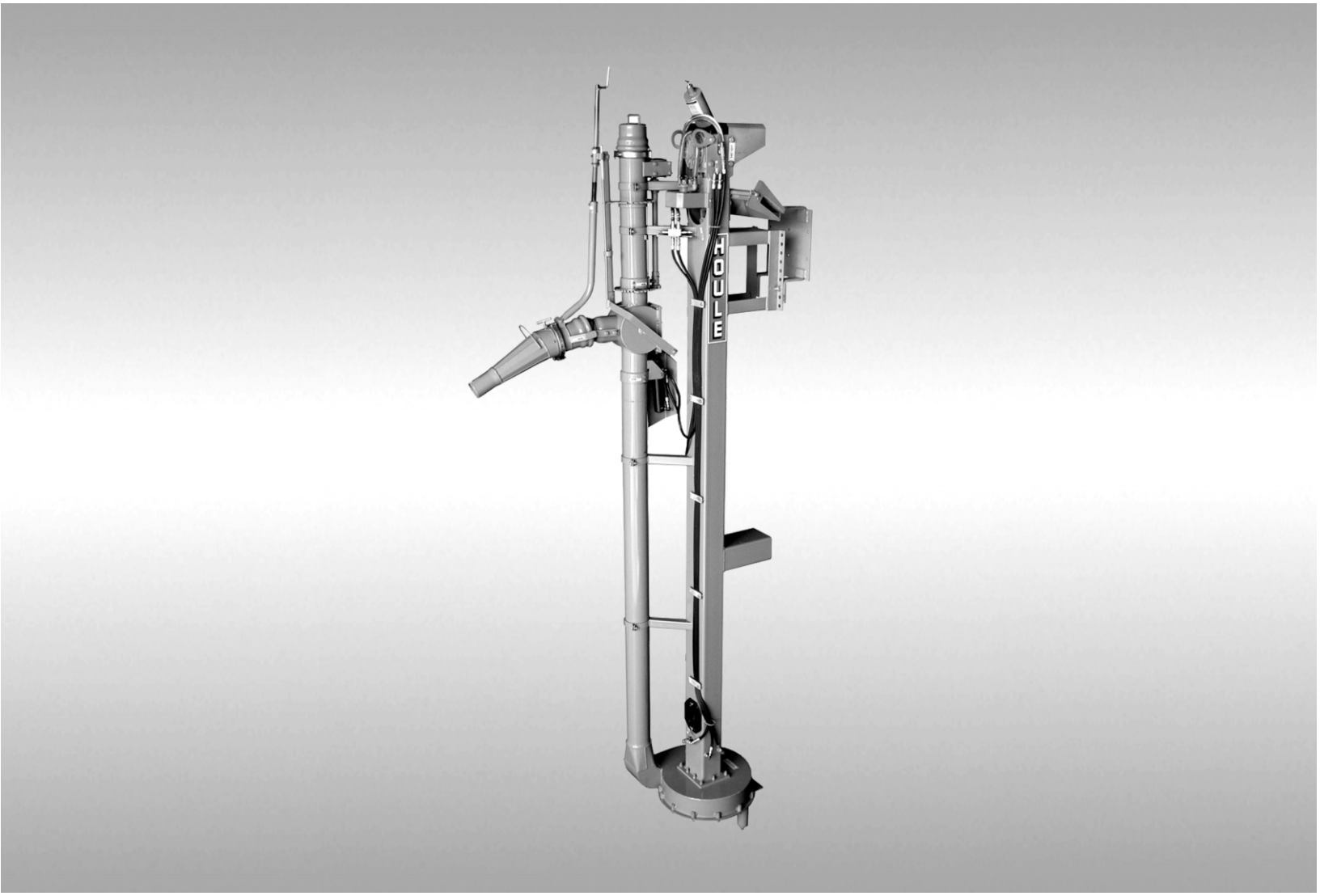

Stationary Super Pump

PTO pumps

Instruction Manual / Installation Instructions
(Original instructions)

2010-9015-002
03-2014

engineering for a better world

GEA Farm Technologies

Contents

1 Preface

1.1 About this manual

The manufacturer reserves the right to make changes due to technical developments in the data and images given in this manual.

Reproductions, translations and copies of any kind, even of extracts, require written authorization from the manufacturer.

The abbreviations, units, technical terms, special names or industry-specific terminology used in this manual are explained in more detail in the "Appendix".

These instructions are part of the supply.

- They should be kept close at hand and remain with the equipment even if the equipment is sold.
- This manual is not subject to an amendment service. The most recent version at any time can be obtained through the technical dealer or directly from the manufacturer.
- It is designed modular and is only in relation to the mentioned product. More information on the product and components associated with the product may also be given in the corresponding documents and manuals. This applies especially to safety information!

Pictograms used

This pictogram indicates information that will help towards better understanding of a procedure or operation.

A correction bar in the margin indicates changes to the previous edition. The character string "!!" in the search field of the PDF document locates the correction bar.

This pictogram refers to another document or another section of this manual.

If a manual number is given, the middle 4 figures indicate the language, as follows:

	Language		**Language**		**Language**
-9000-	German	-9013-	Dutch	-9032-	Serbian
-9001-	English (Great Britain)	-9015-	English (North America)	-9034-	Slovak
-9002-	French (France)	-9016-	Polish	-9035-	Chinese
-9003-	Italian	-9018-	Japanese	-9036-	Lithuanian
-9004-	Romanian	-9021-	Danish	-9038-	Portuguese (Brazil)
-9005-	Spanish (Spain)	-9022-	Hungarian	-9039-	French (Canada)
-9007-	Swedish	-9023-	Czech	-9040-	Latvian
-9008-	Norwegian	-9024-	Finnish	-9041-	Estonian
-9009-	Russian	-9025-	Croatian	-9043-	Spanish (Central America)
-9010-	Greek	-9027-	Bulgarian		
-9012-	Turkish	-9029-	Slovene		
Not all of the above languages may be available.					

1.2 Manufacturer's address

GEA Farm Technologies Canada Inc. / Division GEA Houle
4591 boul. St-Joseph
Drummondville, Qc, J2A 0C6

☎ +1 819 477 - 7444
🖷 +1 819 477 - 5565
✉ geahoule@gea.com
@ www.gea-farmtechnologies.com

1.3 Customer services

Authorized Technical Dealer

If necessary, please contact your nearest authorized technical dealer.

There is a comprehensive dealer Internet search function on our website at the following address:

www.gea-farmtechnologies.com

European Contact Information:

GEA Farm Technologies GmbH
Siemensstraße 25-27
D-59199 Bönen

☎ +49 (0) 2383 / 93-70
🖷 +49 (0) 2383 / 93-80
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@ www.gea-farmtechnologies.com

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GEA Farm Technologies, Inc.
1880 Country Farm Dr.
Naperville, IL 60563

☎ +1 630 369 - 8100
🖷 +1 630 369 - 9875
✉ contact_us@gea.com
@ www.gea-farmtechnologies.com

1.4 Declaration of conformity

Manufacturer:	**GEA Farm Technologies Canada Inc. / Division GEA Houle** **4591 boul. St-Joseph** **Drummondville, Qc, J2A 0C6**
Product description:	**PTO pumps**
Type of product:	**Stationary Super Pump**

The named product is in conformity with the requirements of the following European directives:

2006/42/EC Machinery Directive

Conformity with the requirements of these directives is testified by complete adherence to the following standards:

- Harmonized European standards

EN 809 (2009-06)	Pumps and pump units for fluids - general safety requirements
EN 953 (2009-07)	Safety of machinery Guards
EN 4254-1 (2010-01)	Agricultural Machinery - safety General requirements
EN 4413 (1999-08)	Hydraulic fluid power General rules relating to systems
EN 12100-1 (2009-10)	Machine safety, basic terms, general design guidelines. Part 1: Basic terminology, methods
EN 12100-2 (2009-10)	Machine safety, basic terms, general design guidelines. Part 2: Technical guidelines and specifications
EN ISO 14121-1 (2007-12)	Safety of machinery - Risk assessment - Part 1: Principles
EN ISO 14121-2 (2007-12)	Safety of machinery - Risk assessment - Part 2: Practical guidance and examples of methods
NF X 08-003-1 (2006-07)	Graphic and pictographic symbols - colors and safety signs

Person responsible for compiling the relevant technical documents:	Josef Schröer GEA Farm Technologies GmbH Siemensstraße 25-27 D-59199 Bönen ☏ +49 (0) 2383 / 93-70
Drummondville, 01 August 2009	Yann Desrochers (Head of Research and Development)

The undersigned is acting by virtue of power of attorney from the management of:
GEA Farm Technologies Canada Inc. / Division GEA Houle, 4591 boul. St-Joseph, Drummondville, Qc, J2A 0C6

This declaration certifies compliance with the guidelines indicated, but does not establish any guarantee in the sense of paragraphs 443, 444 of the BGB.
This declaration of conformity becomes invalid if design changes are made which affect the technical data given in the instructions and the correct use of the product, thereby significantly altering the machine!

1.5 GEA Houle Inc. - General Equipment Warranty

Important notice!
THIS GENERAL WARRANTY APPLIES TO ALL EQUIPMENT SOLD UNDER THE GEA HOULE TRADEMARK.

1.5.1 Limited warranty

GEA Houle Inc. (hereinafter referred to as "the Company") warrants to the original buyer and end user (hereinafter referred to as the "Purchaser") that the parts of all equipment sold under the Company trademark are free from defects in material or workmanship for a period of twelve (12) months from the date of delivery of the equipment to the Purchaser. This written warranty takes precedence over any other written warranty included in previous versions of the Company's manuals. Any equipment used for commercial usage, commercial lease on one or more farms is warranted for a reduced period of thirty (30) days only.

Components from third-party manufacturers that are not built by the Company, and which are accessory to the equipment sold under the Company trademark (including, without limitation, the motors and tires), are subject to such third-party manufacturers' specific warranty coverage.

THIS WARRANTY EXTENDS ONLY TO THE PURCHASER AND DOES NOT APPLY IN THE EVENT THAT THE EQUIPMENT IS SOLD OR OTHERWISE TRANSFERRED.

1.5.2 Condition of the limited warranty

The Company, through its GEA authorized dealers only (hereinafter referred to as "Dealer"), reserves the right to either repair or replace all parts deemed defective under the following conditions:

1. That the equipment is installed, operated and maintained in accordance with the Company directives;
2. That the Purchaser uses the equipment in accordance with specific instructions, under normal conditions, for the sole purpose for which the equipment was designed;
3. That the Purchaser notifies in writing his Dealer or the Company (whichever the case may be) of any defect of the equipment. In either case the notification must be made within the twelve (12) months following the date of the delivery to the Purchaser;
4. The Purchaser or the Dealer must keep the defective parts or equipment for inspection by the Company and return such defective parts or equipment prepaid to the Company, if requested;
5. That the Purchaser does not modify the equipment, nor attempts to repair any equipment or parts without proper authorization from the Company;
6. Depending on the nature of the equipment involved and whether it is fixed or transportable, the Company will repair or replace the defective parts of the equipment free of charge where installed, or at the business place of the Dealer or the Company, at its sole discretion.

1.5.3 Extent of limited warranty

This limited warranty DOES NOT cover:

- Defects caused by negligence of the Purchaser in the maintenance of the equipment, improper use resulting from failure to adhere strictly to the Company's manuals or non-compliance with prescribed maintenance instructions provided by the Company (including, without limitation, lack of lubrication of the equipment), as well as damages arising from non-conforming installation of the equipment, or ambient temperature or conditions of storage of the equipment that do not comply with the Company's recommendations (including, without limitation, any damages resulting from storage or operation of the equipment at a temperature equal or below the freezing point (5°C/41°F));
- Damages to equipment due to normal wear and tear or to external causes, including issues of power or inadequate electrical conditions (including, without limitation, inadequate tension (neutral/ground), abnormal mechanical or environmental conditions (including, without limitation, damages caused by fire, lightning, flood or other natural disaster), damages caused by the use of sand litter or other abrasive or inadequate material (including, without limitation, damages caused by solids in the manure, such as stone, wood, iron, concrete, and strings), as well as damages caused by ice or frozen manure blocking the evacuation line of the equipment or the introduction of such solids in the equipment;
- Freight and shipping associated with repair or replacement of equipment under this limited warranty, as well as all costs relating to removal or replacement of any equipment that is welded or affixed permanently to the ground or a building (including, without limitation, labor costs, and costs related to concrete or excavation);
- Claims arising from repairs or replacements made by the Purchaser without the prior written consent of the Company. The Purchaser shall not remove or alter any safety device, guard, or warning sign.

If the Purchaser fails to comply with any of its obligations referred to in this paragraph, the Purchaser agrees to save the Company and the Dealer harmless in respect of any liability or obligation incurred by the Company or the Dealer resulting from such failure of the Purchaser.

1.5.4 Warranty limitations and exclusion

NO WARRANTY, ORAL OR WRITTEN, EXPRESS OR IMPLIED, OTHER THAN THE ABOVE WARRANTY IS PROVIDED IN RESPECT OF THE EQUIPMENT SOLD.

Some states (or jurisdictions) do not allow the exclusion of implied warranties so it is possible that this limitation may not apply.

THE COMPANY DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY, ADAPTABILITY OR OF PERFORMANCE, PROVIDED THAT SUCH EXCLUSION OF LIABILITY COMPLIES WITH THE LAWS HAVING APPLICABLE REGULATORY JURISDICTION.

THE LIABILITY OF THE COMPANY AND ITS DEALERS UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF DEFECTIVE PARTS UP TO THE CONTRACT VALUE FOR THE PURCHASED EQUIPMENT. IN NO EVENT SHALL THE COMPANY BE LIABLE FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, INCIDENTAL, PUNITIVE OR EXEMPLARY DAMAGES IN ANY KIND OR CHARACTER, INCLUDING INDIRECT COSTS, LOSS OF PRODUCTION, LOSS OF REVENUES OR PROFITS, AND OTHER DISBURSEMENTS WHICH MAY OCCUR.

Some states (or jurisdictions) do not allow the exclusion or limitation of incidental or consequential damages and so it is possible that these limitations or exclusions may not apply.

1.5.5 General statements

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS THAT VARY BY JURISDICTION.

THE DEALER IS NOT AUTHORIZED TO MAKE ANY ADDITIONAL OR REPRESENTATIONS OR PROMISES THAT DIFFER IN ANY WAY FROM THE TERM OF THIS LIMITED WARRANTY, OR MODIFY THE PROVISIONS, DURATION AND CONDITIONS OF THIS LIMITED WARRANTY. NO WAIVER OR MODIFICATION OF THIS LIMITED WARRANTY IS VALID UNLESS AGREED TO IN WRITING AND SIGNED BY THE AUTHORIZED REPRESENTATIVES OF THE COMPANY.

IN THE EVENT OF ANY CONFLICT BETWEEN THE ENGLISH LANGUAGE VERSION AND ANY OTHER TRANSLATED VERSION OF THIS LIMITED WARRANTY (WITH THE EXCEPTION OF THE FRENCH LANGUAGE VERSION) THE ENGLISH VERSION SHALL PREVAIL.

2 Safety

2.1 Owner's obligation of care

The product has been designed and constructed while taking account of a potential risk analysis and after careful selection of the harmonized standards and other technical specifications to be complied with. It therefore guarantees a maximum level of safety.

This safety can only be achieved in practice on the farm however when all of the necessary measures have been taken. It is part of the farmer's obligation of care to plan these measures and check that they are carried out.

In particular, the owner must ensure that

- Everyone who works with or performs activities in connection with the product must carefully read the instructions (especially the safety instructions and warnings) and sign to confirm that they have understood them and will act in accordance with them!
- A full set of legible instructions is always kept by the product.
- Anyone who has to carry out work on the product can look at the instructions at any time.
- The instructions in the section entitled ”Basic safety instructions” are observed.
- The legal requirements are observed.
- The owner has to produce operating instructions for the farm which are especially adapted to the conditions of his business, once again expressly taking account of the safety aspects.
- The product
  - Should only be used for its intended purpose.
  - Should only be used if it is in perfect operating condition and, in particular, the safety equipment should be regularly checked to make sure it is in perfect operating condition.
- The work to be carried out is performed by a sufficiently qualified person!

In this respect, please also read the section on ”Personnel Qualification”.

- These personnel will be regularly instructed in all relevant matters of safety at work and protection of the environment and be familiar with the manual, particularly the safety instructions it contains.
- Operating personnel who require training may only work on the product under the supervision of an experienced person. The successful completion of training is to be confirmed in writing.
- All safety or warning instructions applied are not removed and remain legible.
- A Danger! TOXIC GASES sign is posted at the eye level, at the entry of the pit area. Make sure this sign remains visible all the time.

- Escape routes are marked by means of signs in accordance with national regulations!
- The personal protective equipment required for personnel carrying out operation, maintenance and repairs is made available and used.
- No one must enter into a manure pit at any time.
- The “Safety Procedures for Confined Spaces” are always followed before operating or maintaining the pump. These safety procedures clearly explain the risks associated with manure, procedures for a safe access to work spaces and the minimum ventilation requirements to ensure the safety of humans and livestock. Find local safety procedures for confined spaces using Web Site below.

Location	Administrated by	Web Site
In Canada	Canadian Centre for Occupational Health and Safety	**www.ccohs.ca**
In USA	Occupational Safety and Health Administration	**www.osha.gov**
In European Union	European Agency for Safety and Health at Work	**www.europe.osha.eu.int**

- Unauthorized persons (e.g. children) are not allowed in hazardous areas and do not have access to cleaning agents or disinfectants.
- All guard are kept in place.
- Hands, feet and clothing are kept away from all moving parts.
- No one stands close to moving parts before starting the equipment.
- Never allow bystanders to stay close to the pump when it is lifted and / or in operation.
- The equipment is stopped before lubricating, maintaining and adjusting.

2.2 Explanation of the safety symbols used

Safety symbols draw attention to the importance of the adjacent text.
The design of the warnings is based on ISO 3864-2 and ANSI535.6.

Safety symbols and signaling word

Danger!
The indication "Danger" signals immediate danger to life or health of personnel.
Death or serious injury will result if the danger is not avoided.

Warning!
The indication ”Warning” signals danger to life or health of personnel.
Death or serious injury may result if the danger is not avoided.

Attention!
The indication "Attention" signals important information on risks for the product or the environment.

2.3 Basic safety instructions

Danger!
There are warnings about specific residual dangers in the corresponding chapters.

Attention!
If the work requires special qualifications, these are described in the corresponding chapters!

- There are risks involved in the operation and maintenance of equipment for dairy farms. For your own safety, read and follow the operating manual carefully (especially the section entitled ”Safety information”)!
- The chapter on ”Technical data” gives the permissible working conditions (pressure ranges, temperature ranges, airflow quantities etc.) and these must be observed!
- Do not open or dismantle devices (risk of injury)!
- Do not remove any protective devices (risk of injury)!
- When working with products from other manufacturers always observe the warnings from the safety data sheets and operating instructions from the product manufacturer!
- Do not stand underneath suspended loads.

2.4 Personnel qualification

All personnel who perform work on or with the product must carefully read and understand the instructions and act in accordance with them!

- Participation in corresponding product training is necessary.
- In principle, any work on hydraulic and pneumatic equipment may only be carried out by specialist personnel who have received the necessary training.

In addition, special qualifications are required for the following activities:

- Transport
- Cleaning
- Installation
- Commissioning
- Operation
- Maintenance / servicing
- Troubleshooting
- Repairs
- Shut-down

Attention!
Particular qualifications are described in the corresponding chapters!

2.5 Protective devices

- Protective devices

Protective guard for power take off driveline
(part no. 2010-7600-960) European

Safety cap
(part no. 2010-7704-670)

- Safety symbols, warnings, warning signs and labels

Danger! - Toxic gases (American model)
Manure produces toxic gases that can cause loss of consciousness, asphyxia or death in few seconds.
(part no. 2099-4720-010)

Danger! (European model)
Manure produces toxic gases that can cause loss of consciousness, asphyxia or death in few seconds.
(part no. 2099-4725-210)

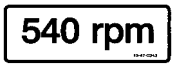
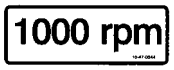
Danger! (European model)
Read the instruction manual before operating.
(part no. 2099-4725-100)

Danger! (American model)
Rotating driveline. Keep away!
(part no. 2099-4720-020)

Danger! (American model)
Before removing this cap, stop the pump.
Actuate directional valve cylinder a few times in order to relief pressure from the discharge pipe.
(part no. 2099-4720-070)

Danger! (European model)
High pressure
(part no. 2099-4725-400)

Warning! (American model)
Always stop the equipment before servicing and maintenance.
Never adjust the equipment while it is running.
Keep all shields and guards in place.
Keep hands and loose clothing away from moving parts.
Make sure everyone is clear from moving parts before starting the equipment.
Refer to the owner's manual for operating and maintenance instructions.
(part no. 2099-4721-020)

	**Warning! (European model)** (part no. 2099-4725-200)
	**Warning! (European model)** Read the instruction manual before operating, maintenance. (part no. 2099-4725-130)
	**Maximum 540 RPM** (part no. 2010-4703-430)
	**Maximum 1000 RPM** (part no. 2010-4703-440)

3 Description

3.1 Correct applications

GEA Houle products and equipment are designed exclusively for agricultural livestock farms.

The Pump is exclusively designed for:

- To homogenize and transfer liquid manure that may contain limited chopped bedding and minimal water with bottom sediments.
  - Maximum consistency for agitation is 2¼" [57 mm]
  - Maximum consistency for transfer is ¾" [19 mm]

Any applications that are not listed here are not part of the intended purpose and are therefore considered as improper use!

We would like to point out that the following in particular are prohibited:

- Processing substances other than manure and water through the pump.

The manufacturer/supplier is not liable for any resulting damage. The user alone bears the risk.

Correct use also includes reading the instructions and observing the inspection and maintenance conditions.

- The manufacturer expressly points out that only original parts and original accessories have been adapted, tested and authorized for use with the product.
- The installation or use of products from other manufacturers may affect the specified properties of the original parts and lead to injury to people and animals.
- The manufacturer does not accept any liability for injury to people or animals, or damage to the product, caused by the use of products from other manufacturers.

3.2 Changes to the product

For safety reasons, do not carry out any unauthorized changes!

Any planned changes must be approved by the manufacturer in writing.

Parts and special equipment which have been obtained elsewhere must be expressly authorized by GEA Houle, in writing, for use in GEA Houle components and installations.

3.3 Design of the equipment

Design

The Stationary Super Pump consists of:

- a vertical pump mounted to the wall of a manure pit.
- an adjustable nozzle to homogenize manure.
- a directional valve to divert the flow to either the agitation nozzle or the discharge line.

Drive

The pump is driven with a PTO shaft connected to the tractor.

3.4 Functional description

Stationary Super Pump

- The pump is mounted to the wall of a manure pit.
- The pump will agitate, homogenize and transfer manure from the manure pit.
- The agitation nozzle is adjusted up and down plus rotated side to side to homogenize the manure in the pit.

3.5 Technical Data

Performance data

6” Super pump with impeller 20” x 6 blades and 12” intake.

RPM/ ratio	Hp	Nozzle diameter	Nozzle pressure	Shut-off pressure	Maximum head *
540 / +10%	70	3” [76 mm]	20 psi [1.4 bar]	22 psi [1.5 bar]	36 ft [11.0 m]
540/ +26%	85	3” [76 mm]	26 psi [1.8 bar]	28 psi [1.9 bar]	45 ft [13.7 m]
540/ +26%	100	(2) x 3” [76 mm]	22 psi [1.5 bar]	28 psi [1.9 bar]	45 ft [13.7 m]
1000/ -35%	95	3” [76 mm]	30 psi [2.1 bar]	33 psi [2.3 bar]	53 ft [16.2 m]
1000/ -35%	120	(2) x 3” [76 mm]	25 psi [1.7 bar]	33 psi [2.3 bar]	53 ft [16.2 m]
1000/ -26%	110	3” [76 mm]	35 psi [2.4 bar]	38 psi [2.6 bar]	61 ft [18.6 m]
1000/ -26%	135	(2) x 3” [76 mm]	28 psi [1.9 bar]	38 psi [2.6 bar]	61 ft [18.6 m]

8” Super pump with impeller 21” x 4 blades and 14” intake.

RPM/ ratio	Hp	Nozzle diameter	Nozzle pressure	Shut-off pressure	Maximum head *
1000/ -26%	145	3¼” [83 mm]	35 psi [2.4 bar]	40 psi [2.8 bar]	65 ft [19.8 m]
1000/ -26%	155	4” [102 mm]	32 psi [2.2 bar]	40 psi [2.8 bar]	65 ft [19.8 m]
1000/ -26%	160	(2) x 3” [76 mm]	30 psi [2.1 bar]	40 psi [2.8 bar]	65 ft [19.8 m]
1000/ -26%	170	(2) x 3¼” [83 mm]	28 psi [1.9 bar]	40 psi [2.8 bar]	65 ft [19.8 m]

8” Super pump with impeller 22” x 4 blades and 14” intake.

RPM/ ratio	Hp	Nozzle diameter	Nozzle pressure	Shut-off pressure	Maximum head *
1000/ -26%	170	4” [102 mm]	34 psi [2.3 bar]	43 psi [3.0 bar]	70 ft [21.3 m]
1000/ -26%	175	(2) x 3” [76 mm]	32 psi [2.2 bar]	43 psi [3.0 bar]	70 ft [21.3 m]
1000/ -26%	185	(2) x 3¼” [83 mm]	30 psi [2.1 bar]	43 psi [3.0 bar]	70 ft [21.3 m]
1000/ -26%	195	(2) x 3½” [89 mm]	28 psi [1.9 bar]	43 psi [3.0 bar]	70 ft [21.3 m]

8” Super pump with impeller 22” x 6 blades and 14” intake.

RPM/ ratio	Hp	Nozzle diameter	Nozzle pressure	Shut-off pressure	Maximum head *
1000/ -26%	190	(2) x 3” [76 mm]	34 psi [2.3 bar]	46 psi [3.2 bar]	74 ft [22.6 m]
1000/ -26%	200	(2) x 3¼” [83 mm]	32 psi [2.2 bar]	46 psi [3.2 bar]	74 ft [22.6 m]
1000/ -26%	210	(2) x 3½” [89 mm]	30 psi [2.1 bar]	46 psi [3.2 bar]	74 ft [22.6 m]

* Maximum pumping head permitted.

Hydraulic hoses

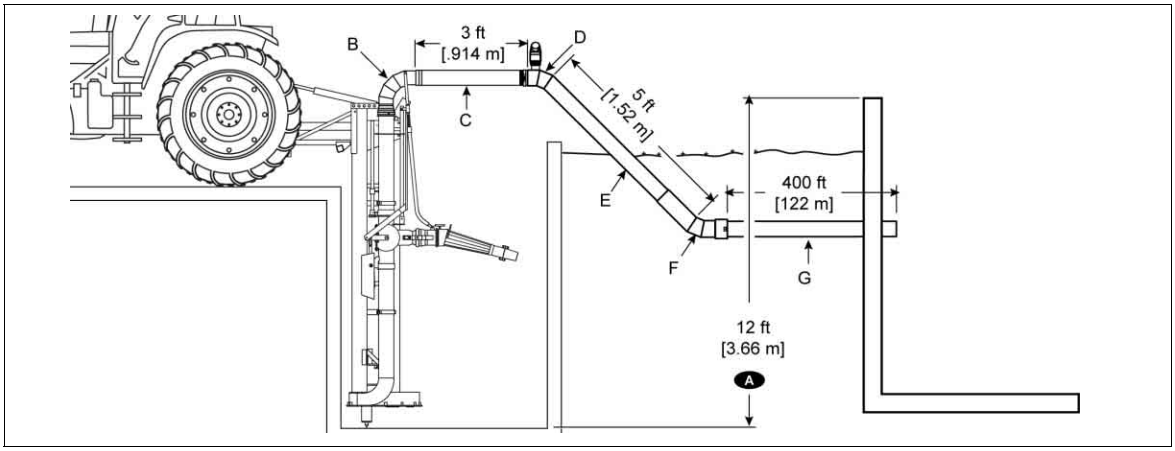
I.D.	¼”	½”	¾”
O.D.	0.58”	0.86”	1.10”
Quantity of braids	2	2	1
Service pressure	400 bar (5,800 psi)	276 bar (4,000 psi)	105 bar (1,525 psi)
Service temperature	-40ºC to 100ºC (-40ºF to 212ºF)		

3.6 Total Pumping Head Formula

3.6.1 S.A.E. Example

Refer to Appendix: Pumping Head Calculation to correctly fill the formula.

- Determine the Wanted Transfer rate.
- Execute the manure Consistency Test.
- Sketch the Transfer Line with all lengths, diameters, elbows valves, adaptors material type and elevation like the example below.
- To get the Total length of the line, add length of pipes of same type to the Equivalent Linear Dimension of components of same diameter: Elbows, Adaptors and Valves are added with their PVC pipes or flexible hoses.
- Multiply the Total length of the line by its corresponding Friction Loss Coefficient.

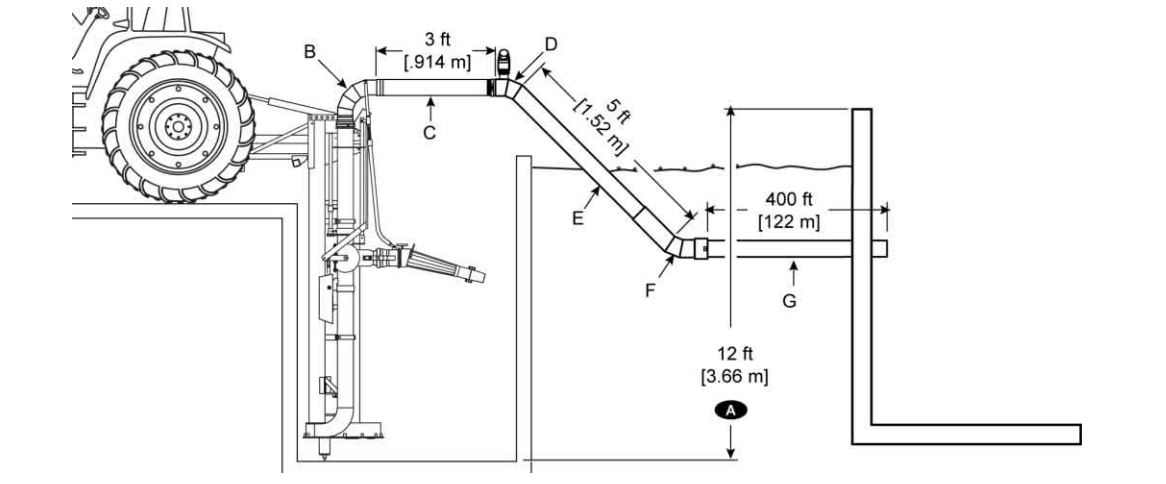


	Wanted Transfer Rate	Pipe Diameter	Consistency	Type of pipe or component		Evacuation Line Total or Equivalent Length (ft)		Friction Loss Coefficient		(ft)
A				elevation	>	12			=	12
B	600 gpm	6”	1/8”	90° Steel elbow	>	32	X	0.0344	=	1.101
C	600 gpm	6”	1/8”	hose	>	3	X	0.0344	=	0.103
D	600 gpm	6”	1/8”	45° Steel elbow	>	12	X	0.0344	=	0.413
E	600 gpm	6”	1/8”	steel pipe	>	5	X	0.0344	=	0.172
F	600 gpm	6”	1/8”	45° Steel elbow	>	12	X	0.0344	=	0.413
G	600 gpm	6”	1/8”	PVC pipe	>	400	X	0.0286	=	11.44
H	600 gpm	6”	1/8”	90° Steel elbow	>	32	X	0.0344	=	1.101
						Total Pumping Head of Transfer Line (ft) (Add all components length to obtain the Total Pumping Head)			=	26.743

3.6.2 Metric Example

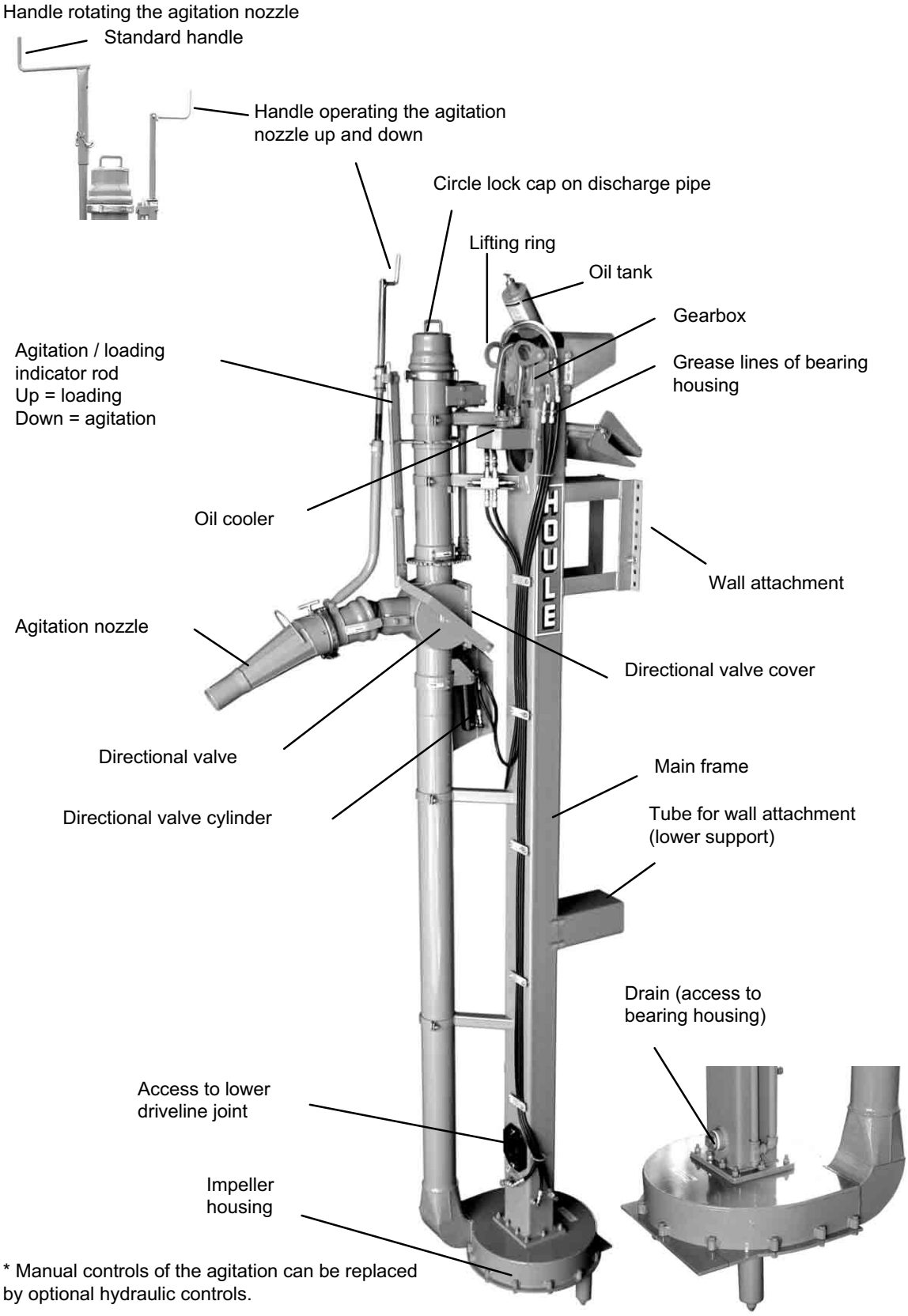
Refer to Appendix: Pumping Head calculation to correctly fill the formula.

- Determine the Wanted Transfer rate.
- Execute the manure Consistency Test.
- Sketch the Transfer Line with all lengths, diameters, elbows valves, adaptors material type and elevation like the example below.
- To get the Total length of the line, add length of pipes of same type to the Equivalent Linear Dimension of components of same diameter: Elbows, Adaptors and Valves are added with their PVC pipes or flexible hoses.
- Multiply the Total length of the line by its corresponding Friction Loss Coefficient.



	Wanted Transfer Rate	Pipe Diameter	Consistency	Type of Pipe or component		Evacuation Line Total or Equivalent Length (m)		Friction Loss Coefficient		(m)
A				elevation	>	3.658			=	3.658
B	2280 lpm	150 mm	3 mm	90° Steel elbow	>	10	X	0.0344	=	0.344
C	2280 lpm	150 mm	3 mm	hose	>	0.914	X	0.0344	=	0.031
D	2280 lpm	150 mm	3 mm	45° Steel elbow	>	3.5	X	0.0344	=	0.120
E	2280 lpm	150 mm	3 mm	steel pipe	>	1.524	X	0.0344	=	0.052
F	2280 lpm	150 mm	3 mm	45° Steel elbow	>	3.5	X	0.0344	=	0.120
G	2280 lpm	150 mm	3 mm	PVC pipe	>	122	X	0.0286	=	3.489
H	2280 lpm	150 mm	3 mm	90° Steel elbow	>	10	X	0.0344	=	0.344
						Total Pumping Head of Transfer Line (m) (Add all components length to obtain the Total Pumping Head)			=	8.158

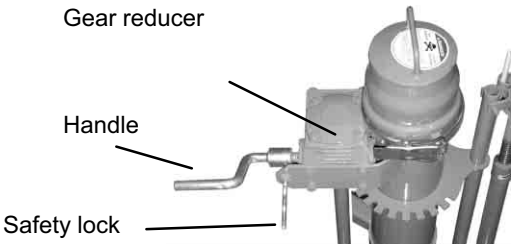
3.7 Main view



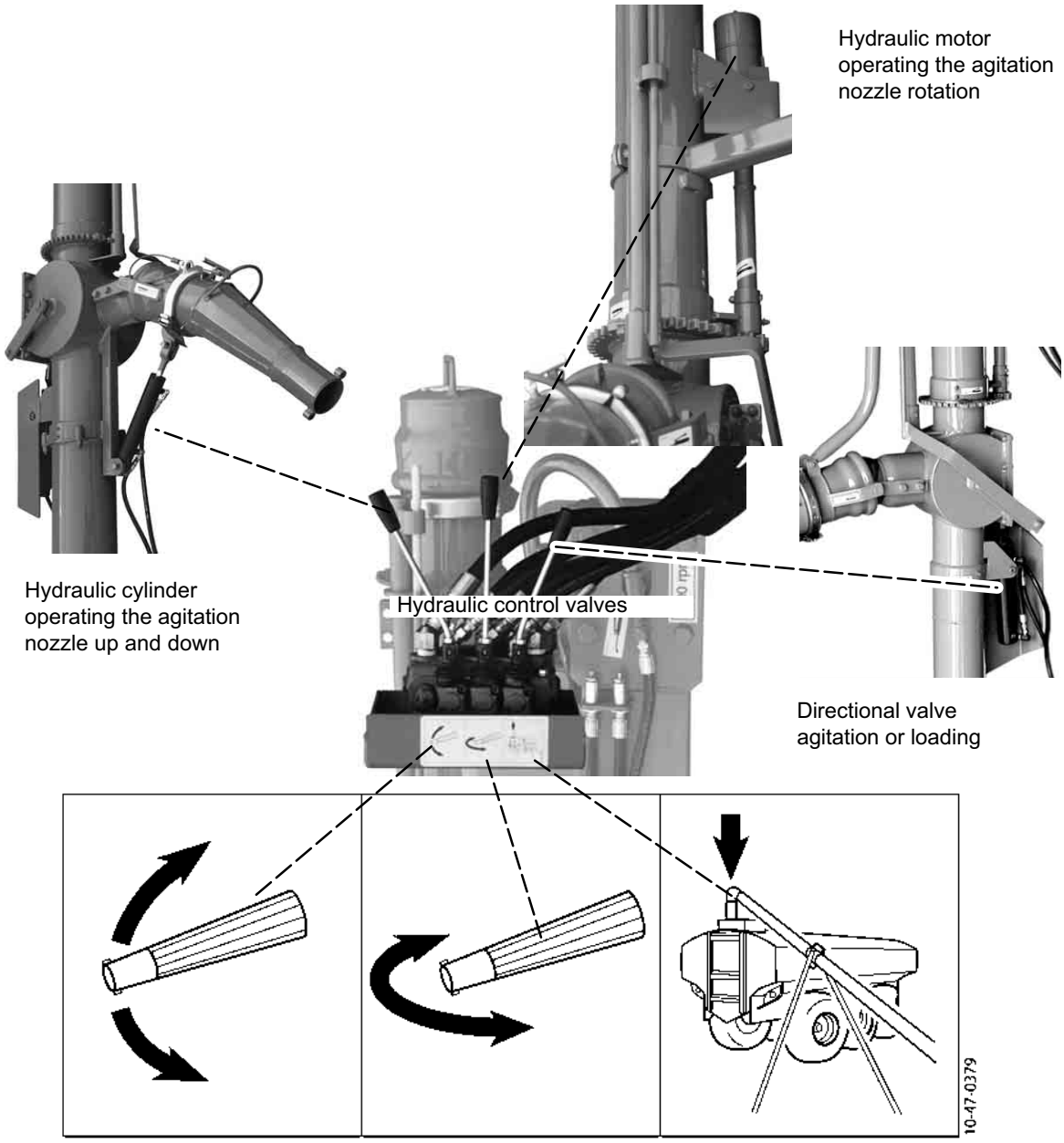
* Manual controls of the agitation can be replaced by optional hydraulic controls.

3.8 Options

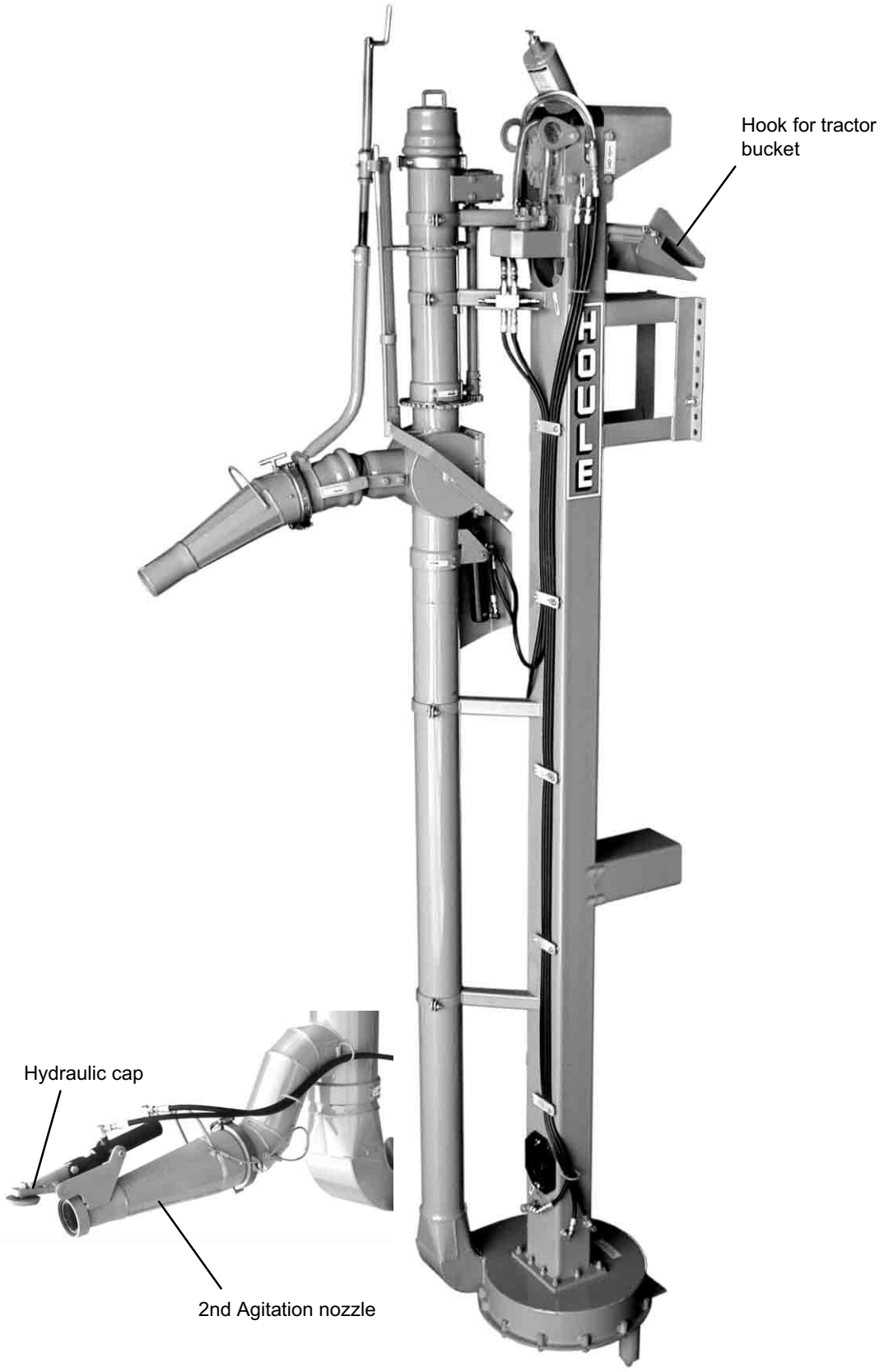
Gear reducer to rotate the agitation nozzle



Hydraulic controls



Hook for tractor and 2nd agitation nozzle



4 Transport

4.1 Special personnel qualification required for transport

Transport may only be performed by specially qualified personnel in accordance with the safety instructions.

- National driver's license for drive-on machines, stackers and other trucks.

4.2 Safety instructions for transport

To prevent damage to property and/or life-threatening injury to personnel always observe the following:

- Only the load suspension and support equipment indicated here should be used, at the specified support points, for transport.


Also read the chapter on ”Safety”.

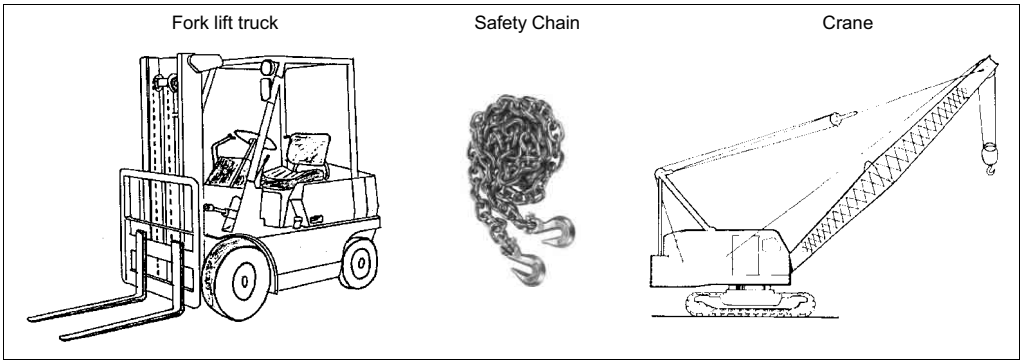
Special transport hazards:

- Projecting sharp edges may cause cuts.
- Suspended loads can fall and then there will be a risk of death - do not stand underneath suspended loads!
- Parts which are stacked too high can collapse.
- If load suspension devices other than those indicated here are used, this may lead to serious damage to property and/or life-threatening injury to people.
- There is a fire hazard due to the highly inflammable packing material - naked flames and smoking prohibited!
- If lubricants, preservatives, ... are not kept upright during transportation they can leak out and there is a risk of irritation if they come into direct contact with the skin.

4.3 Permissible devices and aids for transportation

The Pump is made up of heavy components.

Appropriate lifting gear and carrying devices such as, chain hoist, safety chain, fork lift truck or front loader is to be provided.

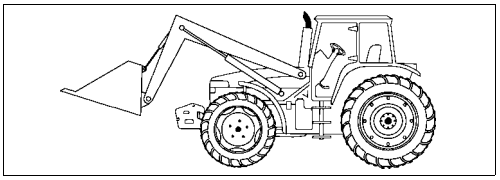


Note!
To lift the pump and steady in place when assembling, use a lifting device with a minimum capacity of;
1,300 lb [600 kg].

Danger!
Do not stand underneath suspended loads.
Suspended loads may fall, so there is a danger of death!

4.4 Transport

The pump has an (optional) hook for tractor bucket allowing the pump to be easily lifted with a front end loader.



4.5 Includes

Check the goods supplied against the packing list enclosed for completeness and damage.

4.6 Information on disposing of packing material

After unpacking, the packing material is to be handled properly and disposed of carefully in accordance with the valid local regulations on waste disposal and utilization.

5 Installation

If necessary, please contact your nearest authorized technical dealer.

5.1 Special personnel qualification required for installation

Installation may only be carried out by specially qualified personnel in accordance with the safety instructions.

5.2 Safety instructions for installation

Danger!
Read Instructions First! To prevent serious injury or death, do not operate or service this machine without first reading and understanding the operator's manuals for all of the equipment. If these manuals are lost, contact your nearest dealer or the manufacturer for replacements.

To prevent damage to property and/or life-threatening injury to personnel always observe the following:

- Before installation, look for any damage caused during transport. Do not use damaged components!
- Use only the special tool indicated for assembly.
- In particular, make sure that the tightening torques specified are complied with.

Also read the chapter on ”Safety”.

Special hazards during installation:

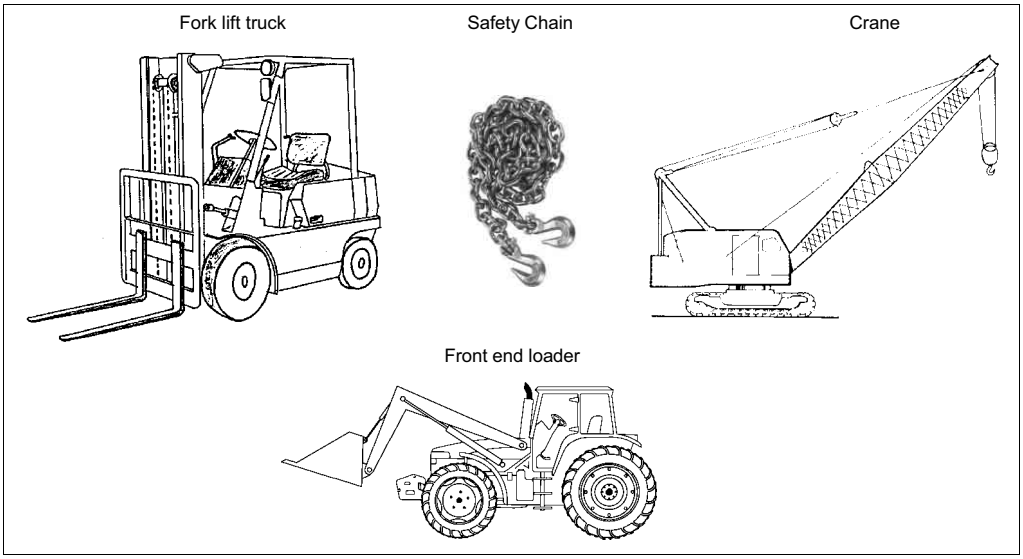
Any on/off or emergency stop switches are to be fitted with a lock to immobilize them in the open position and a warning sign is to be put up.

- Components which have not been removed correctly may fall off or twist
- Parts loosely placed on top of each other can slip and fall off.
- Components with sharp edges which are still open and accessible represent a source of injury.
- Depressurize hydraulic/pneumatic components before working on them!
- Faulty pressure pipes and connections can lead to serious physical injury.
- Cleaning and disinfecting agents which are not connected properly may lead to caustic burns and the formation of gas.
- Leaking lubricants, solvents, preservatives, ... can cause injury if they come into direct contact with the skin.
- Serious injury to personnel or damage to property can be caused if the incorrect torque is applied when tightening screws.

5.3 Assembly preparations

Special tools

Attention!
To lift the pump and steady in place when assembling, use a lifting device with a minimum capacity of;
1,300 lb [600 kg].



5.4 Pump assembly

Agitation nozzle

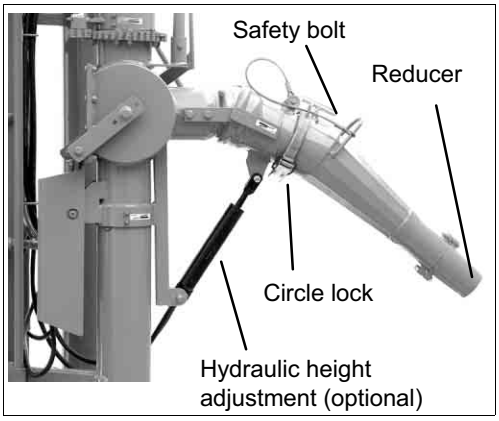
Install the handle rotating the agitation nozzle;

Install the nozzle on the directional valve.

Point the nozzle towards the ground.

Install the circle lock and tighten the safety bolt to secure the nozzle;

If required, install the reducer at the tip of the nozzle.

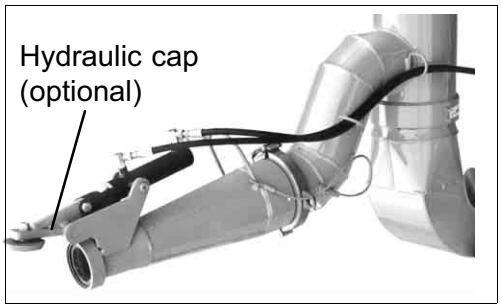


Note!
On certain pump models, the reducer is used to increase the pressure of the nozzle to reach farther, cut through thick floating crust material more effectively and/or to decrease tractor horsepower required.

2nd agitation nozzle (optional)

Install the 2nd agitation nozzle using the circle lock;

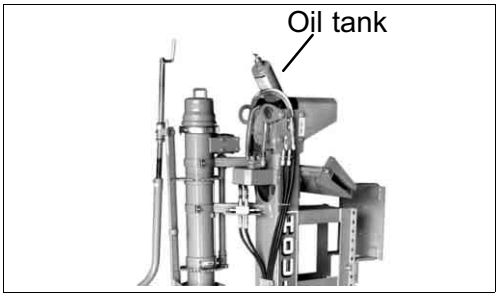
If the nozzle has a hydraulic cap (optional), set the nozzle so that the cylinder is on top.



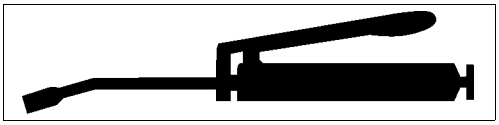
Oil tank and lubrication

Install the oil tank on the gearbox;

Fill up the oil tank with SAE 80W90 gear oil to the indicated level;



Grease all parts labeled with.

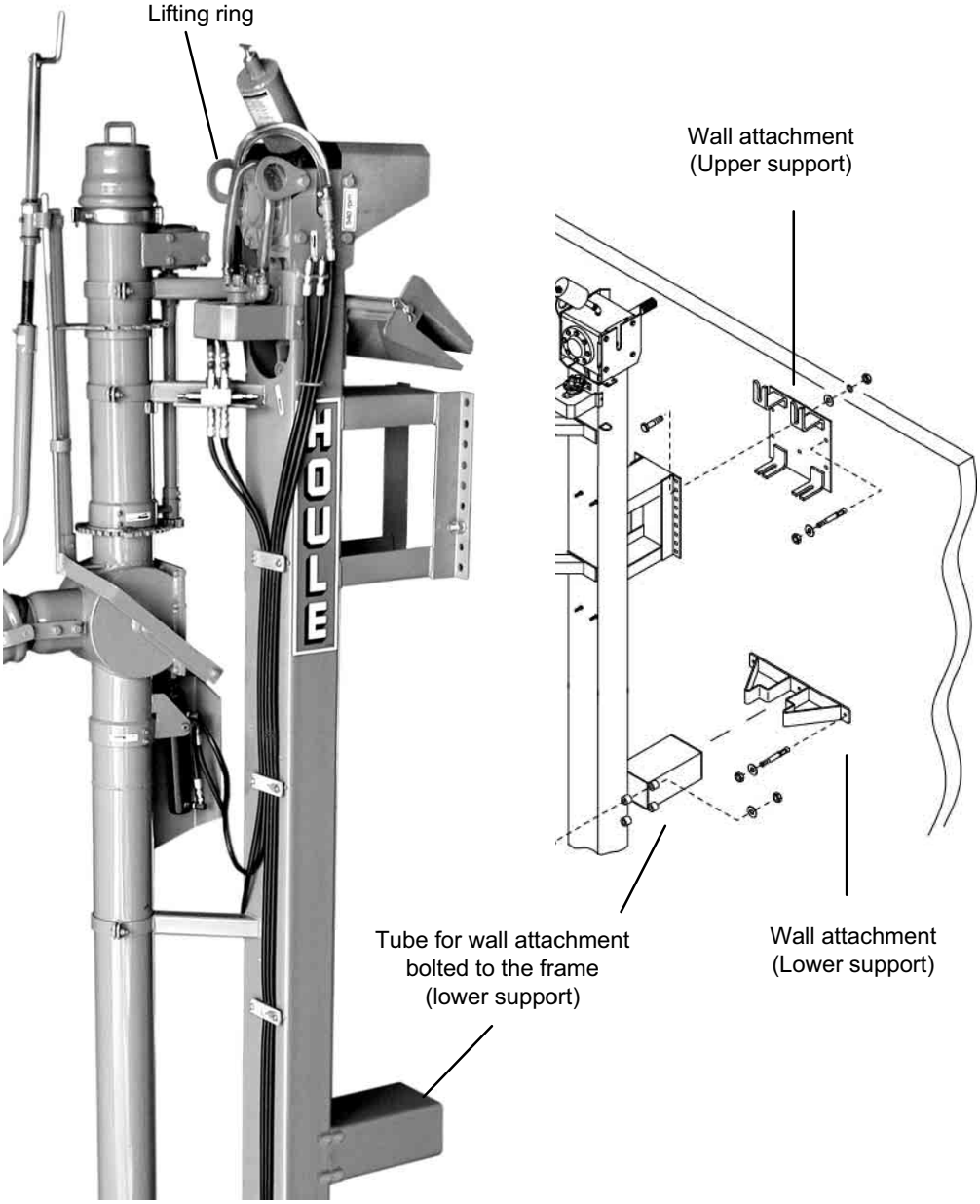


Wall attachment

Attention!
The wall attachment must be anchored to a concrete wall measuring a minimum of 6” [15 cm] thick. Lag bolts must be at a minimum distance of 4” [10 cm] from the edge of the wall.

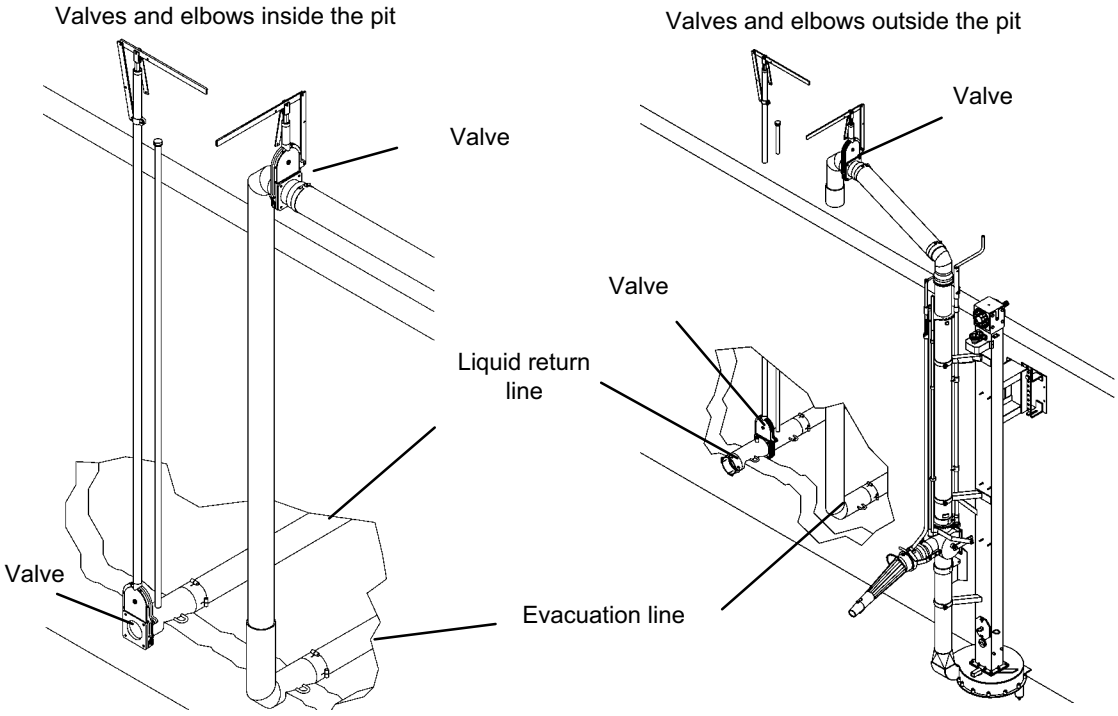
The upper support must be anchored to the wall of the pit or on the floor beside the pit.

The lower support must be anchored to the wall of the pit at the height of the tube bolted to the main frame.

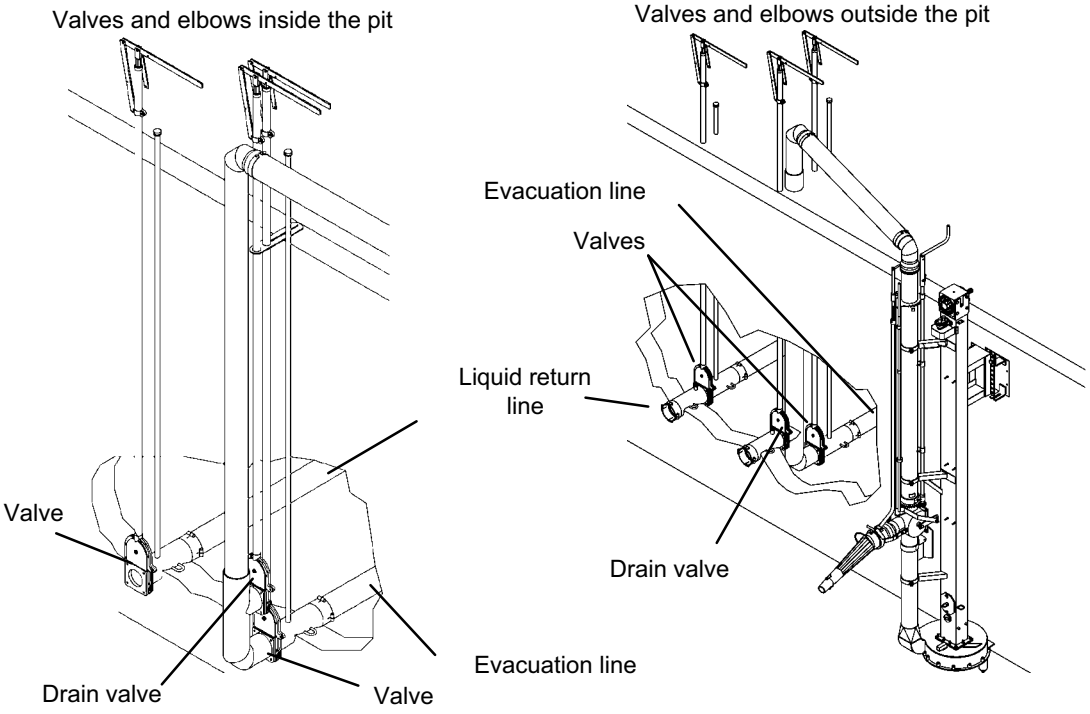


Type of Evacuation Line

Permanent evacuation line installed in a warm barn



Permanent evacuation line installed in a cold barn



5.5 Information on disposing of installation material after installation is finished

Handle unused installation material properly and dispose in accordance with current valid local regulations on waste disposal and utilization.

6 Initial Commissioning

6.1 Special personnel qualification required for initial commissioning

Initial commissioning may only be performed by specially qualified personnel in accordance with the safety instructions.

Any settings that have to be made (e.g. on control units) must always be made by personnel who have been suitably instructed/trained by the manufacturer.

6.2 Safety instructions for initial commissioning

Danger!
Read Instructions First! To prevent serious injury or death, do not operate or service this machine without first reading and understanding the operator's manuals for all of the equipment. If these manuals are lost, contact your nearest dealer or the manufacturer for replacements.

To prevent damage to property and/or life-threatening injury to personnel always observe the following:

- Before starting for the first time, check that all tools and other parts have been removed from the danger area.
- Are all of the operating media suitable, present and connected?

Also read the chapter on ”Safety”.

Special risks involved in initial commissioning:

- If the connections for cleaning and disinfecting agents are mixed up this may cause special dangers
- Check all pressure areas for leaks.

6.3 Checks before initial commissioning

The owner should ensure that:

- Oil in the oil tank is at proper level.
  - Add SAE 80W90 gear oil if necessary.
- All grease zerk have been lubricated.
- Check the product for visible damage; immediately remove any faults that are found (note personnel qualification required) or send to the specialist dealer - the product may only be used if it is perfect condition.
- Check and make sure that only authorized personnel are in the work area of the machine and no other people will be endangered by the machine starting.
- Check and make sure that there are no objects or materials in the working area if they are not necessary for operation.
- Make sure the hydraulic circuit of the tractor contains sufficient hydraulic oil to safely articulate the pump up and down.
- PTO driveline
  - Make sure the driveline guards turn freely;
  - Secure both ends of the driveline;
  - Keep all guards in place.

6.4 First start

Danger!
Manure produces toxic gases that can cause a loss of consciousness, asphyxia or death in a few seconds.
Manure agitation can produce toxic gases in buildings built above the pit. Toxic gases can also emanate in buildings situated by the pit and / or connected to the pit by an evacuation line.

Danger!
Rotating driveline keep away!

Danger!
Hydraulic line under pressure
Escaping fluid can penetrate skin causing serious injury or death. Never use your hand to feel for leaks. Hold a scrap of cardboard to feel around for leaks. Relieve pressure prior to servicing.

Once the pump has been fully assembled in accordance with instructions and the operating instructions have been read carefully, the pump can be put into operation.

Activate the pump and check the functions.

Attention!
PTO driveline must always be activated when the impeller of the pump is immersed into the manure/water. Activating the pump out of manure is only allowed for testing without exceeding one minute of operation. Running the pump impeller out of manure for more than one minute may result in damage.

Refer to the Operation section for proper procedures.

6.5 Checks after initial commissioning

Check for;

- Signs of leaks.
- Loose or damaged equipment.
- Oil in the oil tank is at proper level.
  - Add SAE 80W90 gear oil if necessary.

6.6 Handing over to the owner

Declaration of conformity and CE mark
(only necessary for European Union member states)

A declaration of conformity must be produced and a CE mark applied if a total operational installation is assembled from individual components.

If several directives apply to the total installation, the CE mark means that the requirements of all relevant directives have been met.

The technical centre/specialist dealer performing the installation work must:

- perform the installation work in accordance with the installation and safety information given in the relevant operating and installation manuals
- complete the hand-over report and have it signed
- produce the declaration of conformity for the total installation being handed over
- apply the CE mark so that it is clearly visible on the installation.

7 Operation

7.1 Special personnel qualification required for operation

Operation may only be performed by specially qualified personnel in accordance with the safety instructions.

7.2 Safety instructions for operation

Danger!
Read Instructions First! To prevent serious injury or death, do not operate or service this machine without first reading and understanding the operator's manuals for all of the equipment. If these manuals are lost, contact your nearest dealer or the manufacturer for replacements.

To prevent damage to property and/or life-threatening injury to personnel always observe the following:

- Only fit or use the product for its intended purpose.
- If the correct procedure is not followed in case of an emergency, this can result in serious injury to personnel and damage to property - therefore familiarize yourself with the instructions on what to do in an emergency.

Also read the chapter on ”Safety”.

Special dangers involved in operation and normal operation:

- Incorrect use may lead to serious damage to property and/or life-threatening injury to people.
- The careless use of personal protection equipment can result in serious physical injury.
- If the hydraulic connections to the tractor are mixed up this may cause unexpected movements.

Before operating, make sure you are adequately familiar with the following:

- the operating and control elements
- the equipment
- The method of operation
- The immediate environment
- The safety devices

Danger!
Manure produces toxic gases that can cause a loss of conciousness, asphyxia or death in a few seconds.
Manure agitation can produce toxic gases in buildings built above the pit. Toxic gases can also emanate in buildings situated by the pit and / or connected to the pit by an evacuation line.

Danger!
Rotating driveline keep away!

Danger!
Hydraulic line under pressure
Escaping fluid can penetrate skin causing serious injury or death. Never use your hand to feel for leaks. Hold a scrap of cardboard to feel around for leaks. Relieve pressure prior to servicing.

Carry out the following checks before every start:

- Check the product for visible damage; immediately remove any faults that are found (note personnel qualification required) or send to the specialist dealer - the product may only be used if it is perfect condition.
- Check and make sure that only authorized personnel are in the work area of the machine and no other people will be endangered by the machine starting.
- Check and make sure that there are no objects or materials in the working area if they are not necessary for operation.
- Make sure the hydraulic circuit of the tractor contains sufficient hydraulic oil to safely operate controls of pump.
- PTO driveline
  - Make sure the driveline guards turn freely;
  - Secure both ends of the driveline;
  - Keep all guards in place.

In normal operation:

- The product may only be started from the location specified.
- During operation, operating personnel may only stand at the specified workplaces.

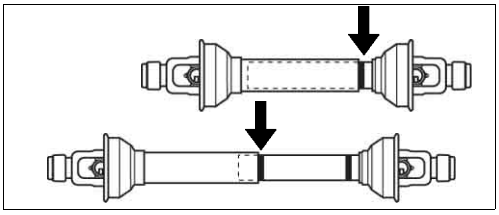
See section on ”Workplaces for operating personnel”

- No safety equipment may be removed or put out of operation during operation.
- Do not remove the guards located on the PTO driveline of the tractor and on the pump.
- Keep hands, feet and clothing away from all moving parts.
- Make sure that no one stands in close proximity to any moving parts before engaging the PTO.
- Never leave the pump in operation without the supervision of a skilled operator.
- Make sure that no one stands in close proximity to the pump when lifted and / or in operation.
- During operation, it is strictly forbidden to remain within the hazard area!
- The following checks should be performed at least once a day:
  - Visual checks for any damage that can be seen on the outside.
  - check that all safety devices are working
  - check that all pneumatic and hydraulic hoses are leaktight and connected correctly
  - Never use the pump if parts of the equipment appear damaged or showing signs of abnormal wear

PTO driveline

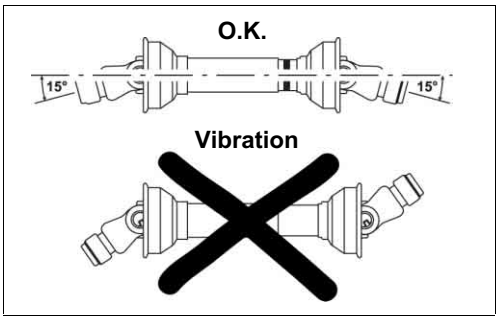
Maximum Extension and Retraction

- While operating the pump, never exceed the maximum points indicated by the adhesive tapes on the male guard.
- The minimum retraction indicator must never disappear underneath the female guard.
- The maximum extension indicator must never be completely visible.



Maximum Angle of PTO joints = 15°

- Both PTO joints must be at the same angle (maximum 15°).
- Joints must always be directed towards the same side of the driveline.

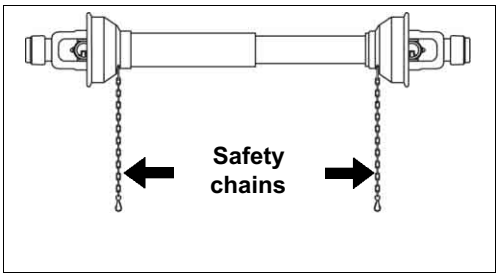


Lubrication

- On universal joints, use a high quality grease formulated specifically for intensive use. Refer to section 9.3 for grease specification.

Safety Chains (on European model only)

- Safety chains must be in place at all times to prevent the driveline guards from rotating.
- Make sure that the safety chains do not restrict the movement of the driveline when operating or transporting the equipment.



- Never use the safety chains to secure the PTO when disconnected from the tractor.
- Replace any damaged chain.

7.3 Workplaces for operating personnel

Danger!
Manure produces toxic gases that can cause a loss of conciousness, asphyxia or death in a few seconds.
Manure agitation can produce toxic gases in buildings built above the pit. Toxic gases can also emanate in buildings situated by the pit and / or connected to the pit by an evacuation line.

Do not enter into a manure pit at any time.

Always follow the ”Safety Procedures for Confined Spaces” before operating or maintaining the pump.

These safety procedures clearly explain the risks associated with manure, procedures for a safe access to workplaces and the minimum ventilation requirements to ensure the safety of humans and livestock.

Refer to section 2.1
”Safety Procedures for Confined Spaces”

Danger!
Rotating driveline keep away!

Danger!
Do not lean out over the pit to operate the pump.

7.4 Description of the operating elements

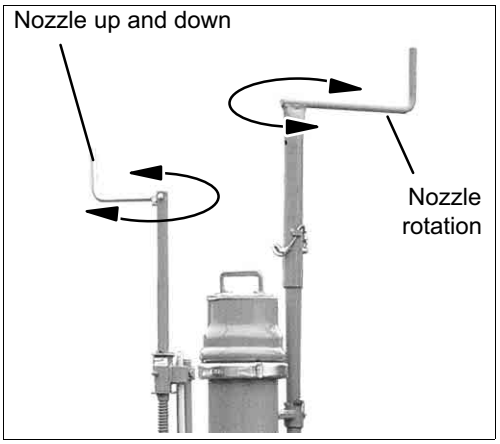
Manual controls

Nozzle rotation

- To rotate the nozzle CW turn the handle CCW.
- To rotate the nozzle CCW turn the handle CW.

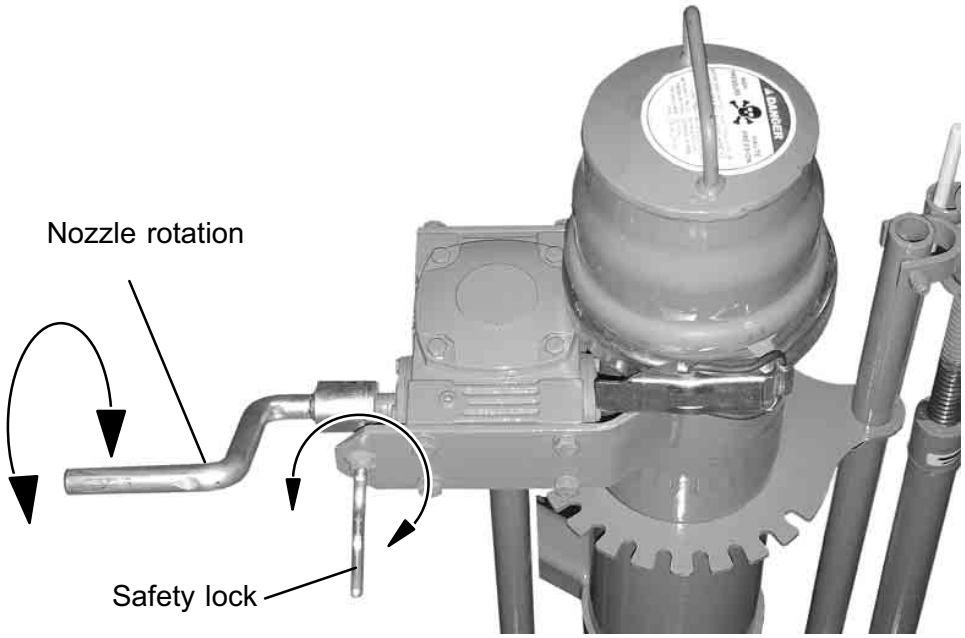
Nozzle height adjustement

- To raise the nozzle turn the handle CW.
- To lower the nozzle turn the handle CCW.

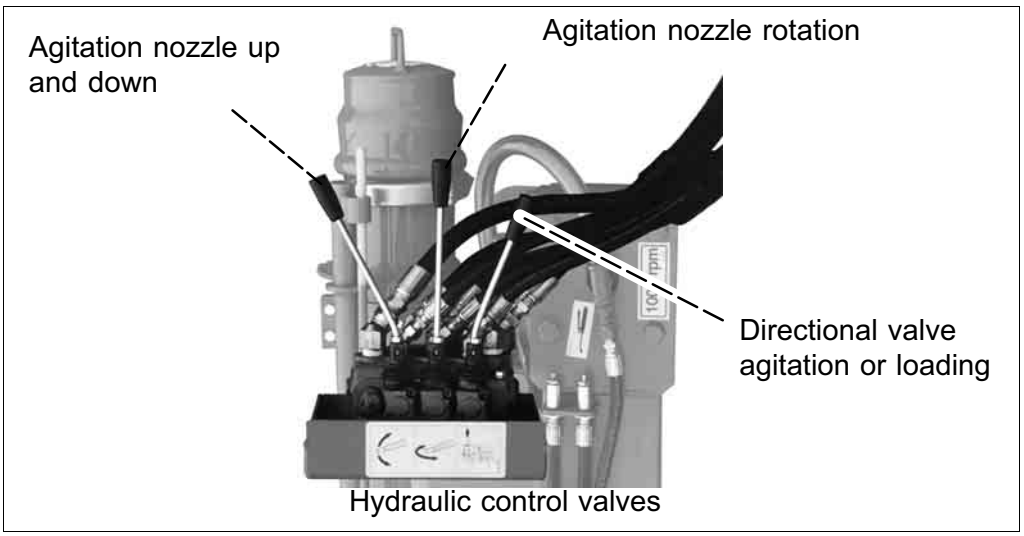


Optional speed reducer control

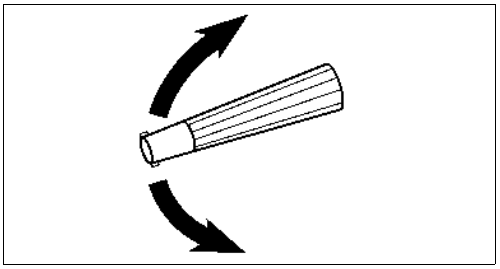
- Turn the safety lock CW to lock the handle.
- Turn the safety lock CCW to unlock the handle.
- To rotate the nozzle CW turn the handle CCW.
- To rotate the nozzle CCW turn the handle CW.



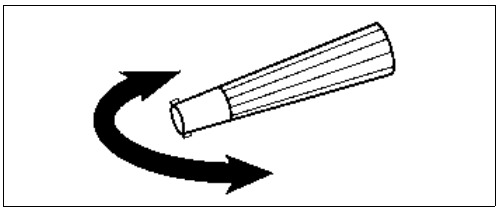
Controls can be operated hydraulically (optional)



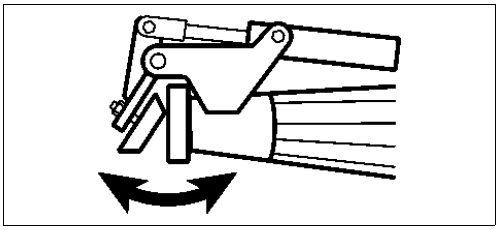
Agitation nozzle up / down



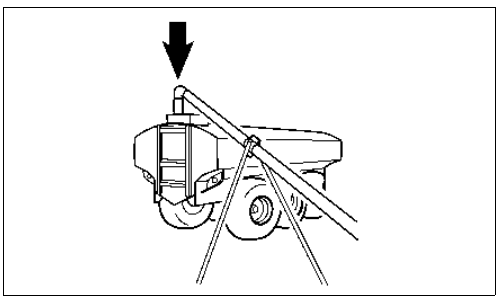
Agitation nozzle rotation



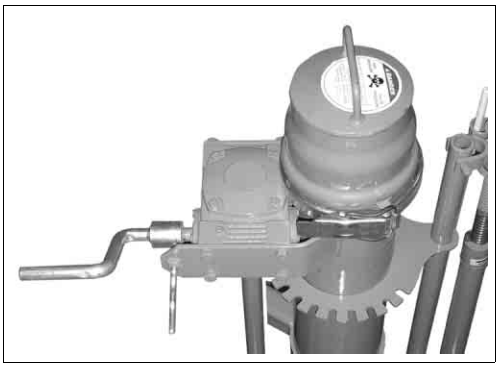
Hydraulic cap on agitation nozzle



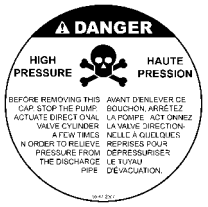
Directional valve agitation/ loading



Circle lock cap on discharge pipe



Danger!
Never unlock a circle lock cap under pressure!
Unlocking a circle lock cap under pressure could cause serious injuries to anyone standing near the cap.
The compressed air inside the pump discharge pipe would propel the cap with force.
Before removing the cap of the discharge pipe, stop the tractor PTO.
Actuate the directional valve a few times in order to relieve pressure from the discharge pipe.
Then switch the directional valve to the loading position by setting the indicator rod at its highest position



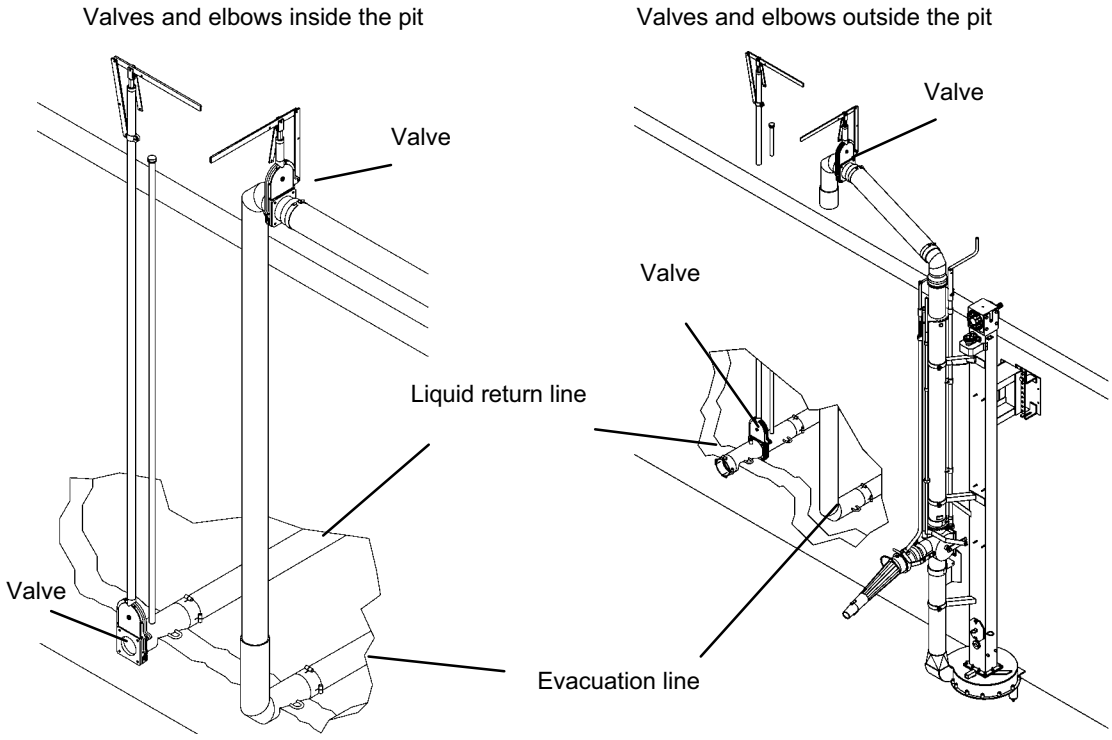
Function of the circle lock cap

When agitating manure, the loading pipe is usually not connected to the pump discharge. If the directional valve is accidentally activated, the operator could be blasted by manure projected with force. The circle lock cap is meant to eliminate the risk of being blasted by manure projected with force if the directional valve is accidentally activated.

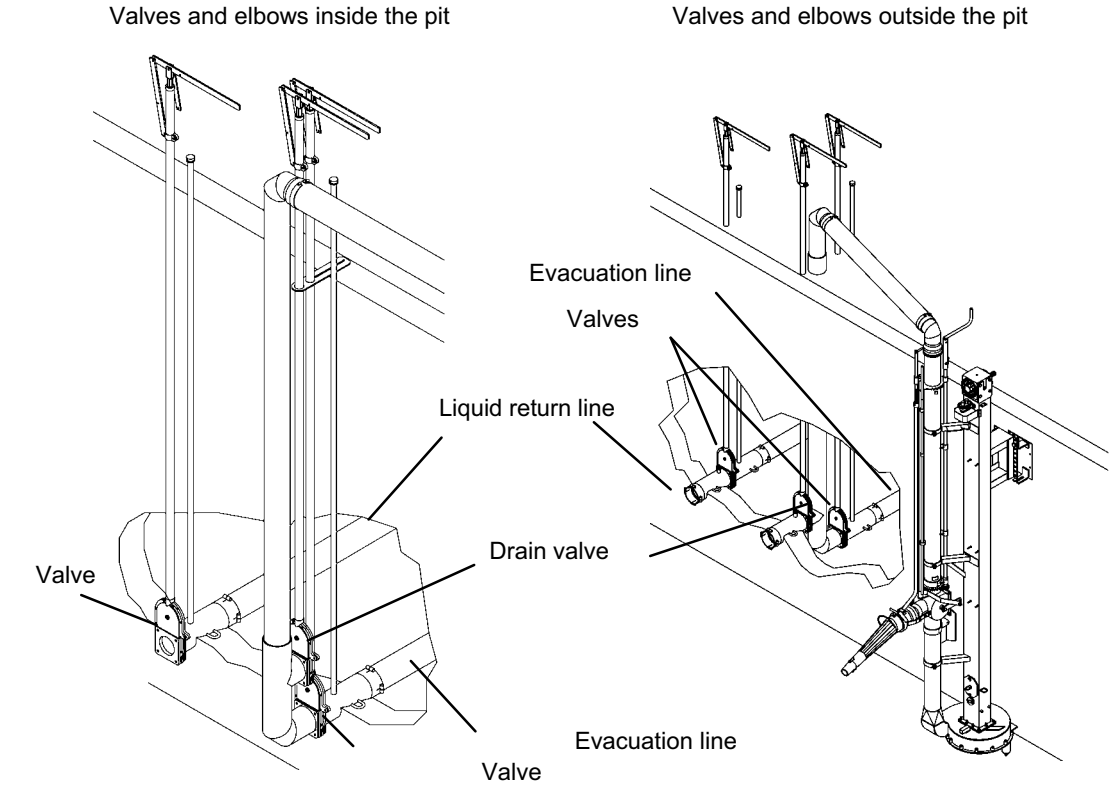
Compressed air under the circle lock cap

If the directional valve changes position while agitating a pit, the impeller of the pump will force manure into the discharge pipe, compressing the air inside the pipe.

Permanent evacuation line installed in a warm barn



Permanent evacuation line installed in a cold barn



7.5 Operating

Danger!
Manure produces toxic gases that can cause a loss of conciousness, asphyxia or death in a few seconds.
Manure agitation can produce toxic gases in buildings built above the pit. Toxic gases can also emanate in buildings situated by the pit and / or connected to the pit by an evacuation line.

Danger!
Do not enter into a manure pit at any time.
Always follow the Safety Procedures for Confined Spaces before operating or maintaining the pump. These safety procedures clearly explain the risks associated with manure, procedures for a safe access to work spaces and the minimum ventilation requirements to ensure the safety of humans and livestock.

See Safety section to find safety procedures for confined spaces.

Danger!
Rotating driveline keep away!
Turn off the tractor before installing or removing the PTO driveline.

Attention!
Make sure all control levers are locked at desired position before operating the pump.

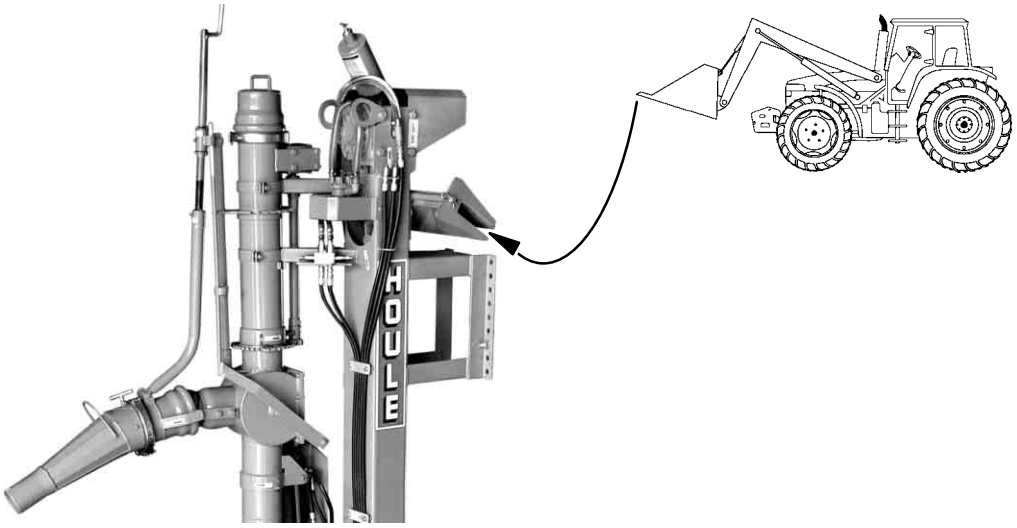
7.5.1 Moving the pump

Attention!
Moving the pump

- The pump must be moved on a farm tractor with a minimum towing capacity of; **1,300 lb [600 kg]**
- Make sure that the tractor hydraulic circuit have enough oil to safely raise and lower the pump.
- For long distance transportation, use a truck and trailer approved for public roads.
- If a pump needs to be towed on a public road, use a farm tractor strong enough to easily tow and safely brake under the weight of the pump. The pump must be equipped with signal lights and reflectors recommended by the Standard ANSI/ASAE S279.12 or better if required by local laws.

Hook for tractor bucket (optional)

Insert the front edge of the bucket into the slot to lift the pump.

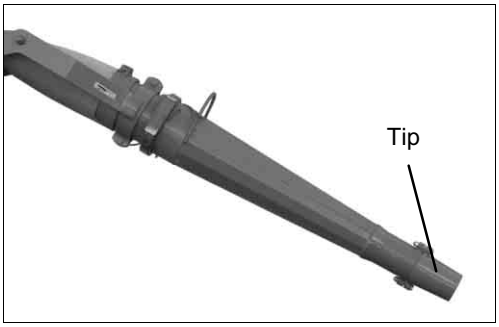


7.5.2 Agitation mode

Danger!
Rotating driveline keep away!
Turn off the tractor before installing or removing the PTO driveline.

Note!
The hydraulic cap on the bottom nozzle may be used to shut off flow to bottom nozzle and therefore increase pressure and flow to the top nozzle.

- Install the PTO driveline;
- Connect the pump's hydraulic controls to the tractor.
- Set the directional valve to the agitation mode at its lowest position.
- Engage the PTO at minimum RPM.
- Gradually increase the PTO to 540 or 1000 RPM, depending on the PTO model.
- Use the nozzle controls (rotation, up/down) to agitate the content of the pit.
- Operate the agitation nozzle to break chunks and direct them towards the pump intake.
- A boltable tip may be installed on the nozzle to improve thick crust cutting. The tip should be removed when crust has been broken up or when there is a thin crust.



- To speed up agitation, move the agitation nozzle from liquid to solids.

Note!
Never allow the nozzle to operate in the same direction for long periods of time without supervision.
Agitate the pit thoroughly before transferring.

- When the whole content of the pit is mixed, gradually decrease the PTO to minimum RPM.
- Turn off the pump.

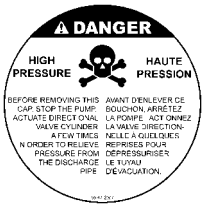
7.5.3 Manure transfer mode

Danger!
Rotating driveline keep away!
Turn off the tractor before installing or removing the PTO driveline.

Note!
Thoroughly agitate the content of the reservoir before transferring the manure.

Note!
The hydraulic cap on the bottom nozzle must be closed when transfering manure to other storage or spreader.

Danger!
Never unlock a circle lock cap under pressure!
Unlocking a circle lock cap under pressure could cause serious injuries to anyone standing near the cap.
The compressed air inside the pump discharge pipe would propel the cap with force.
Before removing the cap of the discharge pipe, stop the tractor PTO.
Actuate the directional valve a few times in order to relieve pressure from the discharge pipe.
Then switch the directional valve to the loading position by setting the indicator rod at its highest position



Function of the circle lock cap

When agitating manure, the loading pipe is usually not connected to the pump discharge. If the directional valve is accidentally activated, the operator could be blasted by manure projected with force. The circle lock cap is meant to eliminate the risk of being blasted by manure projected with force if the directional valve is accidentally activated.

Compressed air under the circle lock cap

If the directional valve changes position while agitating a pit, the impeller of the pump will force manure into the discharge pipe, compressing the air inside the pipe.

Pump connected to a permanent evacuation line

- Open the valve of the evacuation line.
- Set the directional valve to the transfer mode (indicator rod at the highest position);
- Engage the PTO at minimum RPM.
- Gradually increase the PTO RPM until the desired transfer capacity is reached;
- When the transfer is completed, gradually decrease the PTO RPM to minimum.
- Stop the PTO.
- Set the directional valve to the agitation mode.
- Shut off the valve of the evacuation line.

Note
When the PTO RPM is at minimum, the directional valve can be switched from the loading mode to the agitation mode between two spreader loads.

- If the pump is installed in a cold barn, open the drain valve to remove any liquid left between the pump and the valve of the evacuation line to prevent freezing.

Attention!
All remaining liquid must be drained to prevent freezing.

- If the pit is equipped with a liquid return line, open the valve of this line and add liquid as required. Shut off the valve of the liquid return line.

Pump with loading pipe

Danger!
Never unlock a circle lock cap under pressure!
Unlocking a circle lock cap under pressure could cause serious injuries to anyone standing near the cap. The compressed air inside the pump discharge pipe would propel the cap with force.
Before removing the cap of the discharge pipe, stop the tractor PTO. Actuate the directional valve a few times in order to relieve pressure from the discharge pipe. Then switch the directional valve to the loading position by setting the indicator rod at its highest position

- Remove the cap of the discharge pipe;
- Install the loading pipe using the circle lock.
- Stabilize the loading pipe according to the instructions supplied with the loading pipe.
- Set the directional valve to the transfer mode (indicator rod at the highest position);
- Engage the PTO at minimum RPM;
- Gradually increase the PTO RPM until the desired transfer capacity is reached.
- Before loading is completed;
- Gradually decrease the PTO RPM to minimum.
- Stop the PTO.
- Set the directional valve to the agitation mode.
- Once finished, remove the loading pipe from the auxiliary pipe.
- Position back the circle lock cap on the auxiliary pipe using the circle lock.

Note
When the PTO RPM is at minimum, the directional valve can be switched from the loading mode to the agitation mode between two spreader loads.

8 Operating faults

If necessary, please contact your nearest authorized technical dealer.

8.1 Special personnel qualification required for troubleshooting

Troubleshooting may only be performed by specially qualified personnel in accordance with the safety instructions.

Also see the section on ”Personnel qualification”.

8.2 Safety instructions for troubleshooting

Danger!
Read Instructions First! To prevent serious injury or death, do not operate or service this machine without first reading and understanding the operator's manuals for all of the equipment. If these manuals are lost, contact your nearest dealer or the manufacturer for replacements.

To prevent damage to property and/or life-threatening injury to personnel always observe the following:

- First of all, prevent the product from being restarted accidentally.
- Ensure that safe disconnection can be carried out by a second person at any time.
- Secure the range of action for any moving parts.

Also read the chapter on ”Safety”.

Special dangers involved in troubleshooting:

Danger!
Manure produces toxic gases that can cause a loss of consciousness, asphyxia or death in a few seconds.

Manure agitation can produce toxic gases in buildings built above the pit. Toxic gases can also emanate in buildings situated by the pit and / or connected to the pit by an evacuation line.

Danger!
Do not enter into a manure pit at any time.

Always follow the Safety Procedures for Confined Spaces before operating or maintaining the pump. These safety procedures clearly explain the risks associated with manure, procedures for a safe access to work spaces and the minimum ventilation requirements to ensure the safety of humans and livestock.

Danger!
Rotating driveline keep away!

Turn off the tractor before working on the equipment.

Danger!
Hydraulic line under pressure

Escaping fluid can penetrate skin causing serious injury or death. Never use your hand to feel for leaks. Hold a scrap of cardboard to feel around for leaks. Relieve pressure prior to servicing.

8.3 Troubleshooting possible faults

Symptom	Possible cause	Remedy
Pump is not working properly or not at all.	Broken PTO shear bolts.	Replace PTO shear bolts.
	PTO driveline has a defective joint or is disconnected.	Inspect the drive line.
	Broken shaft in drive line.	Replace.
	Manure too thick	Refer to section; **11.3.3**
	Foreign material in the directional valve.	Remove cover and clean out.
	Obstruction in the impeller intake.	Lift the pump and clear the obstruction.
	Worn out impeller/housing	Replace part.
	Lack of lubrication	Refer to section; **9.3**
Vibration in the driveline	The PTO joints are out of alignment.	Refer to section; **7.2**

9 Maintenance

If necessary, please contact your nearest authorized technical dealer.

9.1 Special personnel qualification required for maintenance work

Maintenance work may only be performed by specially qualified personnel in accordance with the safety instructions.

9.2 Safety instructions for maintenance

Danger!
Read Instructions First! To prevent serious injury or death, do not operate or service this machine without first reading and understanding the operator's manuals for all of the equipment. If these manuals are lost, contact your nearest dealer or the manufacturer for replacements.

To prevent damage to property and/or life-threatening injury to personnel always observe the following:

- Only use original spare parts / original wearing parts / original accessories. In the case of products by other manufacturers it cannot be ensured that they have been designed and produced from the point of view of loads and safety.
- All of the steps involved in the maintenance work must be worked through in the order specified.
- The maintenance work specified in the instructions (adjustment, cleaning, lubrication, inspection, etc.) must be performed at the times specified.
- Maintenance work should only be performed with the tools envisaged for this purpose.
- Also note the special information in this manual for the individual components.
- Only use the media specified.
- All warnings and warning signs must be present and legible.
- Immediately replace any components that are not in perfect condition.

Also read the chapter on ”Safety”.

Before carrying out any maintenance work, make sure of the following:

- The area for the maintenance work and access to the working area should be secured over a wide area and there should not be any unauthorized people in the working area.
- Disconnect all pressure units from the pressure source and make sure they cannot be switched back on again unintentionally.
- There are suitable hoists and load suspension devices available for changing larger parts.
- Suitable collection vessels are available for all substances that might be harmful to the ground water (oils, coolants, cleaning and disinfecting agents, etc.).

Special risks involved in maintenance work:

- Serious damage to property may occur if incorrect replacement or wearing parts are installed.
- If energy sources are switched on unintentionally, this may lead to serious bodily injury or damage to property.
- There is a risk of injury from components/tools... with accessible sharp edges.
- Injury can be caused by contact with leaking liquids.

Danger!
Hydraulic line under pressure
Escaping fluid can penetrate skin causing serious injury or death. Never use your hand to feel for leaks. Hold a scrap of cardboard to feel around for leaks. Relieve pressure prior to servicing.

- Serious injury to personnel or damage to property can be caused if the incorrect torque is applied when tightening screws.
- Unsecured manual operation means a higher risk of injury due to crushing/shearing/being pulled in/...

After completing the maintenance work, check the following:

- The installation values set before the work are not altered by the work (report).
- Any screwed connections that were loosened earlier have been tightened.
- Any guards, cover, lids, sieves, filters, ... that were removed earlier have been put back again correctly.
- All safety equipment is working perfectly again.
- Have all of the tools, materials and other equipment that were used been removed from the working area again?
- The working area has been cleaned.
  (possibly to remove any fluids or similar substances that came out of the machine)
- Operation has been checked after maintenance work has been completed or parts replaced. Produce a full test report if necessary.
- Follow the maintenance and safety instructions on the labels affixed to the pump.

**Refer to section 2.5 Protective devices
Maintenance and Safety Labels**

- Do not remove the labels at any time.
- Stop the PTO before lubricating, maintaining and adjusting.
- Lubricate, maintain and store the pump according to instructions in this Manual.

9.3 Inspections and preventive maintenance

Lubrication

Danger!
Manure produces toxic gases that can cause a loss of consciousness, asphyxia or death in a few seconds.
Manure agitation can produce toxic gases in buildings built above the pit. Toxic gases can also emanate in buildings situated by the pit and / or connected to the pit by an evacuation line.
Never attempt to change the oil or to grease the lower joint of the pump driveline while the pump is in the reception pit.

Danger!
Rotating driveline keep away!
Turn off the tractor before lubricating or cleaning the pump.

Oil level

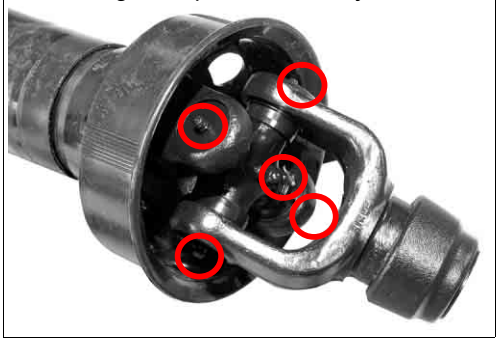
- The oil tank must be filled to the indicated level when the pump is operating. Add oil when required;
- Add SAE 80W90 gear oil if necessary.

9.3.1 Every 5 hours

Note!
Use specified grease or equivalent:
Red Texas 880 crown and chassis® grade 0
(2010-4300-790)

- Grease joints and sliding section of PTO driveline.
  On universal joints, use a high quality grease formulated specifically for intensive use.

5 grease points on each joint



9.3.2 Every 10 hours

- Grease the articulation and pivots of the agitation nozzle;
- Grease the directional valve.
- Grease the upper and lower joints of the pump driveline;

Lubrication of the lower joint

- Add 2 gallons [10 liters] of oil in the main frame to keep the lower joint always lubricated.

9.3.3 Every 50 hours

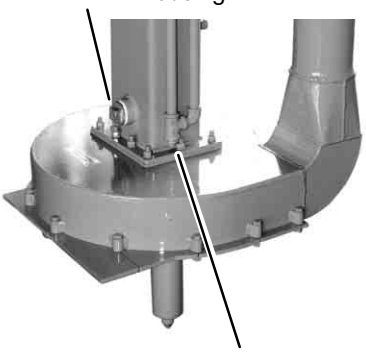
- Check the tension of the oil coolers belts.

9.3.4 Every 75 hours

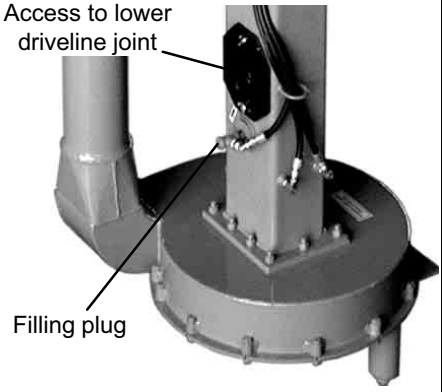
To change the oil of the pump main frame:

Note!
Use gearbox oil SAE 80W90.

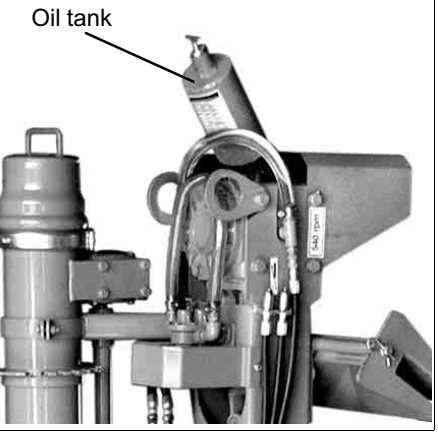
- Remove the magnetic plug located at the bottom of the oil cooler pipes.
- Remove the access plug to the bearing housing located under the pump main frame
- Remove the magnetic plug of the bearing housing.



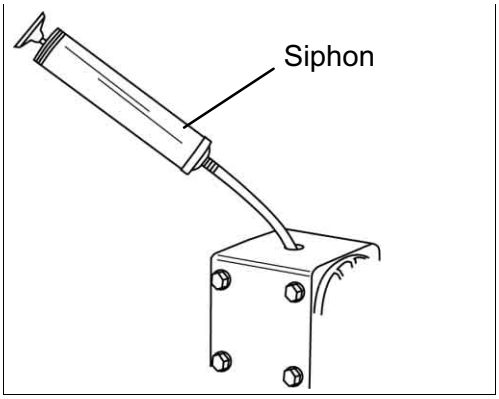
- Remove the filling plug located on the pump frame,
  This allows air to enter at the top of the gearbox and the oil to drain from the bottom.



- Remove the oil tank located on the top gearbox;



- Use a siphon to complete the drainage of the gearbox;



- Clean and reinstall both magnetic plugs;
- Reinstall the access plug to the bearing housing.
- Through the hole of the filling plug, fill the bearing housing with oil and reinstall the filling plug;
- Fill the top gearbox with oil and reinstall the oil tank;
- Fill up the oil tank to the indicated level.

Attention!
After an oil change, run the pump for 1 minute only.
Stop the pump and check the oil level.
Add oil if necessary.

Attention!
Wipe out any oil spill.
Safely dispose of used oil by following local and/or state regulations concerning the proper handling of dangerous goods.

Cleaning the pump

Attention!
Pressure washer may damage the paint if it is not used properly. Use pressure washer not exceeding 2000 psi [105 bar]. Only use cold water when cleaning with a pressure washer. Keep the pressure washer nozzle at least 1 ft [30 cm] from the surface to be cleaned.

- Pressure wash the entire pump.

9.4 Repairs

PTO driveline shear bolts

Tractor PTO	Part No.	Dimensions	Grade	Quantity
1-3/8" - 6 splines	2018-2404-670	3/8"-16NC x 1	8	2
1-3/8" - 21 splines	2010-2404-010	3/8"-16NC x 1	2	2
1¾" - 20 splines	2018-2404-670	3/8"-16NC x 1	8	2

10 Decommissioning

10.1 Special personnel qualification required for decommissioning

Decommissioning may only be performed by specially qualified personnel in accordance with the safety instructions.

10.2 Safety instructions for decommissioning

Danger!
Read Instructions First! To prevent serious injury or death, do not operate or service this machine without first reading and understanding the operator's manuals for all of the equipment. If these manuals are lost, contact your nearest dealer or the manufacturer for replacements.

To prevent damage to property and/or life-threatening injury to personnel always observe the following:

- All of the steps involved in the decommissioning work must be worked through in the order specified.
- First of all, make the operating area for decommissioning completely safe.
- Make sure that operating media are disposed of without harming the environment.

Also read the chapter on ”Safety”.

Special dangers involved in decommissioning:

- Components which have not been removed correctly may fall off or twist.
- There is a risk of injury from open components / tools /.... with sharp edges.
- Suspended loads can fall and then there will be a risk of death - do not stand underneath suspended loads!
- Using load suspension devices other than those specified here may result in serious injury to people and damage to property.

10.3 Temporary decommissioning

Danger!
Rotating driveline keep away!
Turn off the tractor before lubricating or cleaning the pump.

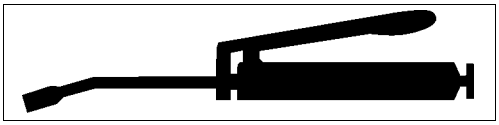
Storage

- Place the pump on a flat and firm surface.
- Remove the cover of the directional valve and clean the housing. Be sure to clean out any accumulation of dry manure;

Attention!
Pressure washer may damage the paint if it is not used properly. Use pressure washer not exceeding 2000 psi [105 bar]. Only use cold water when cleaning with a pressure washer. Keep the pressure washer nozzle at least 1 ft [30 cm] from the surface to be cleaned.

- Pressure wash the entire pump.

- Drain the driveline guards (located on the main frame) and the impeller housing;
- Grease the driveline joints and all parts labeled with;



Refer to section 11.1 Label position

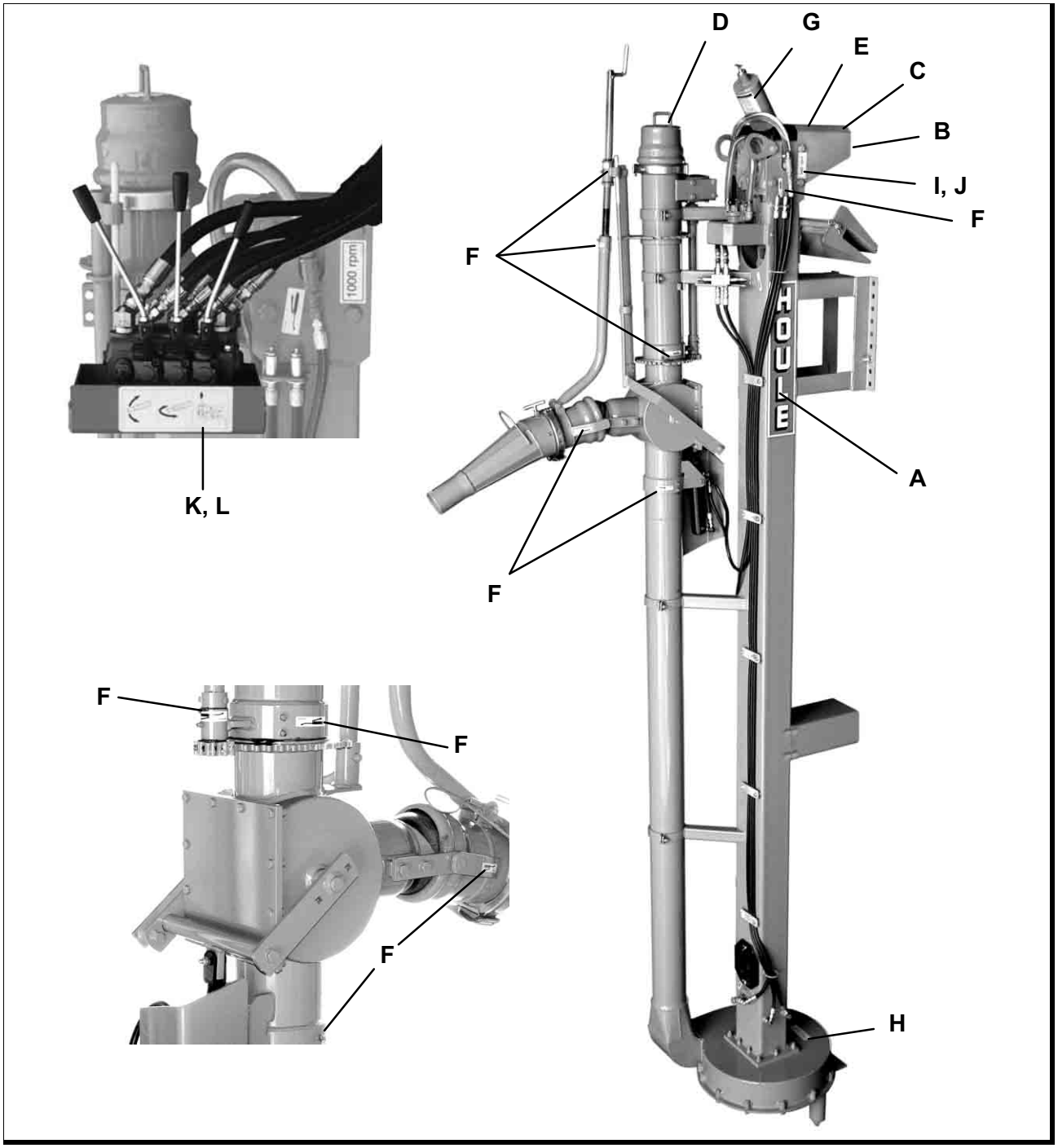
- To prevent corrosion, spread a film of oil on all moving parts.

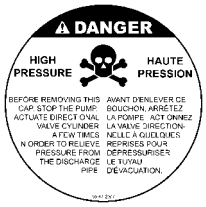
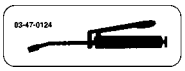
10.4 Final decommissioning/disposal

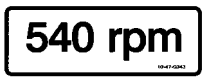
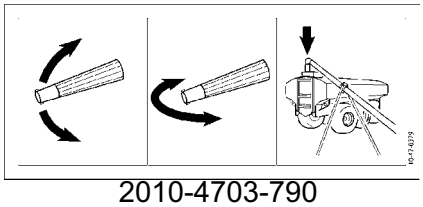
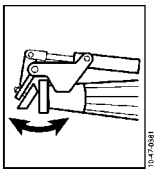
After final decommissioning, handle all components properly and dispose of them in accordance with valid local regulations on waste disposal and utilization.

11 Appendix

11.1 Label position



	American	European
A	GEA Farm Technologies Houle 2010-4700-400	
B	 2099-4720-010	 2099-4725-210  2099-4725-100
C	 2099-4720-020	
D	 2099-4720-070	 2099-4725-400
E	 2099-4721-020	 2099-4725-200  2099-4725-130
F	 2003-4701-240	
G	 2099-4725-310	
H	 2010-4701-590	

I	 2010-4703-430
J	 2010-4703-440
K	 2010-4703-790
L	 2010-4703-381

11.2 Abbreviations

Units	
@	at
°	Degrees (angles)
CE/ EC	European Union
cm	Centimeters
CW	Clockwise
CCW	Counterclockwise
gal	Gallon
Hp	Horsepower
” (in)	Inch (= 25.4 mm)
Inc	Incorporated
kg	Kilograms
km/h	Kilometers per hour
L	Left or liters
lbs	Pounds
m	Meter
mm	Millimeters
max	Maximum
min	Minimum
mph	Miles per hour
NC	National coarse thread
PTO	Power take-off
QC	Quebec (Canada)
R	Right
RPM	Revolutions per minute
SAE	Society of Automotive Engineers
us/ USA	United States of America
www	World wide web

11.3 Pumping Head Calculation

Note!
Read the following information prior to calculate and fill the Total Pumping Head Formula.

11.3.1 Transfer rate

- In SAE, the Transfer Rate is expressed in US GPM.
- In Metric, the Transfer Rate is expressed in Liters per minute.

11.3.2 Difference in Elevation

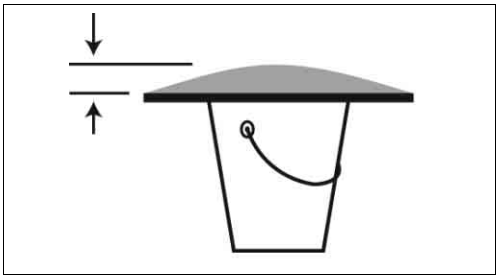
Determined by the height between the pump intake and the top of the storage pit.

- In SAE, the Difference in Elevation is expressed in feet.
- In Metric, the Difference in Elevation is expressed in meters.

11.3.3 Consistency test

The following test must be performed to find the viscosity of well-agitated slurry.

- Set a 24” (60cm) disc over a pail.
- Slowly pour enough slurry to get overflow all around the disc.
- After 1 minute of rest, measure the thickness of slurry at the center of the disc.



Ratio (Free stall manure vs Water added)	**1 : 2**	**1 : 1 1/2**	**1 : 1**	**2 : 1**
Approximate thickness on 24” (60cm) disc	1/8” (3mm)	1/4” (6mm)	1/2” (12mm)	3/4” (18mm)

11.3.4 Diameter, Length and Type of Transfer Line

Diameter, length and type of a line all affect friction loss. Total Pumping Head Calculation is the addition of each individual Transfer Line section of same type and diameter.

Line diameter is chosen in accordance with the Transfer Rate and available horsepower. We suggest to use line diameters are slightly larger than the minimum required for a new transfer line, intended that residues may build up inside pipes and thus decrease the effective line diameters through the years.

11.3.5 Straight pipe equivalent for components

To complete the total friction loss calculation, each elbow, adapter and valve must be converted into it's equivalent linear dimension of line and added to the length of line.

Components	Pipe Diameter													
	S.A.E.							METRIC						
	3”	4”	6”	8”	10”	12”	15”	75mm	100mm	150mm	200mm	250mm	300mm	350mm
45° PVC elbow	9 ft	12 ft	18 ft	24 ft	30 ft	36 ft	45 ft	3 m	3,5 m	5,5 m	7,5 m	9 m	11 m	14 m
90° PVC elbow	9 ft	32 ft	48 ft	64 ft				7,5 m	10 m	14,5 m	19,5 m			
45° Houle * steel elbow		8 ft	12 ft	16 ft		24 ft			2,5 m	3,5 m	5 m		7,5 m	
90° Houle * steel elbow*		22 ft	32 ft	42 ft		48 ft			7 m	10 m	13 m		14,5 m	
“Y” Houle * steel						48 ft							14,5 m	
Houle valve	8 ft		15 ft	20 ft				2,5 m		4,5 m	6 m			
Flush tank adaptor *						48 ft							14,5 m	
PVC adaptor from 12¾” to 15” diameter						45 ft								
PVC adaptor from 304,8mm to 381mm diameter													14 m	

* For 12” [300 mm] Houle steel components, use the Friction Loss Coefficient for PVC pipes.

11.3.6 Friction Loss Coefficient for PVC Pipes

PVC Pipes Diameter	US Gallons per minute	Liters per minute	Consistency of Liquids and Manure				
			Water	1/8" (3mm)	1/4" (6mm)	1/2" (12mm)	3/4" (18mm)
3" (75mm)	150	570	**0.0526**	**0.0599**	**0.0710**	**0.1041**	**0.1519**
	210	800	**0.0980**	**0.1117**	**0.1323**	**0.1940**	**0.2832**
	270	1020	**0.1560**	**0.1778**	**0.2106**	**0.3088**	**0.4508**
	330	1250	**0.2261**	**0.2577**	**0.3052**	**0.4477**	**0.6534**
4" (100mm)	200	760	**0.0220**	**0.0251**	**0.0297**	**0.0436**	**0.0636**
	280	1060	**0.0410**	**0.0468**	**0.0554**	**0.0813**	**0.1186**
	360	1360	**0.0653**	**0.0745**	**0.0882**	**0.1294**	**0.1888**
	440	1670	**0.0947**	**0.1080**	**0.1278**	**0.1875**	**0.2737**
	520	1970	**0.1290**	**0.1470**	**0.1741**	**0.2554**	**0.3728**
6" (150mm)	400	1510	**0.0110**	**0.0125**	**0.0148**	**0.0218**	**0.0318**
	500	1890	**0.0166**	**0.0189**	**0.0224**	**0.0329**	**0.0480**
	600	2280	**0.0233**	**0.0265**	**0.0314**	**0.0461**	**0.0673**
	700	2650	**0.0310**	**0.0353**	**0.0418**	**0.0613**	**0.0895**
8" (200mm)	500	1890	**0.0041**	**0.0047**	**0.0055**	**0.0081**	**0.0118**
	700	2650	**0.0076**	**0.0087**	**0.0103**	**0.0151**	**0.0220**
	900	3410	**0.0121**	**0.0138**	**0.0164**	**0.0240**	**0.0350**
	1100	4160	**0.0176**	**0.0200**	**0.0237**	**0.0348**	**0.0508**
10" (250mm)	800	3030	**0.0033**	**0.0037**	**0.0044**	**0.0065**	**0.0095**
	1100	4160	**0.0059**	**0.0068**	**0.0080**	**0.0117**	**0.0171**
	1400	5300	**0.0093**	**0.0105**	**0.0125**	**0.0183**	**0.0267**
	1700	6440	**0.0133**	**0.0151**	**0.0179**	**0.0262**	**0.0383**
12" (300mm)	1200	4540	**0.0029**	**0.0033**	**0.0039**	**0.0057**	**0.0083**
	1600	6060	**0.0049**	**0.0056**	**0.0066**	**0.0096**	**0.0141**
	2000	7570	**0.0074**	**0.0084**	**0.0099**	**0.0146**	**0.0213**
	2400	9480	**0.0103**	**0.0118**	**0.0139**	**0.0204**	**0.0298**
	2800	10600	**0.0137**	**0.0156**	**0.0185**	**0.0272**	**0.0396**
15" (350mm)	1500	5680	**0.0015**	**0.0017**	**0.0020**	**0.0029**	**0.0042**
	2000	7570	**0.0025**	**0.0028**	**0.0033**	**0.0049**	**0.0072**
	2500	9460	**0.0037**	**0.0043**	**0.0051**	**0.0074**	**0.0108**
	3000	11360	**0.0053**	**0.0060**	**0.0071**	**0.0104**	**0.0152**

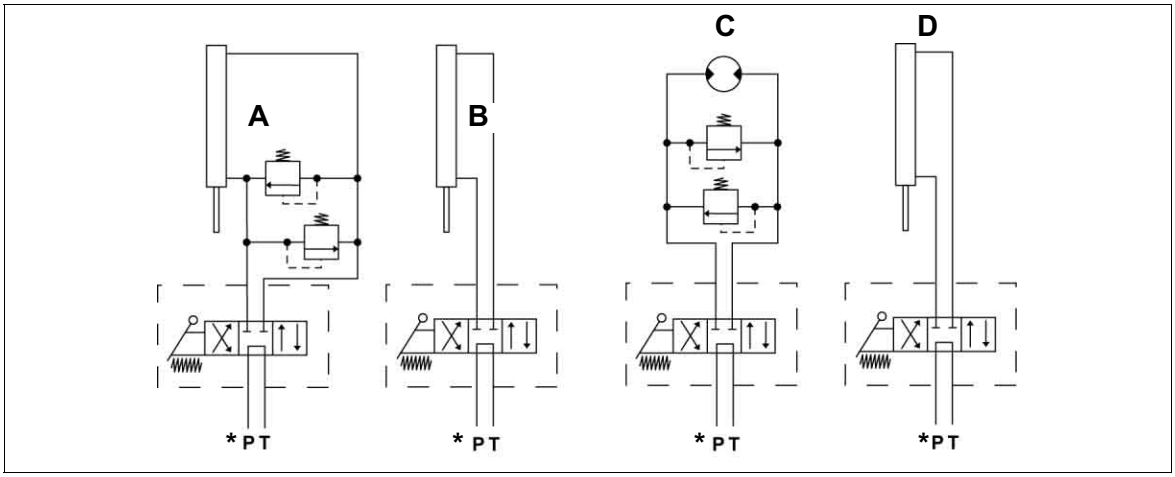
11.3.7 Friction Loss Coefficient for Flexible Hoses and Steel Pipes

PVC Pipes Diameter	US Gallons per minute	Liters per minute	Consistency of Liquids and Manure				
			Water	1/8" (3mm)	1/4" (6mm)	1/2" (12mm)	3/4" (18mm)
3" (75mm)	150	570	**0.0682**	**0.0777**	**0.0920**	**0.1350**	**0.1970**
	210	800	**0.1271**	**0.1448**	**0.1715**	**0.2516**	**0.3672**
	270	1020	**0.2023**	**0.2306**	**0.2730**	**0.4005**	**0.5845**
	330	1250	**0.2932**	**0.3342**	**0.3958**	**0.5805**	**0.8473**
4" (100mm)	200	760	**0.0286**	**0.0326**	**0.0386**	**0.0565**	**0.0825**
	280	1060	**0.0532**	**0.0607**	**0.0718**	**0.1054**	**0.1538**
	360	1360	**0.0847**	**0.0966**	**0.1144**	**0.1677**	**0.2448**
	440	1670	**0.1228**	**0.1400**	**0.1658**	**0.2431**	**0.3549**
	520	1970	**0.1673**	**0.1907**	**0.2258**	**0.3312**	**0.4834**
6" (150mm)	400	1510	**0.0143**	**0.0163**	**0.0193**	**0.0282**	**0.0412**
	500	1890	**0.0215**	**0.0246**	**0.0291**	**0.0427**	**0.0623**
	600	2280	**0.0302**	**0.0344**	**0.0408**	**0.0598**	**0.0873**
	700	2650	**0.0402**	**0.0458**	**0.0542**	**0.0795**	**0.1161**
	800	3030	**0.0514**	**0.0586**	**0.0694**	**0.1018**	**0.1486**
	900	3410	**0.0639**	**0.0729**	**0.0863**	**0.1266**	**0.1848**
	1000	3790	**0.0777**	**0.0886**	**0.1049**	**0.1538**	**0.2245**
	1100	4160	**0.0927**	**0.1056**	**0.1251**	**0.1835**	**0.2678**
8" (200mm)	600	2280	**0.0074**	**0.0085**	**0.0100**	**0.0147**	**0.0215**
	800	3030	**0.0126**	**0.0144**	**0.0171**	**0.0250**	**0.0365**
	1000	3790	**0.0191**	**0.0218**	**0.0258**	**0.0378**	**0.0552**
	1200	4540	**0.0268**	**0.0305**	**0.0361**	**0.0530**	**0.0774**
	1400	5300	**0.0356**	**0.0406**	**0.0481**	**0.0705**	**0.1029**
	1600	6060	**0.0456**	**0.0520**	**0.0616**	**0.0903**	**0.1318**
	1800	6810	**0.0567**	**0.0646**	**0.0765**	**0.1123**	**0.1638**
	2000	7570	**0.0689**	**0.0785**	**0.0930**	**0.1364**	**0.1991**
	2200	8330	**0.0822**	**0.0937**	**0.1109**	**0.1627**	**0.2375**
	2400	9480	**0.0965**	**0.1100**	**0.1303**	**0.1911**	**0.2790**
	2600	9840	**0.1119**	**0.1276**	**0.1511**	**0.2216**	**0.3235**
	2800	10600	**0.1284**	**0.1464**	**0.1733**	**0.2542**	**0.3710**
	3000	11360	**0.1459**	**0.1663**	**0.1969**	**0.2888**	**0.4215**

11.4 Hydraulic diagrams

Hydraulic controls

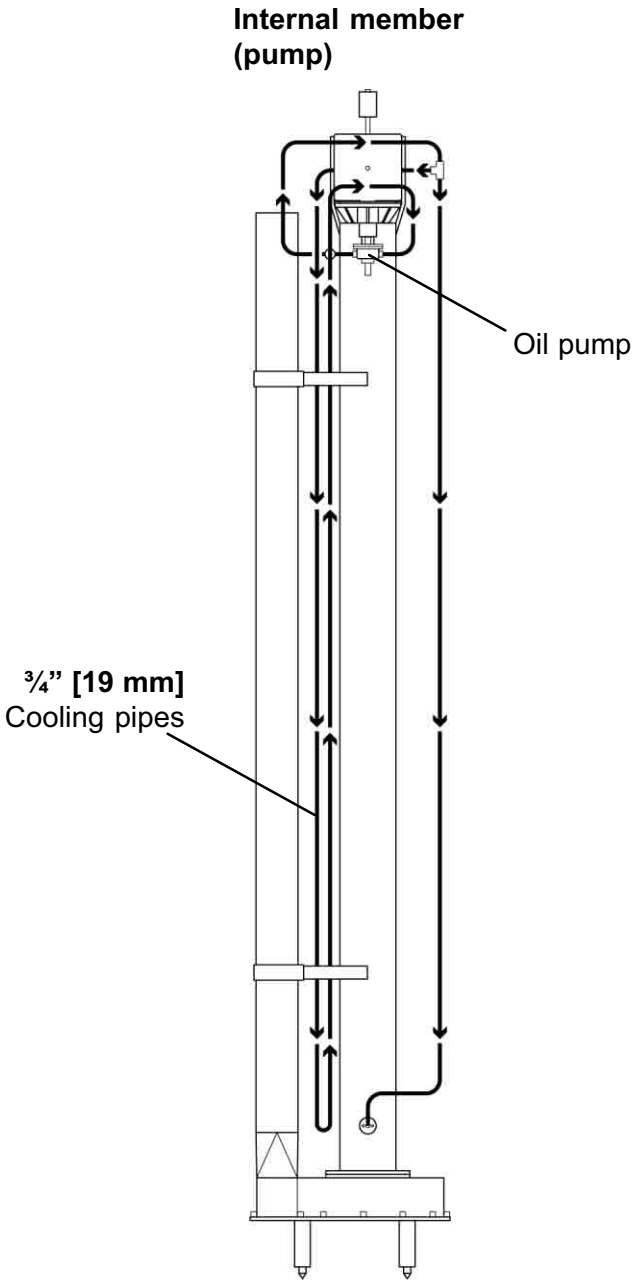
Note!
The diagram illustrates all hydraulic controls available on the pump. The dashed frame shows a component equipped with a control lever.



* All components equipped with a control lever may be connected togheter using the same tractor outlet.

A	Directional valve cylinder
B	Nozzle height cylinder
C	Nozzle rotation motor
D	Hydraulic cap on bottom nozzle

Cooling system



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