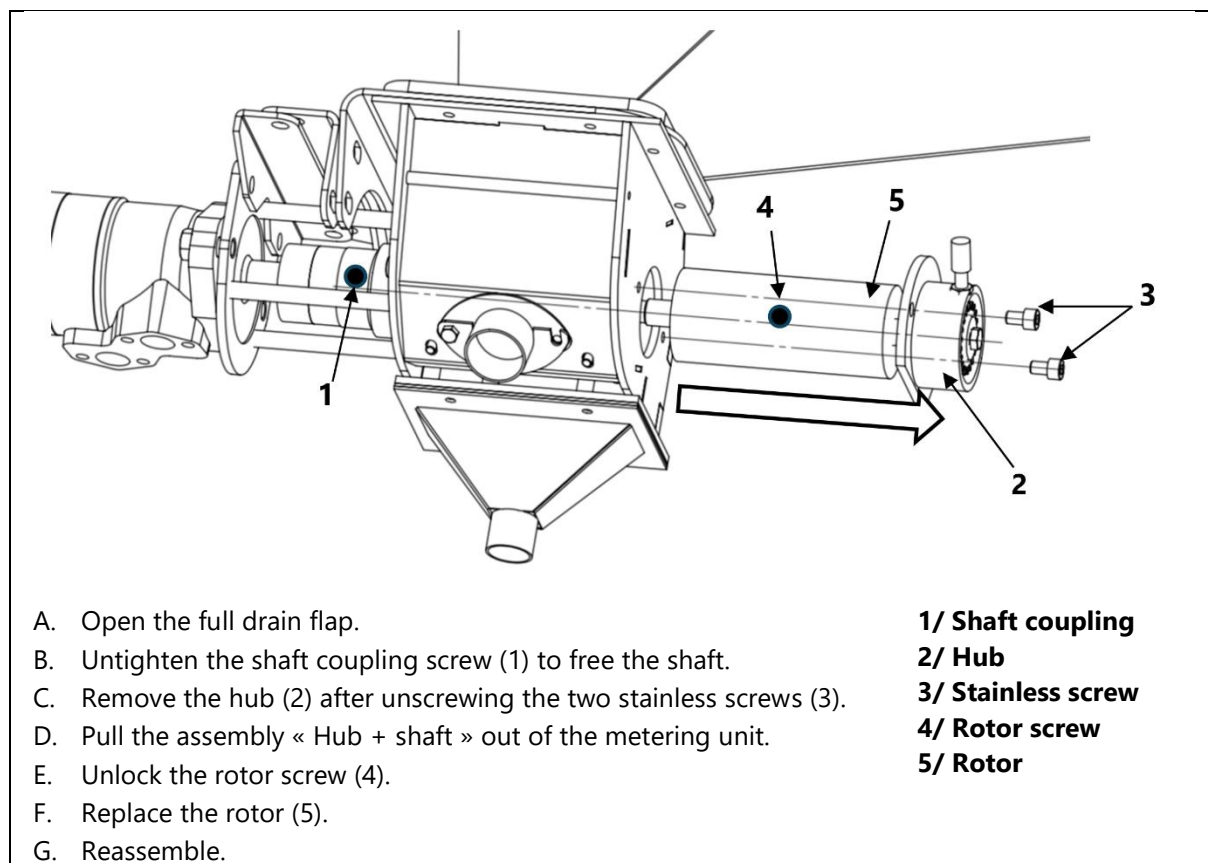
7.1.5 ROTOR SELECTION AND MOUNTING

The Rotors have different shapes and functions. They can be used on any metering unit of the machine.

Rotor		Main use	Calibration ratio	Common Rates
A (Part Nr. PFU044)		Small seeds 28 pockets	20-25	1-6kg
B4 (Part Nr. PFU049)		4 outlet spreader, slug bait, OSR 56 pockets	40-70	3kg – 15kg
C (Part Nr. PFU047)		Small seeds, fertilizer	200-270	10-50kg
D (Part Nr. PFU048)		Grain, Fertilizer 12 pockets	600-800	30-150kg
E (Part Nr. 703474)		Grain, Peas	1200-1600	60-300kg

Z6 (Part Nr. PFU074)		6 Row Singulation Rotor, Sugar Beet 144 pockets	30-50	1.5-10kg
M4 (Part Nr. PFU104)		4 Row Singulat. Rotor, Maize/Corn 80 pockets	80-200	5-40kg
M6 (Part Nr. PFU063)		6 Row Singulat. Rotor, Maize/Corn 60 pockets	80-200	5-40kg

7.1.6 ROTOR REPLACEMENT



Main hoppers are equipped with a changeable rotor metering unit. They use a HVRC system (Hydraulic Variable Rate from the Cab system)

The metering device is controlled by the NOVAG software. Information about adjustments made to the metering device is displayed on the terminal.

7.1.7 MAINTENANCE AND CHECKS

Distributor head

Remove the cover after unscrewing the winged nuts. Check every pipe entrance.

Encoders

The encoder sensor (3) counts the teeth of the encoder wheel (2). A status led (1), visible outside from the cover, blinks and shows the passage of the teeth in front of the sensor.

Sensor heads must be set at 1mm from the wheel teeth. If the drill is powered, the sensor's LED switches on in front of a tooth, and stays off in front of a hole.

Rotor: Rotor clean state must be checked. The hatch (7) allows the user to see the rotor without draining the bin.

If the hopper is full, use the stainless shutter plate (4) located between the metering unit and the hopper outlet.

Venturi

For the same reasons as the splines, venturis must be regularly checked and cleaned.



Make sure the splines are clean from dust before any use. Fertilizer, in particular, may progressively fill the splines if exposed to humidity.



Fig. 46 : Encoder

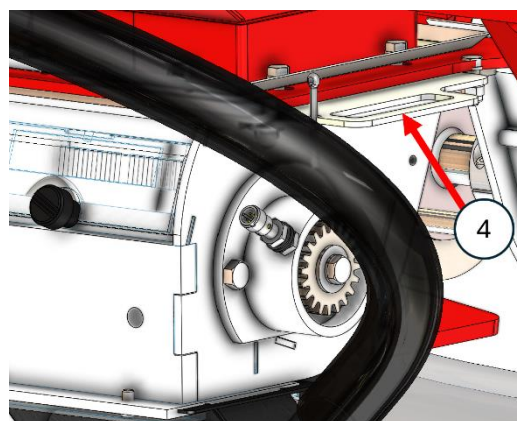


Fig. 47 : Stainless shutter plate

7.2 Auxiliary bin

Auxiliary bins mounted as options on NOVAG Drills are fitted with POLYDOSER metering units. Their metering unit is the same than the main hoppers on T-ForcePlus 250 series.

7.3 Calibration

The role of electronic calibration is to find the exact value of the weight of seed distributed per pulse of the metering unit rotor. This value, the calibration ratio, is calculated in cg/pulse, varies with:

- The weight of 1000 seeds.
- The rotor of the metering unit.
- The actual rotation speed. The faster is the rotation, the lower is the weight of seed per turn carried by the rotor.

The procedure stays the same regardless of the bin to calibrate.

7.3.1 PREPARATION FOR CALIBRATION



Before starting electronic calibration, make sure the rotor of the metering unit is correctly set.

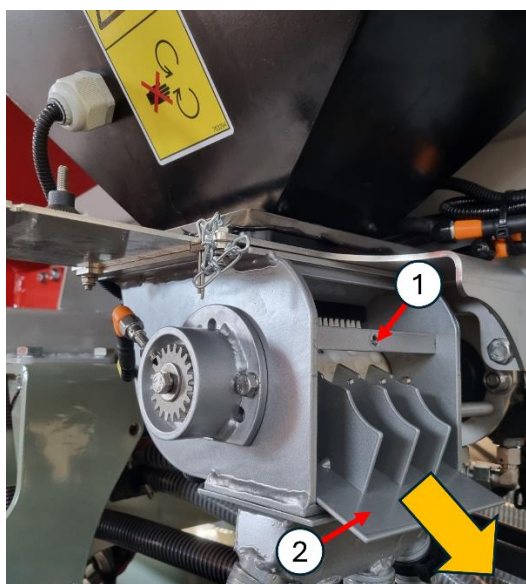


Check that all the calibration switches are deactivated before starting.

When starting a new calibration test:

1. Secure the tractor against rolling away and the being restarted without authorization
2. Place a catch pan under the metering device
3. Open the flap (7)

Fill the seed hopper with enough seed for the calibration test. Make sure the seed is evenly distributed across the width of the metering device



- 1) Remove the knob screw (1), removing the hatch and calibration plate (2)
- 2) Install it in position such as the example. The seeds will flow according to the arrow shown in the photo and can be collected

Fig. 48 : Metering Unit in position for calibration

- 3) From the cab, activate the hydraulic circuit. Only the main spool valve has to be on.
- 4) From the monitor, navigate into system menu.
- 5) Select the option to set the front, rear, or Aux hopper.
- 6) From the hopper menu, select « Other » (button 4).
- 7) Then use the arrows (button 7 and 8) and choose “calibrate the hopper”.
- 8) Press button 10 « Validate »

7.3.2 FIRST CALIBRATION

1. The monitor will state the message « waiting ».
2. Place a bag/bucket under the hopper.
3. Press the calibration switch under the hopper.

Calibration switches are marked with the following stickers:



4. The motor will start rotating at a reference speed. The monitor in the cab counts the number of rotations the motor makes.



Never bring hands or fingers close to the metering unit or the coupling while the tractor motor is turning.

5. At any time, it is possible to stop the shaft rotation by pressing on the button. The rotation can still be carried out by pressing down the button again. The monitor will add the rotations.
6. Once a satisfactory quantity of seeds/fertilizer has been collected, weigh the bucket with a scale.
7. Go back in the cab and validate the step (button 10). The monitor will then ask for the weight of product that has been collected. Input the value using the arrows (buttons 7 and 8).
8. The monitor calculates a rough calibration ratio, measured at a reference rotor rotation frequency.



This first value is not precise enough because it has not been issued at the exact drilling speed. It is recommended to make a finer calibration at the next step.

9. Input the rate/ha.
10. The monitor will then display the maximum and minimum drill speed
11. Once this first information has been calculated, the monitor suggests to make a finer calibration.

7.3.3 FINE CALIBRATION

1. Select the item « Fine Calibration – Yes » using the arrows (buttons 8 and 9) then validate (button 10).
2. Input the planned drilling speed (approximate), then the rate/ha.
4. The motor is ready to turn again. Note the rotational speed written on the monitor.



For good results on the field, this speed must be greater than 100pls/sec, but lower than 1500pls/min.

If the frequency is too low, close the opening/ use another rotor, and start the calibration again from the start.

If the frequency is too high, increase the opening/ use another rotor, and start the calibration again from the start.

5. Place the bucket under the hopper, and use the cal button to start the metering rotation and stop it.
6. Weigh the collected product.
7. Validate the step on the monitor. The monitor suggests at this time the predicted weight, according to the first calibration.
8. Input the real weight found at calibration.
9. The monitor calculates and displays the real rate/ha, and automatically adjusts the calibration ratio to compensate for any difference from the gross calibration.

7.3.4 CALIBRATION CHECKS

A weighing check can be made anytime using the same method as the fine calibration.

This check weighing allows for verification of check the ratio value, for example after a change of seed variety or after some work.

1. From the hopper settings menu, select « Other » (button 4), then choose « Check calibration » using the arrows (button 6 and 7), then validate (button 10).
2. Follow the instruction displayed on the monitor.
3. The calculated rate is displayed at the end of the procedure and the calibration ratio is corrected if necessary.

7.4 Calibration table

These figures are indicative, for a 6m drill. Real values calculated from the calibration can be compared to these reference values.

 **Fine calibration made « at the drilling speed » is important for products such as oil seed rape, which requires high precision.**

Imprecisions of more than 25% could be experienced if drilling is done in different conditions to the calibration. At a lower forward speed, the metering unit will seed at a higher rate, and at higher speed, at a lower rate.


Calibration ratio depends on the seed specifications: weight of 1000 seeds, volumetric weight. Use the user journal (at the back of this manual) to write down the calibration result associated with every seed and product.

For heavy product delivered at a high dose, it is better to slow down the drilling speed to avoid blockages in the air system.

Product	Drilling speed	Rate	ROTOR	Ratio	Mot. speed	Max Rate	Min Rate
Wheat	8km/h	100kg/ha	D	650	615 pls/min	150kg/ha	25kg/ha
Wheat	10km/h	200kg/ha	E	1200	840 pls/min	330kg/ha	60kg/ha
Granular fertilizer	10km/h	150kg/ha	D	700	850 pls/min	180kg/ha	25kg/ha
Maize	8km/h	25kg/ha	M	180	550 pls/min	35kg/ha	5kg/ha
Peas	6km/h*	250kg/ha	E	1200	625 pls/min	350kg/ha	60kg/ha
Oilseed Rape	7km/h	2kg/ha	A	25	350 pls/min	8kg/ha	1kg/ha

 **The maximum rotor speed is 1750 pls/min**

 **The minimum rotor speed is 100 pls/min**

 **As a general rule, a lower rotational speed must be favored with products associated with spline blockage (fertilizer), whereas a higher rotational speed gives more regularity on the row.**

8 Fan adjustment

8.1 Recommended Use

8.1.1 GENERAL

Different fan speeds are advised depending on what is being drilled. Matching the fan speed to the purpose helps to avoid:

- Excessive load on the hydraulic motor.
- Seed positioning problems: light seeds can be pushed to the center of the slot by too much air flow.
- Pipe blockages due to insufficient air flow.



Never go over 6500rpm, in any situation.

Two throttle valves are available to adjust the flow in each hopper. The third throttle valve is dedicated to the auxiliary metering unit flow, like optional spreaders;

8.1.2 TABLES

Scenario	Recommended fan speed	Throttle valve adjustments
Front hopper: Not used Rear hopper: Cereal	5000rpm	Front: Closed Rear: Open
Front hopper: Fertilizer, Big seed Rear hopper: Cereal	5500rpm	Front: Open Rear: Open
Front hopper: Fertilizer, Big seed Rear hopper: Small seed	5500rpm	Front: Open Rear: Half Open
Front hopper: Not used Rear hopper: Small seed	4000rpm	Front: Closed Rear: Open

8.2 Rotational Speed Adjustments

8.2.1 HYDRAULICS FROM THE TRACTOR

- If the tractor is equipped with manual flow adjustment spool valves, set them once when the oil is cold and set them again when the oil is hotter.
- Accelerate the engine to reach full oil flow from the pump.
- Maximum fan speed is a factor of tractor oil flow. If the tractor allows a precise flow adjustment, set the flow to match the desired speed according to the following table:

Spool valve flow (l/min)	Piston motor
12	2000
18	3000
24	4000
30	5000
36	6000

8.2.2 ADJUSTMENT OF FLOW REGULATION VALVE

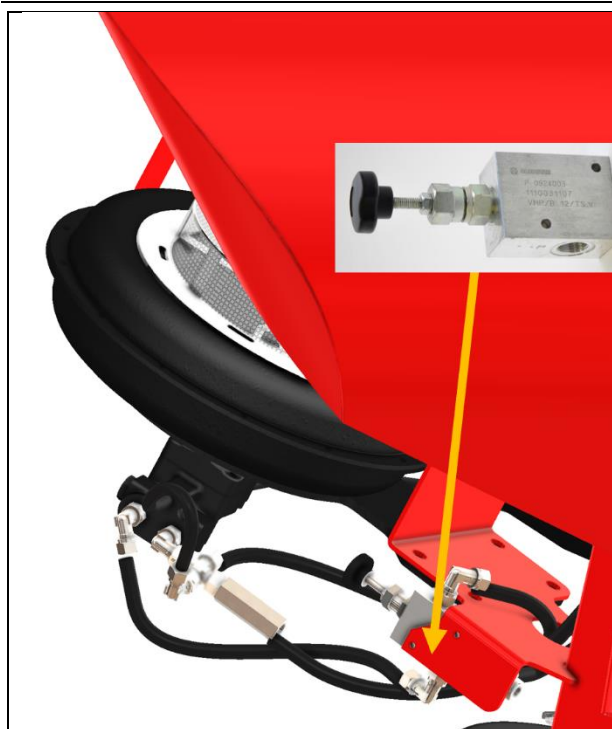


Fig. 49 : Fan hydraulic valve

The flow regulator valve must be adjusted in two cases:

1/ Irregularity of rotation caused by irregular flow from the tractor. In this case, turn the valve knob counter clockwise until the speed stabilizes.

2/ Use of an embarked pump. This valve is then the only way to control the fan speed. Turn the knob clockwise to accelerate the speed and counter clockwise to decrease the speed.



Lock the counter nut after making the adjustments.

8.3 Air flow adjustment for each hopper.

8.3.1 THROTTLE VALVES

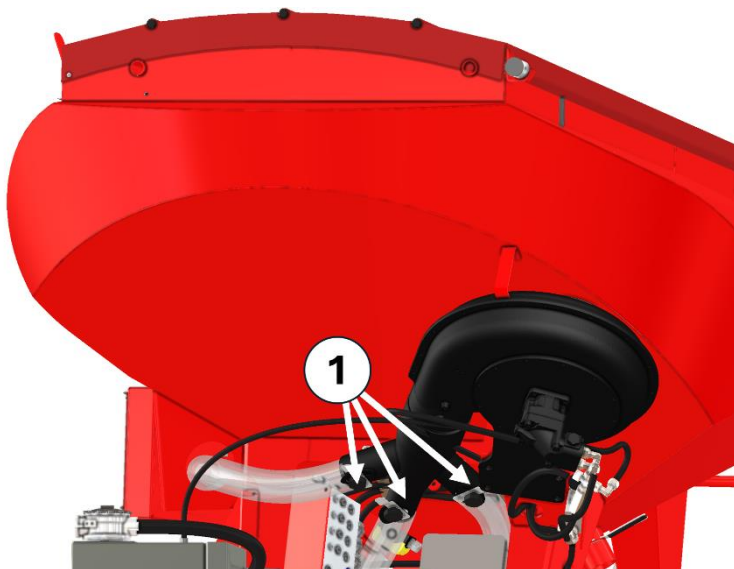


Fig. 50 : Throttle valves

These flaps (1) can be used to close completely one hopper and increase the flow going into the other. They can also be used to decrease the flow for a hopper distributing very light seeds.

- 1 To adjust a throttle, toggle the handle on an open, closed or intermediate position.
- 2 Make the adjustment when the fan is active and control the air flow at the end of the row pipes.



Closing and opening the throttles affects the hydraulic flow control valve. The adjustment of the hydraulic valve must be performed after the throttles are set.

8.3.2 AIR SPEED CHECKING



Always make sure air is consistently flowing out of every row pipe before any use on the field, to find any potential blockage.

1. Using the joystick, or isobus soft key , it is possible to make the metering units turn for a few seconds and deliver the correct flow of seeds under each pipe.
2. To do so, activate the main hydraulic circuit from the tractor and press the joystick yellow button / The "yellow button" softkey for isobus.
3. To learn how to activate the forced rotation of the motor using the monitor, see section 14 of this manual.

9 Field use

The drill must have been calibrated and the essential points of section 5, 6 and 7 must have been observed.

9.1 General principle

9.1.1 BEFORE START

1. Turn the fan on and the main hydraulic circuit.
2. Perform a first depth adjustment following the guidelines explained in section 8.3. Choose a downforce control mode: "Automatic" or "Manual"

9.1.2 BEFORE STARTING A SEEDING PASS

1. Check GPS signal status. (section 8.4) If necessary, use the forced speed mode described in 8.4.2.
2. Accelerate the tractor engine to get to nominal point.

9.1.3 TO START DRILLING

1. Hold the joystick down, or lower the openers from the monitor.
2. The drills automatically switches into work state. The openers go down rapidly. The hopper status on the main monitor screen and the pressure gauge both turn green.
3. Engage in the field progressively to reach working speed.

9.1.4 WHILE DRILLING

1. The main page on the monitor displays:
 - The rate of product distributed by the metering unit.
 - The hydraulic pressure in the openers.
 - The closing force measured under the press wheels.
2. Different error message « Hopper empty, row blocked, rate error... » may be displayed with an alarm. See section 14. Incident Cause Remedy



Drilling along curves or circular trajectory is associated with accelerated wear on openers parts, discs, hubs, bushings, bolts and frame structure. The drill only tolerate very light curves and they must be performed at the operator's own appreciation. In particular, drilling around obstacles such as trees, poles must be avoided!



Driving rearwards while the openers are in lowered position will result in blockages, and part break. This can never be performed!

9.1.5 AT HEADLAND

- A brief upwards impulse to the joystick or a brief push on the monitor raising button will make the openers raise completely.
- Seed metering immediately stops. The pressure gauge on the monitor and the hopper status color become grey or red.



Before making a U-turn, make sure the openers are raised enough and away from the soil.

9.2 Depth adjustment

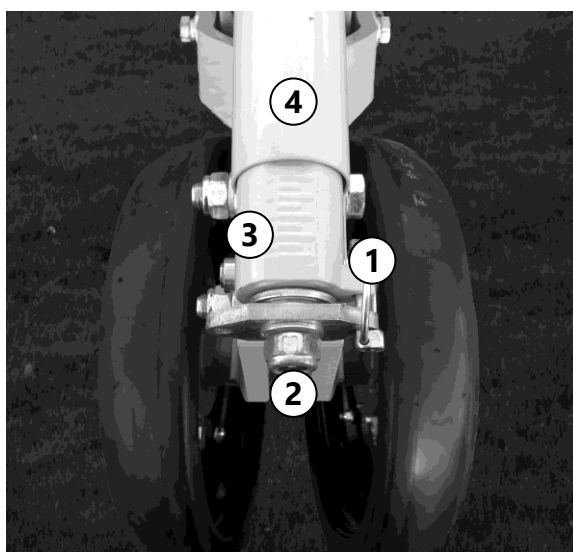


It is advised to make one or more pass without delivering seeds, to correctly adjust the seeding depth using the following guidelines.

Seeding depth is factor of 3 parameters:

9.2.1 PRESS WHEEL HEIGHT ADJUSTMENT

This parameter is the height of the press wheels are compared with the blades/disc. This setting is made individually on each opener.



To change this setting:

1. Remove the lock pin (1).
2. Using a wrench, turn the nut (2) to move the scaled pivot (3) in or out of the tube (4).
3. Rotating the nut clockwise raise the press wheels resulting in deeper seed placement.
4. Rotating the nut counterclockwise will lower the press wheels resulting in shallower seed placement.
5. Replace the lock pin.

Fig. 51 : Press wheel adjustment mechanism.

In this table you will find a guide to the scale setting for various crops. Please mind, that this is only a recommendation and shall give a rough range for general settings. The actual seeding depth varies due to the soil type and the amount of residues. The scale starts from 0, the deepest and goes till 10 the shallowest setting. Thus, the higher the number, the shallower the seeding depth and the lower the number the deeper the seeding depth. The most used area for all kinds of crops lays within 4,0 to 8,0.

Crops	Scale value
Cover Crops, OSR, Grass Seeds (1,5 to 3cm)	8,0 to 6,5
Wheat, Barley, Oat: Cereals (2 to 4cm)	7,0 to 5,5
Peas, Beans, Corn (4 to 8cm)	6,5 to 4,0



The scale on the pivot does not match any real measurement of depth. They only provide a reference for adjustment. Always check in the field as the seeding depth can vary due to soil type and the amount of residues.

9.2.2 HYDRAULIC DOWNFORCE PRESSURE

This pressure is directly measured in the opener cylinders. It greatly affects the job made by the openers. Its value is displayed on the monitor main page.

This pressure can be manually set by the user or automatically controlled by the IntelliForce (IForce) system.

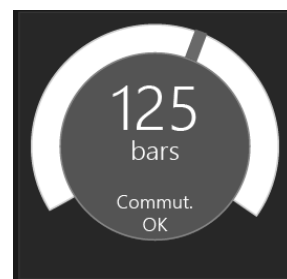


Fig. 52 : Pressure gauge on the display

Hydraulic accumulators act as a hydraulic suspension and allow the openers to follow the soil surface easily.

- To manually adjust the pressure, IntelliForce must be in Manual mode.
- Use the Horizontal axis of the joystick see Fig. 49.
- Or, on the monitor, go to the tab "IntelliForce" on the main page.

9.2.3 PRESS WHEEL CLOSURE FORCE

The opener cylinder presses on the disc and the press wheels at the same time. Once the seeding depth is reached, the press wheels become loaded by a portion of the downforce pressure. If the opener disc and blades are not pushed in the ground enough, then the press wheels are not adequately loaded.

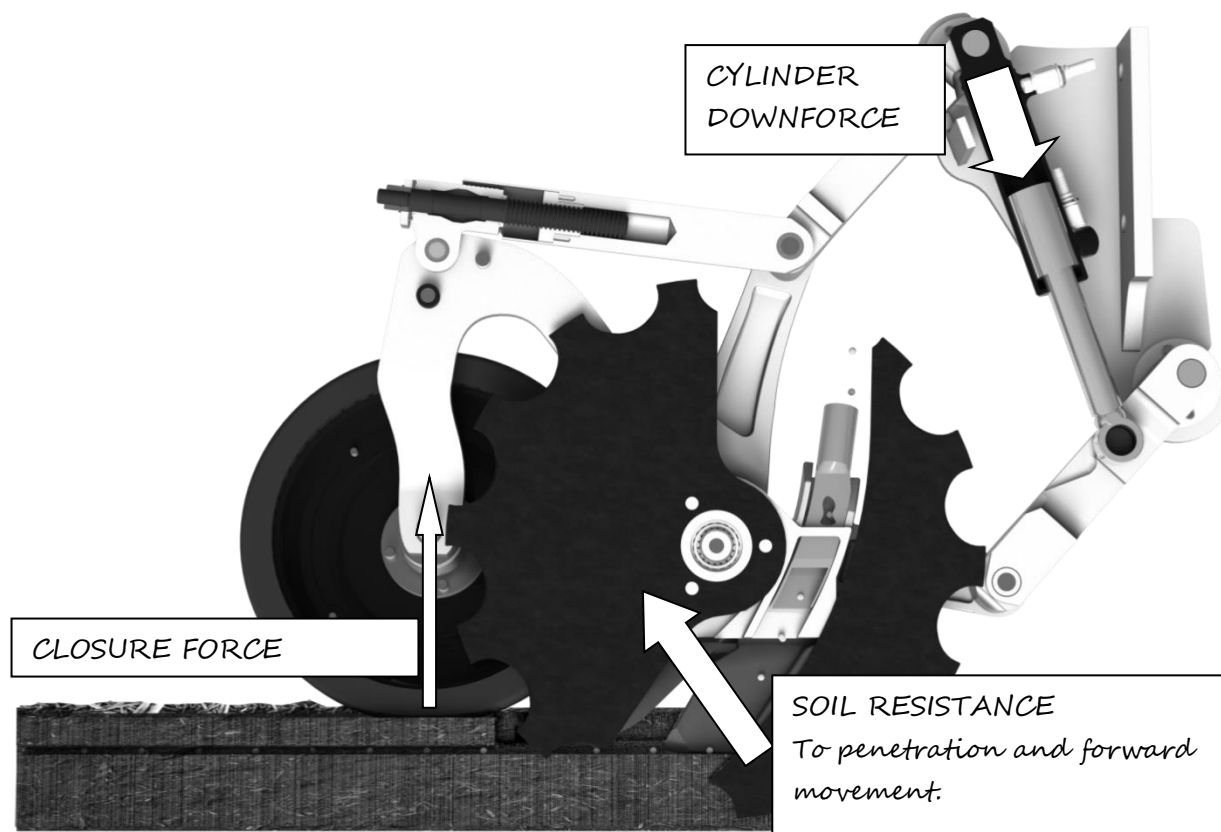


Fig. 53 : Description of closure force

$$\text{CYLINDER DOWNFORCE} = \text{SOIL RESISTANCE} + \text{CLOSURE FORCE}$$

The closure force is the pressing force made by the gauge/press wheels. This force is the basis of the IntelliForce system.

Reading a high enough closure force, combined with a proper wheel height adjustment, implies that the seeding is excellent, because the openers are working at the right depth, and the slots are well closed.

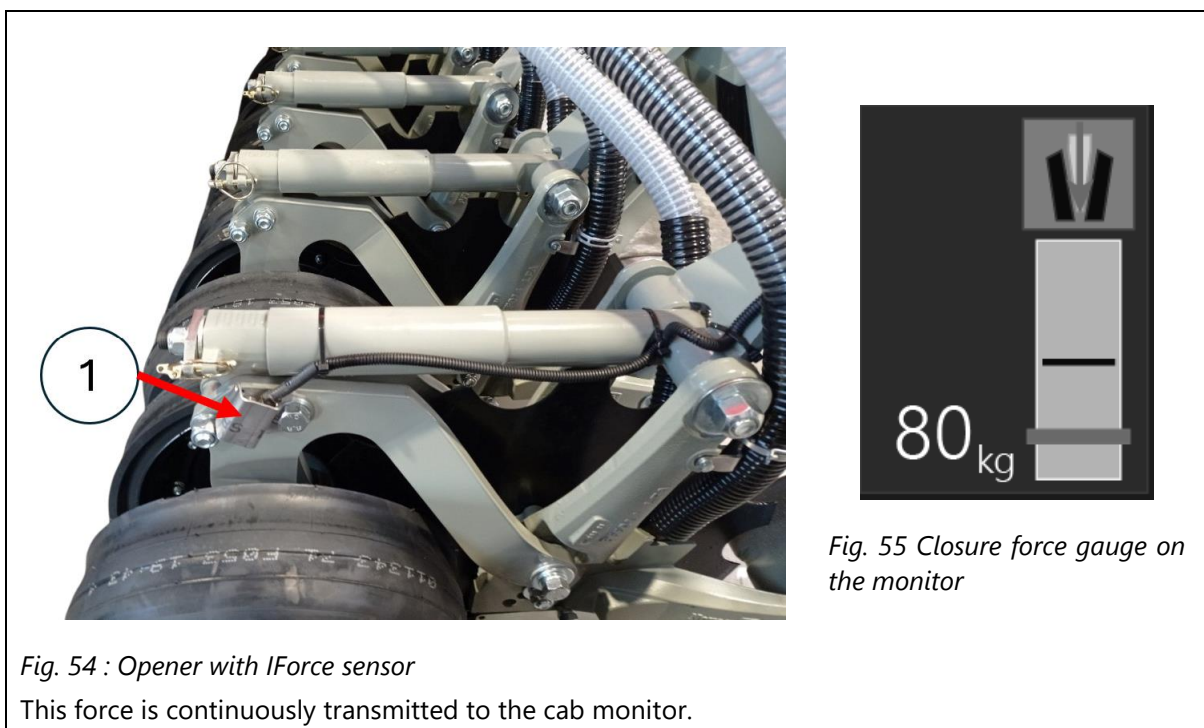
Adjusting the opener depth correctly means finding the equilibrium between the wheel height and the closure force setting (IForce auto) or, directly, the downforce pressure (IForce manual).

9.2.4 INTELLIFORCE SETTINGS

IntelliForce® system automatically adjusts the hydraulic downforce pressure in the opener cylinder according to the real time soil resistance.

1. On the monitor, select IForce Auto to activate IntelliForce. The blue button on the joystick has the same function.
2. On the monitor, go on the main page then to the « Pressure » tab, then set a desired closure force (set point). This value is generally between 10 and 100kg.

To determine the correct pressure adjustment in real time, the drill controller measures the closure force using sensors arranged in various places on the drill.



! If the measured force is under the set point, the system will increase the hydraulic pressure.
 If the force is over the set point, the system will decrease the hydraulic pressure.

Without IntelliForce the hydraulic pressure remains constant and the closure force will decrease if the soil becomes harder, because the disc has more trouble to penetrate the soil. The IntelliForce automatic control system reacts and increases the pressure and the downforce to keep the correct depth. In locally soft or wet areas, the opener encounters less resistance and the system decreases the pressure to avoid drilling too deep.

9.2.5 DRAWBAR ANGLE

The frame angle can be adjusted with the use of the drawbar cylinder.

If the front of the drill is tilted towards the soil, the opener will penetrate the soil more easily, but the seeding quality will suffer, as well as power demand.

The drawbar must be used to correct the real frame angle when drilling, to compensate the load transfer to the tractor.

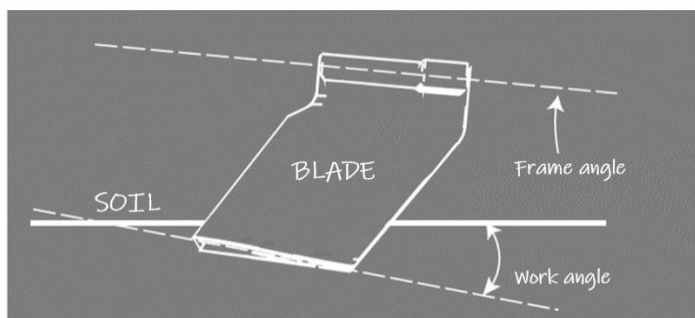
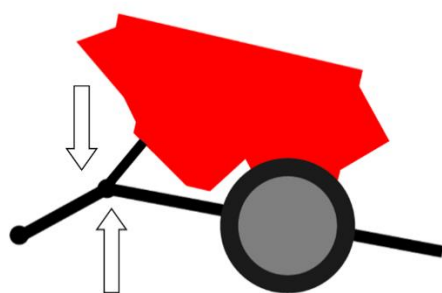


Fig. 56 : Frame tilt using the drawbar



Do not drill with an exaggerated negative blade angle (front overly raised), otherwise the risk of blockage is high.

9.2.6 ADVANCED SETTINGS

These settings can be changed on the « IForce settings » page, from the system menu of the monitor:

- **Error Margin, in kg:** The maximum allowed difference between the measured closure force and the set point, without triggering a pressure adjustment.

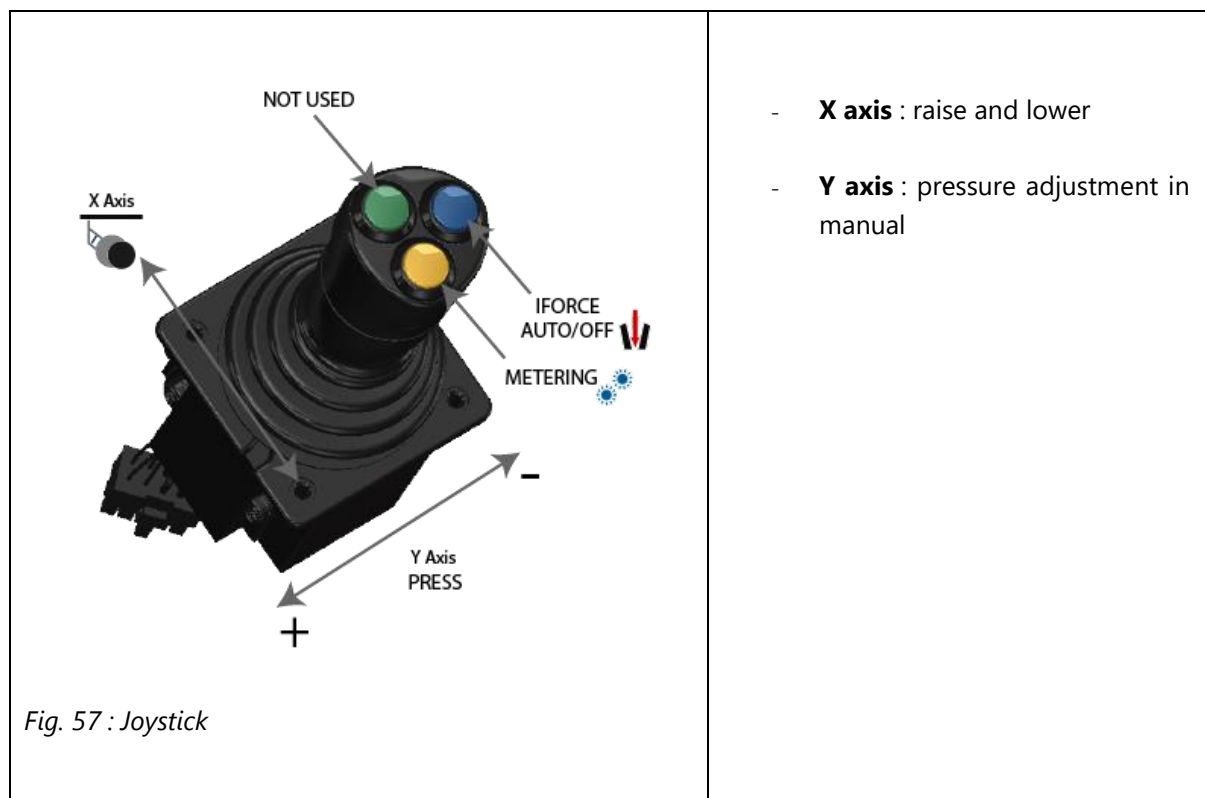


The Error Margin is automatically set by the system, according to the closing force value set by the user.

- **Maximum pressure, in bar.** This setting defines a reasonable maximum pressure corresponding to the soil type. The downforce pressure will not go over this setting.

9.2.7 JOYSTICK USE (NON ISOBUS VARIANT)

The joystick provides quick access to the functions that are often used. It can control the downforce pressure, command the raising and lowering of the openers, activate or deactivate the IntelliForce system (blue button), or trigger the rotations of the hoppers at the beginning of a pass (yellow button).



- **X axis** : raise and lower
- **Y axis** : pressure adjustment in manual

In the Isobus version, all functions of the joystick correspond to soft keys in the Isobus version, that can be mapped to tractor controls through the ISOBUS – AUX Protocol

9.3 Ideal conditions of use

9.3.1 IN PASTURE OR LIVING COVER CROP

In these conditions, the soil is generally well held together by the roots. These conditions are perfect to get familiar with the drill because they allow a great liberty of adjustment.

- The tractor finds grip easily.
- The good soil structure thanks to the roots allows drilling with very low disturbance, even at a very shallow depth. A thin layer of soil is detached and falls in place after the opener.
- The press wheel closure force can be high.
- Very tall cover crops are very well tolerated.
- Drilling speed can be high if the tractor power output is high enough, and with enough ballast.



Fig. 58 : Drilling over a pasture

9.3.2 ON DENSE RESIDUE COVER

Drilling under a thick mulch is particularly interesting because the residue cover limits evaporation and weed germination.

These conditions are encountered after the combine for example. A good straw spread is essential for a uniform crop emergence. These conditions are very good but the adjustments of the drill are often more difficult.

- The residue cover provides good reference to the gauge wheels and this allows fine depth adjustments.
- The best advice would be waiting for the soil to dry, but the residues offer a larger window for drilling because the soil does not stick to the press wheels.
- The adjustment objective is to find the balance between the height of the press wheel and the closure force, which allows drilling without blockage. This balance will be harder to find if the soil is sticky.
- Ideal drilling speed is 8km/h to 10km/h. A lower speed improves the slot quality in some situations.
- The quality of the slot is greatly improved if only one blade can be used. In this case, drilling speed can be increased.



Fig. 59 : Drilling over maize residues

9.3.3 ON STONY FIELDS

Stones do not cause special problems.

- Uniformity in seeding depth is less good than in other conditions because of repeated shocks.
- The disc must not be set at low mounting hole. The deeper the disc work, the more chance it has to find a stone and make the opener bump.
- A general principle could be to use a quite high downforce pressure to reduce the impact of stones on the depth. Manual pressure control is recommended over Automatic, because the stones will alter the closure force measurements under the press wheels.
- It is strongly advised to reduce the drilling speed to 5-6km/h for a better regularity and less wear.



Fig. 60 : Drilling on stones

9.3.4 ON SLOPING FIELDS

Common difficulties encountered on this type of ground are:

- Differences in soil type depending on the terrain.
 - Steep slopes which requires a very high power from the tractor and slippage problems.
 - Slopes that cause an angle between the drill and the tractor towards the bottom of the slope, and potential difference in depth due to roll angle.
-
- A universal solution for this type of ground is to drill in living cover crop, to enhance the tractor grip, and the opener discs grip against the slopes.
 - The IntelliForce system must be activated to automatically adjust the downforce to match the expected variation in drilling speed and soil types.
 - Use the maximum pressure function of the IntelliForce system to avoid the drill wheels lifting off the ground going across slopes.



Fig. 61 : Drilling on sloping ground

9.3.5 ON NAKED SOILS WITH LITTLE OR NO COVER

These soils can be the most difficult but the outcome can be very good under favorable soil conditions.

- It is difficult to get little soil disturbance if the soil is brittle and crumbly. In this case, drilling speed must be low.
- If the soil is sticky, the risk of disc and press wheel blockage is high. In this case, the speed must be high.
- In all circumstances, the disc height adjustment is of primary importance. It has to be adjusted down for a soft and sticky soil. In the opposite case of a very hard soil, the disc must be mounted in the top position. Ballast weight may also prove necessary.
- These soils can be drilled with more ease with only one blade instead of the two.
- Tilled soil can be drilled but, in this case, it is advised to only use one blade and low downforce pressure. Tilled soils should be well consolidated (rollers) before drilling.



Fig. 62 : Drilling over a naked soil (Sunflower residues)

9.4 Adjustments from the cab

9.4.1 RATE ADJUSTMENTS

The product metering rate set from the cab can be adjusted anytime, using the monitor.

- On the main page, go to the desired hopper tab.
- From this tab, two adjustments can be made:
 - Increase or decrease the rate, using the +, - and validate buttons.
 - Activate or completely deactivate the hopper using the button metering ON/OFF.

9.4.2 SPEED SIGNAL

The metering system preferably uses GPS speed as a reference. Signal quality is displayed on the main page of the monitor.



Fig. 63 : Signal quality symbol on the monitor

Fig. 64 : Exemple of GPS antenna

The preferred source for GPS speed is Isobus (only available for Isobus version)

3 quality levels can be handled:

Color	Signal quality	Effects
Green	Good. Satellite number is also shown.	Precision is between 0.1 and 0.2km/h.
Yellow	Bad. Can occur close to trees or down in valleys.	Precision is between 0.5km/h and 1km/h.
Red	Insufficient signal.	Drilling is not possible using this signal. If the drill is in work state, a sound alarm alerts the user that the signal is lost. The drill automatically uses a reference speed of 6km/h. This speed can be adjusted in the GPS settings menu.

9.4.3 ALTERNATIVE SOURCES

- 1) Novag IntelliratePlus (Variable rate add on for non-isobus)
- 2) External Radar signal. Can be provided from tractor ISO-7pin or an external radar sensor/GPS antenna with frequency output in Hz/(km/h)

9.4.4 WORK COUNTER

On the monitor, go to the system menu, and then to the GPS settings page.

The GPS also manages surface counters (factory and work counter).

9.5 Work lights / LED

Work lights are mounted on the drill.

9.5.1 HOPPER LIGHT



Fig. 65 : Hopper LEDs

The main hoppers are fitted with internal LED lights. These LED's can be switched on from the main drill power box.

9.5.2 WORK LIGHTS

The drill can manage up to 4 work lights that can be activated from the monitor:

- From the main page, the button 5, « Lights On » can be used to activate or deactivate all the lights.
- 2 work lights are factory mounted at the back.
- 1 work light is placed under the hopper, to light the metering units.
- 1 socket on the main drill harness is left available for a 4th light.

9.6 Blockage monitoring

9.6.1 PRINCIPLE

AGTRON sensors count the number of seeds per second that flow through the seed tubes.

The sensor will send an error message if too few seeds are flowing through the pipe. If this is the case, the row will be reported as blocked.



If every row is reported blocked, it could mean that the hopper is empty or that the splined rotor is blocked

9.6.2 SETTINGS

These settings are accessible through System -> Front (or Rear) hopper settings.

Sensitivity: This ratio sets an alert level in terms of seeds/second, under which the row is reported blocked. It is recommended to set the sensitivity as approximately half the population of seed/m²

Seedfactor: corresponds to the weight of each seed. Can be autocalibrated while seeding.

9.6.3 ROW BLOCKAGE DISPLAY

In case of a blockage, a sound alarm will be made by the monitor and an error message will show.



The alarm can be activated or deactivated in the hopper settings

The text inside the distributor head on the hopper tab (main page of the monitor) indicates

- 'OK' when all rows have a seedflow
- the blocked row number (see section 13.1)
- or '??' when the seeder is standing still or the info cannot be known.

The rate displayed inside the head drawing is the counted seed rate. From the hopper settings, it can be displayed in seed/m², or kg/ha. The seedfactor is used to convert seed/m² to kg/ha.

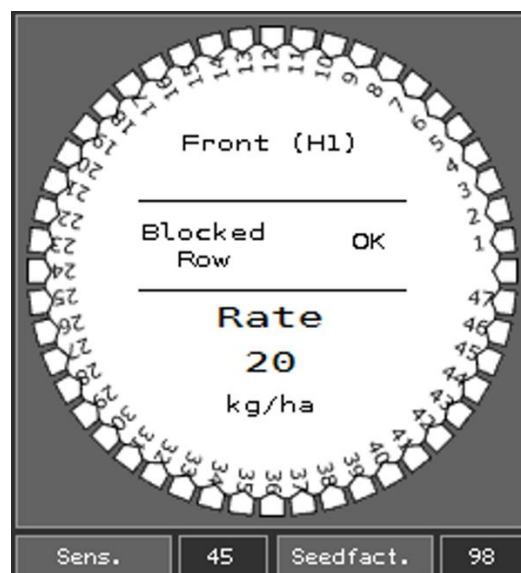


Fig. 66 : Blockage information shown on the monitor

9.6.4 ADJUSTMENT ON THE FIELD

The preferred adjustment method is the following:

1. Check that none of the rows are blocked.
2. Set sensitivity to half the population value/m²
3. Make a test pass.
4. If some rows are reported blocked but are not, then the sensitivity is set too high and can be lowered.
If this is not the case, gradually increase the sensitivity until they are reported blocked. Lower then sensitivity.
5. Immediately after calibration, use the "Agtron CAL" button available on the hopper tab, while drilling. This will automatically calculate the Seedfactor and the real rate will be displayed.

10 Implement drop off

10.1 Hopper drain

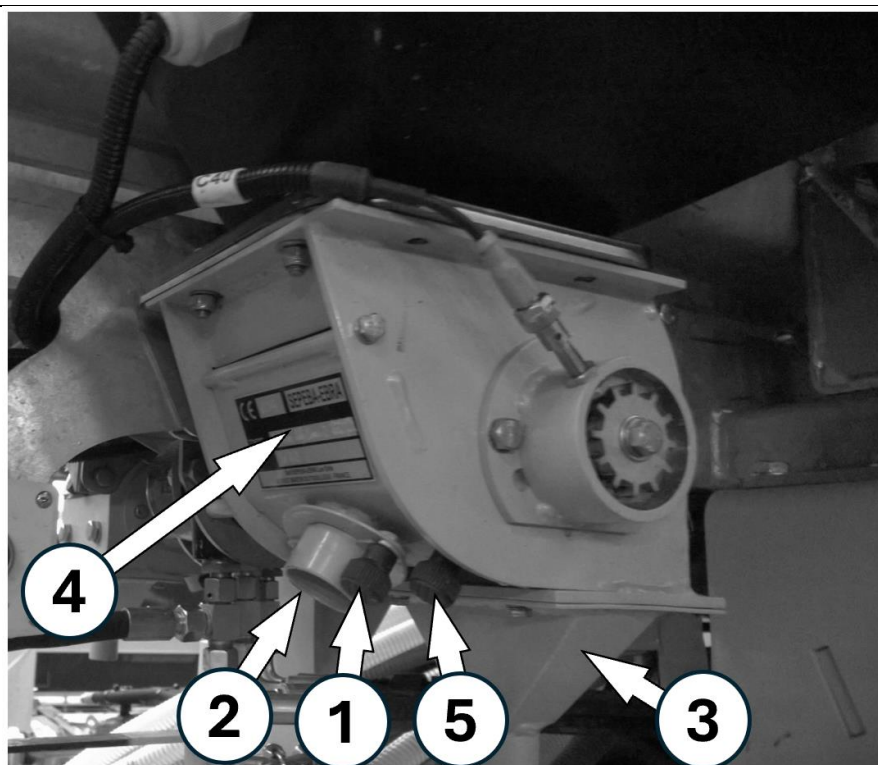


Fig. 67 : Drain features of metering unit

- 1) Cover Knob
- 2) Drain cover
- 3) Outlet
- 4) Hatch
- 5) Hatch Screw

Bins can be drained:

- 1) By Removing the black knob (1) and toggle the cover (2).. The content of the hopper can be directed into a container.
- 2) By opening the hatch (4) after removing the screws (5).
- 3) With a suitable pipe at the tank outlet valve, and by using the handle to open the valve and guide the content of the hopper into a bag
- 4) By use the calibration system and the electronic system to make the metering rotor rotate and meter out the product through the calibration outlet.
 - Activate the metering unit motor from the monitor. In the SYSTEM menu, select « FRONT HOPPER SETTINGS ». (Or REAR HOPPER SETTINGS). Select OTHER, or CONTENT, then « DRAIN THE HOPPER ».
 - Activate the main hydraulic circuit.
 - Use the calibration switch under the hopper to activate fast rotation of the motor.

10.2 Uncoupling from the tractor

10.2.1 DECOMPRESSION OF HYDRAULIC ACCUMULATORS

Before shutting down the drill, the accumulators must be de-pressure and the openers set on the floor. This will prevent any pressure build up in the return line.

Activate the IntelliForce manual mode.

1. Lower the openers to the ground. Use repeated downwards impulses on the joystick to lower them slowly.
2. Deactivate the tractor hydraulics/turn the engine off.
3. Activate the drill work state (holding down the joystick/the monitor down button).
4. Use the joystick or the IForce page on the monitor to set the opener cylinder pressure to the minimum.

10.2.2 DISCOUPLING

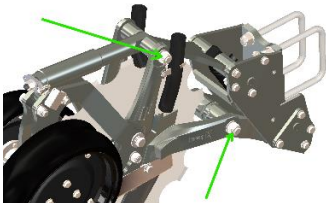
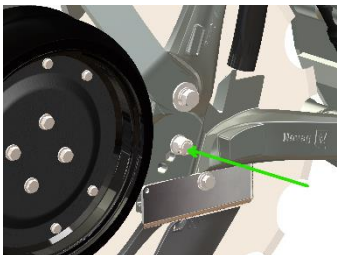

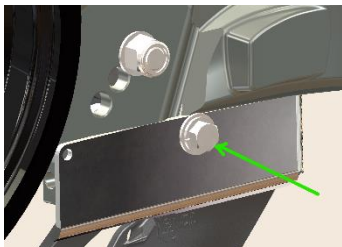
1. Lift the front of the drill using the lower linkage or the hydraulic jack, depending on configurations.
2. Extend the crutch.
3. Tighten the parking brake.
4. Remove the safety pin from the tractor hitch.
5. Set down the front of the drill on the crutch with the lower linkage controls or hydraulic jacks, and carry on until the hitch is freed from the drill weight.
6. Disconnect the battery connector, the road lights socket and the hydraulic hoses.



Always remove the tank return hoses last.

11 Torque Charts

11.1 T-SlotPlus Openers

Function	Picture	Size	Class	Torque	Comment
Lower and Top Drag Arm		M20	8:8	190Nm	Braked Nut
Disc Hub Central Bolt		M16	10:9	190Nm	Fine Thread
Disc bolts		M14	12:9	190Nm	Use "Loctite 271" on clean face
Spring Plate		M14	8:8	50Nm	Light tightening

Disc Hub Preload Nut



/

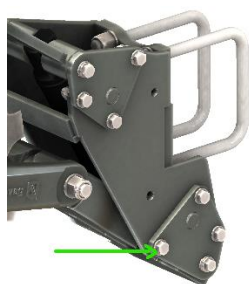
/

160Nm

Regrease before each season

Use Tool PFX110

Spine plate

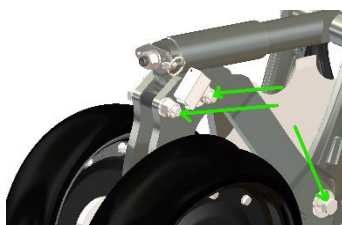


M12

8:8

80Nm

Braked Nut

Press wheels
"Boomerang" brackets

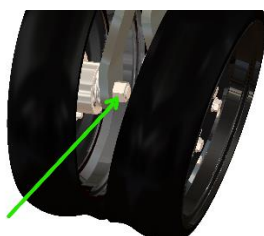
M16

8:8

190Nm

Braked Nut

Press wheel hub

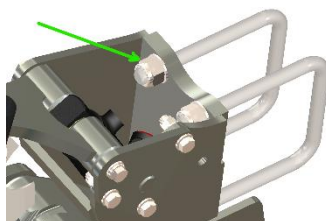


M22

8:8

150Nm

Fine Thread

Openers U-bolts and
Mounting screws

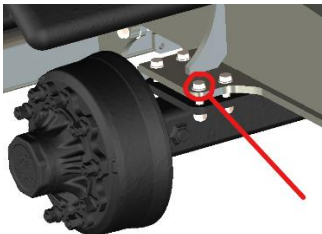
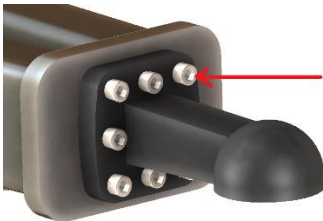
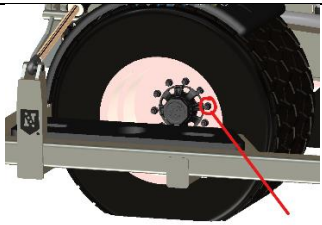
M20

8:8

300Nm

Braked Nut

11.2 Frame and track bolts

General Frame Bolts		M20	8:8	300Nm	
		M16	8:8	190Nm	
Axle Mount		M16	8:8	190Nm	Single use nut
Drawbar Hitch		M16	12:9	300Nm	
Transport Wheels		M22		450N.m	

12 Hydraulic circuit specifications

12.1 Embarked distributors

12.1.1 MAIN DISTRIBUTOR

The main distributor can handle, depending on tractor and drill configurations, the following functions:

- The raising and lowering of the openers.
- The hopper motors.
- The folding and unfolding of the frame.



Fig. 68 : Main Distributor

12.1.2 DOWNFORCE DISTRIBUTOR

The downforce distributor manages the hydraulic downforce pressure. It is fitted with 2 accumulators which serve as a suspension for the openers and to quickly restore the pressure at the beginning of a pass.

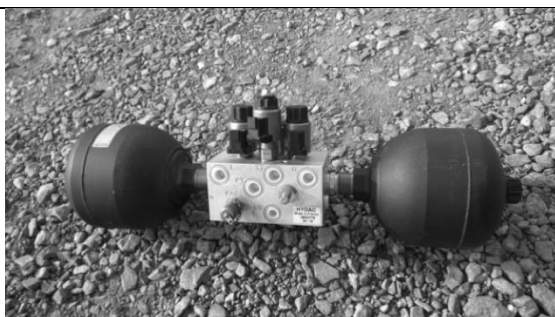


Fig. 69 : Downforce distributor

12.1.3 FOLDING BLOCK

The folding distributor manages the folding and unfolding sequences on folding drills.

Its functions are: the automatic locking and unlocking of the frame wings, the folding/unfolding of the wings, and the walkway control.

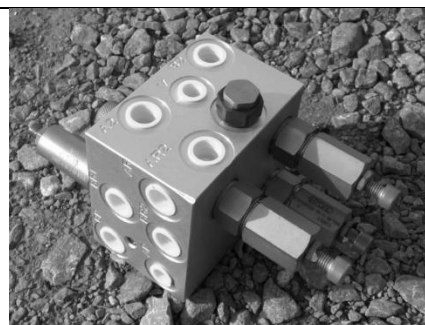


Fig. 70: Folding Block

12.1.4 HOSES AND HYDRAULIC PIPING

Every hose on the drill is referenced.



Fig. 71 : Location of reference number on a hydraulic hose.

12.1.5 WEO COUPLINGS

These couplings are crimped on all the opener hoses as well as on some distributor hoses.



The disconnection of the hose cannot be made if the hose is under pressure.

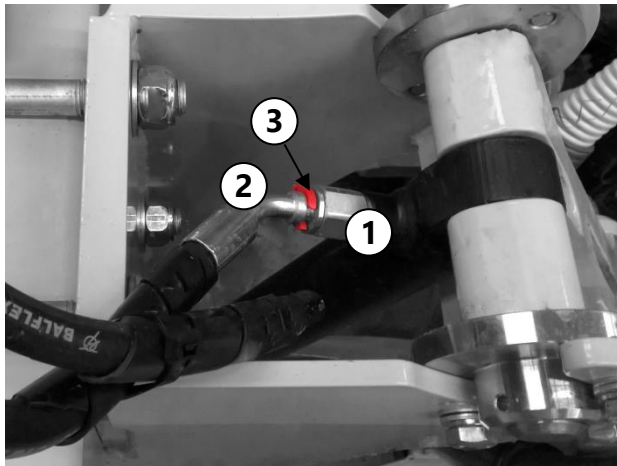


Fig. 72 : WEO coupling

- 1) Female fitting
- 2) Male fitting
- 3) Clip

To connect the couplings:

1. Insert the plastic clip (3) on the male fitting (2).
2. Push the male fitting into the female fitting (3), until the plastic clip touches the edge of the female fitting.
3. Check the coupling by trying to pull out the hose. It must not disconnect.

To disconnect the couplings:

1. Remove the clip (3)
2. Push the male fitting to free it from the female fitting.
3. Pull the male fitting out.

12.2 Hydraulic circuit

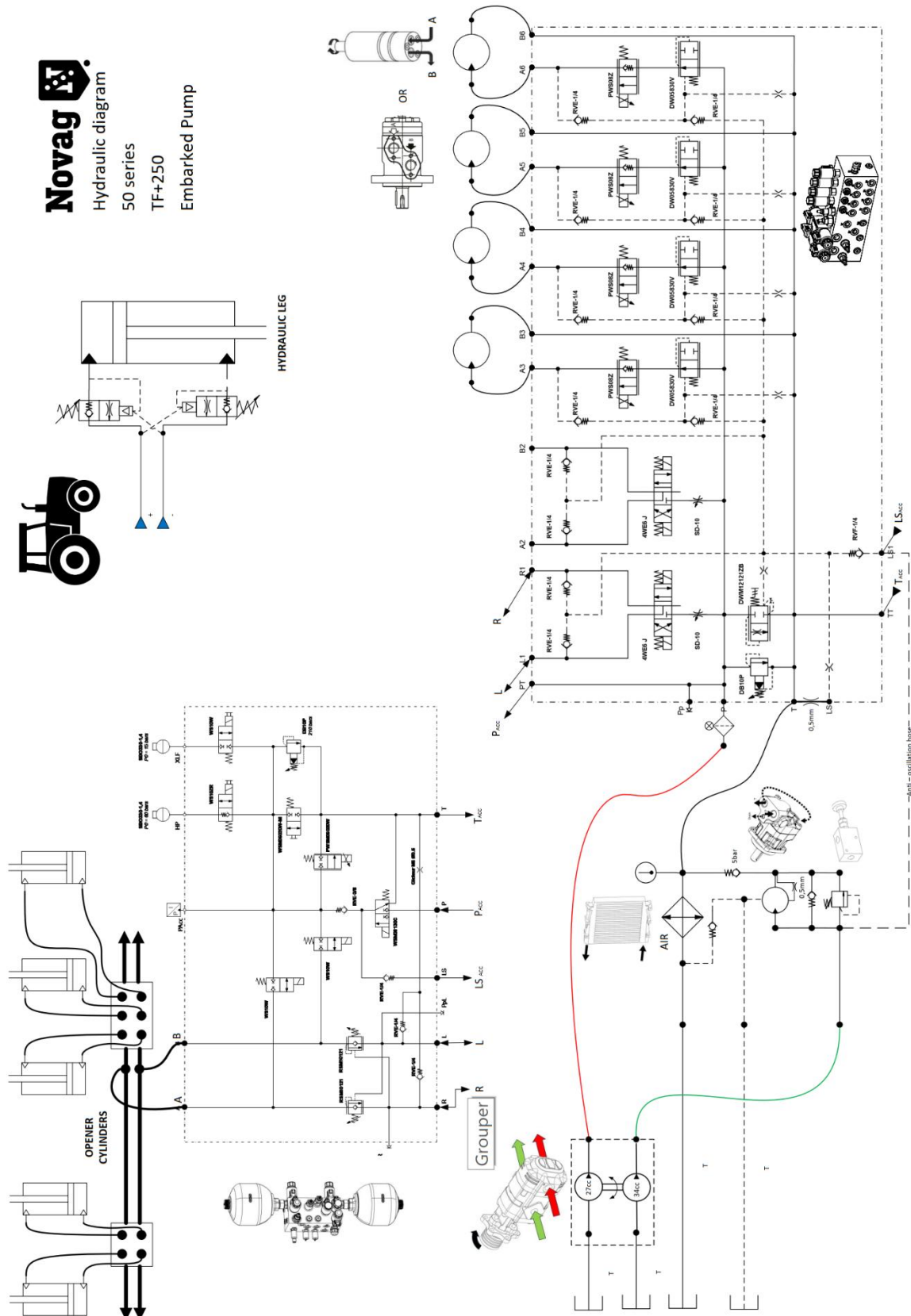


Fig. 73 : Hydraulic circuit schematics : T-ForcePlus 250 embarked pump

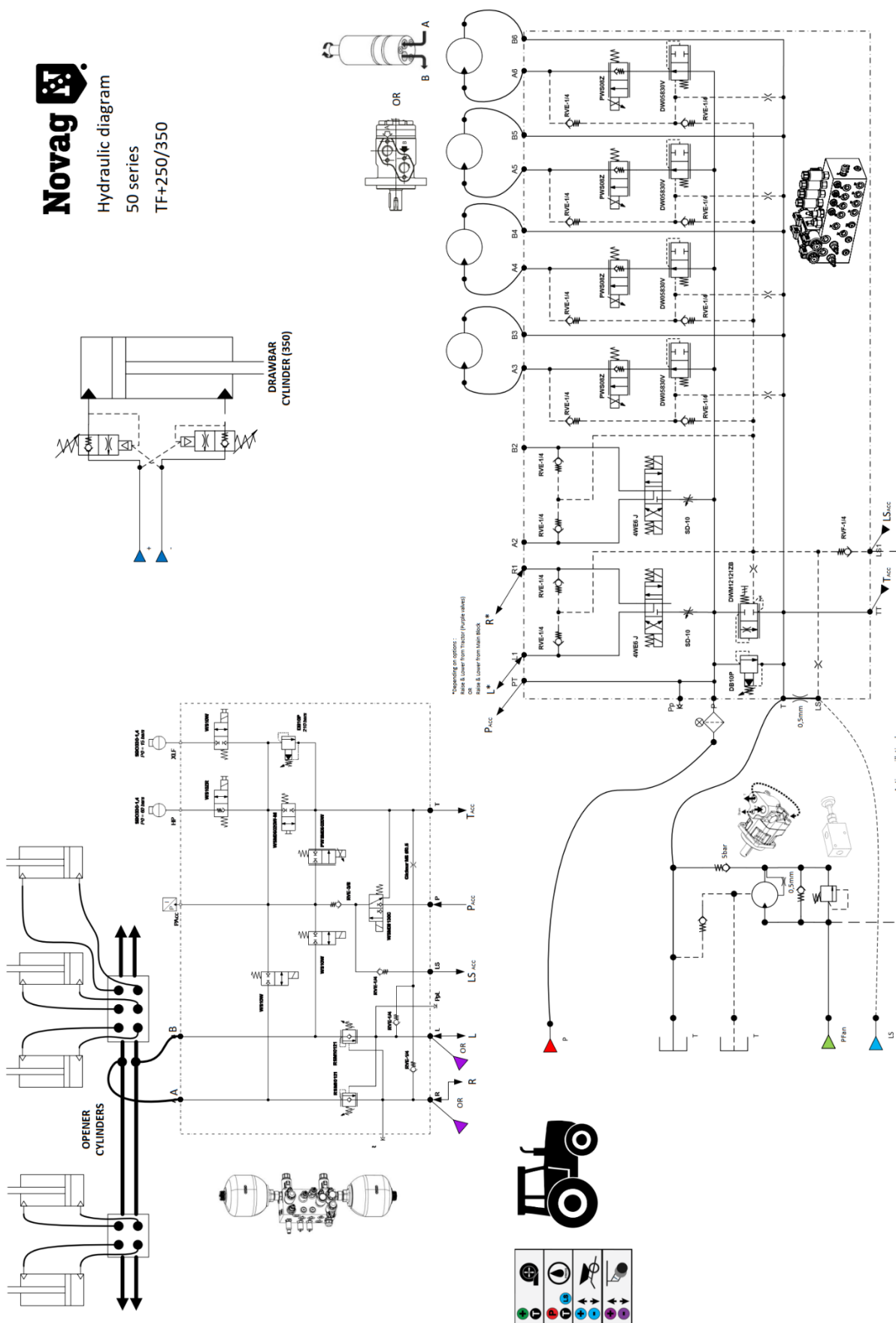


Fig. 74 : Hydraulic circuit schematics : T-ForcePlus 250 with tractor hydraulics

13 Electrical circuit

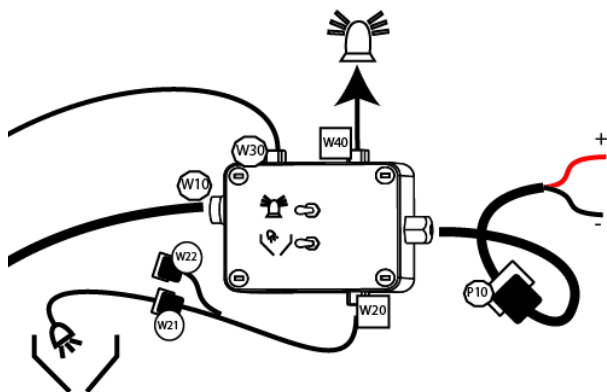


Always take care of the connectors in every connections. In particular, make sure there is not any short circuit after any intervention, using appropriate equipment, before connecting the drill to the battery or switching on the cab monitor.

13.1 Power box

13.1.1 DESCRIPTION

The power box distributes electrical current coming from the tractor battery. The drill features separated circuits, each protected by a fuse located inside the power box. The rotating beacon and hopper LED switches are also part of this box.



Required electrical current

Circuit	Voltage	Current
Main circuit	12V	30A
Work lights	12V	20A
Hopper LED	12V	5A
Rotating beacon	12V	20A

13.2 Circuit schematics

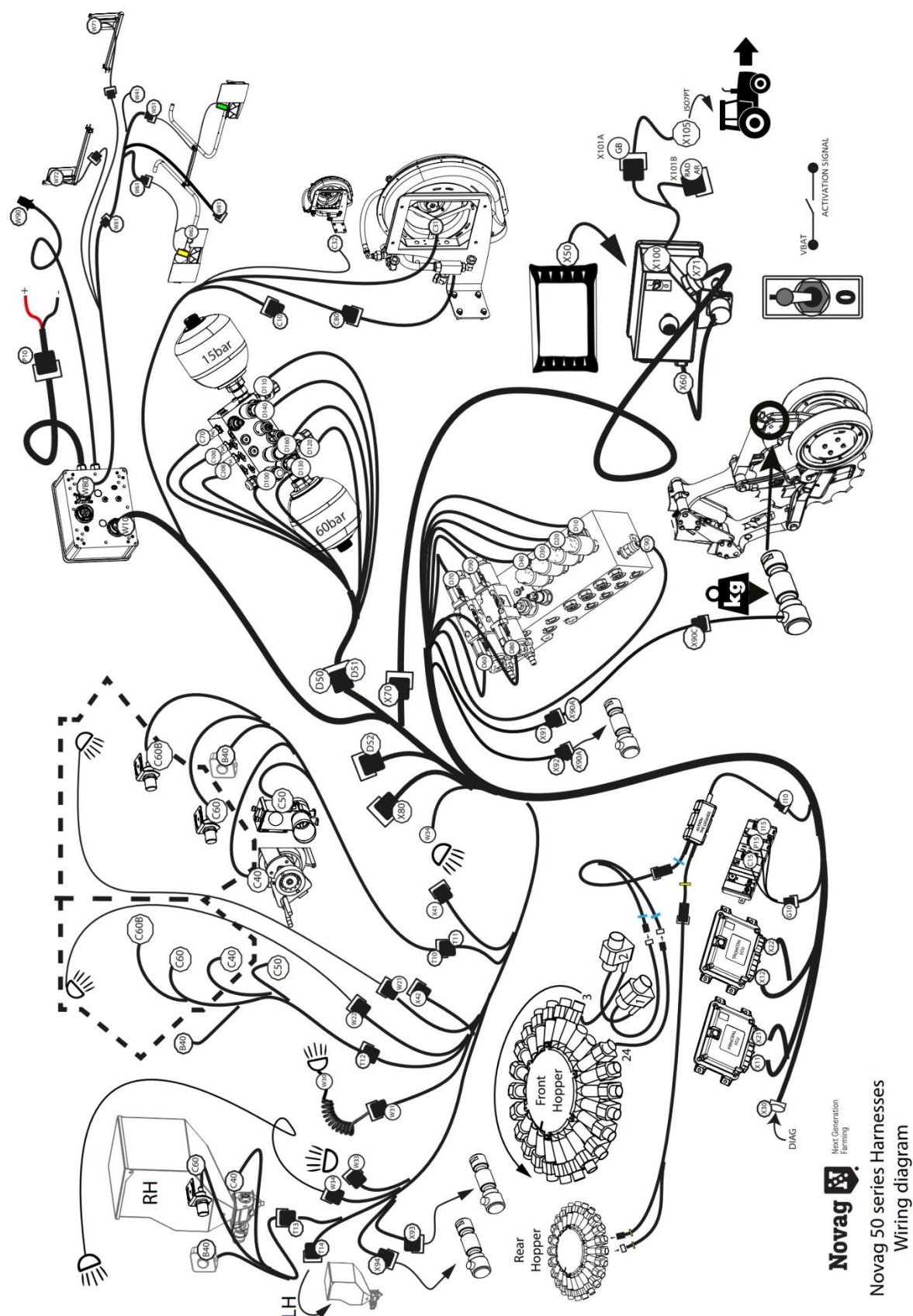


Fig. 75 : Electric circuit schematics

14 Monitor

14.1 Main page

This page is first displayed after the monitor has been switched on

14.1.1 MAIN TAB

This screen is an example of what can be seen while drilling.

- IntelliForce is set on « Manual »
- GPS found a good signal
- The Aux bin is empty but is deactivated.



Display 1 : Main Page

Displayed:

- **Front hopper rate.**
- **Rear hopper rate.**
- **Aux Bin rate** (in the example, the hopper is deactivated).


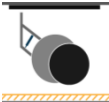


These displayed rates are not the measured rates but only indications of the metering motors speed combined with the calibration ratio.

- Downforce control **IntelliForce Manual or Auto.**
- **GPS Signal quality.**
- **Fan speed.**
- **Ha counter** (work counter).
- **Main circuit pressure (pump pressure).**
- **Maximum drilling speed.** Factor from the desired rate and the maximum permitted speed of the metering units.

- **Downforce pressure gauge.** In the example, the drill is in work state and the gauge back color is green.
- **Closure force gauge.** Measured force under the press wheel.
- Status of worklights **ON/OFF.**
- **Selected mode. Frame folding/unfolding or Opener raise/lower.**
- **Error windows** (example: Aux Bin empty).

Buttons

B1	Go to front hopper tab
B2	Go to rear hopper tab
B3	Go to aux bin tabs (press more times to select which aux bin)
B4	Go to pressure control tab
B5	Go to system menu. (Settings, calibration...)
B6	Switch work lights on/off
B7	<p>Select mode:</p> <ul style="list-style-type: none"> - Fold/unfold the frame (not used on TF+250)  <ul style="list-style-type: none"> - Raise/Lower the opener  <ul style="list-style-type: none"> - Manage tramline counter (with tramline option)
B8 et B9	Use the selected mode
B10	No effect

14.1.2 HOPPER TAB

The tab system on the main page changes contents in the dashed line box.

In this example :

- Front hopper is selected. The front hopper box is in black. And the selected bin is indicated in the center of the distributor head drawing.
- The drills features 19 rows. (Some head outlets are colored in black/dark gray – these are not active).
- The front hopper rate is 110kg/ha.
- The user is modifying this rate but he has yet to validate his choice.
- The rear hopper is deactivated.
- The IntelliForce is in automatic mode. The closure force display is green. And the IntelliForce (ADF) box is in green with the text « Auto ».




Display 2 : Hopper Tab

Display

- **Filling gauge bar.** This bar (yellow) calculates the remaining quantity in the hopper based from the initial quantity that has been loaded after filling the hopper. Its status is based on a theoretical calculation which does not take in account incidents like blockages.
- **Distributor head.** The rows are numbered like on the real head. The blocked rows are shown in red is the AGTRON system as activated.
- **Sensitivity.** Agtron sensitivity.
- **Seedfactor.** Agtron Seedfactor.
- **Actual motor rotational speed.**
- **Calibration ratio** of the hopper.
- **Rate adjustment input.**
- **Current rate** saved.

- **Metering unit status Activated or Deactivated.**

Buttons

B1	Go to front hopper tab.
B2	Go to rear hopper tab.
B3	Go to aux bin tabs (press more times to select which aux bin).
B4	Go to pressure control tab.
B5	Go back to main tab.
B6	Activate or deactivate the metering unit.
B7	Auto calibration of Agtron Seedfactor.
B8 et B9	Change the rate settings.
B10	Validate the rate changes.  The rate will not be modified without validating.

14.1.3 IForce TAB




Display 3: IntelliForce tab

Display

- **Hydraulic pressure in bar.**
Gauge color: green = work state, gray = opener raised
- **Closure force measurement** gauge bar centered on the set point.
- Downforce control **IntelliForce Manual or Auto.**
- **Closure force set point input, in auto mode, or hydraulic pressure** in manual mode, selectable with buttons B7 and B8.
- **Closure force set point or pressure set point saved.**

Buttons

B1	Go to front hopper tab.
B2	Go to rear hopper tab.
B3	Go to aux bin tabs (press more times to select which aux bin).
B4	Go to pressure control tab.
B5	Go back to main tab.
B6	Switch between manual or auto control.
B7	No effect.
B8 & B9	Change the set point settings. In auto mode, the closure force can be set. In manual mode, the hydraulic pressure can be set.
B10	Validate the set point modifications.  The modifications will not take effect without validation.

14.2 Settings pages

14.2.1 SYSTEM MENU



Display 4 : System menu

Displayed:

- Software version (last update).
- Drill Controller version.
- Total Monitor run time.
- Total controller run time.

Buttons

B1	Go to front hopper settings.
B2	Go to back hopper settings.
B3	Go to aux bins settings. The same page manages the two bins.
B4	Go to factory settings (password required).
B5	Go to main page.
B6	Go to IForce settings.
B7	Go to GPS settings.
B8	Set the fan speed alarm. The speed is then set using the buttons B8, B9 and has to be validated with B10.
B9	Go to Tramline settings.
B10	Validate fan speed alarm.

14.2.2 HOPPER SETTINGS



Display 5 : Hopper settings page

4 points can be adjusted regarding the hoppers, corresponding to 4 zones on the page. The general principle is the following:

1. Select a zone with button B1, B2, B3 or B4.
2. The items related to this zone are then shown in the list on the right.
3. Select the desired item with B6 and B7.
4. Validate the selection with B10.

The hopper which is being set is shown in the bottom rectangle.

Zone 1: Agtron (Button B1)

- Status **Activated/Deactivated**.
- **Sensitivity** as a factor of minimum number of seeds per second flowing through the sensor required not to trigger a blockage alarm.
- **Seedfactor**: Individual Seed weight ratio.
- **Number of sensors** counted by the monitor. In case of malfunction of the sensors, this number would be « 0 »
- Sound alarm activated or not.

Zone 2: Fan motor parameters. (Button B2)

- **Maximum speed**. The motor will not turn over this specified speed.
- **Start the motor in manual**. This procedure can be used to check the correct flow of seeds or to drain at a low speed the hopper.
 1. Select the motor menu using the button B2.

2. Select item « Manual Startup »
3. Validate with B10
4. Select the desired rotational speed with B8 and B9 and validate (B10)
5. Use the calibration switch under the hopper to start and stop the motor rotation.

Zone 3: Filling (Button B3)

- Initial qty: total quantity in the hopper after refill.
- Current qty: calculated quantity while drilling. This qty can be adjusted anytime.

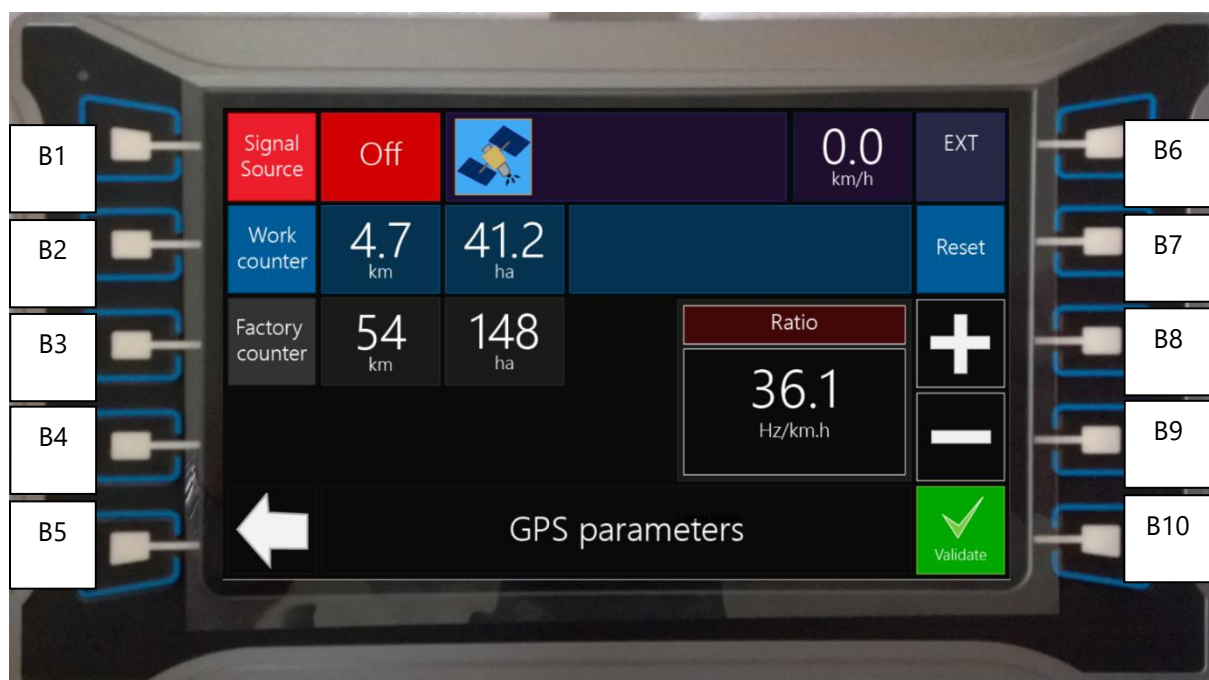
Zone 4: Other (Bouton B4)

- Error margin: Agtron error margin before showing a rate error.
- **Calibration ratio:** Calibration coefficient in memory for the hopper.
- **Drain the hopper.** Choosing this procedure will make the motor rotate at 80% of its maximum speed.
- **Calibrate the hopper. Launch the procedure explained in section 6.3.**
- **Check calibration.** Launch a check weighing to confirm calibration after a variety change for example.

Button B5:

B5 goes to main system menu.

14.2.3 GPS SETTINGS



Display 6 : GPS parameters

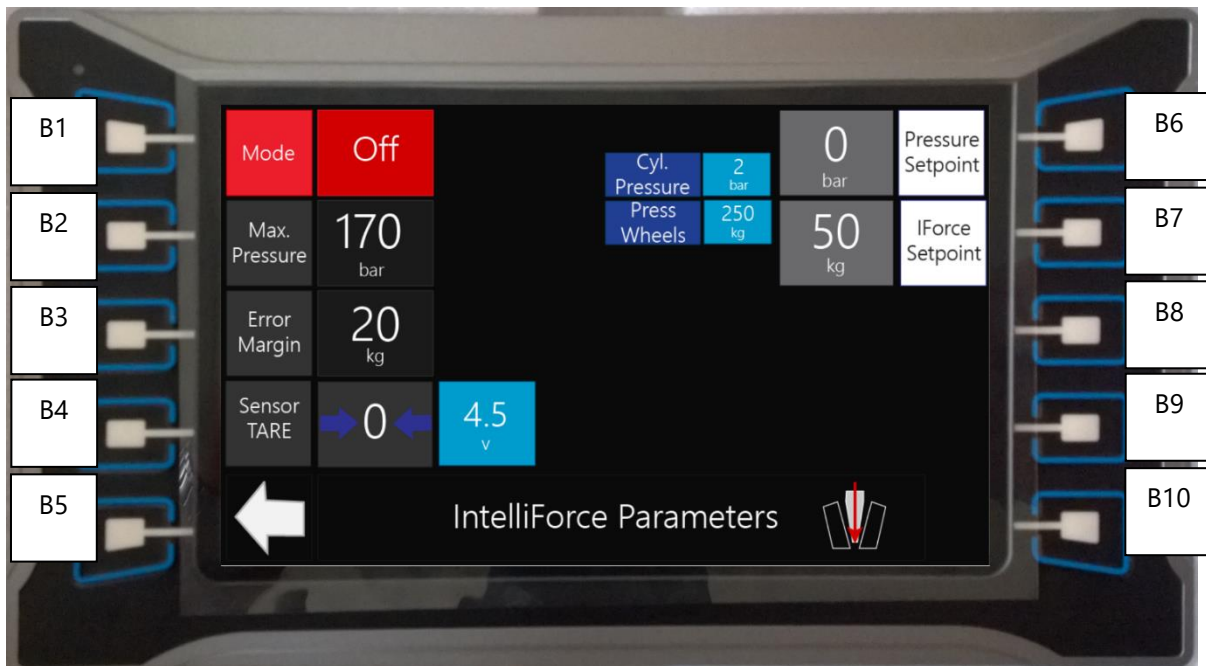
Contents

- **Signal status.**
- **Work counter** in km and ha.
- **Factory counter** in km and ha.
- **Drill speed.** Either the GPS speed (if signal is good enough) or a forced speed.
- **Adjustable forced speed.**
- **Mode « GPS speed » or forced speed**

Buttons

B1	Activate/Override GPS. (use forced speed).
B2	
B3	
B4	
B5	Back to system menu.
B6	Show forced speed adjustment.
B7	Reset work counter.
B8 & B9	Set forced speed.
B10	Validate forced speed.

14.2.4 INTELLIFORCE SETTINGS



Display 7 : IntelliForce settings

Display

- **Mode: Manual (constant hydraulic pressure) or Automatic (Variable hydraulic pressure and closure force control).**
- **Max Pressure:** Maximum permitted pressure for the IntelliForce system in auto.
- **Error tolerance:** In this example, the IntelliForce will not adjust the pressure when the load is in the range of the closure force set point (80kg) + or – 10kg.
- **Pressure set point for manual mode.**
- **Closure force set point for auto mode.**

Buttons

B1	Switch to Auto/Manual.
B2	Adjust max pressure.
B3	Adjust error margin.
B4	Tare for IF+ Sensors.
B5	Back to System menu.
B6	Set the manual pressure set point.
B7	Set the auto closure force set point.
B8 & B9	Change the selected value.
B10	Validate the changes.

15 Incident cause remedy

15.1 General issues

Incident	Cause	Remedy
Actual Rate/ha does not match the desired figure.	Incorrect choice of rotor size.	Start the calibration again with a more suitable rotor.
	Product build up in the splined rotor.	Use the stainless steel shutter plate and clean the rotor.
	Sealing lip damaged by pest.	Replace the sealing lip.
	Wrong calibration/ error during the procedure.	Check calibration ratio. Start the procedure again.
Irregular motor rotation during drilling or calibration.	Sensor malfunction.	Check the sensor and electrical harness. If the sensor is damaged, replace it.
	Foreign object located in the rotor.	Remove the foreign object.
	Main distributor malfunction.	Check the associated flow valve. Check the solenoid.
Pipe blockage.	Excessive banding in the pipe.	Push the pipe further inside the protection tube in the opener. Cut the pipe to length. Replace pinched pipes if necessary.
	Insufficient air flow.	Accelerate the fan or open the air throttle valves.
	Reduction of fan power while raising the opener.	Do not reduce tractor throttle in headlands.
Opener blockage.	Excessively sticky soil.	Postpone the operations.
	Wrong blade disc contact.	Replace the spring plate, the blade, or the disc.

	Tractor slippage.	Decrease the downforce, use only one blade.
	Irregular disc rotation.	Move the disc to a lower mounting hole.
Monitor reports an empty hopper when it is not, or opposite fashion.	Capacitive sensors malfunction.	<p>Check that the sensor does not detect the hopper wall.</p> <p>Check that the status LED changes when an object is placed under the sensor head.</p> <p>Check the electrical cables.</p> <p>Replace the sensor.</p>
Monitor reports a rate error.	Metering motor malfunction.	See above.
	Irregular motor rotational speed.	Rotation speed is too low, reduce the metering unit opening and start the calibration again.
	The drilling speed is above the maximum speed (see 13.1).	<p>Do not drive over the maximum speed.</p> <p>Further open the metering unit and start calibration again.</p>
Hydraulic downforce pressure does not increase enough	IForce max. pressure has been reached.	Change the maximum pressure setting in the IForce page.
	Electrical malfunction.	Check the connections on the downforce distributor.
	Hydraulic pollution.	Replace hydraulic oil.
Difference in depth between front and rear toolbar.	Difference in opener press wheel height.	Check the adjustment screw scale.
	Incorrect frame angle.	Correct the frame angle using the drawbar cylinder.
	Insufficient drill weight.	Add ballasts on the frame.
Irregular fan rotation.	Tractor regulator defects.	<p>Use priority functions.</p> <p>Adjust the fan valve on the drill.</p>

15.2 Monitor error messages

These error messages are displayed on the main page:

15.2.1 Messages occurring while drilling

These messages show in the middle of the main page if a seeding anomaly is reported. A sound alarm is emitted.

	Message	Comments
Empty hopper	« Warning, one hopper is empty »	The rate rectangle of the hopper back color is red.
Row blockage*	« Warning, row blocked on H1,2»	Check the distributor head drawn on the hopper tab. The blocked row appears in red. This message often occurs in the beginning of a pass, when the seeds have not reached the sensors yet.
Fan	« Fan speed error »	The fan speed measured by the sensor is too low. Check the tractor hydraulics.
Rate	« H1,2 Rate error »	Either, the metering unit motor is not able to rotate at the right speed, or the Agtron system reports an invalid number of seeds/s actually flowing*.
GPS signal	« Warning, GPS signal lost. Reference speed is 6km/h »	The drill has lost its GPS signal and is not able to measure the forward speed. The system uses instantly a reference speed of 6km/h.
Drilling speed	"Warning, drilling speed is over the maximum"	Forward speed is above the maximum permitted speed. One of the hoppers cannot distribute enough product to meet the required rate.
Oil temp	« Oil temp too high »	Hydraulic oil is too hot and could damage the installation. Let it cool down before carrying on work.

*Where the « Seed Monitor Option» is fitted.

15.2.2 PERSISTANT ERROR MESSAGES

These messages show in the error message box on the main page of the monitor.

Message	Comment
<i>ERR Joystick</i>	Joystick is not connected or malfunctioning. Check connection of the Elbow Connector at the Terminal/Monitor (X71)
<i>ERR Pump Press</i>	Pump press sensor (connector ID C90) is disconnected or malfunctioning.
<i>ERR GPS</i>	GPS is disconnected, malfunction, or is unable to find satellite signal.
<i>ERR Press T1,2,3</i>	Downforce pressure sensor is disconnected or malfunctioning.
<i>H1,2,3,4 ERR Motor</i>	Hopper motor cannot start successfully.
<i>H1,2 blocked row</i>	Front, Rear hopper reports a row blockage.
<i>Oil temp high</i>	Hydraulic oil is too hot and must be cooled down.
<i>H1,2,3,4 Sensor ERR</i>	Metering sensor is disconnected or malfunctioning.
<i>H1,2,3,4 empty</i>	The hopper is empty.
<i>Agtron ERR</i>	Agtron system malfunction. Check the wiring.

16 Warranty Terms and Conditions

16.1.1 NEW EQUIPMENT WARRANTY

Novag SAS (**Novag**) warrant to the retail purchaser (**Purchaser**) from an authorised Novag dealer (**Dealer**) or from Novag directly that the New Equipment will be free from defects in materials and workmanship, subject to the terms and conditions and limitations on liability set out below (**Warranty**).

For the purposes of these Warranty Terms and Conditions, New Equipment means all new agricultural equipment, machinery and tractors distributed by Novag and sold by the Dealers to the Purchaser or sold directly by Novag to the Purchaser.

Where the New Equipment is supplied directly by Novag to the Purchaser, all references to Dealer in these terms and conditions will be deemed references to Novag.

The benefits provided under the Warranty are in addition to any rights and remedies available under any applicable consumer law.

Limited Warranty

The Warranty is limited to the repair of defective parts and/or components, the supply of replacement parts, and the direct labour cost for the fitting of the replacement or repaired parts (and/or components), in accordance with the manufacturer's repair time schedules, or at Novag's discretion. The defect must occur during normal use of the New Equipment and within the Warranty Period.

16.1.2 WARRANTY PERIOD

The New Equipment is warranted for a period of time depending on the type of machine as specified below. Each period of time commences from the date of delivery and installation to the Purchaser and expires as follows:

- 1) After 24 months
- 2) After the completion of 500 ha/meter of working width

For each type of machine set out above, the Warranty Period expires on whichever limitation occurs first (being date or hectares).

16.1.3 MAKING A WARRANTY CLAIM

In order to make a claim, the Purchaser must:

- 1) Immediately cease using the New Equipment if further usage may cause additional damage to the machine
- 2) Notify the Dealer as soon as possible of the potential warranty claim; and
- 3) Provide any details to the Dealer that may be required in order to process the claim.

The Dealer will lodge the Warranty claim with Novag within 20 days of the Purchaser giving notice of any claim to the Dealer.

The Purchaser must notify the Dealer of any fault or defect in the New Equipment as soon as further it becomes apparent. If a fault or defect in material or workmanship occurs, it is the Purchaser's responsibility to cease operating the New Equipment immediately until repairs are completed.

The Purchaser must make the New Equipment available on request for repairs to be carried out by Novag or its authorised agent. Failure to do so may make the Purchaser liable for further or consequential damages and associated costs, in relation to the New Equipment.

The Dealer will arrange the inspection and if necessary repair of the New Equipment. If the New Equipment is required to be repaired at the Dealer's workshop, all and any associated costs in regard to the transport of the New Equipment will be at the Purchaser's expense.

The Purchaser will arrange to transport the New Equipment to the nearest Dealer at the Purchaser's cost and at their own risk at all times or the Purchaser agrees to pay any costs incurred by Novag or the Dealer in travelling to the New Equipment to carry out the repair.

The Purchaser will clean down the New Equipment for repair or shall be liable for the cost of costs cleaning the Equipment.

The Purchaser acknowledges that neither Novag nor the Dealer will be liable for any costs relating to the use or hireage of additional equipment in place of the New Equipment during the period of repair or resolution of the Warranty Claim.

16.1.4 WARRANTY EXCLUSIONS

The Warranty is subject to the following exclusions:

- 1) second hand equipment (except New Equipment that has an approved Warranty Transfer in accordance with clause 12);
- 2) any equipment that has been altered or modified in ways not approved by the original manufacturer, including changes to the product design for use in an application not intended by the original manufacturer;
- 3) any fault or failure caused from poor quality or contaminated hydraulic oil;
- 4) depreciation or damage (including UV damage) caused by normal wear and tear, lack of proper protection during storage and transport, accident, or other cause beyond Novag's reasonable control;
- 5) depreciation or damage caused using non-approved lubricants, additives parts and accessories;
- 6) depreciation or consequential damage caused by continuing to use the equipment after a fault has occurred;
- 7) items or parts that are deemed to be normal maintenance service parts, including (but not limited to) wear parts and general items;

- a. maintenance/service items are those items that are replaced during normal chains service checks. Examples include but not limited to oil and air filters, lubricants, coolants, fluids
 - b. wear parts include but not limited to wear/skid plates, concaves, anvils, knives, bearings, bushes, PTO shafts and covers, track rod ends, ball joints, ground universal joints, and drive belts;
 - c. ground engaging parts are any parts that come into direct contact with the ground. Examples include but not limited to tyres, plough tips and coulter blades
- 8) noise levels in the hydraulics, which may vary from one machine to another and do not necessarily indicate faulty components;
- 9) any repairs, modifications, or alterations carried out to the equipment during the Warranty Period by any person who is not authorised by Novag, or the use of replacement parts other than the original parts supplied by Novag;
- 10) any equipment which has been used in an industrial-type application or outside the stated limitations and specifications;
- 11) any equipment which has been used negligently or with unsuitable products (notably fertilizers) or attachments;
- 12) damage caused by fire, flood, earthquake, water, wind, lightning, utilities, war, terrorism, civil disturbance or any other cause beyond Novag's reasonable control; and
- 13) non-proprietary parts or accessories (items not manufactured by the original manufacturers), including but not limited to tyres, radios, starter motors, alternators, batteries and oils. In relation to non-proprietary parts or accessories only the manufacturer's warranty will be available, Novag will refer any warranty claims in relation to such items to the manufacturer or its agents.
- 14) **Novag shall on no account have any liability at all where:**
- a. specific abnormal conditions prejudiced the performance of a Product;
 - b. substandard fertilizer or substandard seed, including seed with substandard germination and/or vigour at the time of sowing, was used;
 - c. there was pest or weed attack, or drought, flood, or any form of damage caused to soil prior to or after the use of a Product;
- 15) For the avoidance of doubt, Novag shall not be responsible or liable for any of the exclusions set out in clauses above.

16.1.5 LIMITATION ON LIABILITY

- 1) Novag will not be liable to the Purchaser for a Warranty claim unless the Purchaser gives the Dealer notice of any claim as soon as defect becomes reasonably apparent.
- 2) The Dealer will lodge the Warranty claim with Novag within 20 days of the Purchaser giving notice of any claim to the Dealer.

NEITHER NOVAG NOR THE DEALER SHALL BE LIABLE FOR ANY OTHER LOSSES OR DAMAGES (WHETHER DIRECT OR INDIRECT) INCLUDING BUT NOT LIMITED TO CONSEQUENTIAL LOSS, PERSONAL INJURY OR DEATH, ECONOMIC LOSS OR LOSS OF PROFITS, WHETHER ARISING UNDER STATUTE, CONTRACT,

TORT INCLUDING NEGLIGENCE, HOWEVER SO ARISING, WITHOUT LIMITING THE FOREGOING, NOVAG AND THE DEALER WILL NOT BE LIABLE FOR ANY CLAIMS, DAMAGES OR DEFECTS ARISING FROM OR IN ANY WAY ATTRIBUTABLE TO LOSS OF CROPS, LOSS OF PROFITS, COSTS OF RENTAL OR SUBSTITUTE EQUIPMENT OR OTHER COMMERCIAL LOSS OR NORMAL WEAR AND TEAR.

- 3) In any event, the total liability of Novag and the Dealer for any breach of any stated or implied term, condition, or Warranty which cannot lawfully be excluded, is limited to the fullest extent permitted to one of the following, as determined by Novag:
 - a. the replacement of the defective component or the supply of an equivalent substitute component (or payment of supply costs); or
 - b. the repair of the defective component (or payment of repair costs)

16.1.6 CONDITIONS OF WARRANTY

The Warranty is strictly subject to the conditions set out below in this clause.

Installation and Warranty Registration:

- 1) On delivery and installation of the New Equipment, the Dealer and Purchaser must complete and sign the relevant sections of the Installation and Warranty Registration Form and the Dealer must send the following completed documents to Novag Head office within seven days of delivery and installation:
 - i. the Novag copy of the Installation and Warranty Registration Form and the Extended Warranty Form (if applicable);
 - ii. any other supplier documentation as required, **(Warranty Documentation)**.
- 2) A copy of any original Warranty Documentation must be emailed to Novag prior to posting the original Warranty Documentation (where applicable).
- 3) The Warranty may be invalidated if any Warranty Documentation is not returned, incomplete or incorrect or completed dishonestly

Purchaser's Responsibilities:

The Warranty is subject to the Purchaser undertaking the following obligations:

- 1) completing and returning the Warranty Documentation in accordance with clause 7.2 above the New Equipment must be operated strictly in accordance with the instructions in the Operators Manual current at the date of purchase, considering the New Equipment's application and imitations at all times;
- 2) operating and servicing the New Equipment safely and correctly, and for the use for which the New Equipment was designed, in accordance with the applicable Operators Manual;
- 3) if the Operators Manual does not provide suitable detail for must installation and operation of the New Equipment, then the action to be taken must be in accordance with best trade practice and all relevant laws and expense regulations;
- 4) maintaining and insuring the New Equipment at the Purchaser's own expense from the date of delivery and installation, in accordance with the Operators Manual, including all scheduled servicing and periodic maintenance checks;
- 5) maintaining adequate records of the New Equipment's maintenance and service history and being able to present them when requested by material Novag or the Dealer;
- 6) cease operating the New Equipment immediately if a fault or defect in material or workmanship occurs; The Purchaser is responsible for ensuring that all daily maintenance of the machine is undertaken as described in the Operators Manual.

16.1.7 EXTENDED WARRANTIES

All Extended Warranties will be subject to these Warranty Terms and Conditions and all references to the Warranty Period will include the Extended Warranty Period.

16.1.8 NO IMPLIED WARRANTY OR OTHER REMEDY

Novag neither states nor implies any warranty of merchantability, or fitness for any purpose, except as specified above or as required by law.

16.1.9 NO SALESMAN WARRANTY

No salesman, Dealer or other Novag representative or franchisee has any authority to make any representation, promise, or commitment on behalf of Novag including any modification of the terms or limitations of any of these warranty conditions

16.1.10 EQUIPMENT IMPROVEMENT PROGRAMMES

Novag reserves the right to improve the design, change the specifications of, or withdraw any New Equipment at any time without incurring any obligation to Purchasers of models previously supplied.

16.1.11 WARRANTY TRANSFERS

The Warranty is for the benefit of the original Purchaser only unless transferred in accordance with this clause 12.

If New Equipment is on-sold during the Warranty Period, the Warranty may be transferred to the new purchaser for the balance of the Warranty Period. The original Purchaser and the new purchaser must complete the Change of Owner Notification Form **(Warranty Transfer)**

The new purchaser must register the Warranty Transfer to maintain the Warranty by submitting the Change of Ownership Form to Novag Head Office within seven days of the sale of the New Equipment. In addition, the new purchaser must be approved by Novag (in its discretion) within seven days of receiving the Change of Owner Notification Form, otherwise the Warranty will automatically lapse.

Extended Warranties are subject to the supplier's terms and conditions and may therefore not allow for transfer of the Extended Warranty Period to a new purchaser.

17 User notes

17.1 Calibration results

Type	Variety/Brand name	Rate/ha	Drill Speed	Opening/ Rotor	Ratio

17.2 Intervention notes

Date	Title	Replaced parts	Comments

