USER MANUAL

DRAIN CLEANER
Make : Homburg
Type : Hurricane

Serial no. : _____
Date : February 2014
Issue No. : HU-2 (English)
Version : A

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1 PREFACE
(How to use this user manual)

We thank you for purchasing the Homburg Drain Cleaner type Hurricane. You have bought a high-quality machine. To make the most of this high quality throughout the service life of this machine, it is necessary to accurately follow all instructions in this user manual.

In this user manual you will find all the information you need for using and maintaining the machine in the best and safest possible way as well as guidelines for preventing accidents with the machine. This user manual is exclusively intended for users and maintenance technicians of the Homburg Drain Cleaner type Hurricane.

For this reason you are advised to read the entire user manual and make sure you understand it before the machine is put into use. If you have any questions about the machine, you should contact your supervisor, the importer or the manufacturer as soon as possible.

The following icons are used throughout this user manual. They refer to increasing danger levels, as explained below.

HINT!
The instruction given here shows an efficient method that may save time or to lead to an improved final result.

ATTENTION!
The instruction given here provides the user with additional information.
This instruction draws the user's attention to possible problems.

CAREFUL!
Failure to follow this instruction to the letter may result in damage to the machine or the surroundings or pollution of the environment.

WARNING!
Failure to follow this instruction to the letter may result in injury or permanent disability.

DANGER!
Failure to follow this instruction to the letter may result in injury, permanent disability or death.

To make this user manual more convenient and easy to use it contains the following:
- Table of contents
- List of illustrations
- Conversion table for ANSI units - SI units

All units listed in this user manual are SI units.
All non-SI units are placed in brackets.

The numbered operating instructions must be carried out in that specific numerical sequence.

Instructions for use and maintenance provided by the manufacturers of components such as water pump and cardan shafts have been supplied with this user manual. Ask for them if you have not received them.

HOMBURG HOLLAND does not accept any liability for damage resulting from information in the use and maintenance instructions written by the manufacturers of these components.

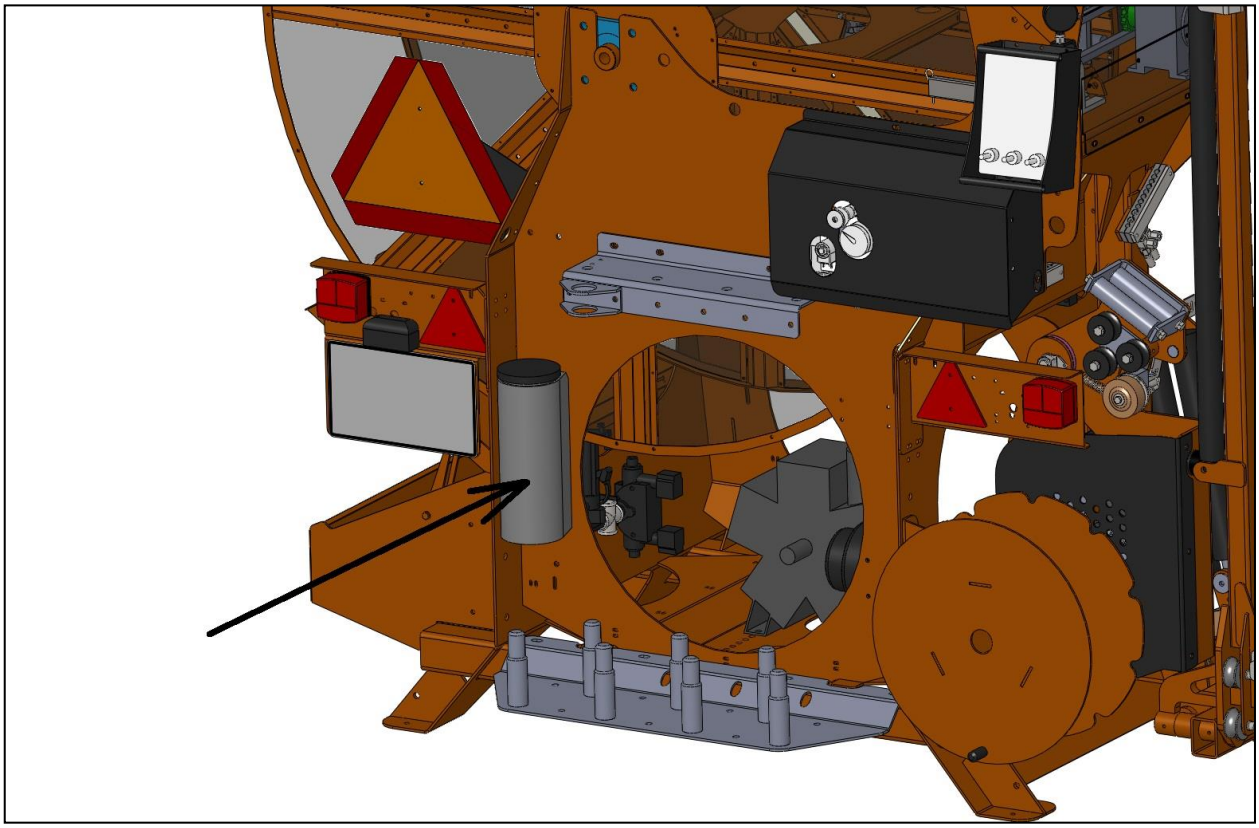
The Homburg Drainage Cleaner type Hurricane is referred to as the *"Machine"* throughout this user manual.

"Feeding in" means: Feeding the flushing hose into the drain pipe.
"Pulling out" means: Pulling the flushing house out of the drain pipe.

Contact HOMBURG HOLLAND if you want to know anything about the machine that is not described in this user manual. When you contact us, please make sure you have the following information at hand:

- machine type
- serial number
- year of manufacture
- water pump type

Always keep this user manual on the machine in its special storage compartment (see fig. A1). If the user manual is missing or damaged or if pages are missing, a new copy must be ordered from the manufacturer at once.



A1 – compartment

The following documents are available for the Homburg Drain Cleaner type Hurricane:

	Order number:
- User manual incl. parts book	13455 (NL) 13456 (GB) 13457 (D) 13458 (F)

- User manual for Walterscheid cardan shafts (supplied)
- User manual for Imovilli Pompe water pumps (supplied)
- Parts Book for Imovilli Pompe water pumps (supplied)

On the last page you will find a form that can be used to list your suggestions, questions and remarks regarding this user manual. If you think that anything needs changing in this user manual, please let us now.

2 INTRODUCTION

The Homburg Drain Cleaner type Hurricane is exclusively intended for cleaning drain pipes in agricultural land using water. No other use of the machine is permitted. The manufacturer is not liable for damage caused by use that is not described in this user manual. If the machine does have to be used for a different purpose, you should obtain prior written permission from the manufacturer.

* The guide arm must never be used as a hoist.
* The machine must not be operated by people younger than 18.

3 DECLARATION OF CONFORMITY

CE Declaration of conformity

Manufacturer:

(visiting address)
HOMBURG HOLLAND
It Noarderfjild 21
9051 BM Stiens
The Netherlands

(mailing address)
HOMBURG HOLLAND
Postbus 5
9050 AA Stiens
The Netherlands

Importer:

declares that the Homburg Drain Cleaner type Hurricane:

- Complies with all the relevant provisions of Machinery Directive 2006/42/EC, and
- All the relevant provisions of Council Directive 2004/108/EC (EMC)

Stiens, 01 JULY 2013

Johannes de Boer
Chief Executive
HOMBURG HOLLAND

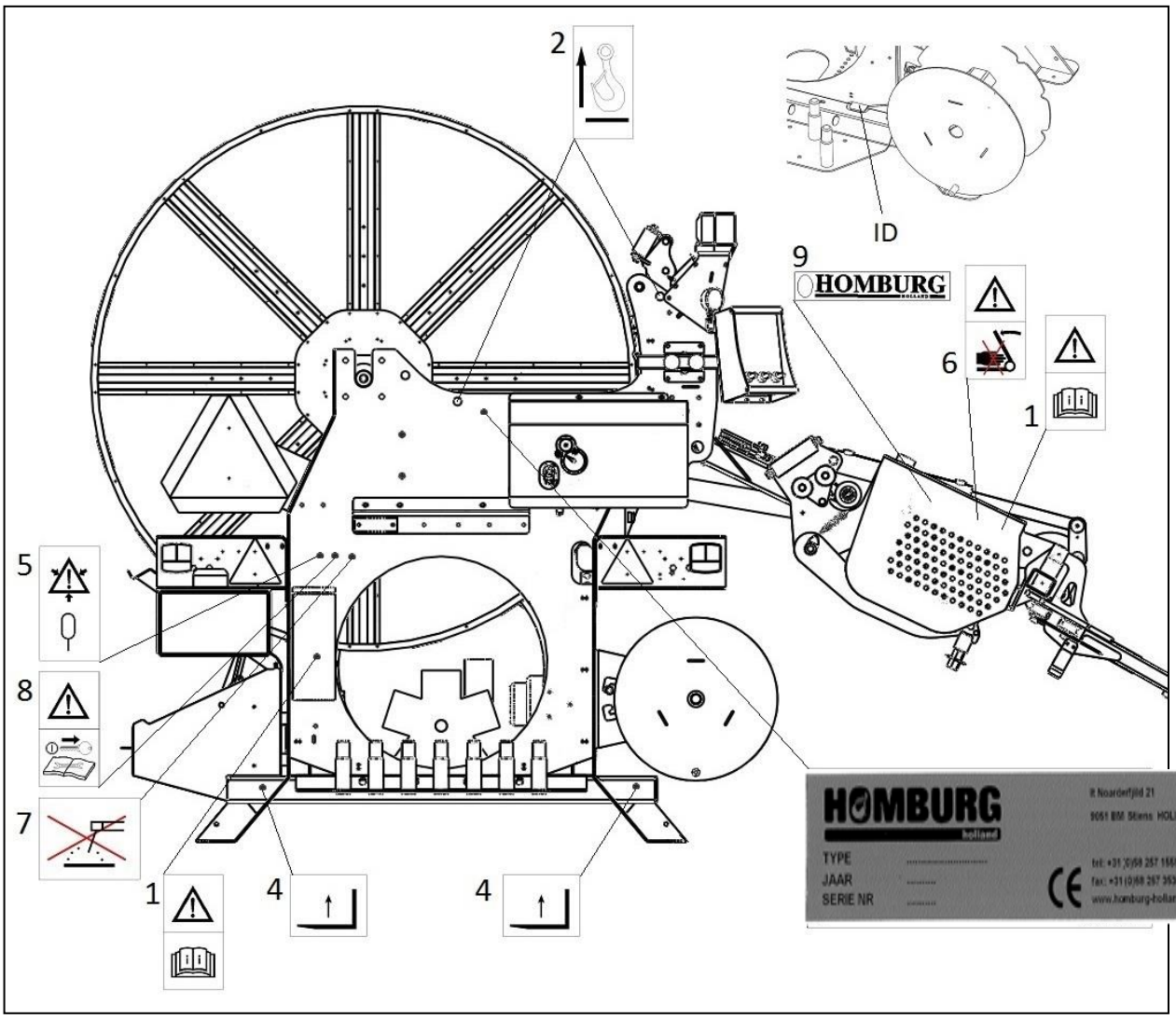
4 IDENTIFICATION

The location of the identification plate (see fig. 13) on the machine is shown in fig. 47A.
The following information can be found on the identification plate:

- Name of the manufacturer
- Visiting address of the manufacturer
- Telephone number of the manufacturer
- Fax number of the manufacturer
- E-mail address of the manufacturer
- Company logo
- Machine type reference
- Serial number of the machine
- Year of construction of the machine
- CE mark (indicating that the machine satisfies the Machine Directive)

13. Identification plate

The last four digits of the machine serial number are also stamped on top of the machine frame close to the identification plate. For the location of this stamped serial number see fig. 48-ID.



48. Location stickers rear

On receipt of the machine please fill out fig. 13 and the information below:

Pump	Make	: Immovilli
	Type	: D135
	Serial no.	:_____
Cardan shaft	Make	: Walterscheid
	Type	: W2100-SD05-660-10100-10100
	Serial no.	:_____

Delivery date Machine :_____

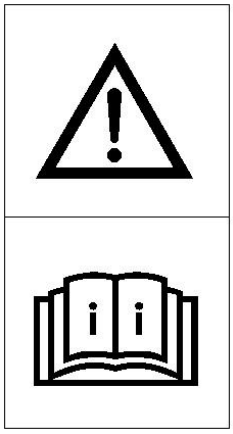
Factory stamp :

5 SAFETY

5.1 General

HOMBURG HOLLAND b.v. does not accept any liability for damage caused by acts in violation of this user manual. If the machine is used in violation of this user manual, the warranty for the machine and the manufacturer's product liability will automatically become void.

The machine may only be used by operating staff or maintenance staff older than 18 who have fully read and understood this user manual and who are familiar with the use of the machine.



07. Sticker "Read the user manual first"

It is also advisable to follow a short course in operating and maintaining the machine This can be arranged by the manufacturer or a different company or importer approved by the manufacturer of the machine.

As the machine's operator or mechanic you are responsible for determining whether the machine is used in accordance with this user manual.

When using the machine also follow the instructions in the operating manual of the tractor, the cardan shaft and the water pump being used.

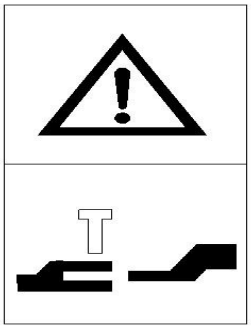
DANGER!
Failure to observe the following safety instructions may result in bodily injury, disability or death.

5.2 Before starting work

* It is essential that warnings, safety provisions and guards that go with the machine are checked regularly to make sure that they are still in place and work properly.
* The machine must not be used unless it is in perfect technical condition. Do not operate a machine when parts are worn.
* The machine must only be used with a suitable tractor that is in perfect mechanical condition.
* Do not switch the water pump on when there is reason to suspect that the water in the pump is frozen.
* Make sure there are no children and/or animals near the machine when it is being operated. People must keep out of the machine's operating range.
* Always inspect the area where the machine is going to be used (height, width, bearing capacity embankments, shoulders, floors, bridges, risk of explosion etc.).
* Wear adequate eye protection (goggles). The flushing water leaving the drain pipe under pressure may carry off small hard objects at high speed.
* Always check the machine for loose bolts and nuts, damage, leakage or defects and correct operation (also the tools and accessories).
* Check all guards, warnings and safety devices for presence and proper performance.
* Do not operate the machine when you are tired or have used alcohol, medicines or drugs.
* Beware of dangerous clothing, long hair or jewellery that may get caught somewhere.
* Keep the controls free of food, oil, dirt, dust, snow and ice.
* When the machine is operated at ambient temperatures below zero degrees Celsius, the water pump may get damaged when it is switched on.
* Use a tractor with safety cab or roll bar as prescribed by the law.

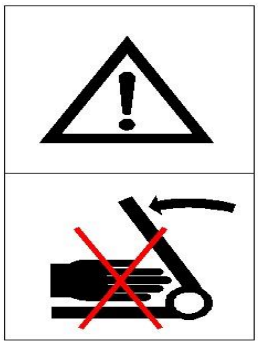
5.3 Hitching and unhitching

* The machine must only be hitched to the tractor using the three-point suspension intended for that purpose in accordance with the safety requirements.
* Utmost care must be taken when hitching or unhitching the machine.
* When hitching or unhitching the machine, the tractor operating lever must be placed in such a position that it cannot inadvertently be moved.
* Make sure the machine link pin diameters match the hole diameters of the tractor three-point suspension.



16. Sticker 3-punts ophanging

* WARNING: In the area of the tractor three-point the risk of getting caught and sustaining injury exists.

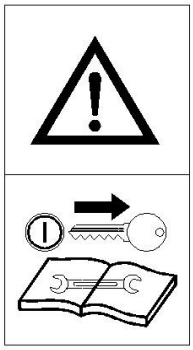


10. Sticker "Danger of getting caught"

* Lock the stabiliser rods before entering a public road. This will prevent inadvertent lateral movement of the machine.

5.4 Drive (pto and cardan shafts)

* Only use the universal cardan shaft that came with the machine or the one prescribed by the manufacturer.
* The pto or cardan shaft protection must always be mounted and in good condition.
* Make sure the protective sleeve of the universal cardan shaft provides complete protection in working position as well as in transport position.
* Stop the tractor engine and take out the ignition key before mounting or dismounting the cardan shaft.

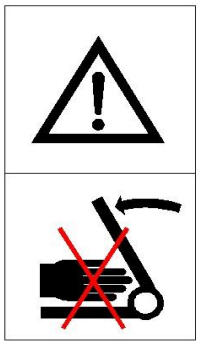


14. Sticker "Remove ignition key for maintenance

* If the cardan shaft is equipped with a slipping clutch or a freewheel clutch, then mount it on the machine side.
* Always make sure the universal cardan shaft is mounted and locked correctly.
* Always make sure that the protective sleeve of the universal cardan shaft is locked firmly in the rotating direction with the aid of lock chains.
* Select the correct rpm for the cardan shaft before switching it on.
* Check that there are no people or animals near the machine before switching on the cardan shaft.
* Switch off the cardan shaft when the angle with the machine or the tractor exceeds the value prescribed by the manufacturer.
* WARNING: When the cardan shaft has been switched off, the driven pump may coast down a while. Never touch it while it is coasting down.
* Place the cardan shaft in the special cardan shaft support when it is not in use. Never let it hang on the lock chain.
* After uncoupling the universal cardan shaft from the pto, the protective cover must be placed back on the tractor pto.
* Damaged and/or defective pto and cardan shaft covers must be replaced at once. Only use original replacement parts.
* Never stand on the cardan shaft or on the protective sleeve of the cardan shaft.
* Always observe the cardan shaft instruction manual when working with the machine.
* Make sure the cardan shaft has been shortened correctly.
  If the cardan shaft is too long, it may severely damage the three-point suspension and the machine.

5.5 Working with the machine

* The guide arm must never be used as a hoist.
* The machine must not be operated by people younger than 18.
* Always apply the tractor handbrake before working with the machine or leaving the tractor seat.
* Always ensure you have sufficient room when using the machine guide arm.
* Beware of electric cables and lines when working with the guide arm. Touching them can be fatal!
* Never play games with the machine.
* Wear adequate eye protection (goggles). The flushing water leaving the drain pipe under pressure may carry off small hard objects at high speed.
* Only operate the machine from the position intended for it.
* Only operate the tractor from the position intended for it.
* Always ensure a good view of the work.
* Always switch off the machine when you leave it and take the tractor ignition key with you.
* WARNING: In the area of the machine guide arm the risk of getting caught and sustaining injury exists.



10. Sticker "Danger of getting caught"

* When working from public roads, always keep other road users in mind. Switch on the flashing light or rotating light.
* The maximum permissible values such as: engine rpm, hydraulic oil pressure and water pressure etc. of the machine must not be exceeded.
* When the machine is operating, the noise production of the machine is lower than 70 dB(A). Use hearing protection dependent on the noise produced by the tractor.
* When the machine is operating, the mechanical vibration energy value of the machine is lower than a_{vhw} 2,5 m/s^2 .
* If a thunderstorm approaches while you are working on the land, go and sit in the tractor immediately if it has a cab.

* Never leave the machine when the tractor ignition key is still in the ignition lock.
* Always observe the operating manual of the tractor used when working with the machine.
* Emergency: In the event of a runaway tractor diesel engine due to insufficient maintenance of the air filter or the crankcase ventilation system, the machine and the tractor engine may get severely damaged due to a very high rpm. If this happens, the air intake of the tractor engine must be shut off as quickly as possible to stop the engine.
* Emergency: If the tractor with the machine has toppled, the tractor engine must be shut off directly to prevent damage to the tractor engine and the machine water pump.
* The machine must in no event touch the tractor cab or the tractor cab window when it is being lifted.

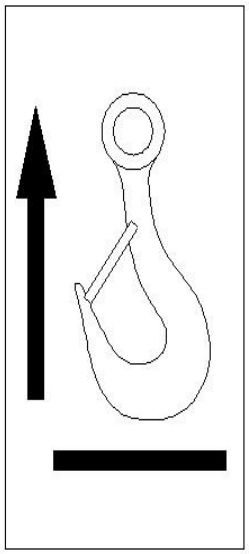
5.6 Transport (behind the tractor)

* If the tractor with the machine has to use public roads, the assembly must satisfy the current traffic regulations and legislation. When the machine is hitched to the tractor, in many cases the original rear lighting of the tractor is obscured. This means that a correctly functioning light beam must be mounted to the rear of the machine fitted with:
    * Rear lights
    * Brake lights
    * Flasher lights
    * Licence plate lighting (i.a.)
    * Licence plate holder (i.a.)
    * Holder for triangle "Slow traffic"
    * Reflectors

  These components are optional and can be supplied.
* Also make sure that the flashing light or rotating light mounted on the tractor is clearly visible for traffic approaching the tractor with machine from the rear. Use of the flashing light is permitted only if the tractor/machine is wider than 2,6 metres.
* Make sure the maximum permissible axle loads and maximum permissible dimensions of tractor and machine are in accordance with the traffic regulations when using public roads.
* Make sure the machine has been brought into transport position as prescribed by the manufacturer when using public roads with the tractor and machine.
* Carrying people, animals or goods with the machine is not permitted.
* Keep in mind that the tractor handles differently with a hitched machine.
* Check that the tractor front axle pressure is sufficient before driving off. If not, place ballast weights as prescribed by the tractor manufacturer.
* Make sure that the maximum permissible axle loads or the axle loads division of the tractor are never exceeded.
* Allow for the protruding rear length when taking corners and reversing when the machine is hitched to the tractor. Insufficient room when taking corners can cause irreparable damage to the complete machine and the three-point suspension.
* When the machine is transported behind the tractor in its highest position, then lock the operating lever of the three-point suspension.
* Keep in mind that the machine may hit the ground with force when driving over rough terrain with the tractor. This may cause severe damage to both the three-point and the machine itself.
* Switch off all working lights when driving over public roads.

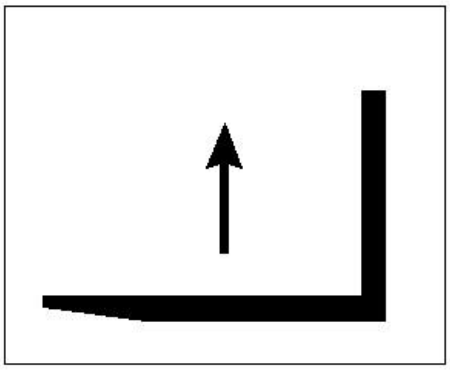
5.7 Transport (not behind the tractor)

* Be mindful of the total transport height (flyovers etc.).
* Be mindful of the total transport weight.
* Never stand under a lifted machine.
* Only use the special hoisting eyes when the machine has to be hoisted. The location of the hoisting eyes is shown in fig.48 and fig. 49.



08. Sticker "Hoisting point"

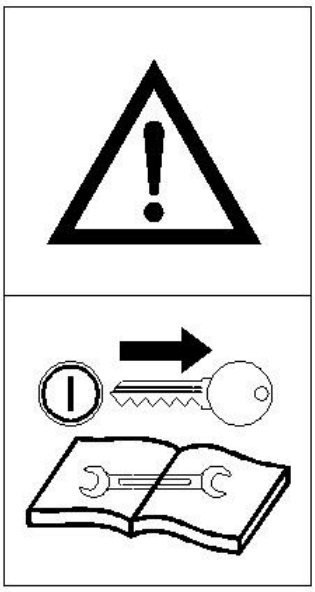
* Only lift the machine at those places indicated with the sticker below.



12. Sticker "Forklift lift point"

5.8 Service, Maintenance and Repair

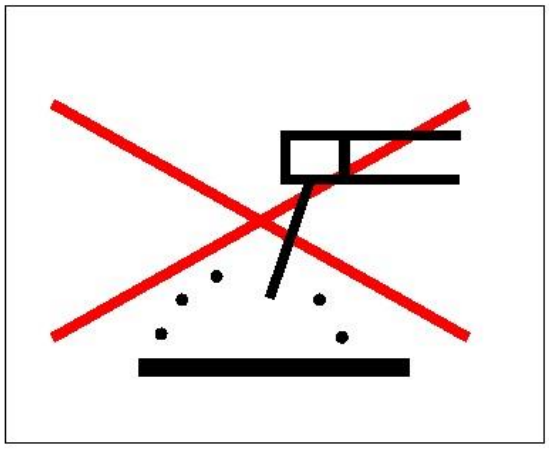
* Maintenance and repairs must only be carried out by trained, appointed and authorised personnel that does not use alcohol, medicines or drugs.
* Operators must not carry out any other maintenance repair described in this user manual.
* The settings and accesses sealed by the manufacturer must not be broken.
* A broken seal automatically voids the manufacturer's product liability.
* Always use the tools, spare parts, materials, lubricants and operating procedures prescribed by the manufacturer.
* Never use defective tools.
* Use tools only for their intended purpose.
* Don't leave any tools in the machine after maintenance.
* Make sure during maintenance and repairs on the machine that the ignition key has been removed from the lock and that the cardan shaft is uncoupled.



14. Sticker "Remove ignition key for maintenance"

* Beware of exhaust gases in confined spaces, risk of carbon monoxide poisoning!!

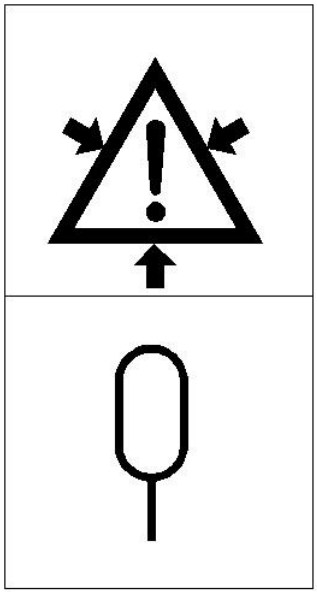
* Never weld on the machine without the manufacturer's written permission.



11. Sticker "No welding on the machine"

* Unhitch the machine from the tractor before welding on the machine.
* Place suitable supports under the machine when carrying out maintenance with the machine in lifted position.
* Never unfold the guide arm when the machine is not hitched to the tractor. The machine may topple if you do.
* Always observe the safety precautions from suppliers of battery acid, fuels, lubricants, cooling fluid and hydraulic oil.
* Deposit used oil, used grease and oil filters at the intended places in accordance with environmental regulations.
* The substances used on or in the machine are not suitable for internal use.
* Uncouple the battery or the electric connection to the tractor when working on the electric system of the machine.
* Never remove lines, hoses or valves of hot and/or pressurised fluids.
* Never remove a protective casing of an operating machine.
* Never modify the machine without the manufacturer's written permission. Modifying also includes: removing parts, breaking seals for instance on the pump, the hydraulic valves control block and water pressure controller, or adding parts or equipment on or to the machine that are not described in the user manual.

* The machine has a water pump equipped with a pressurised air-filled accumulator. Be very careful when working on this accumulator. Work must only be carried out by specialised personnel with special tools.

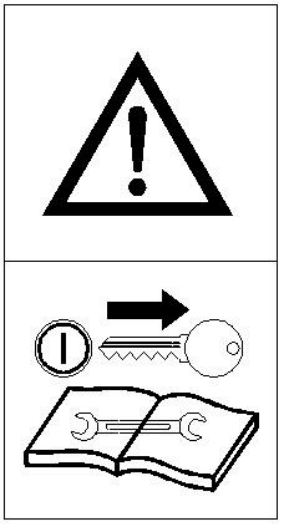


09. Sticker "Accumulator present"

5.9 Hydraulic system

Regularly check the hoses.

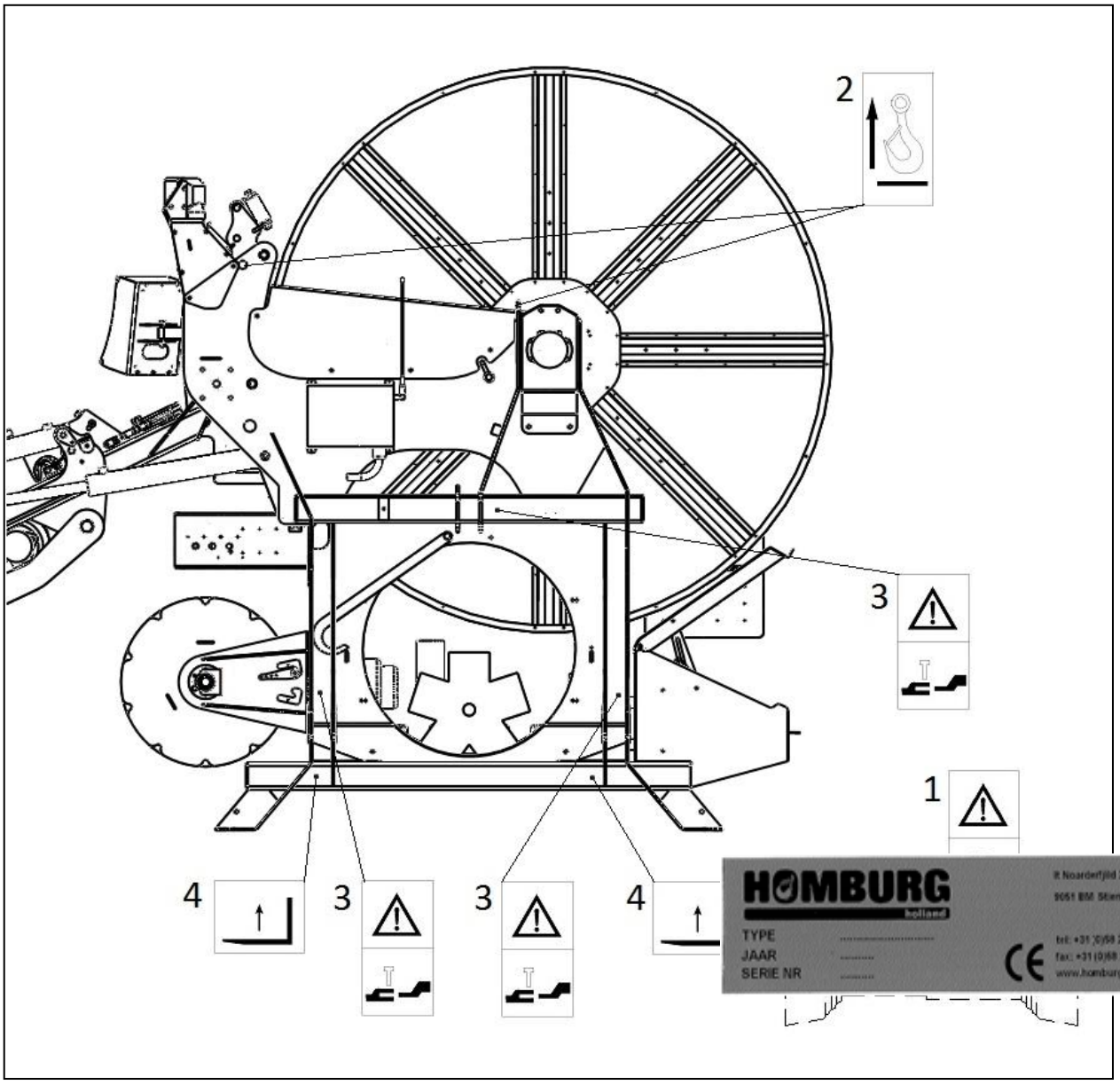
* Warning: The hydraulic system is pressurised. Hydraulic oil under pressure may cause serious injury when it touches the skin. Directly consult a physician if that happens, because there is a risk of infection.
* Mark the quick-connect couplings of the tractor as well as those of the machine to prevent incorrect connection of the quick-connect couplings. If the quick-connect couplings have been connected incorrectly, the machine will not work.
* Work on the hydraulic system must only be carried out by personnel with special training.
* Regularly check the hoses. Damaged and/or defective hoses must be replaced at once. When mounting new hoses, these must satisfy the specifications prescribed by the manufacturer.
* If the hydraulic system has a leak, all necessary precautions must be taken to prevent accidents and/or damage to the environment.
* Make sure there is no pressure when replacing hydraulic hoses or other components (fig. 56b).
* Pressure can be relieved from the system by using the emergency mode.
* Cylinders are fitted with relief valves. Disconnecting the hoses between valve A31 and the hydraulic cylinders can result in uncontrolled movements. First support the arm structure and then proceed to relieve the pressure from the hydraulic system by using the emergency mode (fig. 56b).



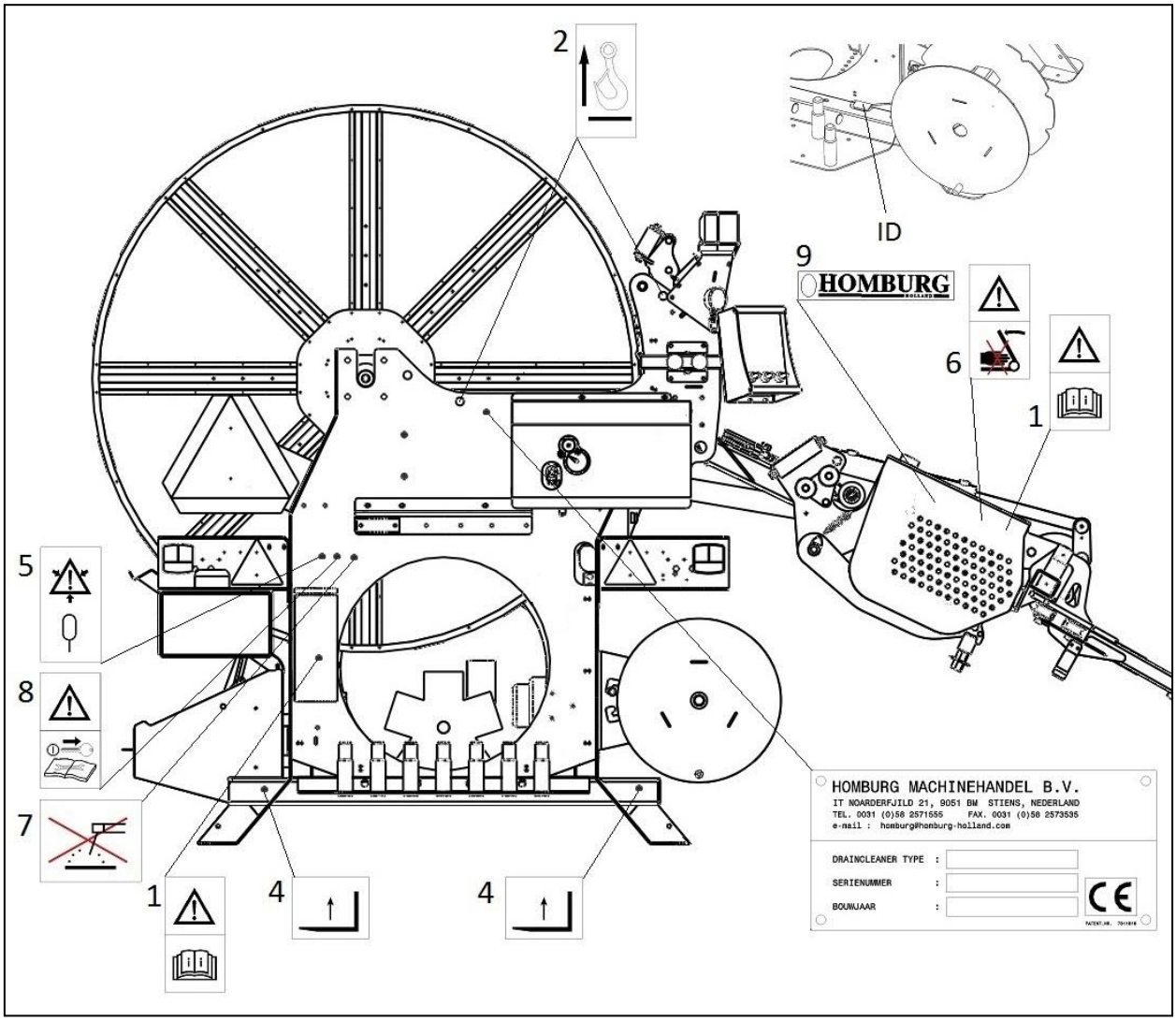
14. Sticker "Remove ignition key for maintenance"

5.10 Safety warnings (stickers) fig. 48 + 49:

* Warnings on the machine must be durable, indelible, and permanently present on the machine throughout the machine's service life. If the warnings have been removed or have become illegible, they must be replaced at once. The meaning of all stickers has been described in the above text.

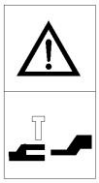
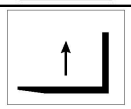
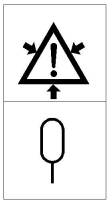
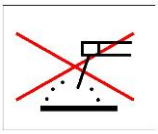
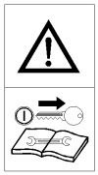


48. Location stickers – rear 01



49. Location stickers - front 01

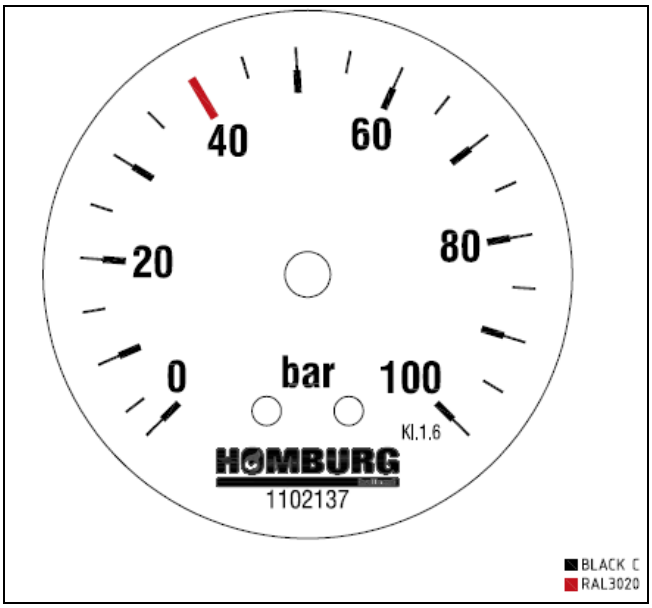
Missing or damaged stickers can be ordered by using the following parts numbers:

Nummer	Afbeelding	Bestelnummer
1		978443
2		978439
3		978446
4		13410
5		13411
6		978434
7		13412
8		978436
9	HOMBURG HOLLAND	13413

5.11 Safety provisions:

A. Stickers (see fig. 48 and 49).

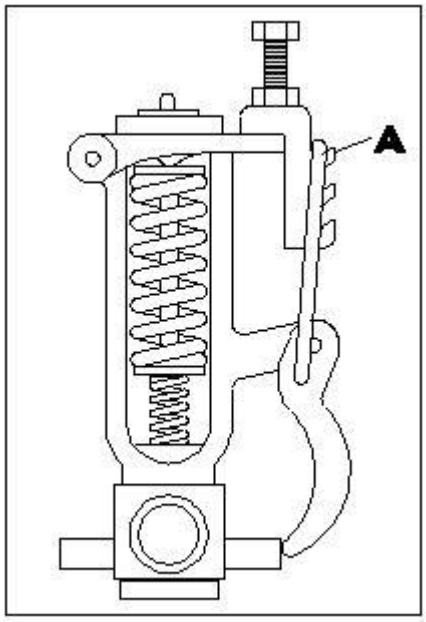
B. Pressure gauge. Indicates the flushing water pump pressure in bar (see fig. 18 and fig. 50 pt. 17).



18. Pressure gauge for flushing water.

C. Safety mesh in reel. Prevents limbs from getting caught in the rotating cardan shaft (see fig. 50 pt. 07).

D. Flushing water pressure controller Prevents the pressure from exceeding 3.5 MPa (35 bar) (see fig. 05 and fig. 50 pt. 12).



05. Flushing water pressure controller

E. Protective cover reel drive. Prevents limbs from getting caught in the drive (see fig. 51 pt.10).
F. Protective cover drive for rubber wheels. Prevents limbs from getting caught in the drive (see fig. 50 pt. 23).
G. Protective sleeve cardan shaft. Prevents limbs from getting caught in the rotating cardan shaft (see fig. 51 pt. 03).
H. Protective sleeve cardan shaft. Prevents limbs from getting caught in the rotating cardan shaft (see fig. 51 pt. 04).
K. User Manual (see "Preface" and fig. 50 pt.47).
L. Light bar for use on public roads. Prevents traffic accidents (see fig. 50 pt. 44).
M. Triangle "Slow traffic". Prevents traffic accidents (see fig. 50 pt. 08).
N. Protective cover chain drive flushing hose guide. Prevents limbs from getting caught in the drive (see fig. 51 pt. 12).
O. Protective cover lateral chain drive flushing hose guide. Prevents limbs from getting caught in the drive (see fig. 50 pt. 14).

WARNING!
Never remove or deactivate safety provisions. Any defective safety provision must directly be repaired in a correct manner. Never use the machine with one of the safety provisions removed, defective or deactivated.

6 GENERAL DESCRIPTION OF THE MACHINE

6.1 Main components

The Homburg Drain Cleaner type Hurricane is a machine for cleaning drainage systems as found in agricultural land using water when they have got clogged up, for instance with clay silt.

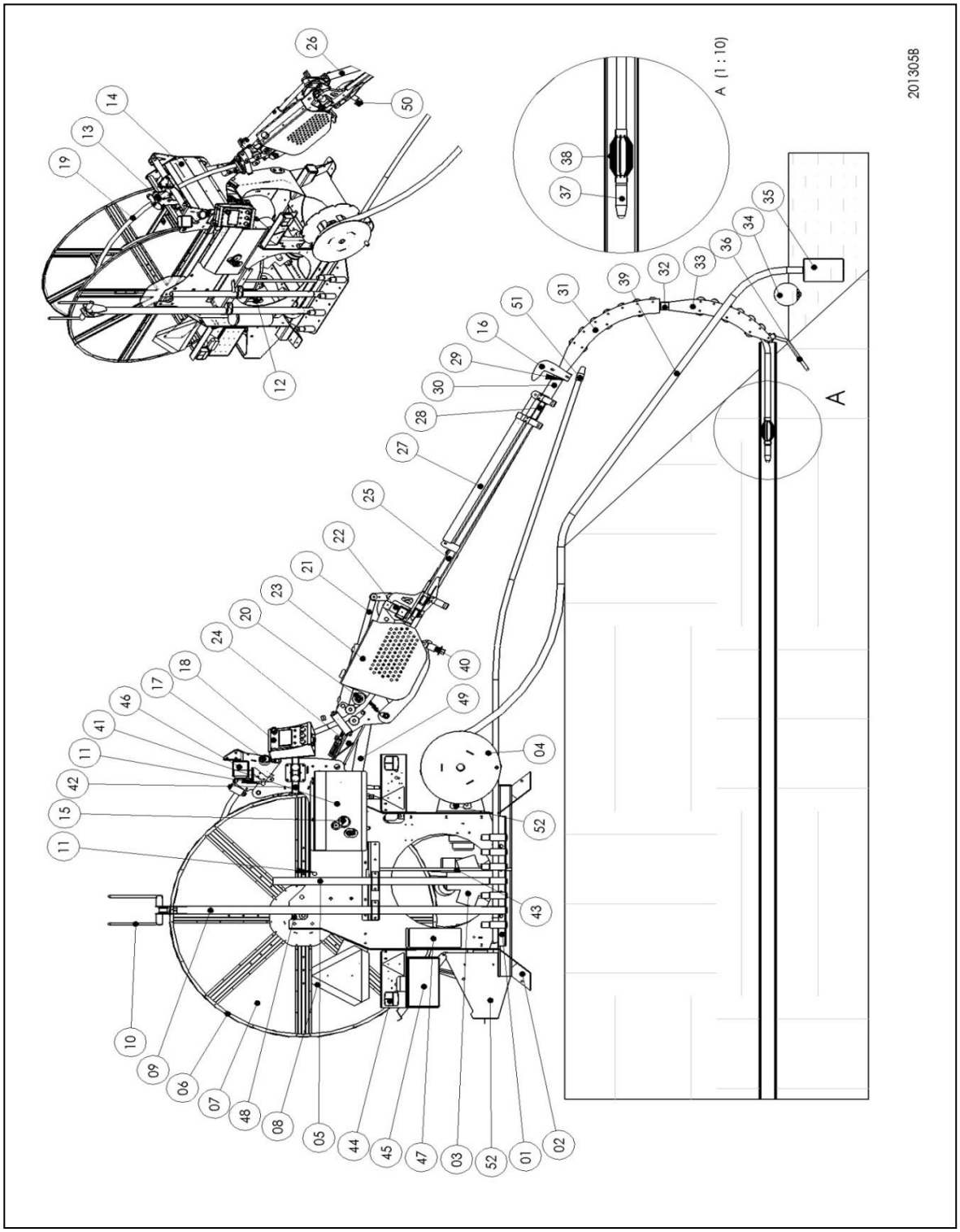
The machine can only operate when it is directly connected to a suitable agricultural tractor using:

* Three-point suspension
* Cardan shaft
* Hydraulic hoses (2) with quick-connect couplings
* Electric connection (7-pin) for rear lighting
* Electric connection (3-pin) for control box

The main components of this machine are (see fig. 50 rear):

01. Transport support roller bend/accessories
02. Steel frame
03. Flushing water pump
04. Suction hose suspension bracket, overflow hose, float and suction basket (option)
05. Guide tube 2 m wells set (option)
06. Reel
07. Safety mesh
08 Triangle "Slow traffic" (option)
09. Guide arm extension opposite bank
10. Fixing pins extension
11. Hoisting eye rear
12. Flushing water pressure controller and electric water valve (option)
13. Automatic flushing hose guide
14. Protective cover automatic flushing hose guide drive
15. Hydraulic system pressure gauge
16. Hook transport lock chain
17. Pressure gauge (flushing water)
18. Control box
19. Flushing hose
20. Metre counter
21. Hydraulic folding cylinder
22. Arm pivot point (top part with bottom part)
23. Protective cover for hydraulic motors and hose drive
24. Guide arm (top part)
25. Guide arm (bottom part)
26. Hydraulic slewing cylinder
27. Hydraulic sliding cylinder
28. Sliding section guide arm
29. Locking clamp with lever

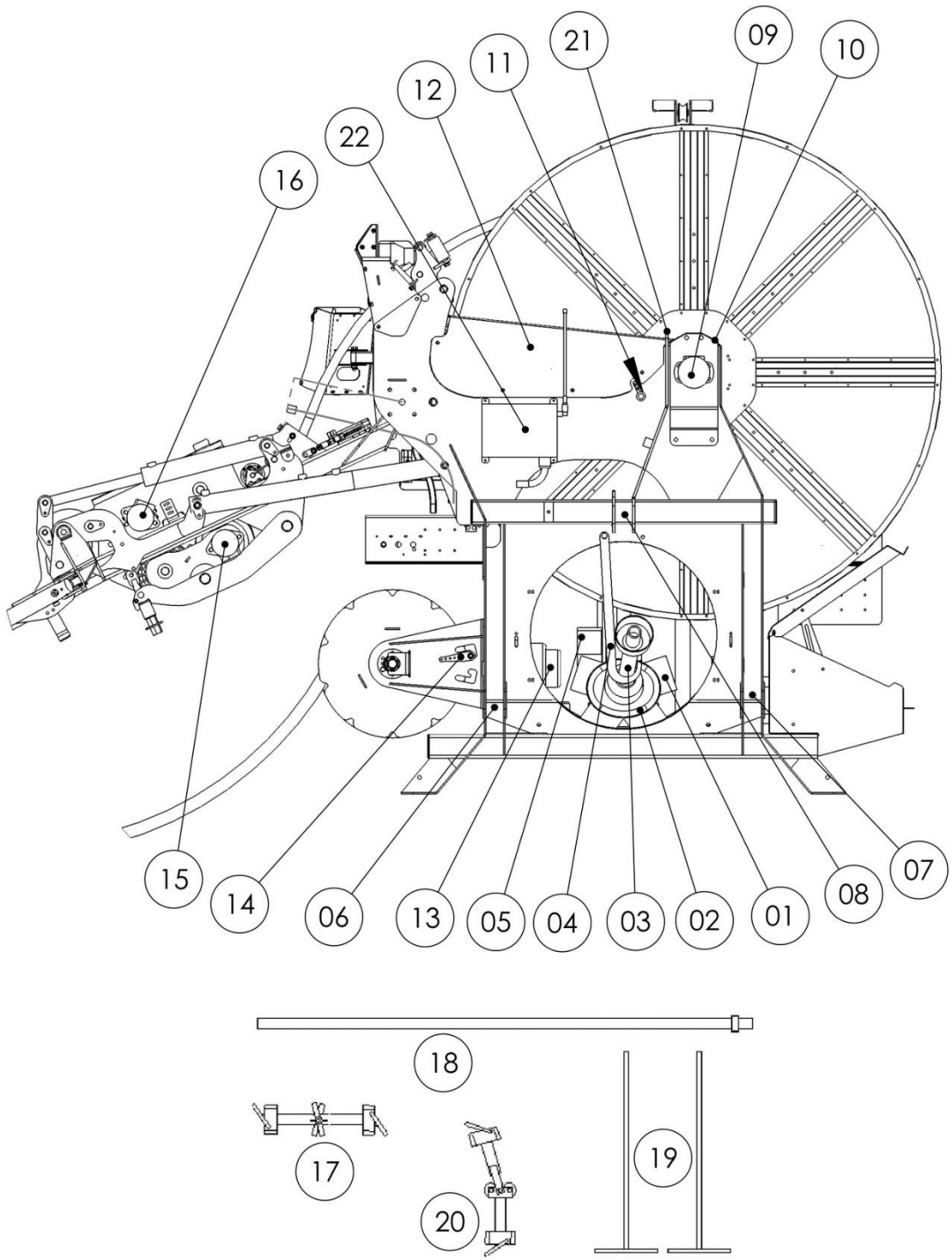
30. Removable adapter guide arm (take out when using the extension)
31. Roller bend - top
32. Locking clamp with lever
33. Roller bend - bottom
34. Float
35. Suction basket
36. Fixing pin (small)
37. End piece with nozzle
38. Guide basket (option)
39. Suction hose
40. Adjusting lever drive rolls pressure
41. Protective cover hydraulic valve block
42. Adjusting tube control unit
43. Fixing pin
44. Rear lights (option)
45. Licence plate holder with lighting (option)
46. Working light (option)
47. Instruction book holder
48. Reel bearing block
49. Arm lifting cylinder
50. Suction hose suspension bracket
51. Overflow hose
52. Suction hose reel locking lever



50. Main components rear.

The main components of this machine are (see fig. 51 front):

01 flushing water pump
02 protective cover flushing water pump shaft
03 cardan shaft
04 cardan shaft support
05 oil gauge glass/filler cap flushing water pump
06 lift arm point right
07 lift arm point left
08 top link point
09 hydraulic motor reel drive
10 protective cover reel drive
11 chain tensioner
12 protective cover automatic flushing hose chain drive
13 suction filter flushing water (option)
14 suction hose reel lock (goes with reel)
15 flushing hose drive hydraulic motor
16 flushing hose drive hydraulic motor
17 extension tube coupling
18 extension tubes (option)
19 support legs (option)
20 knee 30° wells set (option)
21 hoisting eye front
22 remote control electrical box (optional)



51 Hoofdcomponenten Hurricane voorzijde

6.2 Operation

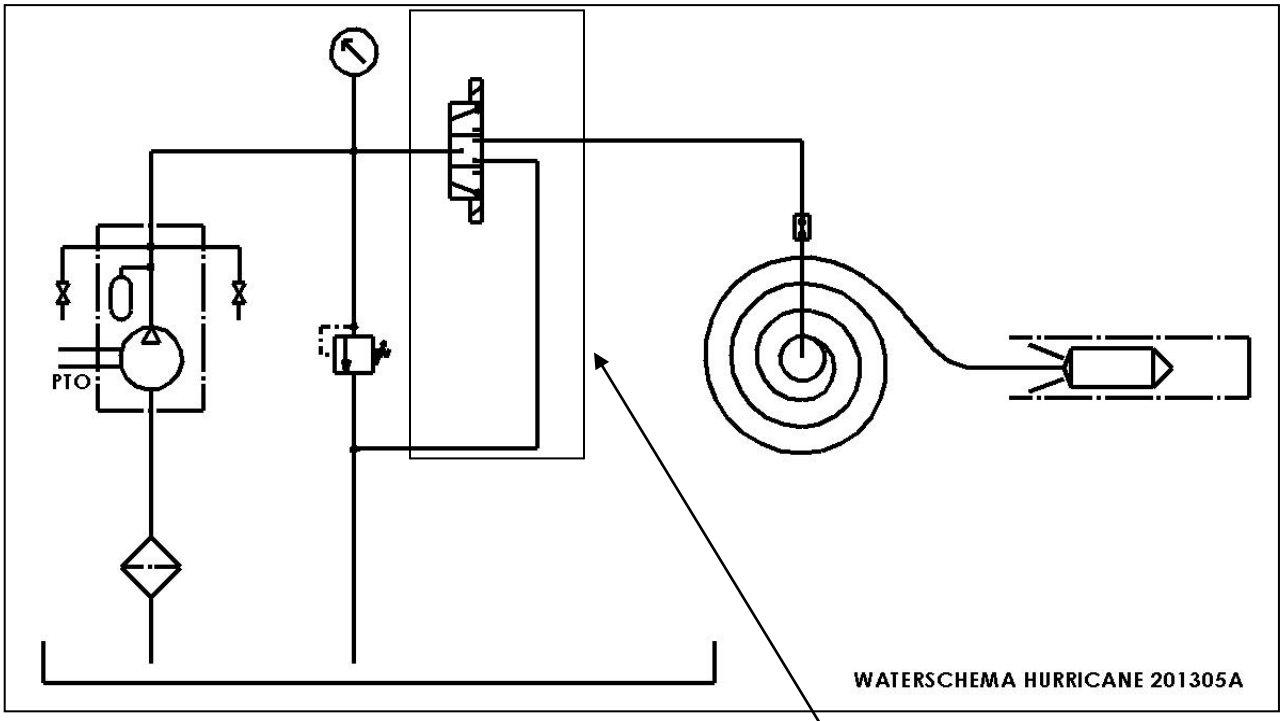
The tractor pto drives the diaphragm water pump. The suction hose water is sucked in from a ditch or a water tanker through the suction basket, the suction filter (options). Next the water is sent through a pressure controller (the excess pressure is sent back through an overflow hose to the ditch or the water tanker) and an optional electric water valve (choice between return and flushing hose) and then through the rotating centre of the flushing hose reel, after which it sprays out of the nozzle and performs its cleaning action in the drain pipe. The flushing hose runs from the reel with the drive mechanism through the guide arm and roller bend into the drain pipe. See diagram fig. 52.

The guide arm can be folded in and out with the aid of two hydraulic cylinders from vertical to horizontal position and back. The guide arm can be extended and retracted with the aid of a fourth cylinder. A third cylinder is used to slew the guide arm. The flushing hose can be fed through the guide arm and the roller bends with the aid of 4 rubber wheels that are clamped around the flushing hose and that are driven by a hydraulic motor. The hydraulic system is designed in such a manner that both during feeding in and feeding out the reel wants to roll up under slight pressure, so the flushing hose always winds tightly around the reel.

The flushing hose guide of this machine is driven mechanically and it ensures that the flushing hose winds evenly on the reel. The bottom roller bend can be turned to enable cleaning drain pipes in the own bank as well as in the opposite bank. Various options as described in this manual are available for the machine.

The front of the machine is the side facing the tractor. The guide arm can only be unfolded to the right of the machine. That means the drain pipes to be cleaned must always be kept to the right of the tractor and the machine.

In areas without ditches in which the drain pipes end, concrete wells are used to discharge the drain pipes into. In this case the machine must be equipped with an optional wells set. This wells set is composed of a 2-metre long pipe and a 30° knee that are mounted between the top and bottom roller bends.

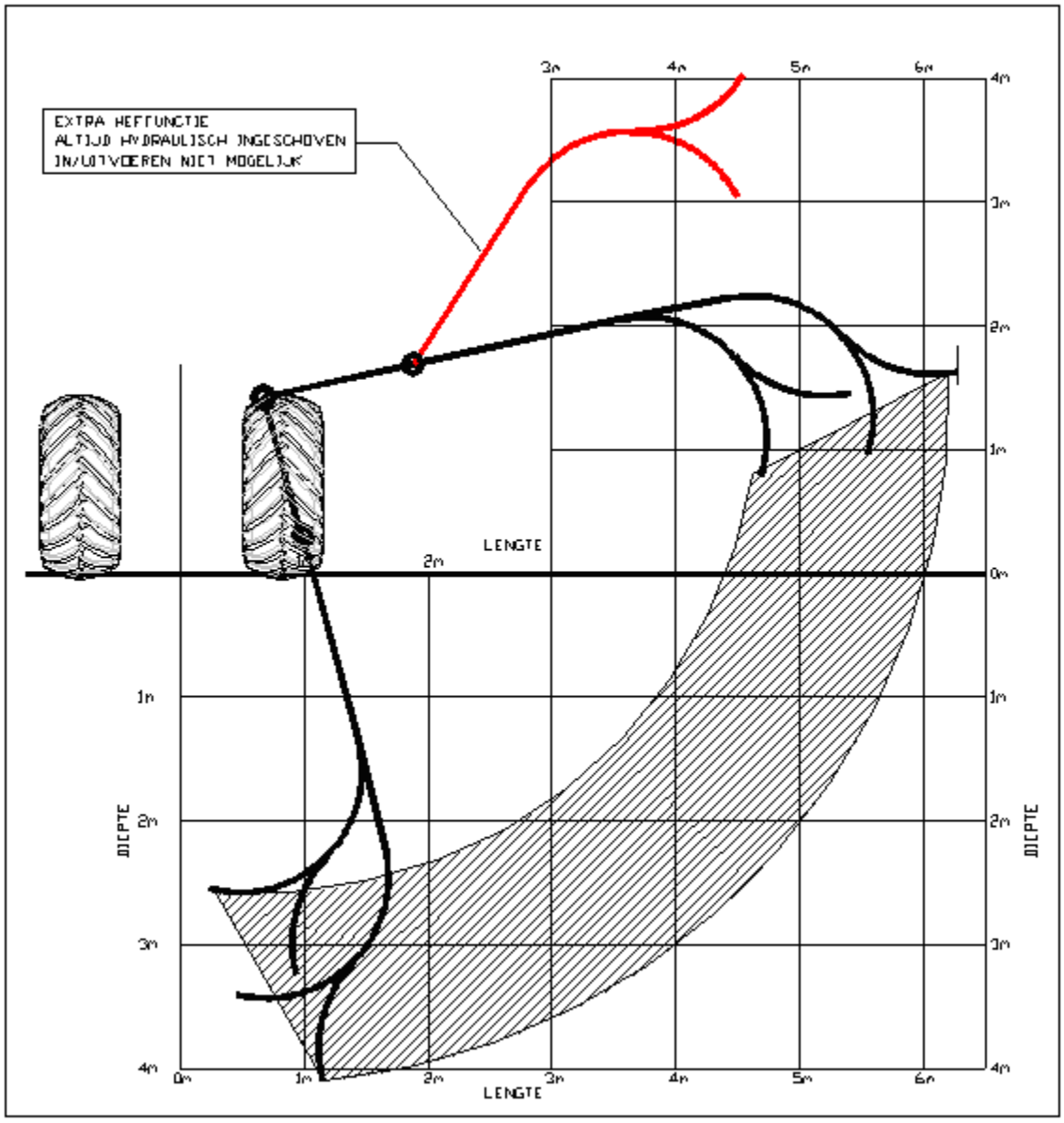


52. Water diagram flushing system Hurricane

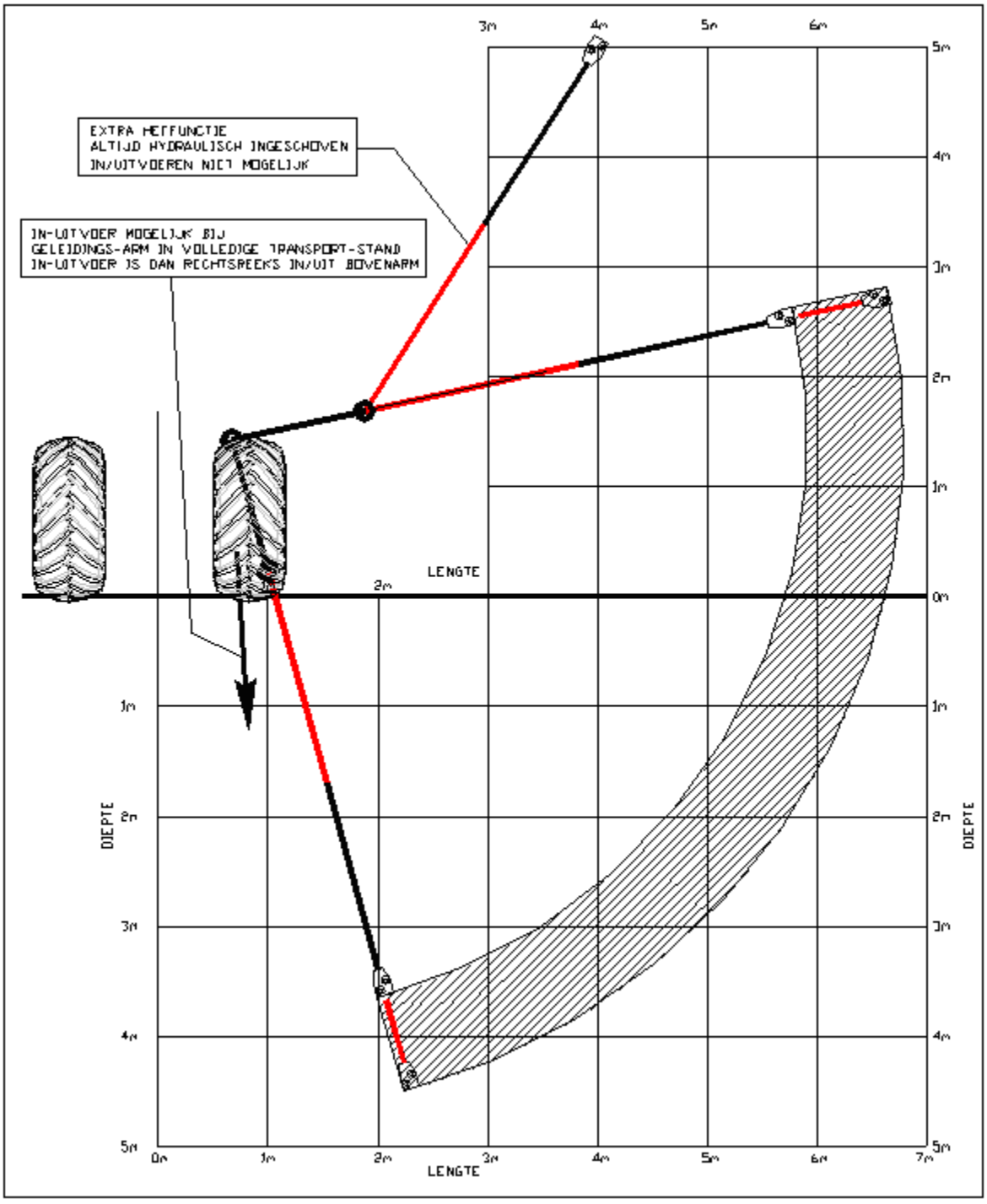
7 TECHNICAL SPECIFICATIONS

7.1 Machine

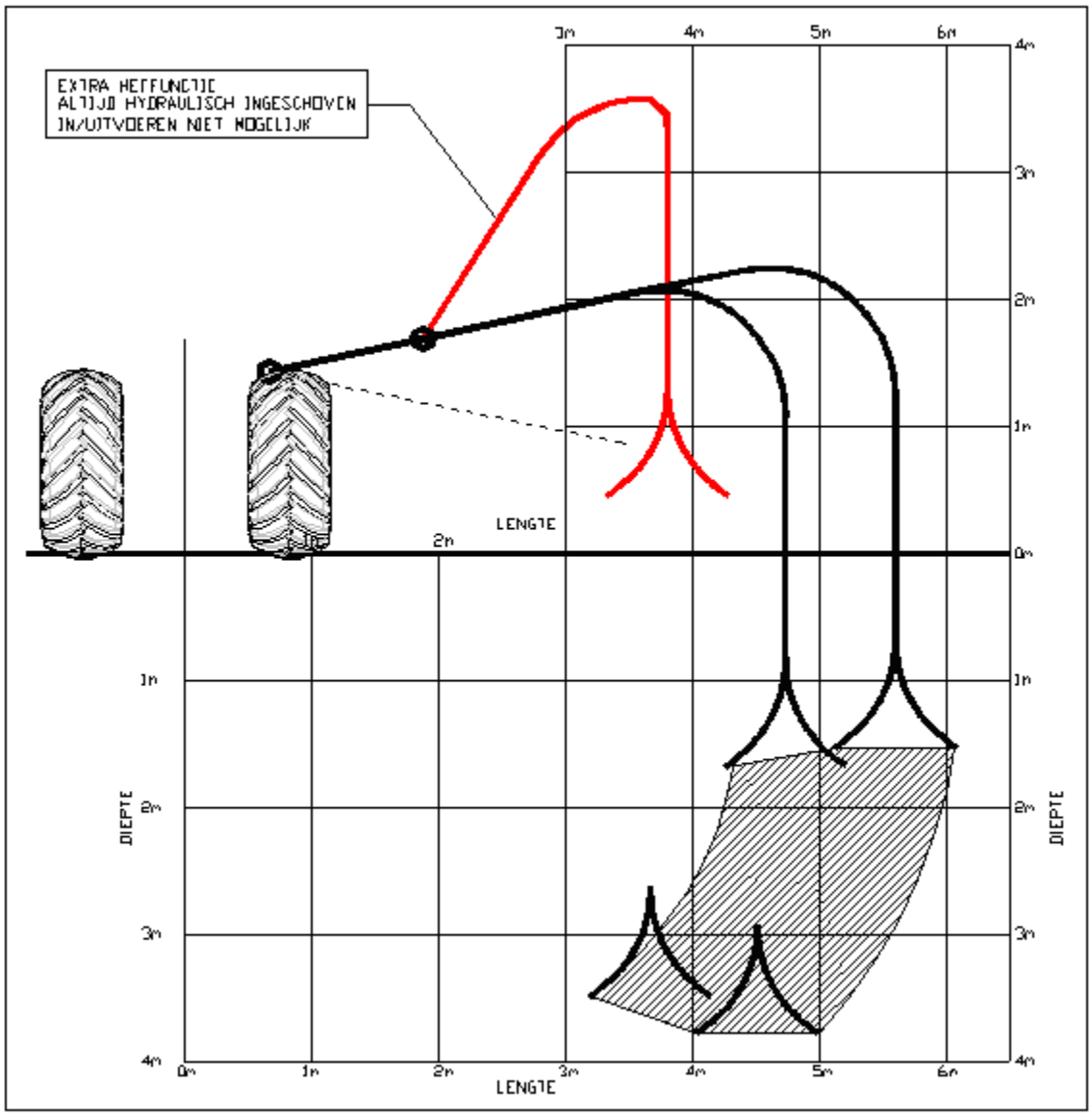
Make	:	Homburg
Type	:	Hurricane HU-M135
Length	:	1.26 m
Width	:	2.22 m (arm in folded position)
	:	6.50 m (arm folded out and fully extended)
Height	:	2.26 m (arm in folded position and standing on the ground, guide arm fully retracted and roller bends placed on supports)
	:	2,95 m (arm in folded position and standing on the ground, guide arm fully retracted and roller bends on the arm hanging over the machine)
Mass empty	:	994 kg
Mass with water	:	1109 kg
Material flushing hose	:	HPE (Hard PolyEthylene)
Length flushing hose	:	300 m
Diameter flushing hose	:	27 mm
Wall thickness flushing hose:		3.5 mm
Drive flushing hose	:	hydraulic
Operating speed	:	≈20m/min. (max.)
Water pressure controller	:	2,5-3,5MPa (25-35 bar)
Water pressure at the nozzle:		1,0-1,5MPa (10-15 bar)
Nozzle	:	12 + 1 holes Ø2mm
Length suction hose	:	10 m with suction basket and float
Diameter suction hose	:	Ø 32 mm 1¼”
Mesh size suction basket	:	2 mm
Mesh suction filter	:	100
Length overflow hose	:	10 m
Paint	:	RAL2004
Hydraulic system	:	3 hydraulic gear motors 4 double acting cylinders 2- part operating valves block - 4- part valve for cylinder drive - Input valve with pressure and flow compensation for the hydraulic motors 1 pressure gauge electrically operated with manual emergency control
Noise level	:	< 70 dB(A)
Mechanic vibrations	:	$a_{vhw} < 2,5\ m/s^2$
Well set (option):	:	Knee 30°, Extension tube length 2 m.
Arc angle roller bends	:	60°
Operating range machine	:	(see fig. 54, 59 and 60)
Horizontal range of guide arm	:	40°
Bottom guide arm extension/retraction range	:	880 mm



54. Operating range Hurricane



59. Operating range Hurricane with extension opposite bank



60. Operating range Hurricane with well set

7.2 Cardan shaft

Make	:	Walterscheid
Type	:	W2100-SD05-660-10100-10100 (14kW 19hp)
Maximum permissible cardan shaft angle measured from the centre line of the pto	:	25°

7.3 Flushing water pump

Make	:	Imovilli Pompe
Type	:	M135
Drive	:	pto, universal cardan shaft
Capacity	:	115 l/min 5MPa (50 bar) (max.)
Capacity	:	70-80 l/min 3MPa (30 bar) (nominal)
Pressure accumulator	:	0,7MPa (7 bar)
Speed	:	350-550 t/min.
Input power	:	13.3 kW (18hp)
Mass	:	27.5 kg
Lubricating oil	:	1.85 litres (SAE20/30)
Maximum head	:	3 m

7.4 Technical requirements tractor

Tractor must be fitted with

* three-point suspension Category 2 in accordance with DIN9674 and ISO730
* sufficient counterweight
* pto connection 350-550 rpm.
* $1^3/_8$" 6 splines according to DIN9611 and ISO500
* hydraulic supply 15 l/min.15MPa (150 bar)
* hydraulic quick-connect couplings $^1/_2$" -bi SAE according to ISO7241-1 Series A or ISO-5675 or SAE1036
* electric connection rear/working lighting according to DIN72577
* separate rear lighting beam according to traffic regulations (option)
* electric 3-pin connection electric operation according to DIN9680.

7.5 Permissible operating conditions of the machine

Ambient temperature	from	0 ºC	to	50 ºC
Humidity	from	10%	to	90%

Indoors as well as outdoors: environment without dust and/or gas explosion risk.

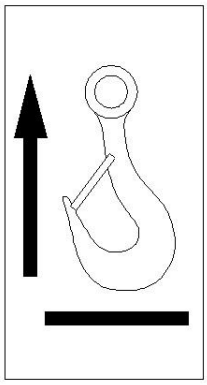
7.6 Conversion table

SI units	ANSI units	ANSI units	SI units
1kg	2.2046 lbs	1 lb	0.453592 kg
1m	3.28 ft	1 ft	0.3048 m
1mm	0.03937 in	1 in	25.4 mm
1km	0.62 mile	1 mile	1.609 km
1 liter	0.264 gallon (US)	1 gallon (US)	3.785 litres
1 MPa (=10 bar)	145 psi (=145 lbs)/m²	1 psi (=1 lb)/m²	0.0068966 MPa (0.0689 bar)
1 kW	1.36 hp	1 hp	0.736 kW
ºC	0.555 x (ºF - 32)	ºF	(1.8 x ºC) + 32

8 TRANSPORT (NOT BEHIND THE TRACTOR)

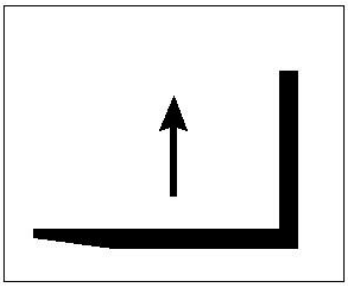
The machine always comes completely assembled. The machine therefore does not require assembly after it has been delivered. The machine is fitted with 4 hoisting eyes (see fig. 48 pt. 2 and fig. 49 pt. 2). Make sure the reel is not squashed by slings or hoisting cables when hoisting it! Use of a 4-point sling or hoist may prevent damage.

WARNING!
Only hoist the machine on the hoisting eyes.



08. Sticker "Hoisting point"

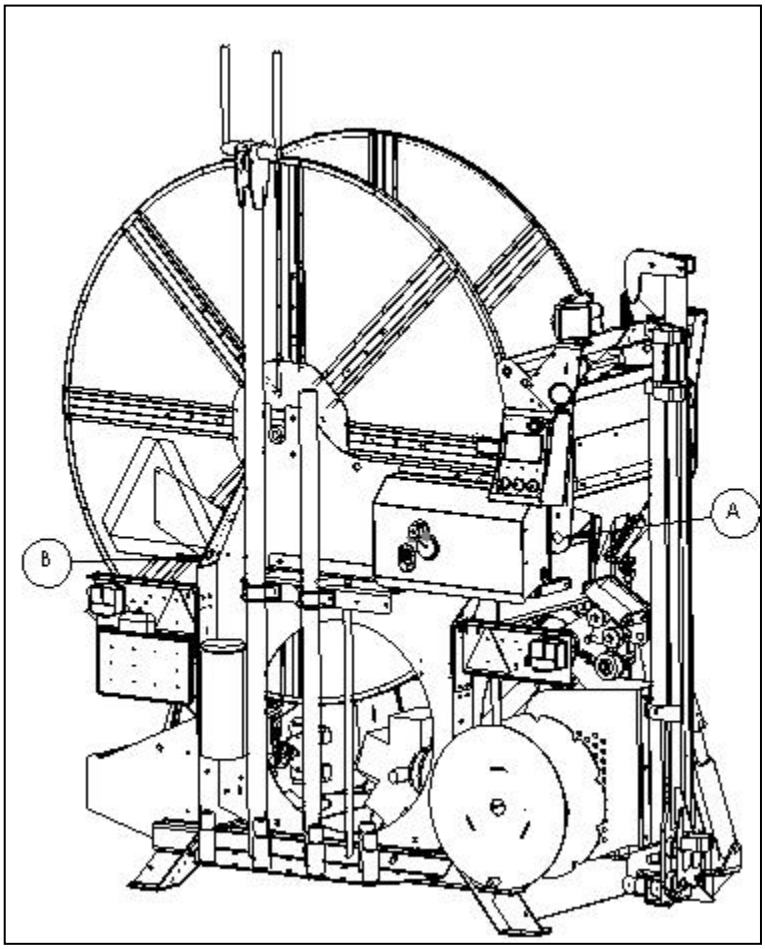
A forklift should only pick up the machine under the lower horizontal beams of the basic frame. Prevent toppling when transporting by forklift.



12. Sticker "Forklift lift point"

To prevent the machine from tipping over the machine must be secured on the truck or container with lashings and tensioners.

To prevent the machine from tipping over the machine must be secured on the truck or container with lashings and tensioners (fig. 51 pt. 06+07+08) and at the back by the eyes cut into the sheet metal (fig. 62 pt. A+B).
Otherwise machine parts may get damaged.



62. Fixing eyes at the back

9 CONTROLS

56A. Electric controls

1 : top section (folding cylinder) folds out guide arm
2 : top section (folding cylinder) folds in guide arm
3 : bottom section (lift cylinder) folds in guide arm
4 : bottom section (lift cylinder) folds out guide arm
5 : retracts guide arm
6 : extends guide arm
7 : slewing left
8 : slewing right

AUTO : automatic flushing hose feeder
AUTO : automatic flushing hose retractor (coil back on reel)
MAN : manual flushing hose feeder
MAN : manual flushing hose retractor (coil back on reel)
STOP : stops hose feeder/retractor

Emergency stop
On : control box off (press)
Off : control box on (turn to right)

Menu : menu for settings
Reset : distance meter reset (set zero)
l→ l : length of drain
HDD : Homburg Dynamic Drive
H2O : water on/off
F1 : working light on/off
Ok : accept button (menu)
ESC : escape button (menu)
▲ : arrow up (menu)
▼ : arrow down (menu)

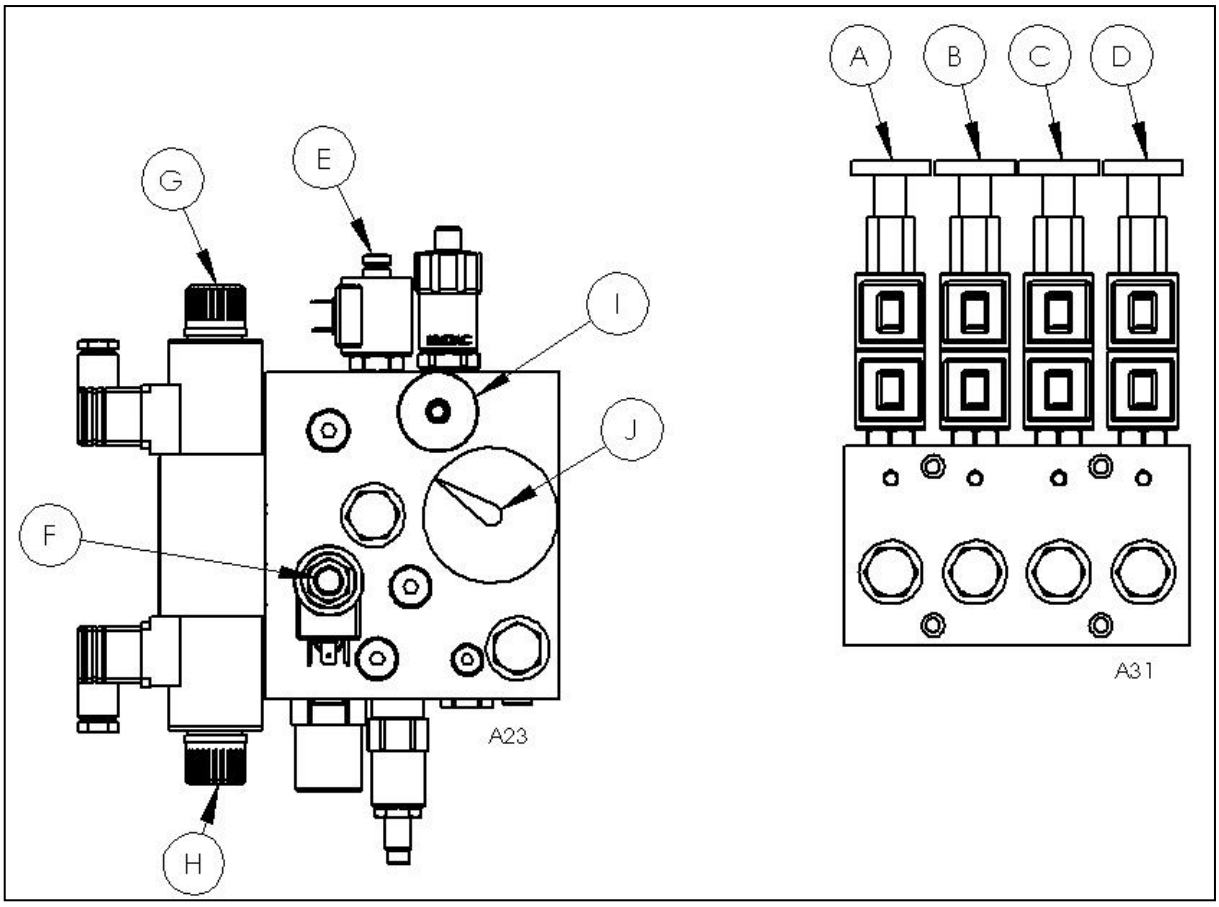
Menu structure

Menu	Submenu 1	Submenu 2	Submenu 3	Unit	Min	Max	Default
User settings	14. Cilinder Speed	15.Cilinder 1-2 up	16. Low speed	%	0	100	50
			16. High speed	%	0	100	90
		17. Cilinder 1-2 down	18. Low speed	%	0	100	50
			18. High speed	%	0	100	90
		19. Cilinder 3-4 up	20. Low speed	%	0	100	30
			20. High speed	%	0	100	90
		21. Cilinder 3-4 down	22. Low speed	%	0	100	45
			22. High speed	%	0	100	90
		23. Cilinder 5-6 in	24. Low speed	%	0	100	55
			24. High speed	%	0	100	90
		25. Cilinder 5-6 out	26. Low speed	%	0	100	65
			26. High speed	%	0	100	90
		27. Cilinder 7-8 left	28. Low speed	%	0	100	20
			28. High speed	%	0	100	90
		29. Cilinder 7-8 right	30. Low speed	%	0	100	20
			30. High speed	%	0	100	90
		31. Unrol hose	32. Low speed	%	0	100	50
			32. High speed	%	0	100	70
		33. Roll-up hose	34. Low speed	%	0	100	50
			34. High speed	%	0	100	70
	35. Cilinder speed ramp	36. Ramp 0 -> low		%/sec	0	100	100
		36. Ramp low -> high		%/sec	0	100	10
		36. Ramp high -> 0		%/sec	0	100	100
	37. Force detection	38. Active		None	0	1	1
		38. Pressure		Bar	40	150	60
		38. Distance/bar		m/bar	10	60	60
		38. Detection time		Sec	0	5	2
		38. Hold time		Sec	1	10	5
	39. Slip detection	40. Active		None	0	1	1
		40. Stop%		%	0	30	17
		40. Warn %		%	0	30	12
		40. Max time		Sec	0	5	1
	41. HDD functions	42. Auto retour		None	0	1	1
		42. Slip detection		None	0	1	1
		42. Force detection		None	0	1	1
43.System settings	44. LCD backlight			%	0	100	90
	44. LCD contrast			%	0	100	22
	44. Key beep			None	0	1	1

Hydraulic emergency override

If the electric controls no longer work, it is possible to use an emergency override that enables the machine to be folded in for transport.

1. Before the emergency override can be reached the cover (fig. 50.41) at the back of the machine needs to be removed. This cover goes over the hydraulic valves (fig. 56B).
2. Switch on the hydraulic valve for the tractor.
3. Press buttons E and F and turn them to the left so that they come up. Please note! This allows the hydraulic oil to heat up more quickly. Do not leave the buttons in this position any longer than necessary, therefore.
4. Roll the flushing hose up by pressing button G, taking care that the flushing hose is pulled back completely between the rubber drive wheels.
5. The guide arm can be folded in using buttons A to D. Turn to the next page for a guide to the button functions.
6. Allow the transportation hook to drop into the coupling jaw of the frame so that the arm is held fast for transport.
7. Press buttons E and F and turn them clockwise so that they remain depressed.
8. Switch off the hydraulic control valve of the tractor.



56B. Hydraulic controls

A. ↑ : top section (folding cylinder) folds out guide arm
   ↓ : top section (lifting cylinder) folds in guide arm

B. ↑ : bottom section folds out guide arm - lift
   ↓ : bottom section folds in guide arm

C. ↑ : slewing right
   ↓ : slewing left

D. ↑ : extend guide arm
   ↓ : retract guide arm

E. ↑ : preselector valve switched on (manually)
   ↓ : preselector valve switched off (switch on electrically

F. ↑ : pressure control valve switch on (manually)
   ↓ : pressure control valve switched off (switch on electrically)

G. Feed in flushing hose (unroll from reel)

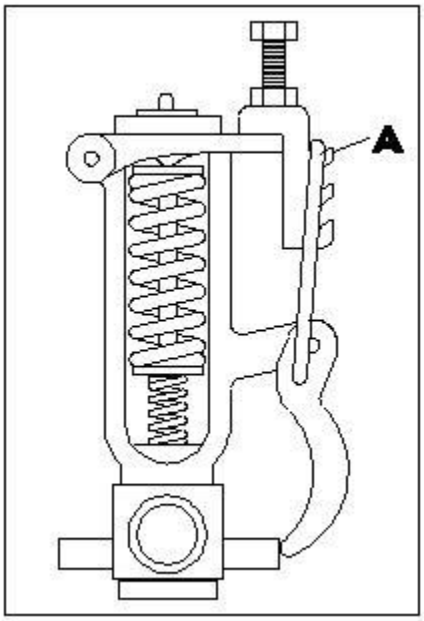
H. Retract flushing hose (roll back on reel)

I. Pressure regulator for flushing hose drive wheels
   Clockwise : increase pressure
   Anticlockwise : lower pressure

J. Hydraulic flushing hose drive wheel pressure meter

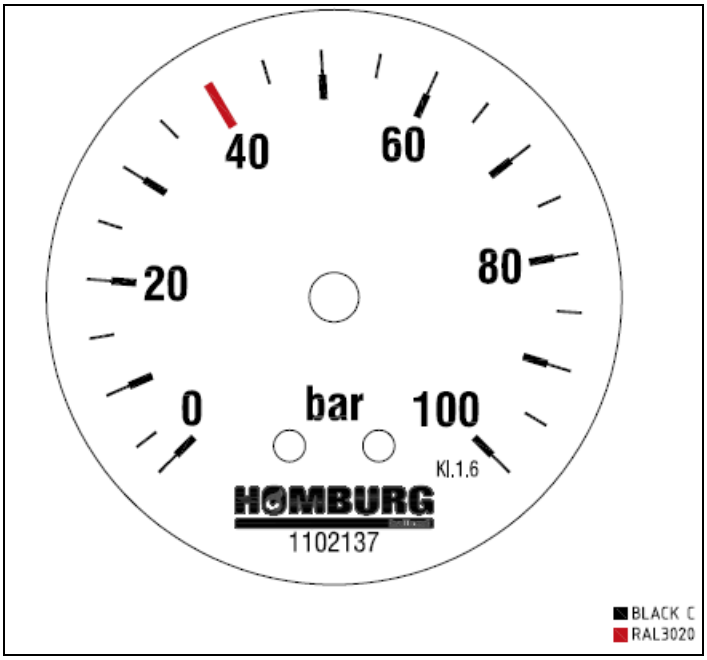
After using the emergency override always make sure that buttons E and F are back in the pressed down position. During normal (electrical) operation the machine will not function properly if the buttons are not pressed down.

Flushing water pressure controller (see fig. 05)
(Screw setting is factory-sealed at 3.5 MPa (35 bar))
* Always use the top hook A.



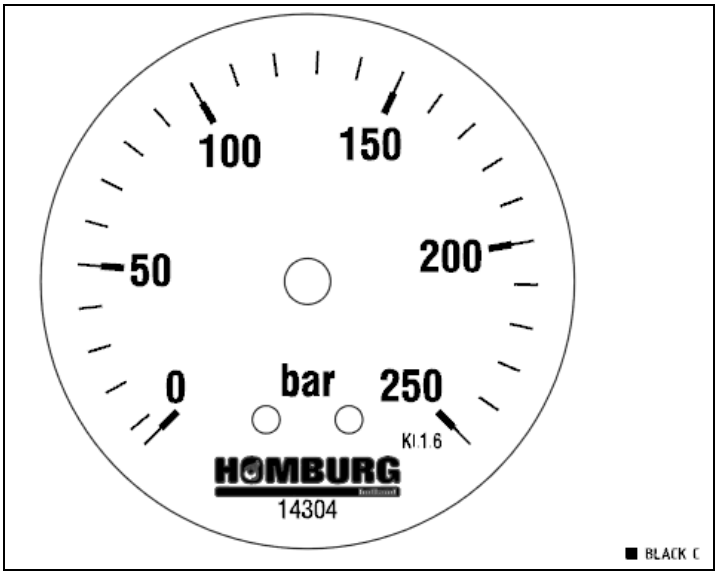
05. Flushing water pressure control

Flushing water pressure gauge
* Used to read out the water pump pressure.



18. Pressure gauge for flushing water

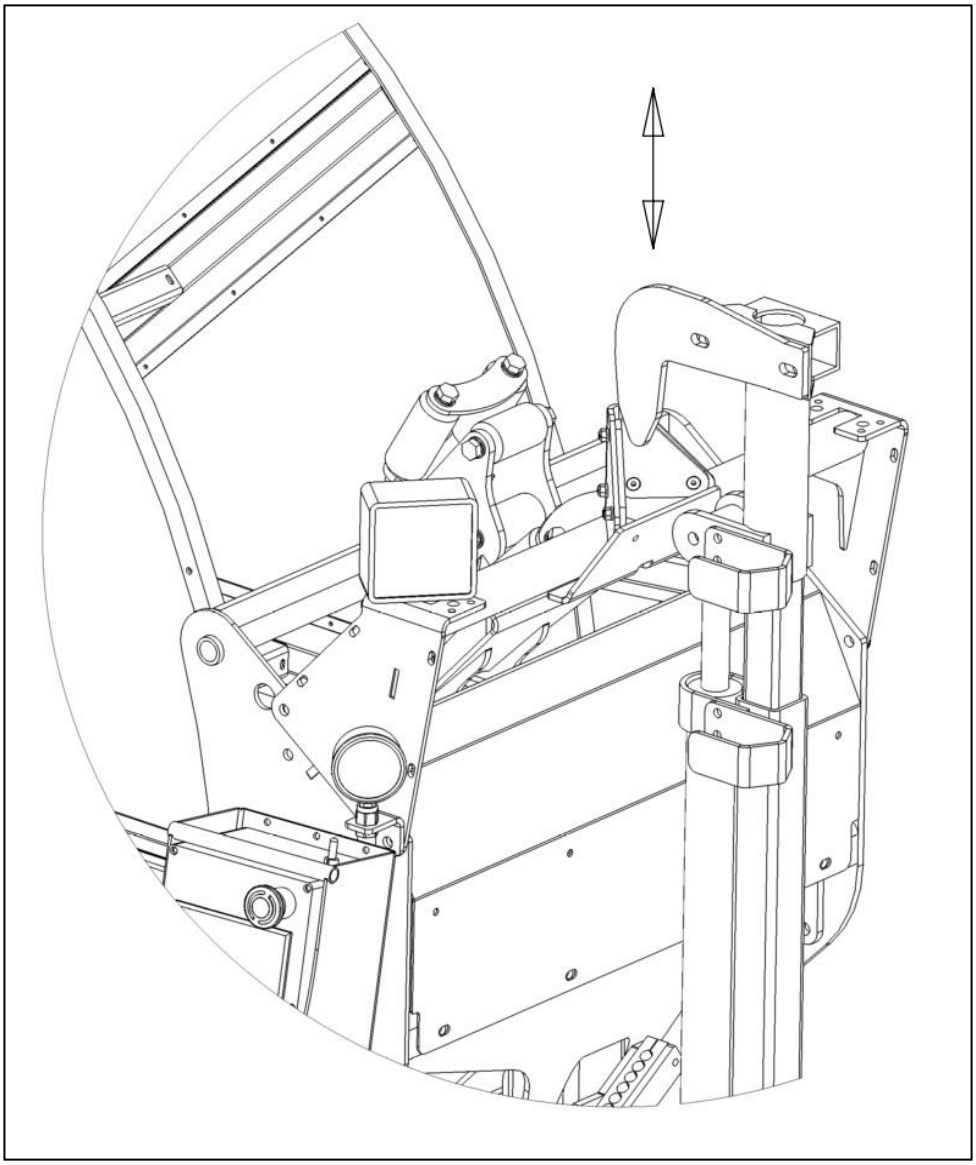
Pressure gauge (hydraulic system).
* Use for checking the operating pressure of the machine's hydraulic system.



57. Hydraulic system pressure gauge

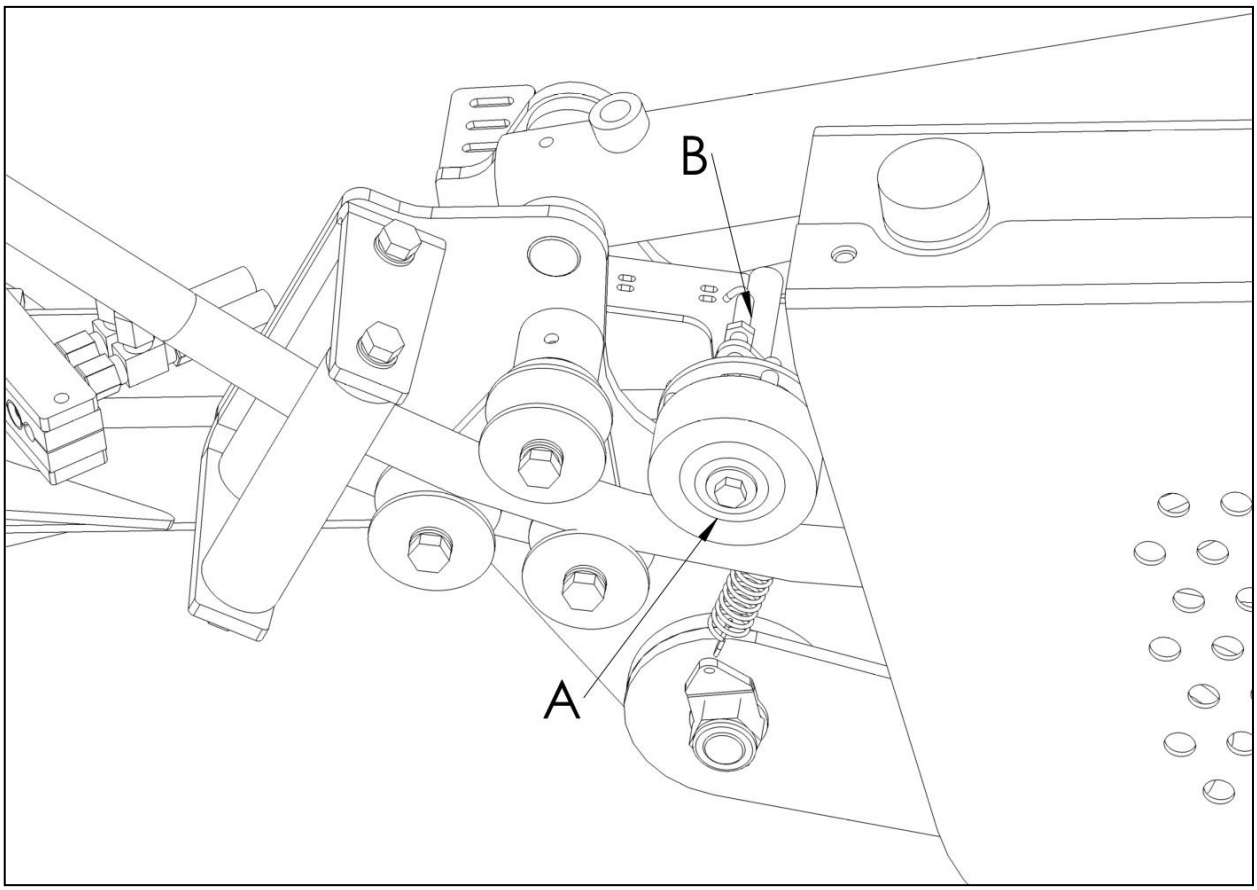
Adjusting lever for flushing hose pressure roll (see fig. 50 pt. 40).
* Rotate lever anticlockwise to decrease the pressure on the feeding in/out rolls of the flushing hose.
* Rotate lever clockwise to increase the pressure on the feeding in/out rolls of the flushing hose.

Transport lock guide arm (see fig. 50 pt. 16).
* Used to lock the guide arm in transport position.



Transport lock

Metres counter (see fig. 23B).
* Displays the length of the flushing hose that has been fed in or out.



23. Metre counter

Cleaning tube is mounted on the top roller bend (see fig. 50, page 32 - pt. 31).
* Can be used to clean the flushing hose on reeling in. Increase the tractor rpm a little to get a higher bypass flow rate for cleaning.

Fixing pin (see fig. 50, page 32 - pt. 43).
* The lowest roller bend has a bush which enables the roller bend to be held in place with a fixing pin. This holds the roller bend in place at the outlet opening of the drainage tube while the flushing hose is being fed out or retracted.

Fixing pins are welded on the extension tube for the opposite bank and on the bottom roller bend. (see fig.50 pt. 10 and 36).

Extension guide arm opposite bank (see fig. 50 pt. 09).

* The machine comes with an extension that can be placed on the guide arm for use in the opposite banks. This extension makes it possible to reach the opposite bank of a wide ditch. As in that case the flushing hose does not have to be pushed/pulled through the roller bends, more power is available to push/pull the flushing hose through the drain pipe.

Locking clamp (see fig. 50, page 32 - pt. 29 and 32).

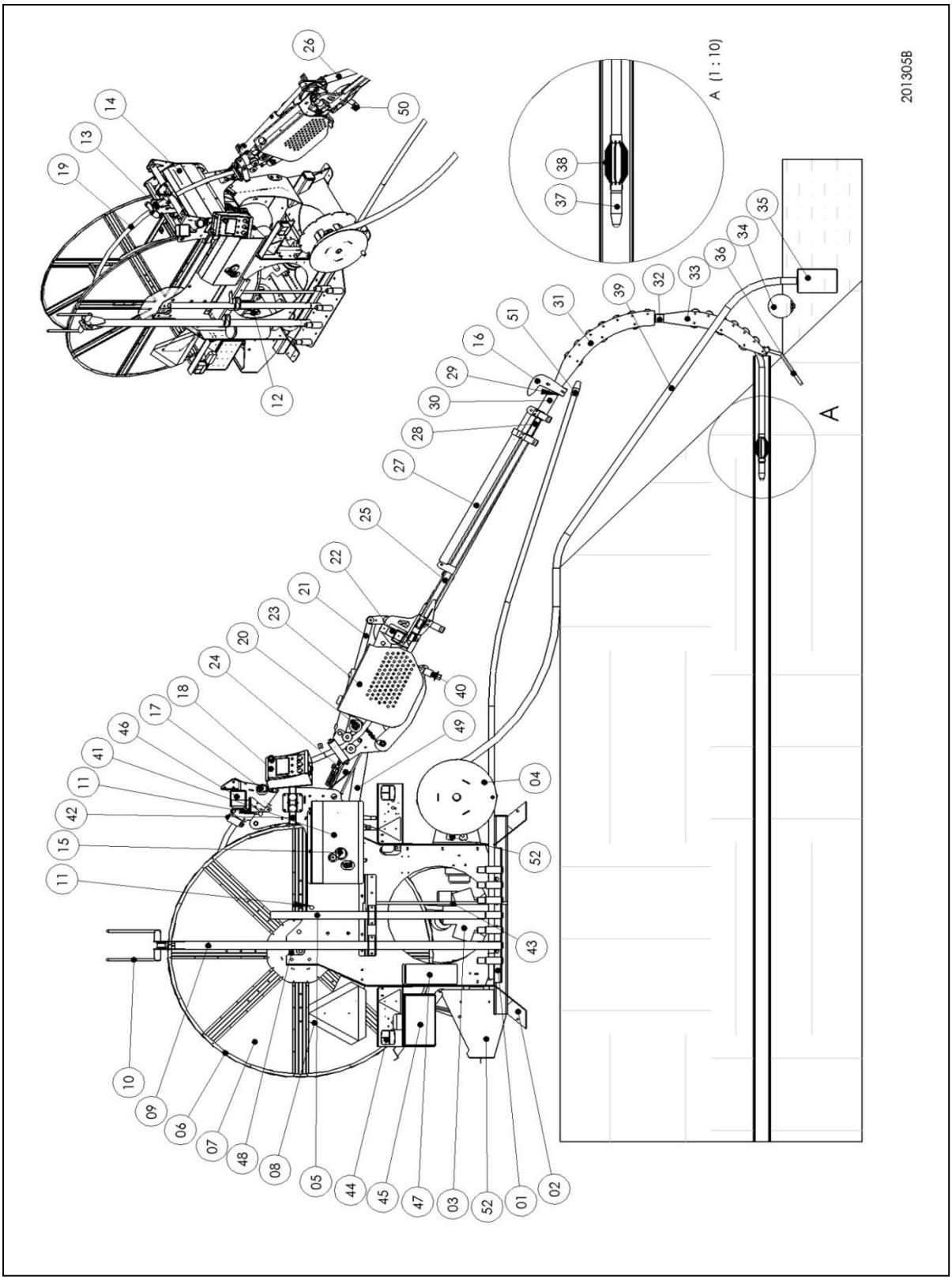
* A locking clamp has been welded on the base frame, on every roller bend, on the wells set and on the end of the guide arm.

Rpm counter pto (on tractor).

* Displays the water pump rpm of the machine.

Manual throttle (on tractor).

* Used to set the water pump rpm of the machine.



50. Main components rear 01

10 OPERATING INSTRUCTIONS

10.1 Daily inspection list

Every day the checklist below must be completed before starting work with the machine. The list is used to check correct and safe operation of the machine. Copy this list so it can be entered every day. The fully completed lists can be stored in a folder that can be used as technical record for the machine.

Check carried out by :_____

Date check :_____

Time start check :_____

Check:	OK	Not OK
General damage and leakage machine	□	□
Presence and operations safety provisions:		
Stickers	□	□
Pressure gauge	□	□
Pressure gauge hydraulic system	□	□
Casing drive flushing hose guide	□	□
Safety mesh in reel	□	□
Water pressure controller	□	□
Protective cover reel drive	□	□
Protective cover drive rubber wheels	□	□
Protective sleeve cardan shaft	□	□
Support cardan shaft	□	□
User manual	□	□
Lighting bar for use on public roads	□	□

WARNING!
Never remove or deactivate safety provisions. Any defective safety provision must directly be repaired in a correct manner. Never use the machine with one of the safety provisions removed, defective or deactivated.

Check:	OK	Not OK
Water pump:		
Oil level	□	□
Accumulator pressure 7 bar	□	□
(check and correct with air compressor and pressure gauge if necessary!)		
Presence suction basket	□	□
Presence float	□	□
Presence and operation of:		
Roller bends (2)	□	□
Extension opposite bank	□	□
Well set pipe (option)	□	□
Well set knee 30° (option)	□	□
Suction hose	□	□
Overflow hose	□	□
End piece	□	□
Nozzle	□	□
Centering basket (option)	□	□
Cardan shaft	□	□
Three pins three-point suspension	□	□
Fixing pin	□	□
Extensions (option)	□	□
Couplings (option)	□	□
Support legs (option)	□	□

Make sure you obtain information that shows the exact location of the drain pipes and the length of every drain pipe in the system being cleaned. (For instance, drawings obtained from your supervisor or the client).

10.2 Cleaning drain pipes: When and how often?

How often you clean the drain pipes depends on the weather conditions, soil type and soil structure, on the diameter, type and condition of the drain pipe, and on how accurate the pipe lies in the ground. The following test that should be carried out in or after a wet period with a lot of rain, preferably in autumn, provides a guideline:

01. Find a drain pipe in the edge of the ditch.
02. Collect the water in a one litre graduated beaker.
03. Measure how many seconds (T) it takes to collect one litre.
04. Use the following formula:

$$\frac{86400}{(L \times A \times T)} = M$$

L = Length drain pipe (metres)
A = Drain pipe spacing in (metres)
T = Measured time (seconds)
M = Number of millimetres discharged per day

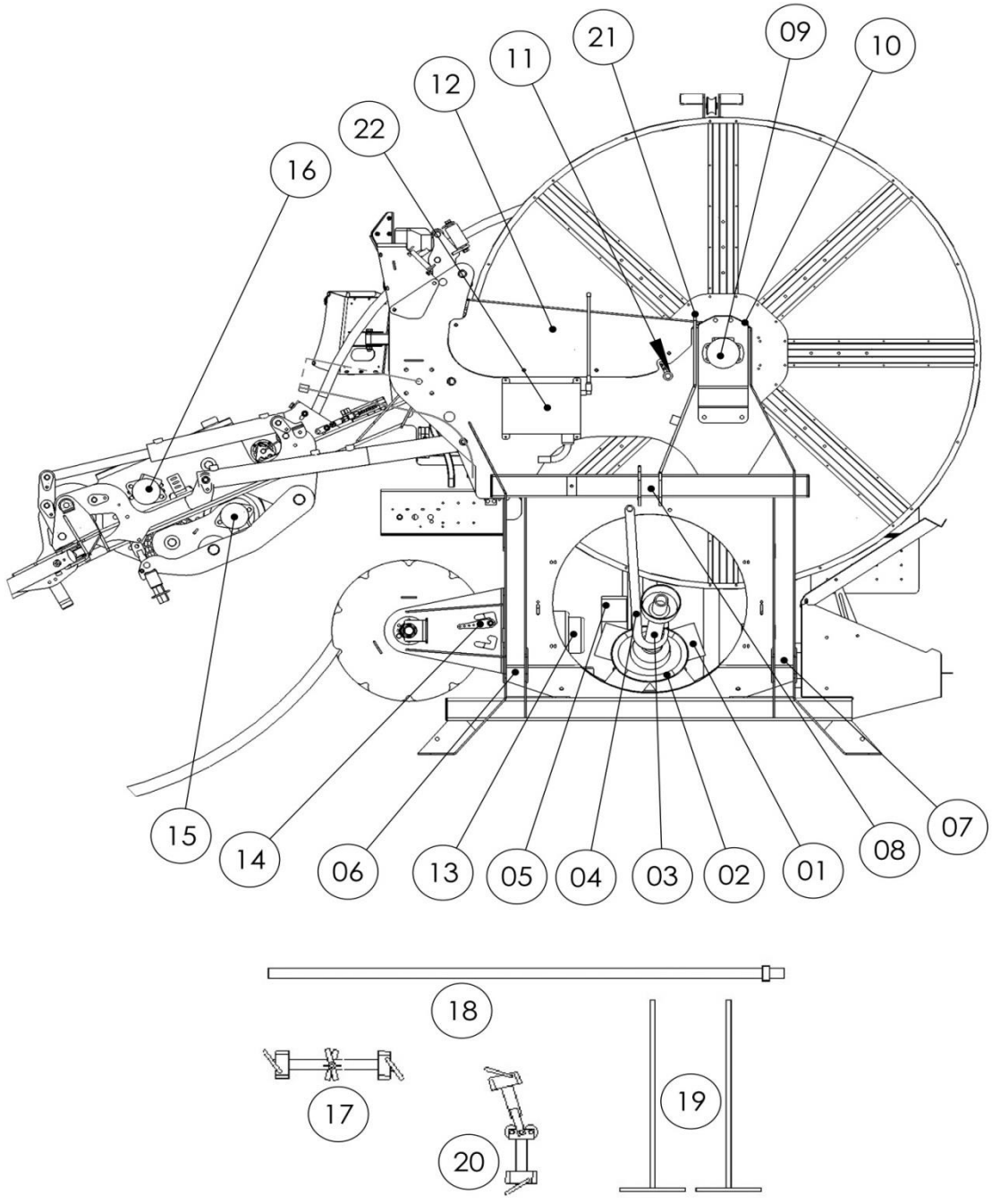
For grassland, maize land and arable land this discharge must be 7 millimetres. (Note, this applies to drain pipes with single-sided discharge). If it is less, it must first be checked whether the drain pipes are situated correctly. If they are, the drain pipes must be cleaned. Do this for a number of drain pipes in the field, to determine an average.

It is recommended to clean the drain pipes during a wet period when the drain pipes are already discharging water. For more detailed agricultural knowledge and recommendations on the use and maintenance of drain pipes you should consult the relevant institutions and/or literature. Agricultural science is not within the scope of this user manual.

10.3 Getting ready to operate the machine

10.3.1 Hitching the machine to the tractor

01. Observe all safety instructions as described in the safety chapter of this user manual.
02. If necessary, equip the tractor with sufficient front weights.
03. Make sure the machine is on a level surface.
04. If necessary, place guide shells on the lower link pins of the machine (see fig. 51 pt. 06 and pt. 07).
05. Connect the lower lift arms of the three-point suspension to the lower link pins of the machine (see fig. 51 pt. 06 and pt. 07).
06. Lock the lower lift arms.
07. Connect the top rod of the three-point suspension to the top link pin of the machine and, if necessary, set the correct length (see fig. 51 pt. 08).
08. Lock the top link pin.



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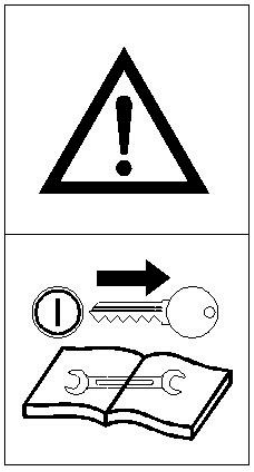
10.3.2 Matching the cardan shaft and the tractor

01. Lift the machine to minimise the distance between the tractor pto and the water pump shaft.
02. Support the machine in a sensible manner if the machine is not on the ground after carrying out the previous action.
03. Check that the cardan shaft matches the manufacturer's specifications.
04. Check whether the cardan shaft can be mounted without modifying its length. If not, shorten the cardan shaft.

10.3.3 Shortening the cardan shaft (also refer to the instructions that came with the cardan shaft)

WARNING!
Apply the tractor parking brake, switch off the tractor engine and take the tractor ignition key from the lock.



14. Sticker "Remove ignition key for maintenance"

01. Slide the cardan shaft over the water pump shaft. Slide the cardan shaft over the pto while holding the thin side of the protective sleeve down.
02. Check that the spring-tensioned catch of the cardan shaft sits in the recess of the pump shaft.
03. Slide the cardan shaft fully in.
04. Measure the distance from the rear of the tractor pto to the front of foremost steel part of the cardan shaft. (=for instance 15 cm)
05. Add 1 cm to this distance. (= 16 cm)
06. Remove the cardan shaft from the water pump.
07. Take the front section of the cardan shaft (and protective sleeve) from the rear section.

08. Cut 16 cm off:
    * front cardan shaft section;
    * rear cardan shaft section;
    * front protective sleeve section;
    * rear protective sleeve section.

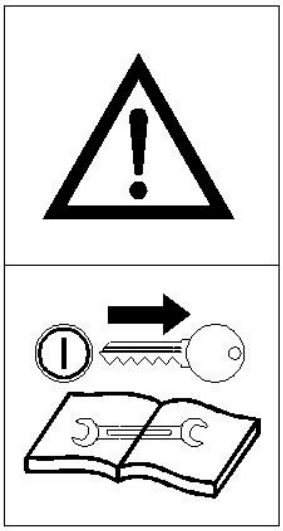
    Note: The above values are only examples.
09. Deburr the cut sections and round off sharp edges.
10. Remove the synthetic and steel sawdust and filings.
11. Coat the sliding splines with lubricating grease.
12. Slide the two cardan shaft sections (and the protective sleeve) back together. Be sure to slide the sections together in their original orientation!
13. Other modifications to the cardan shaft are not permitted.

WARNING!
Make sure that the two cardan shaft sections are at least half the total sliding length of the cardan shaft into each other when the distance between the pto and the water pump shaft is at its maximum!

10.4 Working with the machine

10.4.1 Coupling the cardan shaft between the tractor and the machine

DANGER!
Apply the tractor parking brake, switch off the tractor engine and take the tractor ignition key from the lock.



14. Sticker "Remove ignition key for maintenance"

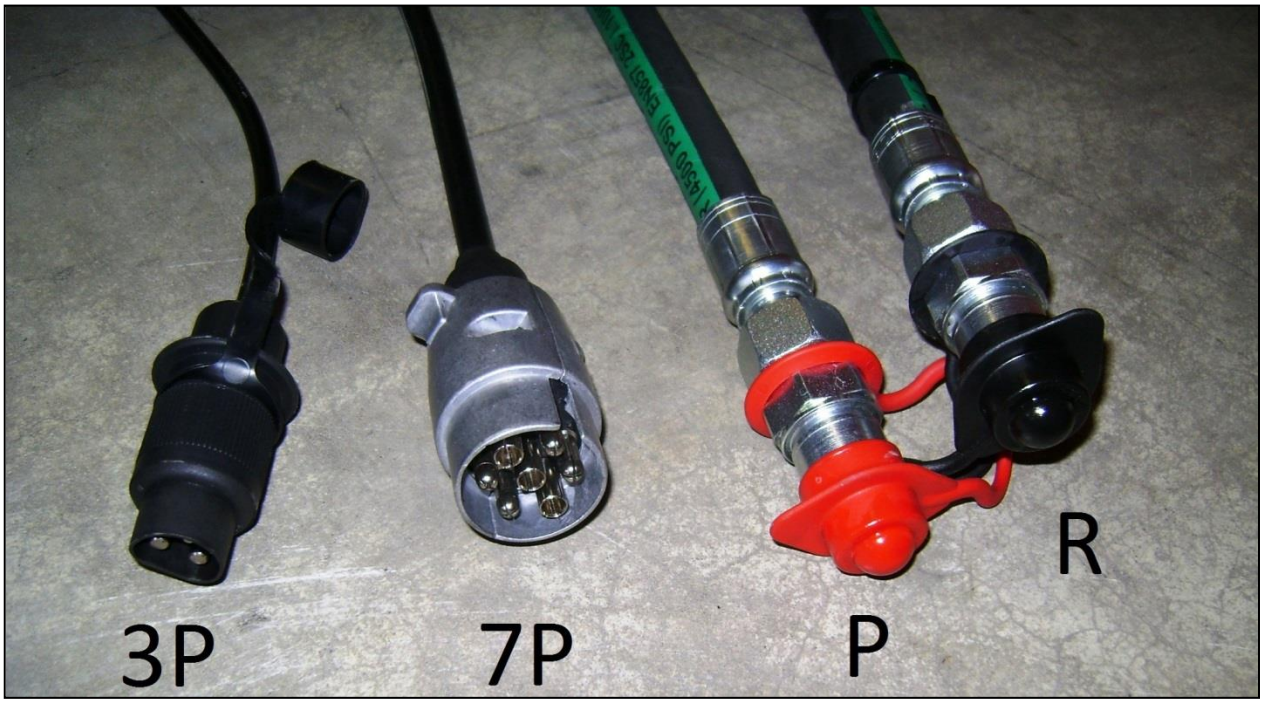
01. Slide the cardan shaft over the water pump shaft. Slide the cardan shaft over the pto while holding the thin side of the protective sleeve down.
02. Check that the spring-tensioned catch of the cardan shaft sits in the recess of the pump shaft.
03. Slide the cardan shaft fully in.
04. Slide the cardan shaft over the pto. Slide the cardan shaft over the pto while holding the thickest side of the protective sleeve upward.
05. Check that the spring-tensioned catch of the cardan shaft sits in the recess of the pto.
06. Prevent the protective sleeve of the cardan shaft from rotating with the two lock chains.

10.4.2 Coupling the hydraulic quick-connect couplings to the tractor

WARNING!
First switch off the hydraulic control valve of the tractor, then move the three control levers of the machine back and forth a number of times before connecting or disconnecting the hydraulic quick-connect couplings of the machine to/from the tractor.

CAREFUL!
Take measures to prevent environmental pollution due to spilling hydraulic oil.

01. Connect the hydraulic quick-connect coupling for the return (black dust guard) to one of the gates of the double-acting valve or pressureless return (see fig., R).
02. Connect the hydraulic quick-connect coupling for the supply (red dust guard) to the other gate of the double-acting valve (see fig. 51A, P).



51A. Hydraulic and electrical plugs

10.4.3 Connecting (electrically) and mounting the rear lighting beam

(Only when using public roads)

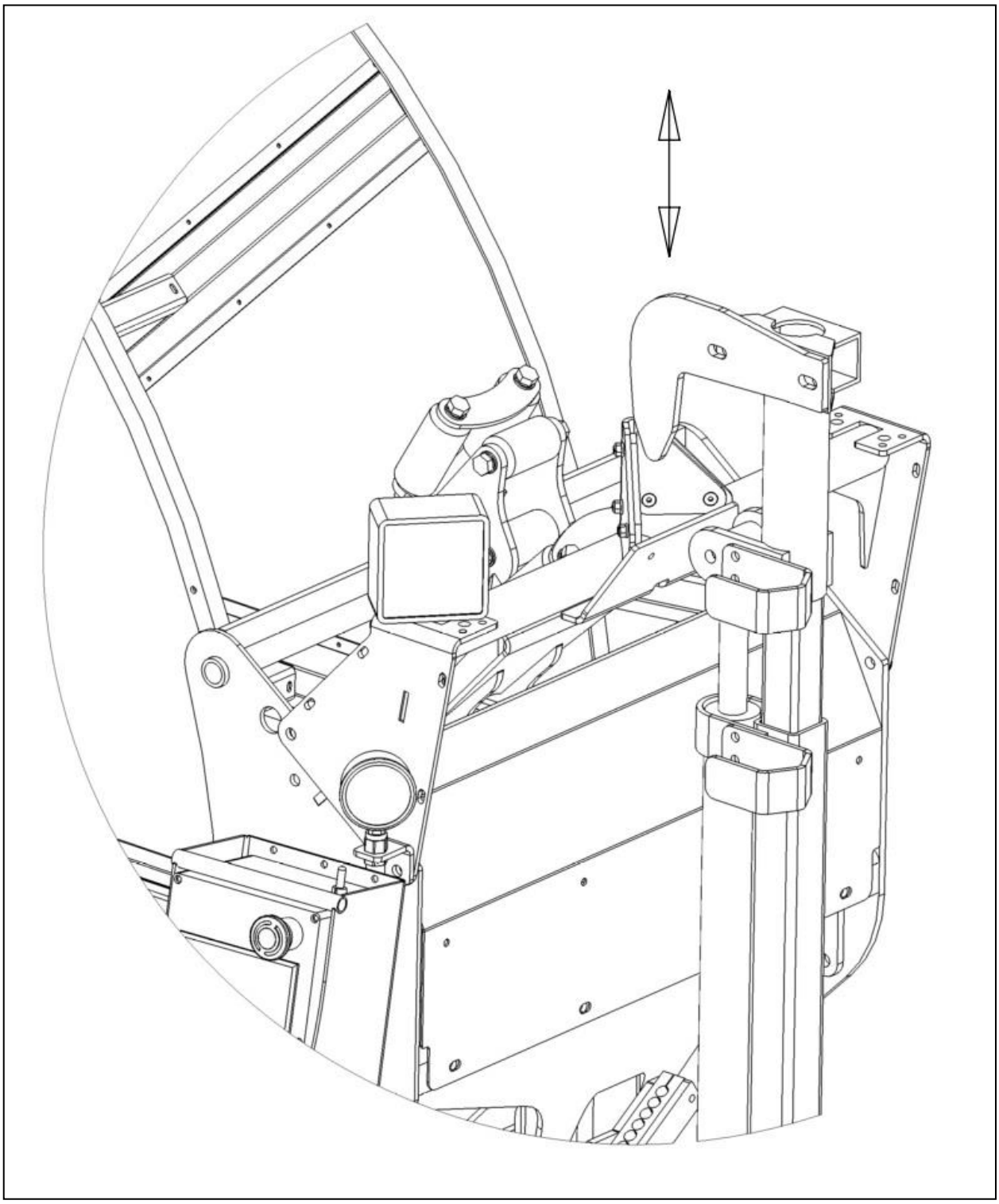
01. Connect the plug of the machine's lighting to the tractor's socket outlet (fig. 51A, 7P).
02. Check the correct operation of the lighting beam.
03. Lift the machine into transport position.
04. Check that the rotating light or flashing light (if mounted) for traffic approaching from the rear is clearly visible.
05. Check the presence of the triangle "Slow traffic".
06. Connect the plug for the electrical and hydraulic controls (fig. 51A, 3P).

10.4.4 At the work location

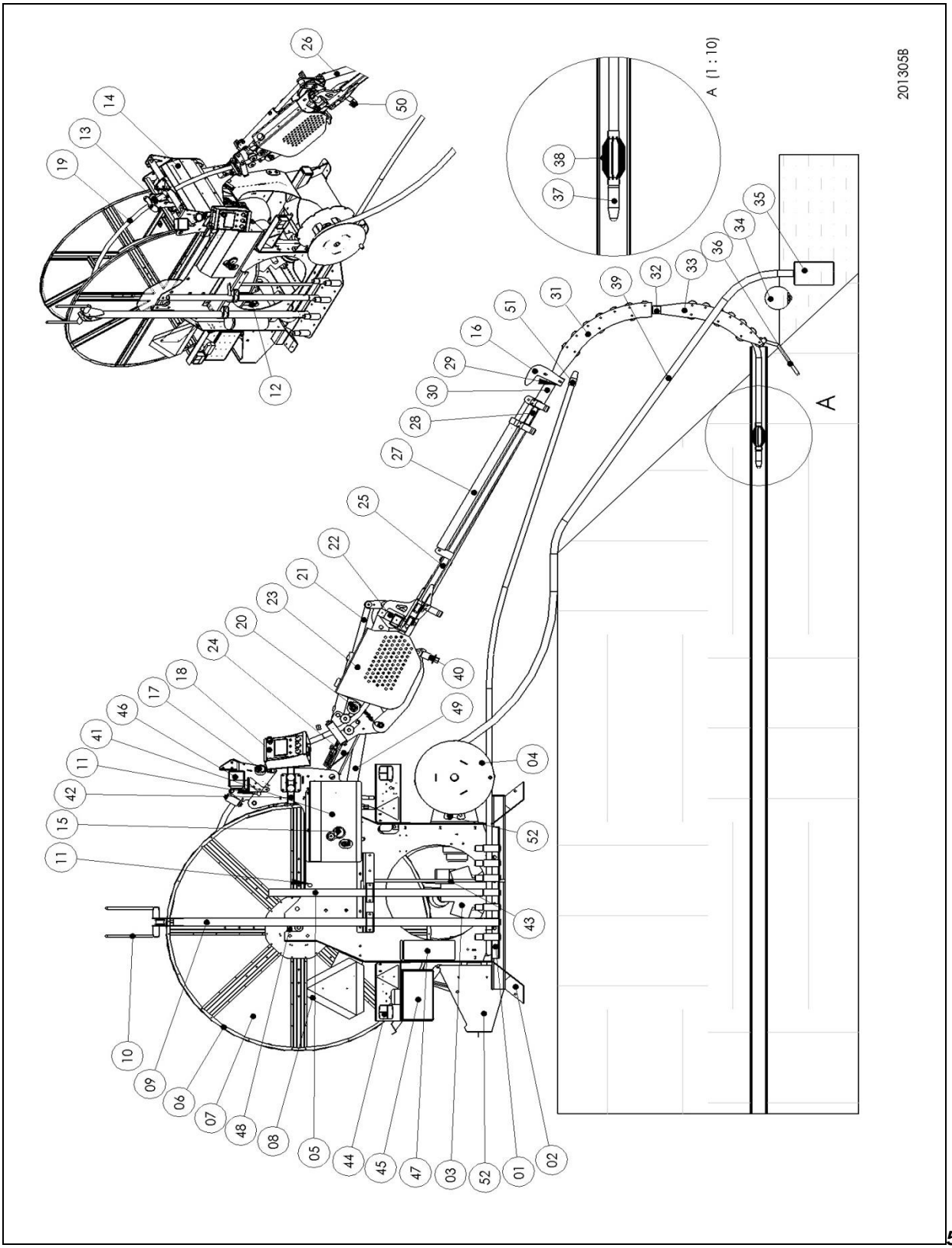
01. Observe all safety instructions as described in the safety chapter of this user manual.
02. Switch on the working lights if you have to work in the dark (make sure you pull out the emergency stop button first (turn clockwise) (fig. 56A pt. K).
03. Take the plug of the lighting beam from the tractor outlet (if mounted).
04. Lift the machine some 10 cm off the ground.
05. Place the machine at a suitable distance from the drain pipe to be cleaned.
06. Apply the tractor parking brake.
07. Unroll the suction hose and overflow hose from the suction hose reel.

ATTENTION!
Make sure you know the maximum pump head. If it is too high, the pump will not suck in any water.

08. Put the suction basket on the float in a ditch (upstream so the suction basket does not suck in used flushing water) or in a water tanker. If the head is too high, or if there is no suction basket or if it is not clean, the pump must not be activated.
09. Make sure the filter is fully submerged and does not suck in any dirt or air.
10. Connect the overflow hose to the water pressure controller and fix it.
11. Put the hydraulic operating valves block in operating position. Fix the sliding beam with the wing bolts.
12. Switch the control box on (turn emergency stop button clockwise) (fig. 56A pt. K) if this hasn't already been done.
13. Switch on the hydraulic control valve of the tractor.
14. Press button 6 to slide out the extension section of the guide arm (fig 56A) which releases it from the coupling jaw of the steel frame.



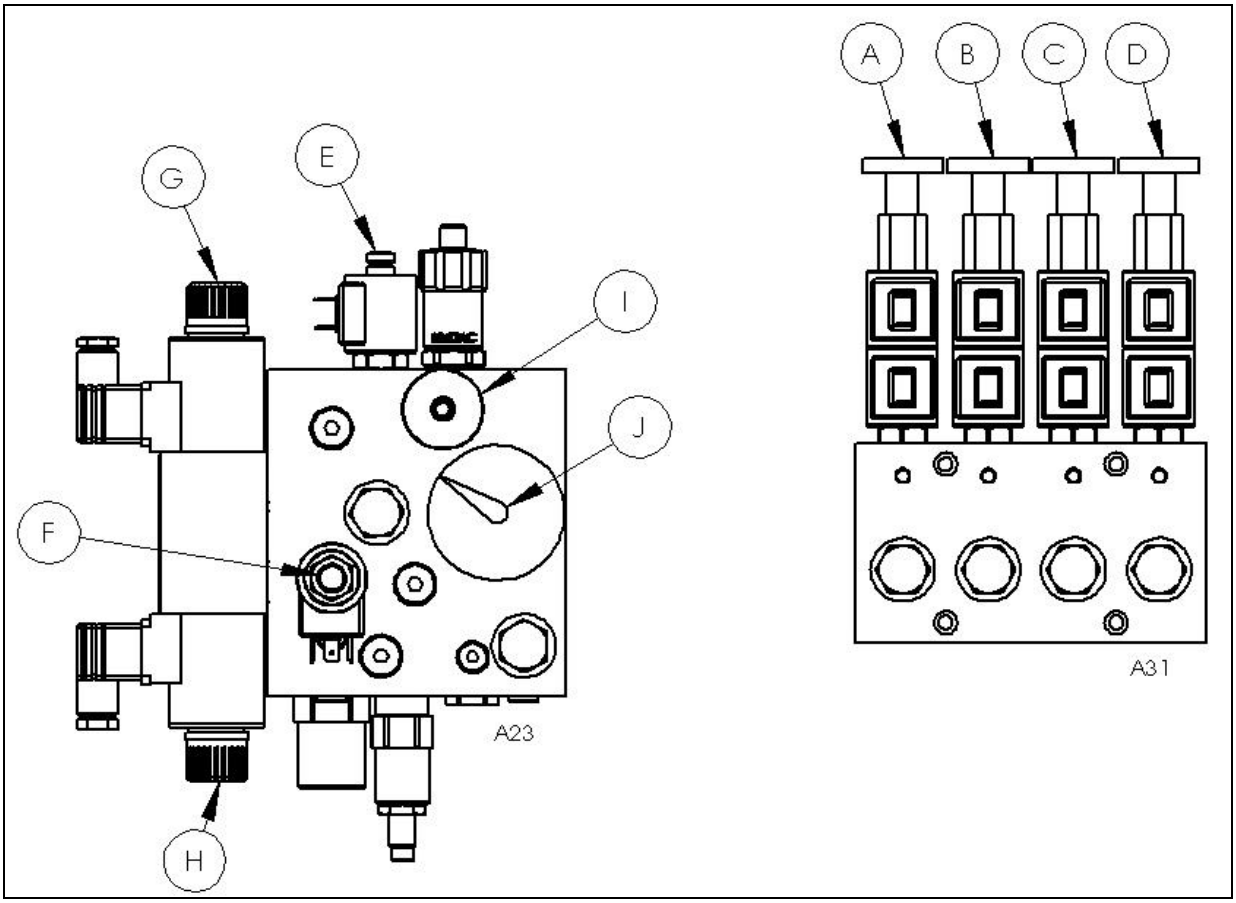
Transport lock.
Switch the power and hydraulics on first.



55

O. Main components rear - Hurricane

56A. Electric controls



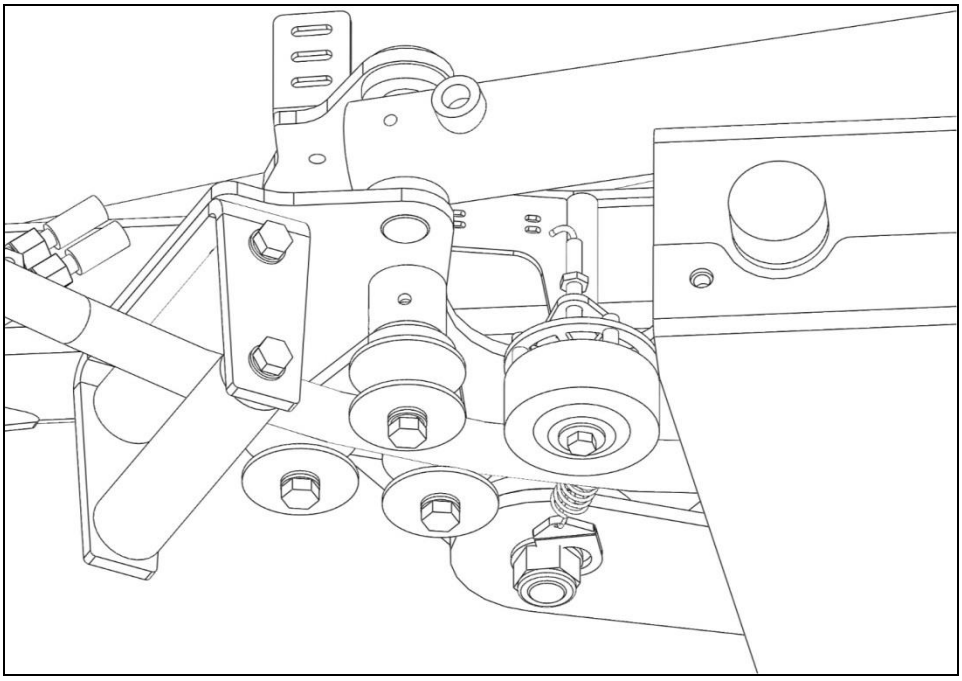
56B. Hydraulic controls

15. Press button 4 to fold out the lower section of the guide arm (fig. 56A).
16. Press button 1 to fold out the top section of the guide arm (fig. 56A).
17. Repeat 15 and 16 till the entire guide arm is completely extended in a horizontal position. The two buttons can be operated at the same time.
18. Put the top roller bend or the extension (fig. 50 pt. 09) on the end of the guide arm and fasten it. If the extension is placed on the guide arm, the adapter must be removed first (fig. 50 pt. 30).
    If the flushing hose feed point is out of the machine's range, an optional set of extension tubes is available. It can be used to give the guide arm the desired length and includes: 2 metres long extension tubes, couplings and supports (see fig. 51 pt. 17, 18 and 19).
19. Put the overflow hose (fig. 50 pt. 51) on the cleaning tube (only if the top roller bend is placed).
20. Attach the bottom roller bend to the top roller bend and fasten it (only if the top roller bend is placed).

21. Press button 6 to extend the guide arm (fig. 56A). The guide arm can be extended hydraulically by a maximum of 880 mm.
22. Wear adequate eye protection (goggles). The flushing water leaving the drain pipe under pressure may carry off small hard objects at high speed.
23. Put the end of the second roller bend or the extension in front of the drain pipe discharge opening. This can be done by using a combination of buttons:

    1: top section (folding cylinder) folds out guide arm
    2: top section (folding cylinder) folds in guide arm
    5: retracts guide arm
    6: extends guide arm
    7: slewing left
    8: slewing right

    Note! Only two buttons can be used simultaneously.
    If the drain pipe is under water, positioning the roller bend requires more attention.
24. Slew the guide arm to the left or to the right if the roller bend cannot be placed in front of the drain pipe.
25. Apply the tractor parking brake.
26. Manually guide the flushing hose through the flushing hose guide and through the drive wheels and pressure rolls.
27. Adjust the pressure roll clamping pressure using the adjusting lever (fig. 50 pt. 40). Do not set the clamping pressure too high.
28. Mount the end piece with guide basket and nozzle if necessary. Please note! Do not mount these until the hose or the extension has been fed through both roller bends.
29. Fix the roller bend using the supplied fixing pin (fig. 50 pt. 43), when the roller bend has been positioned in front of the drain pipe. That will prevent the roller bend from shifting while the flushing hose is being fed in and out. When working on the opposite bank, the pin (fig. 50 pt. 36) that is fixed on the second roller bend can be pushed into the bank to fix the end of the roller bend. The extension (fig. 50 pt. 09) is fitted with 2 pins for this purpose (fig. 50 pt. 10).
30. Check if the wheel of the metre counter is secured to the flushing hose correctly (fig. 23).
31. Place the nozzle at the start of the drain and reset the metre counter by holding down the RESET button (fig. 56A) for 3 seconds. N.B. While the flushing hose is positioned along the bend between the bottom and top sections of the guide arm, the bottom arm must never be folded in because this could cause kinks in the flushing hose.
32. Enter the length of the drain pipe with the use of the │→ │button in combination with up and down arrows ▲(longer) ▼(shorter) (fig 56A). The length is shown on the display.



23. Metre counter

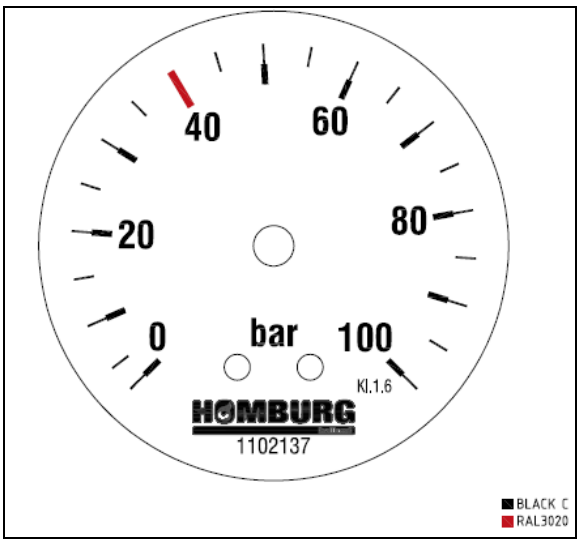
33. Select whether to have HDD (obstacle detection) on or off (fig.56A).
    HDD anticipates obstacles and the end of the drain pipe (set at step 32).

CAREFUL!
Do not activate the cardan shaft or the water pump when there is reason to suspect that the water in the pump is frozen.

34. Switch on the cardan shaft (tractor).
35. Set the cardan shaft speed. About 400 rpm. (tractor).
36. Wait until all the air has disappeared from the transparent suction hose. If the air does not disappear, the pump does not suck properly or the suction hose leaks or the head is too high.
    Please note! The pump must not run dry for longer than 5 min to prevent damage to the pump.

10.4.5 Feeding the flushing hose into the drain pipe

01. Observe all safety instructions as described in the safety chapter of this user manual.
02. Press the **AUTO** button (fig.56A) till the light starts to glow on the button. The hose will now be introduced and the water will start automatically.
03. Check that the flushing water pressure is no more than 3.5 MPa (35 bar) with the use of the pressure gauge (fig. 18 en fig. 50 pt. 22).

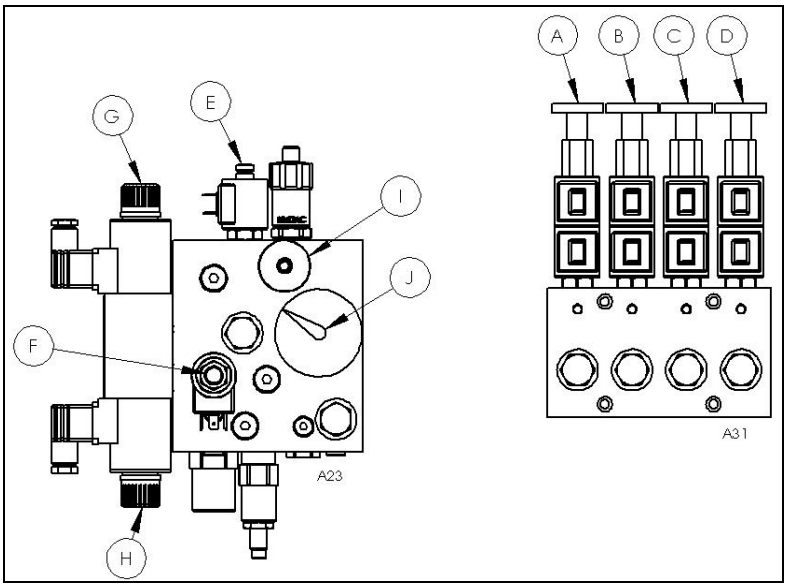


18. Pressure gauge for flushing water

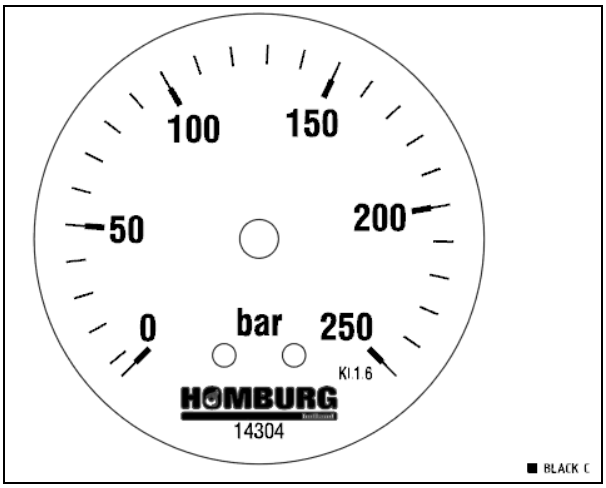
CAREFUL!
The water pressure must never exceed 5MPa (50 bar).

04. Set the cardan shaft speed to achieve the smallest possible water flow from the overflow hose. This saves energy.
Make sure that the pressure indicated on the pressure gauge (see fig. 05 and fig. 50 pt. 17) remains between 2.5 MPa and 3 MPa (25 bar and 30 bar).
05. If the drive wheels are slipping, the machine will stop feeding the hose and the display will show “E12 Slip”. Possible causes are that there may be too much resistance or the pressure of the rollers may be too low on the flushing hose. If the roller pressure is too low the rollers will have to be set more tightly.
06. This equals ± 70% on the display. The speed can be adjusted simply by using the ▲▼ buttons on the control panel (fig. 56A). The speed can normally be set in the menu so that the machine always operates at the set speed.
07. When the HDD system is switched on, the feeding in of the hose will stop automatically at the set length of the drain pipe. If HDD is not switched on you need to keep checking the metre counter yourself to see if the flushing hose has reached the end of the drain pipe (to feed in 300 m will take 12 minutes!).
If the nozzle hits an obstacle during the feeding-in process, e.g. a blockage, and HDD is switched on, the machine will respond to this by stopping briefly and then continuing to feed the hose in further. This will be repeated till the obstacle has gone. If HDD is not on, the user will have to move the flushing hose back and forth through the drain pipe at a lower speed by pressing buttons **MAN** **MAN** (fig. 56A. Note that when feeding in and retracting the hose manually the water does not start automatically but needs to be switched on manually with button H2O (fig. 56A).
08. Keep checking the pressure of the hydraulic system with the use of the top pressure gauge (see fig. 50 pt. 15 and fig. 57) or on the display of the control

panel. The pressure will increase gradually the further the flushing hose is fed into the drain pipe. The pressure must never exceed 90 bar. HDD keeps monitoring the pressure and will correct it in good time. If HDD is not switched on, the user will need to monitor the pressure himself. If the pressure is allowed to become too high, the flushing hose could be damaged by the drive wheels The hydraulic system has a pressure relief valve (see fig. 50 pt. 15 and fig. 56B pt. I) which can be adjusted with the knob to the desired maximum pressure.



56B. Hydraulic controls



57. Hydraulic system pressure gauge

09. If HDD is switched on, the feeding in and the water will stop automatically at the set drain pipe distance. If HDD is not on, the **STOP** button (fig. 56A) must be pressed. This stops feeding in the flushing hose and the water.

10.4.6 Feeding out the flushing hose from the drain pipe (reeling in)

HINT!
Be sure to reel in the flushing hose as clean as possible to prevent slip and drive problems with the flushing hose.
Proceed as follows to achieve this:

WARNING!
The water pressure must never exceed 5MPa (50 bar).

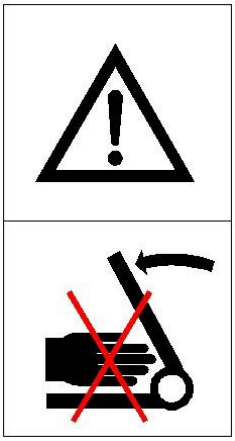
01. Slide the end of the overflow hose over the upturned end of the cleaning tube (fig. 50 pt.31).
02. Press button **AUTO** (fig. 56A). The machine will now start to retract the flushing hose and the water will start.
03. Set the speed of the cardan shaft in such a way that the pressure shown by the pressure gauge never exceeds a max. of 3.5 MPa (35 bar).
04. Set the retraction speed of the flushing hose at around 25 metres per minute, which is ± 70% on the display.
05. Make sure the drive wheels do not slip on the flushing hose. This could damage the flushing hose. If the drive wheels slip the drive speed is too high.
07. From 3 metres before the end the machine emits an acoustic signal after every completed metre. The water is stopped well before the end and the machine stops retracting the hose (coiling back on the reel).
08. Continue to pull the hose out of the drain pipe by hand by pressing button **MAN** (fig. 56A) till the flushing hose is adequately retracted between the rubber wheels.
09. Switch off the cardan shaft (tractor).
10. Pull the roller bend fixing pin out of the (fig. 50 pt. 60) ground.
11. Press button 1 (fig. 56A) to raise the guide arm a little.
12. Roll the nozzle and suction basket, float and overflow hose onto the drum on the machine.
13. Retract the guide arm completely by pressing button 5 (fig. 56A).
14. Drive with unfolded but fully retracted guide arm to the next drain pipe. This is the only situation in which driving with unfolded guide arm is permitted.

DANGER!
In all other transport situations, particularly when transporting over public roads, the machine must be put completely into transport position.

10.4.7 Preparing the machine for transport on public roads

01. Observe all safety instructions as described in the safety chapter of this user manual and ensure that the flushing hose is fully retracted between the rubber wheels as described above.
02. Switch off the cardan shaft (lever in tractor).
03. Retract the guide arm completely to 20 cm from the end.
04. Remove the lower roller bend, put it on the roller bend transport support and lock it.
05. Remove the upper roller bend, put it on the roller bend transport support and lock it.
06. Remove the guide arm extension (fig. 50 pt. 09) from the guide arm, and put it on the extension transport support (only if the roller bends have not been used).

WARNING!
When folding in the guide arm there is a risk that limbs may get caught.



10. Sticker "Danger of getting caught"

07. Fold the bottom section of the guide arm in by pressing button 3 (fig. 56A).
08. Fold in the top section of the guide arm by pressing button 2 (fig. 56A).
09. Repeat 07. and 08. till the entire guide arm is back in the transport position. Buttons can be used at the same time.
10. Next, lower the telescope with the transportation hook into the coupling jaw of the frame by pressing button 5 (fig. 56A). The arm is now secured for transport.
11. Switch off the hydraulic control valve of the tractor.
12. Put the electrical control box into transport position (slide in and lock with the wing bolts).
13. Switch the control box off by pressing the emergency stop button (fig. 56A).
14. Pull the 3P plug from the control box out of the socket outlet on the tractor.

CAREFUL!
Take measures to prevent environmental pollution due to spilling hydraulic oil.

15. Disconnect the hydraulic quick-connect coupling for the supply (red).
16. Disconnect the hydraulic quick-connect coupling for the return (black).
17. Roll the overflow hose and suction hose with suction basket and float back on the suction hose reel.
18. Connect the 7P plug from the machine to the socket outlet on the tractor (if not already connected).
19. Check the correct operation of the lighting beam.
20. Lift the machine into transport position (lifted some 20 cm off the ground).
21. Switch off the working lights of the machine (if they are on).
22. Check that the rotating light or flashing light (if mounted) for traffic approaching from the rear is clearly visible.
23. Check the presence of the triangle "Slow traffic ".
24. Release the tractor parking brake.
25. Drive to the new destination.

10.4.8 Unhitching the machine from the tractor

01. Make sure the machine is on a level surface.

WARNING!
Apply the tractor parking brake, switch off the tractor engine and take the tractor ignition key from the lock.

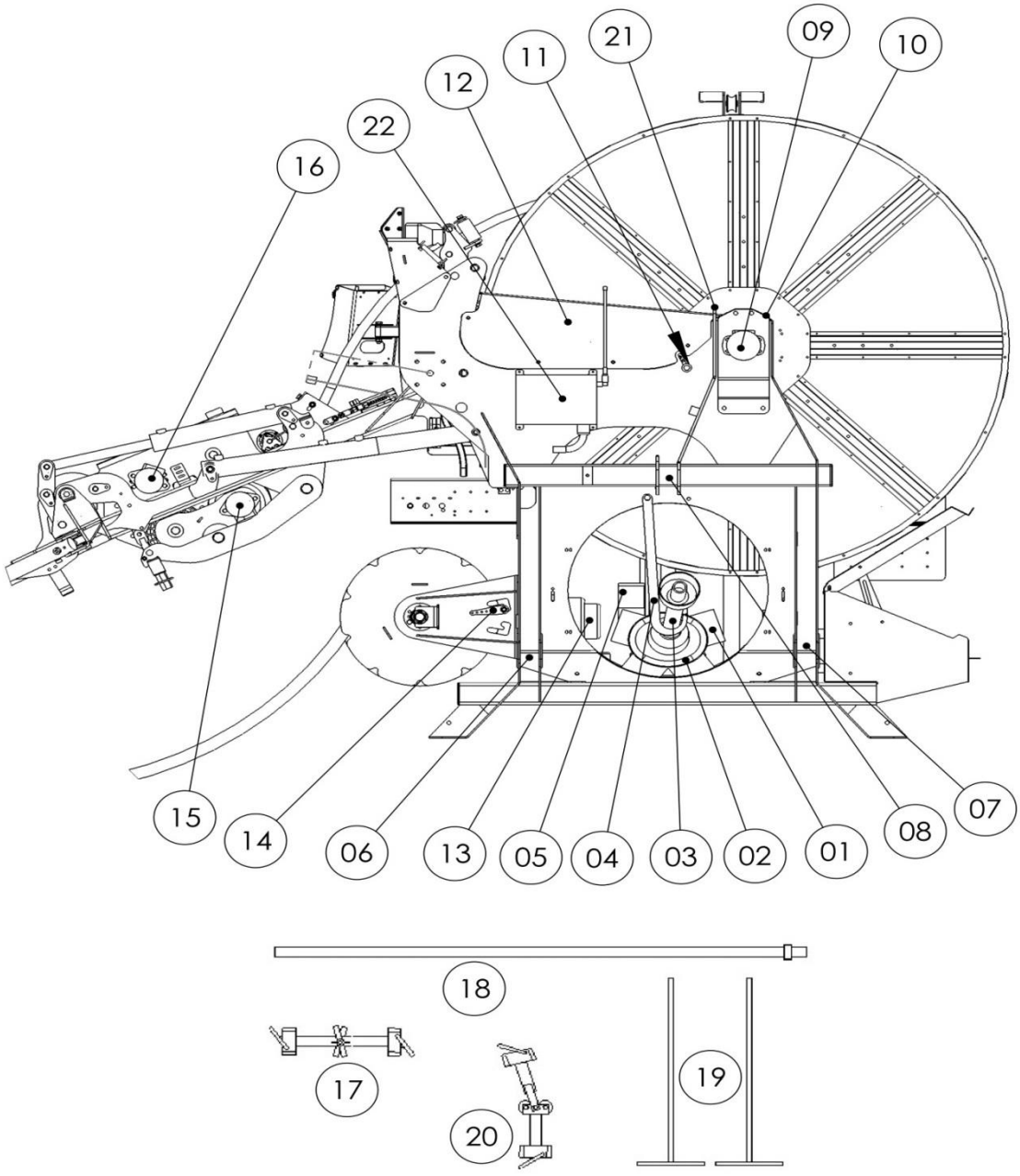
02. Pull the 7-pole plug from the light beam out of the socket outlet on the tractor (if mounted).
03. Pull the 3-pole electrical plug out of the socket outlet on the tractor.

WARNING!
First switch off the hydraulic control valve of the tractor, then move the three control levers of the machine back and forth a number of times before connecting or disconnecting the hydraulic quick-connect couplings of the machine to/from the tractor.

CAREFUL!
Take measures to prevent environmental pollution due to spilling hydraulic oil.

04. Check that all relevant hydraulic levers of the machine are in central position.
05. Disconnect the hydraulic quick-connect coupling for the supply (red).
06. Disconnect the hydraulic quick-connect coupling for the return (black).
07. Push in the spring-tensioned catch of the cardan shaft and slide the cardan shaft off the tractor pto.

08. Hang the cardan shaft on its special support (fig. 51 pt. 04) on the machine.
09. Uncouple the top link of the three-point suspension from the machine (fig. 51 pt. 08).



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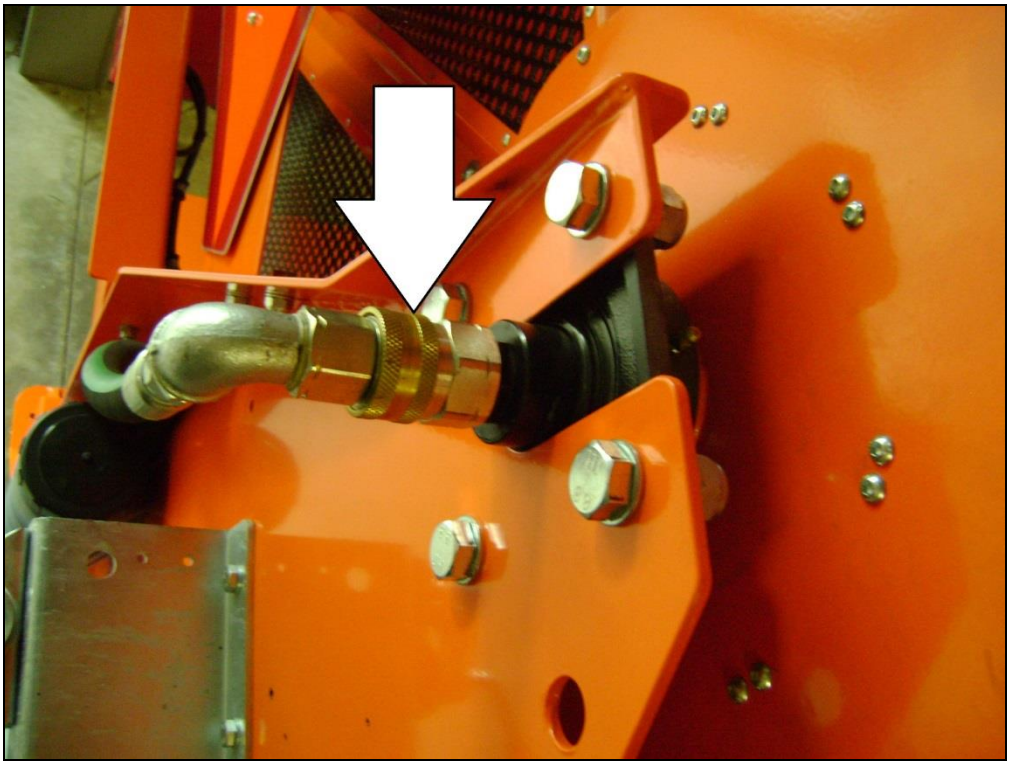
10. Uncouple the lower lift arms of the three-point suspension (fig. 51 pt. 06 and 07).
11. If applicable, remove the front weights from the tractor.

10.4.9 Storing the machine

01. Uncouple the central reel coupling (fig. 58).



58. Reel bearing and water coupling

02. Remove the nozzle and use pressurised air to purge all water from the flushing hose. Makes sure the nozzle is removed.
03. Open both valves of the flushing water pump and let the pump run to remove al water.
04. Fill a 10-litre bucket with a mixture of water and anti-freeze with protection up to -25° C.
05. Close both valves of the flushing water pump.
06. Put the end of the suction hose, the end of the overflow hose and the water supply hose of the reel (fig. 58) in the bucket.
07. Switch on the cardan shaft and let the flushing water pump take up the anti-freeze mixture to prevent frost damage and internal corrosion of the pump and to prevent the diaphragms from drying out.
08. Roll up the suction hose with suction basket and float.
09. Unhitch the machine from the tractor.
10. Always protect the black flushing hose from intense sunlight, particularly in summer or in tropical areas. That will increase the service life of the flushing hose.
11. Grease the two reel bearing grease nipples (see greasing schedule) and central reel coupling (fig. 58A) in.
12. Carry out the activities as prescribed in the maintenance schedule.

11 MAINTENANCE INSTRUCTIONS

11.1 General

Observe all safety instructions as described in the safety chapter of this user manual.

To make the most out of this machine's high quality throughout its service life, it is necessary to accurately follow all maintenance instructions below.

Operators are only allowed to carry out the maintenance and repair described in this user manual. Other maintenance must be carried out by specialised personnel.

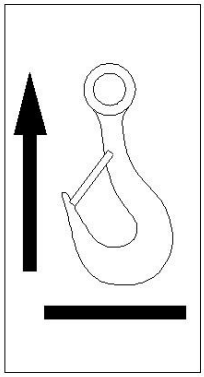
Maintenance must only be carried out by trained and designated personnel that does not use alcohol, medicines or drugs.

The substances used on or in the machine are not suitable for internal use.

During maintenance make sure that no oil or grease is spilled on the flushing hose or the drive wheels and the pressure rolls. This will cause slip when feeding in or out.

The settings and accesses sealed by the manufacturer must not be broken. If a seal is broken, that automatically voids the manufacturer's product liability.

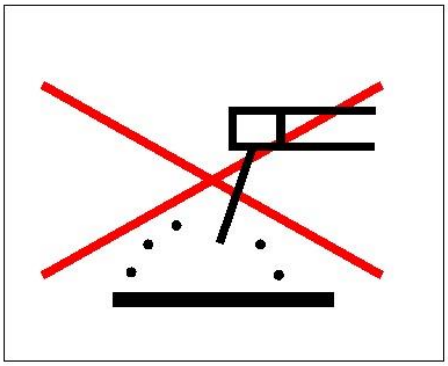
Only hoist the machine on the special hoisting points.



08. Sticker "Hoisting point"

Make sure that nobody can start the machine during maintenance and repairs. For this reason the machine should be completely unhitched from the tractor.

Never weld on the machine without the manufacturer's written permission.



11. Sticker "No welding on the machine"

Always observe the safety precautions from suppliers of battery acid, fuels, lubricants, cooling fluid and hydraulic oil.

When working with grease, battery acid, fuel, lubricants, cooling fluid and hydraulic oil, make sure these substances do not end up in the environment.
Never remove a protective casing of an operating machine.

If the machine is used under special operating conditions (for instance: 24 hours a day, 7 days a week, with very dirty flushing water, a modified maintenance schedule must be observed. Consult your supplier in that case.

11.2 Paint damage

Paint damage, through mechanical causes or corrosion, must be repaired as follows:

01. Sand the location in question to the plain metal.
02. Remove all dust and grease.
03. Apply a zinc-based primer.
04. Let it dry completely.
05. Sand the surface lightly.
06. Apply a coat of paint in the original colour of the machine.
07. Let it dry completely.

11.3 Cleaning the machine

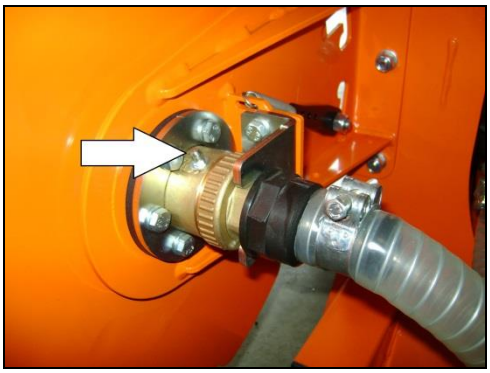
If a high-pressure cleaner or a steam cleaner with tap water are used, the water temperature must not exceed 40°C. Do not use detergent, for that will cause the flushing hose drive wheels to slip.

11.4 Oil change Flushing water pump

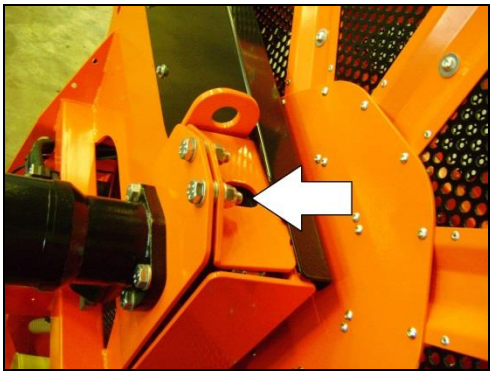
This must be done annually. Be sure there is no air left in the cylinder head after changing the oil of the flushing water pump. The air can be removed by tilting the pump forward and simultaneously rotating the shaft. That way the air between the piston and the diaphragms will disappear (also refer to the manufacturer's instructions that came with the pump).

11.5 Maintenace schedule (fig. 61)

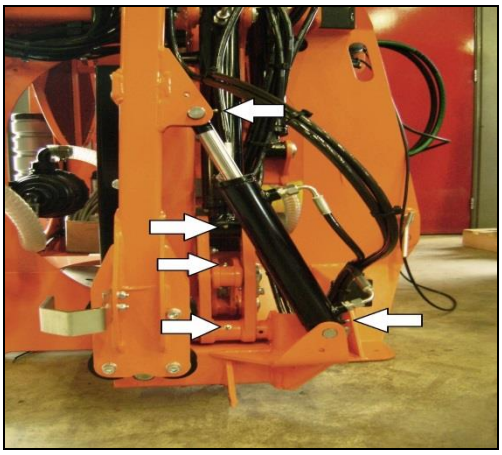
Section (fig.61x)	8 hours or daily	40 hours or weekly	250 hours or monthly	Qty per machine	Material / Method	FIG
Water-coupling (B)	Lubricate	--	--	1	Grease Mollub-Alloy 777-1	61F
Reel bearings (A)	Lubricate	--	--	2	Grease Mollub-Alloy 777-1	61F + 61B
Chains Hose guide (D)	Invetten	--	--	2	Grease Mollub-Alloy 777-1	61G + 61H
Chain hose drive (G)	--	Lubricate	--	1	Grease Mollub-Alloy 777-1	61L
Swivel points guide arm (F,H and L)	--	Lubricate	--	12	Grease Mollub-Alloy 777-1	61C +61D+61E+ 61N
Cardan shaft	--	Lubricate / Check protective sleeve	--	3	Grease Mollub-Alloy 777-1	
Tractor pto	--	Lubricate	--	1	Grease Mollub-Alloy 777-1	
Water pump shaft	--	Lubricate	--	1	Grease Mollub-Alloy 777-1	
Water pump (N)	--	Check/top up	--	1.85 litres	Engine oil SAE30/40 Change after 1000 hours	61K
Suction basket	Clean	--	Check	1	Using a brush	
Suction Filter	Clean + grease 3x O rings	-	-	1	Hose down + Grease Mollub-Alloy 777-1	
Nylon rollers	--	Lubricate	--	20	Engine oil 5W30	
Pressure control valve (E)	--	Lubricate	--	1	Engine oil 5W30	61J
Sliding tube (J)	--	Lubricate	--	1	Grease Mollub-Alloy 777-1	61E
Vastzetklem (K)	--	Lubricate	--	4	Engine oil 5W30	
Dust covers quick-connect coupling	--	Check	--	2	Check presence and condition	
Hydr.system	--	--	Check	1	Check for leakage	
Water system	--	--	Check	1	Check for leakage	
Accumulator	--	Check	--	1	0,7mPa (7bar)	
Pressure roll tightener (M)	--	Lubricate	--	1	Engine oil 5W30	61M
Rotating coupling for suction hose reel	--	Lubricate	--	1	Grease Mollub-Alloy 777-I	61A



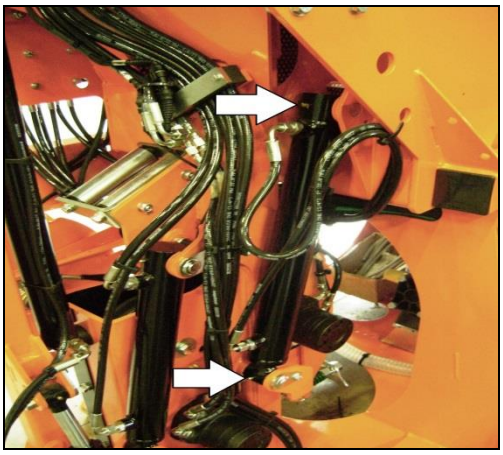
61A. Rotating coupling grease nipple for suction hose reel



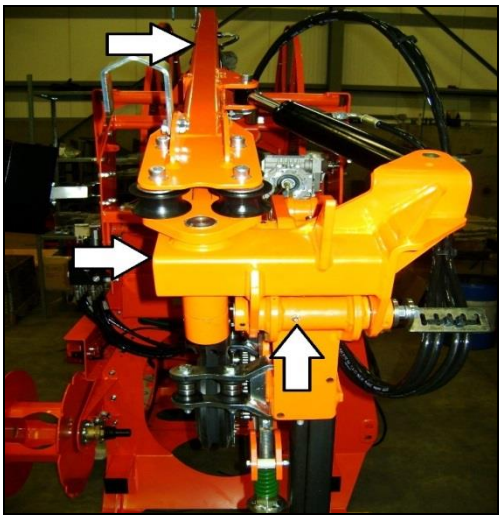
61B. Grease nipple for front of reel bearings



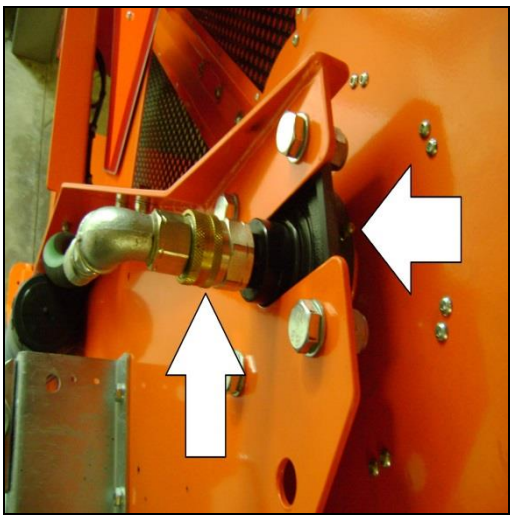
61C. Grease nipples for cylinders and swivel points 1



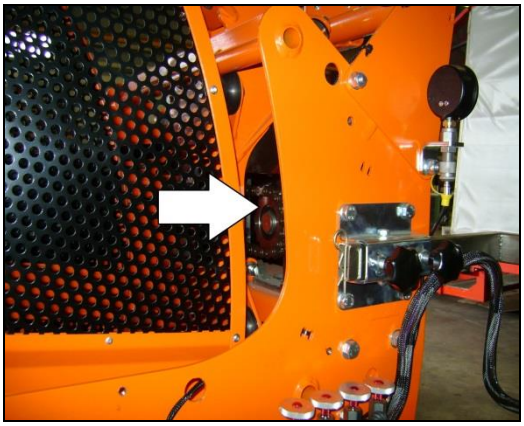
61D. Grease nipples for cylinders and swivel points 2



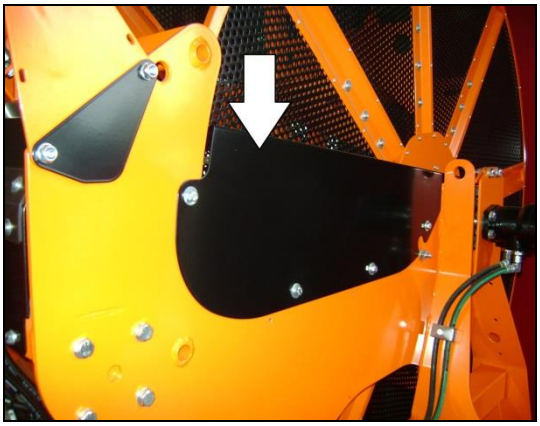
61E. Grease nipples for cylinders and swivel points 3



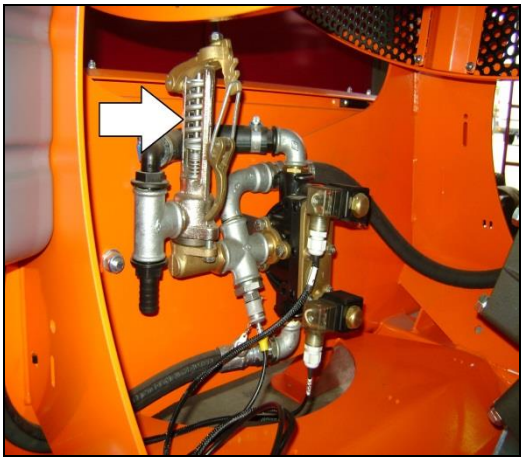
61F. Grease points for rotating couplings and reel bearing



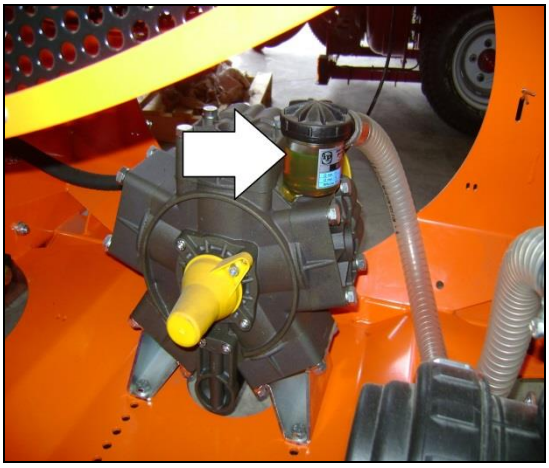
61G. Lateral displacement chain



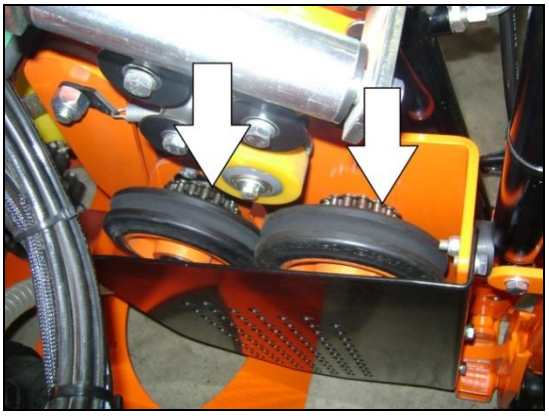
61H. Chain for lateral displacement drive



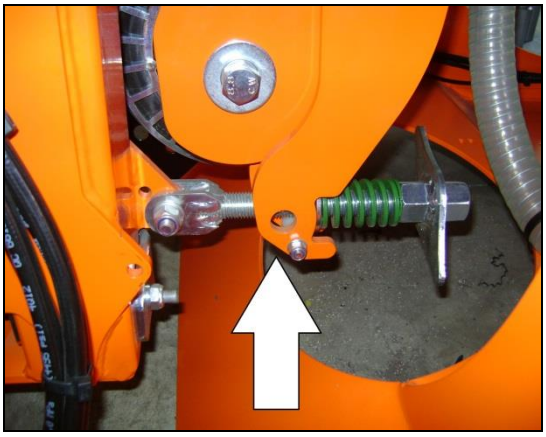
61J. Flushing water pressure regulators



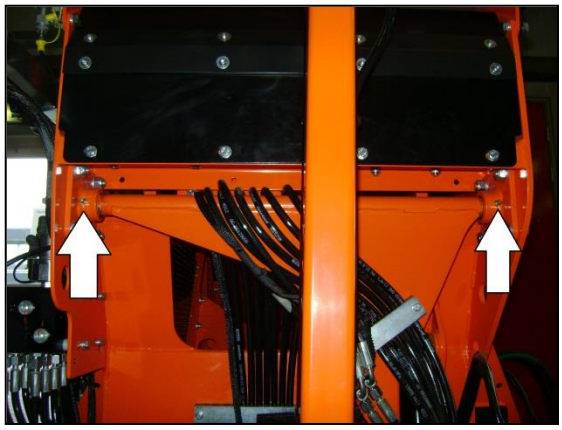
61K. Water pump



61L. Hose drive chain



61M. Pressure roll tensioner



61N. Grease nipples for cylinders and swivel points 3

11.6 Technical support

If you want to know what your nearest address is for minor and major maintenance and repairs, ordering parts and obtaining technical advice, you can ask the manufacturer for the telephone number of the current importer in your country. The importer can then refer you to the dealer or service provider nearest to you.

You can also obtain information from the dealer where you bought the machine.

12 TROUBLESHOOTING TABLE

Operators are only allowed to carry out the maintenance and repairs described in this user manual. Other malfunctions must be resolved by specialised personnel.

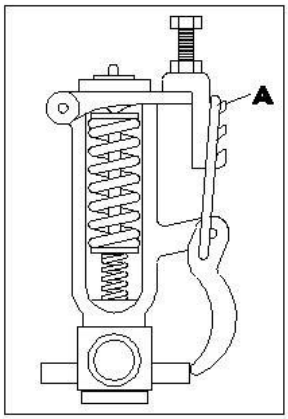
Maintenance and repair must only be carried out by specially trained personnel that does not use alcohol, medicines or drugs.

Malfunction	Cause	Solution
Pump sucks irregularly	Pump sucks irregularly Suction basket is fouled Suction basket connection defective Pump valves do not close properly Pressure in accumulator incorrect	Submerge suction basket Clean suction basket Repair connection Repair pump Change accumulator pressure
Maximum flushing pressure is not reached	Pump valves do not close properly Suction basket is fouled Leakage water pressure controller Nozzle worn	Repair pump Clean suction basket Replace pressure plate or seat Replace nozzle
Oil level too high	Oil level too high Diaphragm failure	Lower oil level Repair pump
E01: Comm. Error	Communication dropout between display and main processor.	Consult your dealer
E02: 20V too high	The 20V voltage for the pressure sensor is too high (>21V)	Consult your dealer
E03: 20V too low	The 20V voltage for the pressure sensor is too low (<15V)	Consult your dealer
E04: 12V too high	The 12v supply voltage is too high. (>14.5)	Check the supply voltage of the tractor
E05: 12v too low	The 12v supply voltage is too low (<11V)	Check the supply voltage of the tractor
E09: Open load	One of the plugs is not working properly.	- check that all the plugs are still in place. - check cables for breaks
E10: short circ.	One of the outlets is causing a short circuit to earth.	- check the cables

E11: Checksum	Communication problem between main processor and screen	Consult your dealer
E12: Slip	Hose drive wheels slipping	See Chapter 10.4
E13: Drive Wheel	Drive wheel is blocked	- Check whether drive wheel turns during reeling in/out - Check that the sensor is adjusted properly.
E14: Meas Wheel	Metre wheel is not turning	- check whether the metre wheel is turning simultaneously - Check whether the sensor is set properly.
E15: Parcel = 0	Area length is set at 0 m while the button for automatic hose feed is being used.	Enter the correct length for the area concerned.
E15: Dist. <=0	Distance is below 0 while button for automatic retraction is being used.	Put distance at the correct distance or reel hose in by hand.

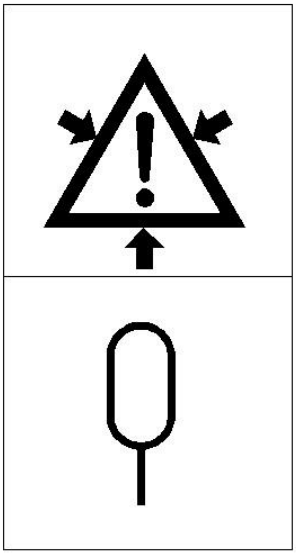
If you find a thick and white emulsion of water and oil in the pump oil reservoir (61K), or if you see slicks in the ditch, a diaphragm has failed. Proceed as follows without delay:

01. Carefully take the tension (open) off the hook clamp (fig. 05A) of the water pressure controller.



05. Flushing water pressure controller

02. Switch off the cardan shaft (tractor).
03. Switch off the hydraulic control valve of the tractor.
04. Switch off the tractor engine.
05. Uncouple the cardan shaft from the tractor and from the pump.
06. Internally clean the pump with diesel or petrol to prevent corrosion of the pump.



09. Sticker "Accumulator present"

07. Check the diaphragms.
08. Replace the defective diaphragm.

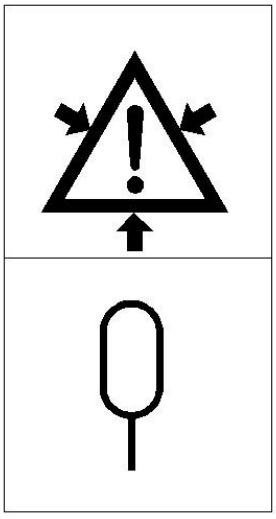
Important: Make sure there is no air left in the cylinder head after changing the diaphragms. The air can be removed by tilting the pump forward and simultaneously rotating the shaft. This will allow the air between the piston and the membranes to escape.

13 DISPOSING OF THE MACHINE

When the machine has reached the end of its technical service life and has to be disposed of, the following should be observed in connection with environment and safety:

Oil and grease (in the water pump):
Dispose of these in an environmentally sound manner as prescribed by the local authorities.

Accumulator (in the water pump):
The gas pressure in the accumulator is high. The accumulator must only be depressurised by specialised persons with specialised equipment.



09. Sticker "Accumulator present"

Flushing hose:
The flushing hose is made of HPE-(Hard PolyEthylene) synthetic. Take the flushing hose, float, guide rollers, suction hose, cleaning hoses and pantograph contact strip to a specialised synthetics recycling company.

The rest is mainly made of steel and can be sent off to a scrap iron processing company.

14 LIST OF ILLUSTRATIONS

15 COMMENT FORM

If you think this manual can be improved, please fill in the form below:

Is this publication:

- complete?	yes*	no*
- set up correctly?	yes	no
- clear?	yes	no
- well-illustrated?	yes	no

* Please circle the appropriate answer.

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