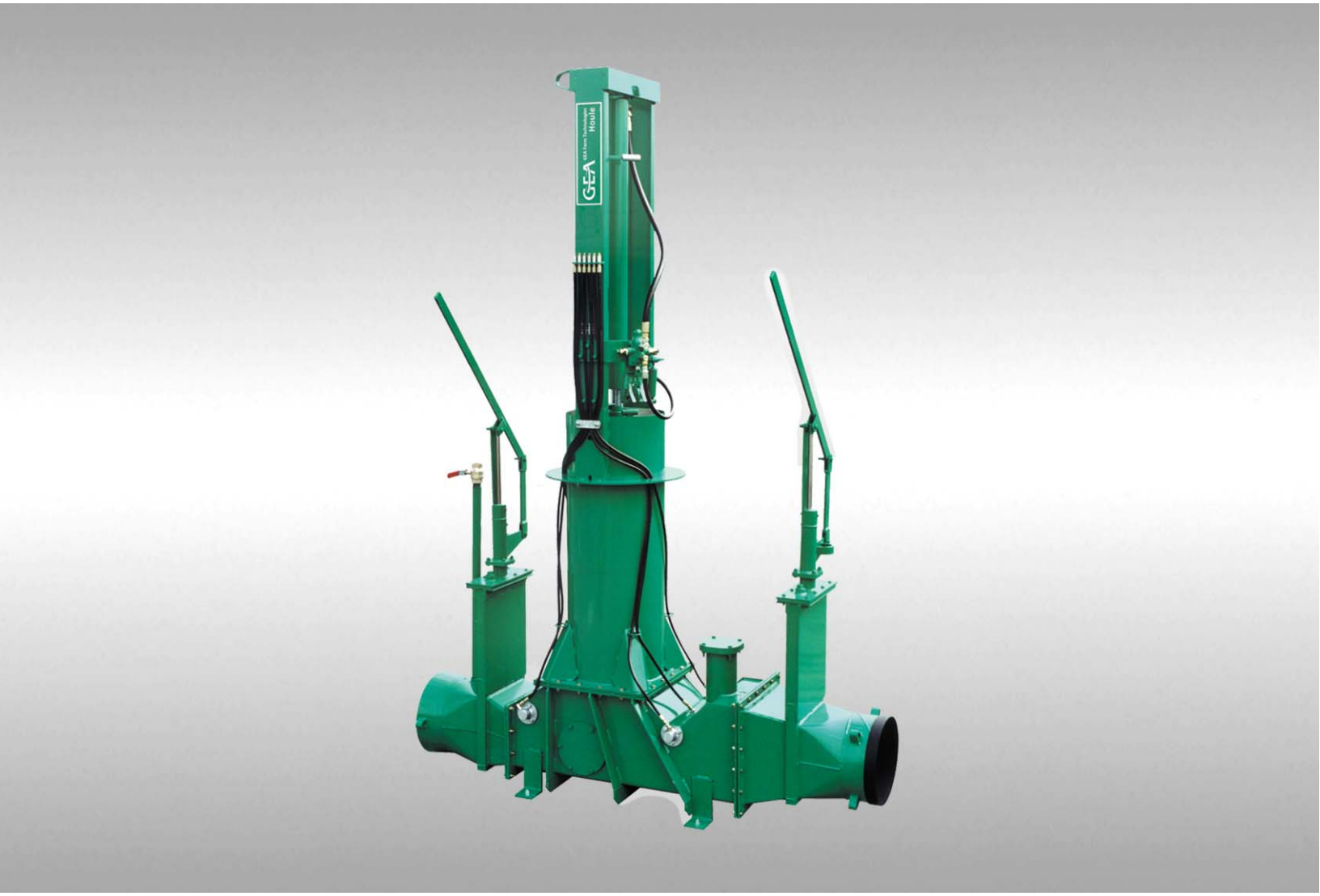


Futuro

Underground Manure Pumps

Instruction Manual / Installation Instructions
(Original instructions)

2007-9015-001
03-2014

engineering for a better world

GEA Farm Technologies

Contents

1 Preface

1.1 Information on the instructions

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.

Abbreviations, units, specialist terms, special names or specialist terminology 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.
- They are designed as modular and only refer to the stated 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 for safety information!

Pictograms used

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

This pictogram indicates a special tool required for installation.

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 (United Kingdom)	-9015-	English (North American)	-9034-	Slovakian
-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-	Slovenian		
Not all of the above languages may be available.					

1.2 Manufacturer 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
✉ contact@gea.com
@ www.gea-farmtechnologies.com

US Contact Information:

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 category:	**Underground Manure Pumps**
Type of product:	**Futuro**

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 894-2+A1 (2008-12)	Safety of machinery Ergonomics requirements for the design of displays and control actuators - Part2 : Displays
EN 953+A1 (2009-07)	Safety of machinery Guards
EN 1037-A1 (2008-06)	Safety of machinery Prevention of unexpected start-up
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 13857 (2008-06)	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
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, 09 January 2010	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 (0°C/32°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.

1.6 Specific Limited Warranty for Steel Evacuation Line

This specific limited warranty extends to the Purchaser of all evacuation line equipment (the ”Evacuation Line”) sold by the Company in connection with any Magnum or Futuro underground manure pumps. All conditions stated in this specific limited warranty are in addition to the General Equipment Warranty that applies to all equipment sold by the Company (see Section 1.5 above). In the event of any conflict between the conditions stated in this specific limited warranty and those specified in the General Equipment Warranty, the conditions of this specific limited warranty shall prevail.

1.6.1 Extent of Specific Limited Warranty

This specific limited warranty DOES NOT cover damages to the Steel Evacuation Line arising from improper installation. More precisely, Purchaser must ensure that the Steel Evacuation Line is surrounded by at least 6” [15 cm] of fine compacted sand. As a result, the trench in which the Steel Evacuation Line is laid must be dug 6” [15 cm] deeper than required to allow spreading of this 6” [15 cm] fine compacted sand bed on the bottom of trench before installing the Steel Evacuation Line.

1.6.2 Prorated Warranty Against Corrosion

The Steel Evacuation Line is warranted against perforation due to corrosion, for a maximum period of five (5) years from the date of delivery of the Steel Evacuation Line to the Purchaser, as further detailed under Subsection 1.6.3 below. This prorated warranty can be extended to fifteen (15) years provided that sacrificial anodes are installed as per the instructions given in this manual.

1.6.3 Applicable Reimbursement Process for Steel Evacuation Line Replacement

In the event that the Steel Evacuation Line must be replaced due to defects covered under this warranty, the Company will reimburse the Purchaser as follows:

- **If sacrificial anodes were not installed by Purchaser:** an amount equal to 1/5 (one fifth) of the Steel Evacuation Line price list (i.e. price in effect at the time the claim is submitted to the Company), multiplied by the number of full years remaining before the expiry of the warranty period;

or

- **If sacrificial anodes were installed by Purchaser as per the Company's instructions:** an amount equal to 1/15 (one fifteenth) of the Steel Evacuation Line price list (i.e. price in effect at the time the claim is submitted to the Company), multiplied by the number of full years remaining before the expiry of the warranty period.

2 Safety

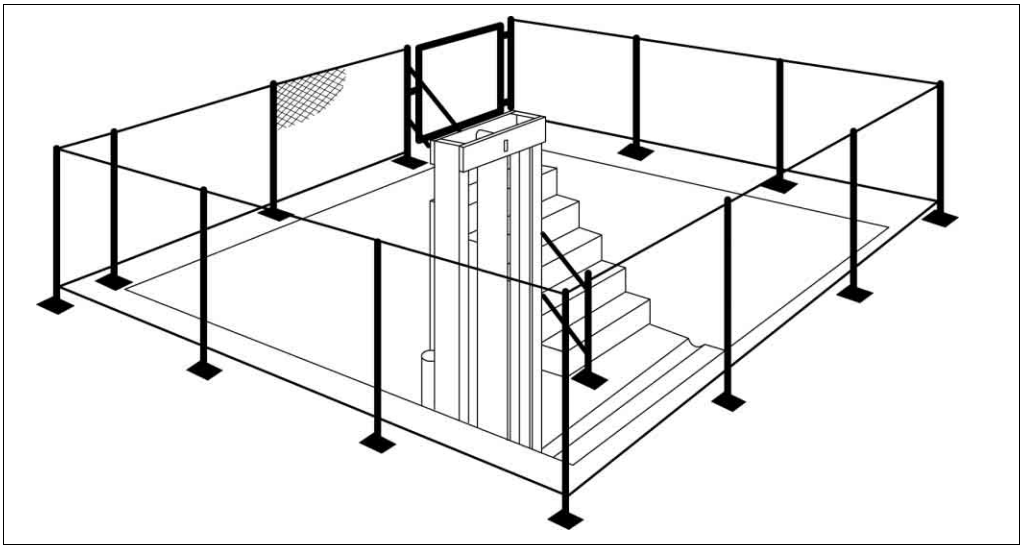
2.1 Owner's obligation of care

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 owner'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 carefully reads the instructions (especially the safety instructions and warnings).
- A Danger! TOXIC GASES sign is posted at the eye level, at the entry of the pit area. Make sure this sign remains visible at all times.
- No one must enter into a manure pit at any time, except qualified personnel having knowledge on procedures in confined spaces.
- Safety fences have been installed around the reservoir and/or equipment to protect people and livestock against hazardous fall. Safety fences must meet local requirements regarding workers safety.



- Safety equipment is available on site (hearing protection, eye protection.). Everyone who works with or performs activities in connection with the product must use safety equipment.
- All local requirements on safety procedures in confined spaces have been followed. Refer to the Basic Safety Instruction section.
- The power source is shut off and locked before lubricating, servicing and adjusting.
- Permanent ventilation has been installed in each structure surrounding the main storage to evacuate toxic gases.

- The equipment have been installed in an environment free of explosive gases.
- Enough light is provided in each operation and maintenance area to light up equipment, controls and safety stickers. To ensure adequate visibility of safety stickers applied on the equipment, lights must provide 200 lux minimum at these areas.
- The motor installed on the equipment meets local regulations and the technical specifications in this manual.
- The control panel of the equipment meets local regulations and the technical specifications in this manual.
- Never allow bystanders to stay close to the equipment when lifted and / or in operation.
- A full set of legible instructions is always kept by the product so that 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 followed.
- The legal requirements are met.
- Operating instructions are produced for the farm. These must be especially adapted to the conditions of the business, once again, expressly taking account of safety aspects.
- The product
  - is only used for its intended purpose.
  - should only be operated if it is in perfect working order.
    Particularly check the operation of the safety equipment on a regular basis.
- The work to be carried out is performed by a sufficiently qualified person!

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

- The personnel is regularly instructed in all relevant matters of safety at work and protection of the environment and is familiar with the manual, particularly the safety instructions it contains.
- Operating personnel who requires training only work on the product under the supervision of an experienced person.
- Safety signs, manufacturer's plate and decals, attached to the product, must be replaced immediately if they become illegible or are lost.
- Escape routes are marked by means of signs in accordance with national regulations!
- The personnel protective equipment required for personnel carrying out operation, maintenance and repairs is made available and used.
- Unauthorized persons (e.g. children) are not allowed in hazardous areas.

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.

Caution!
The indication ”Caution” signals dangerous situations.
Injury may result if the danger is not avoided.

Attention!
The indication ”N.B.” signals important information on risks for the product or the environment.

2.3 Basic safety instructions

Safety procedures in confined spaces

Danger!

Manure produces toxic gases that may cause death in a second. When agitated, the manure produces heavy toxic gases such as hydrogen sulfide (H_2S), carbon dioxide (CO_2), methane (CH_4) and ammonia (NH_3). It is mandatory to follow the Safety Procedures for Confined Spaces before operating or servicing the equipment. These safety procedures clearly explain the risks associated with manure, procedures for a safe access to workspaces and the minimum ventilation requirements to ensure the safety of humans and livestock. Find local safety procedures for confined spaces in Web Sites 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**

Danger!

As manure produces toxic gases that may cause death, it is imperative to follow safety instructions below before attempting to install the equipment:

- Never enter into a manure pit.
- Never attempt to rescue people without the help of qualified personnel. 40% of death caused by intoxication are due to rescue attempts.
- Access to the main storage must be limited to qualified personnel having knowledge on safety procedures in confined spaces.
- Permanent ventilation must be active in each structure surrounding the main storage to evacuate toxic gases.
- Smoking inside or around buildings and manure storage is prohibited.
- Make sure all access to the reservoir and confined space are kept close and locked.

Warning!

Always shut off and lock the power supply before installing, adjusting and servicing the equipment.

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

- All electrical work must be carried out by an electrician.
- Follow the maintenance and safety instructions on the labels affixed to the equipment.
- Keep hands, feet and clothing away from all moving parts.
- Never use the equipment if any part of the equipment seems damaged or shows signs of abnormal wear.
- Make sure that no one stands close to moving parts before starting the equipment.
- Never allow bystanders to stay close to the equipment when it is lifted and / or in operation.
- Before working on equipment (components, housings, etc.), disconnect it from the electrical power source.
  Secure main switches or emergency stop switches with a padlock to ensure they cannot be switched back on again and install a warning sign.
- In particular, make sure that the tightening torques specified are complied with.
- All electrically conductive parts with which the animals might come into contact must be connected to each other and to the installation's protective earth conductor by an additional equipotential bond.
- The operation and maintenance of equipment in livestock farms has inherent risks. Read and follow the instructions carefully (especially the section on ”Safety”) to ensure your own safety!
- The chapter on ”Technical data” gives the permissible working conditions (pressure ranges, temperature ranges, etc.) and these must be followed!
- 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!
- Follow measures on protection against noise!
- Do not stand underneath suspended loads.
- Sharp edges may cause injuries.
- 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.
- Leaking lubricants, solvents,... could cause injury if they come into direct contact with the skin and could make the floor surface slippery which could result in dangerous fall.
- Always keep the control cabinet, all electricity supply units, and electrical control units closed. Access is only permitted to authorized personnel with a key or special tool.
- Protect live and high-voltage components against moisture. Under no circumstances may water jets or high-pressure cleaners be directed at these!

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!

- The operator may only carry out work on the equipment if trained, instructed and authorized to do so by the owner.
- National driver's licence for drive-on machines, stackers and other trucks.
- All equipment handled/moved with lifting devices must be performed by qualified personnel only in accordance with slinging techniques.
- Any work in a reservoir must only be carried out by qualified personnel having knowledge on safety procedure in confined spaces.
- Electrician's licence for any electrical work. The electrician must follow national standards and requirements.
- All welding work must only be performed by trained welders.

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

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

☞ **Note!**
If the work requires special qualifications, these are described in the corresponding chapters!

2.5 Protective devices

- Safety guard

Hydraulic power unit chain joint safety guard
(part no. 2007-1402-710)

- 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 a few seconds.
(part no. 2099-4720-010)

Danger! - High voltage. (American model)
Always turn off main power before service and maintenance. Read the operator's manual for safety information and for operating, servicing and maintenance instructions.
(part no. 2099-4721-000)

Warning! (American model)

- Always turn off main power before maintenance and service.
- 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. 2099-4721-010)

Warning! - Air riser cap under pressure. (American model)
(part no. 2099-4721-120)

Danger! - High voltage. (European model)
(part no. 2099-4725-240)

Danger! - Automatic start. (European model)
(part no. 2099-4725-190)

Warning! - Always keep the ball valve opened before activating the equipment. (European model)
(part no. 2099-4725-420)

Warning! - Air riser cap under pressure. (European model)
(part no. 2099-4725-460)

	Read the instruction manual for safety information. (European model) (part no. 2099-4725-470)
	Read the operator's manual for safety information before service and maintenance. (European model) (part no. 2099-4725-130)
	Always make sure that the top of the piston is covered with at least 2” of oil before starting the pump. (American model) Never operate the pump without manure. (part no. 2099-4724-010)
	Make sure that both valves under the tank are opened before operating the power unit. (American model) Change the oil and replace filter once a year or when the filter jauge reaches the yellow zone. Clean the inside of the reservoir every time the oil is changed. Use hydraulic oil AW32. (part no. 2099-4724-030)
	Oil type AW32 (part no. 2099-4725-360)
	Grease point (part no. 2099-4701-240)
	Rotation direction (part no. 2099-4700-390)
	Refer to the Appendix for labels location

3 Description

3.1 Correct applications

The product described was designed for use in agricultural livestock farm operations.

The product is exclusively designed to:

- Evacuate dairy manure from a free stall barn to a manure reservoir pit or lagoon of a maximum consistency of 1½" [38mm]. Refer to the Appendix section on consistency test.
- Transfer manure that may contain only very limited quantities of bedding,(sand, sawdust, wood shavings, chopped straw/hay).
- Be operated in an environment free of frozen manure.

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

The following in particular are prohibited:

- Processing others substances than manure and water into the pump.
- Processing manure containing excessive amounts of chopped bedding, sawdust, wood shavings, wood pieces or other debris.
- Allowing the temperature in the room where the pump is installed to drop below freezing.
- Installing an electrical motor on the equipment which does not match the motor technical specifications provided in this manual. The equipment is not designed to use any other type of motor than those listed. Improper motor performance may result in damage to the equipment and/or motor.

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

Correct use also includes reading the instructions and following the inspection and maintenance instructions.

- Original GEA Houle parts and accessories are specially designed for GEA Houle equipment.
- The manufacturer expressly points out that only original parts and original accessories have been adapted, tested and authorized for use with the product.
- We would specifically like to point out that parts or accessories not supplied by ourselves and setting instructions not provided by GEA Houle are not checked or released by us either.
- 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

Unauthorized modifications of the product can have a negative impact on the safety, life span or functionality of the product.

Any modifications not described in the product documentation are deemed to be prohibited.

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

Planned changes must be approved by the manufacturer in writing.

Any unauthorized modifications to the product will invalidate the warranty and may invalidate the provided manufacturer's declaration or installation declaration.

3.3 Design of the equipment

Design

The pump consists of:

- A hydraulically powered vertical piston pump fixed on an evacuation chamber based on double check valve principle.

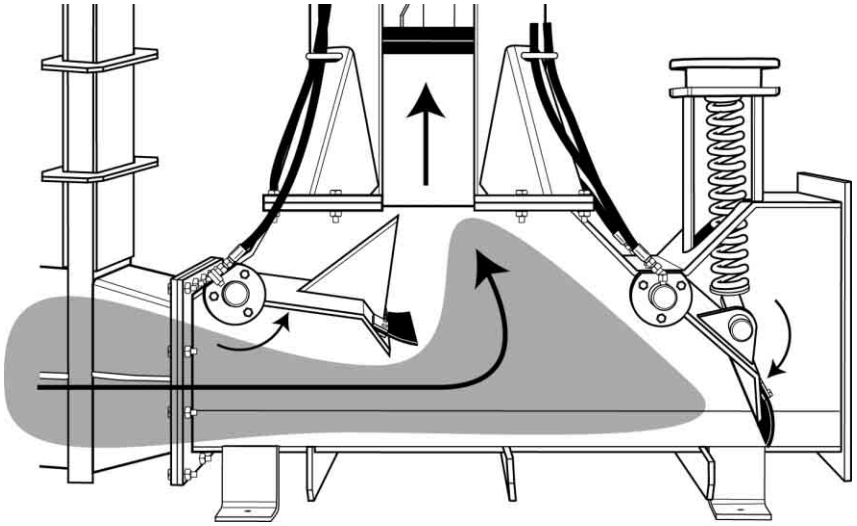
Drive

- The piston pump is driven by a hydraulic power unit.

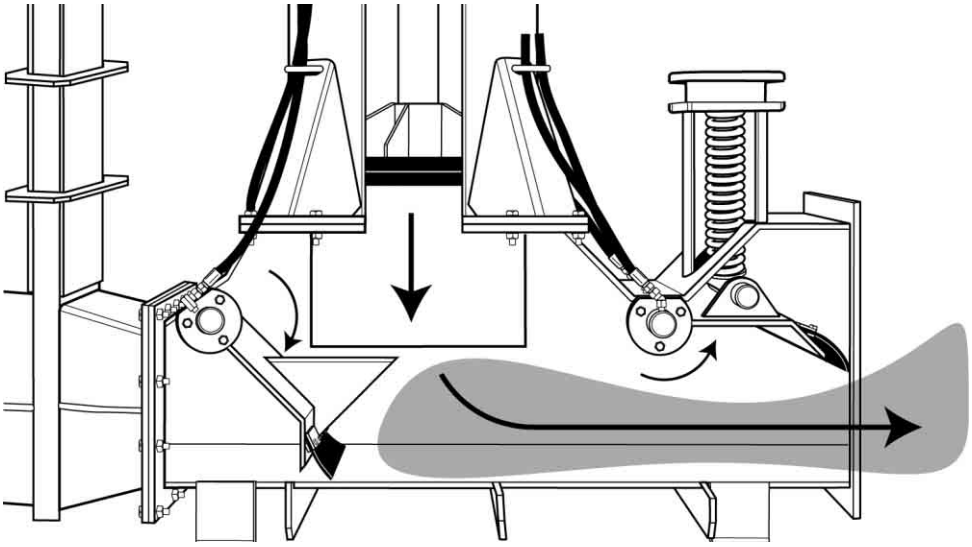
3.4 Functional description

Futuro pumps are used to transfer manure from a freestall barn to a manure reservoir pit or lagoon through an underground pipe. The pump can be installed to automatically or manually start via a control panel.

- During the siphoning cycle (up stroke) the discharge flapper closes and the intake flapper opens to fill the evacuation chamber with slurry.



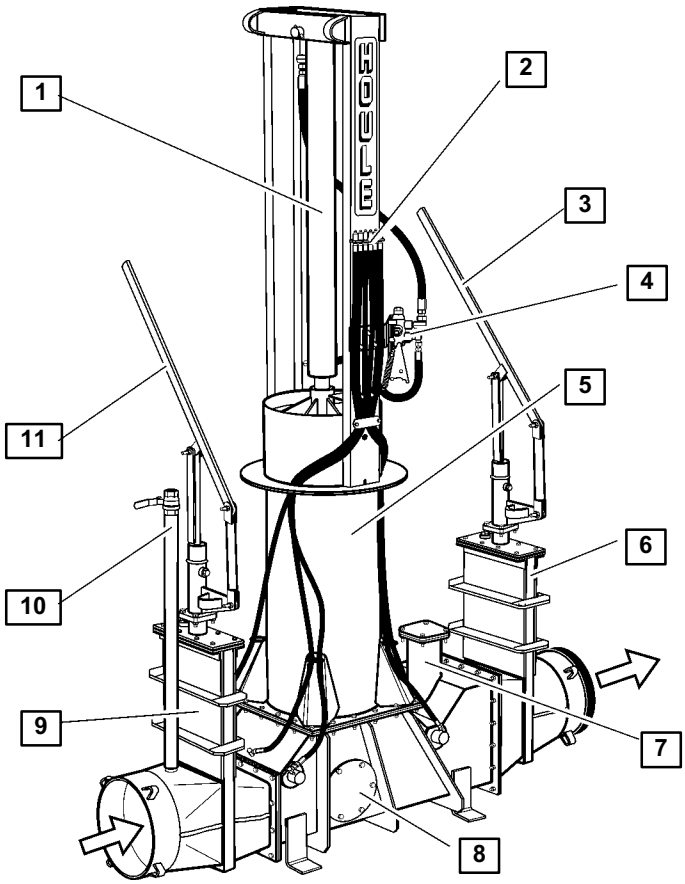
- During the evacuation cycle (down stroke) the intake flapper closes and the discharge flapper opens to move the slurry from the evacuation chamber into the discharge line.



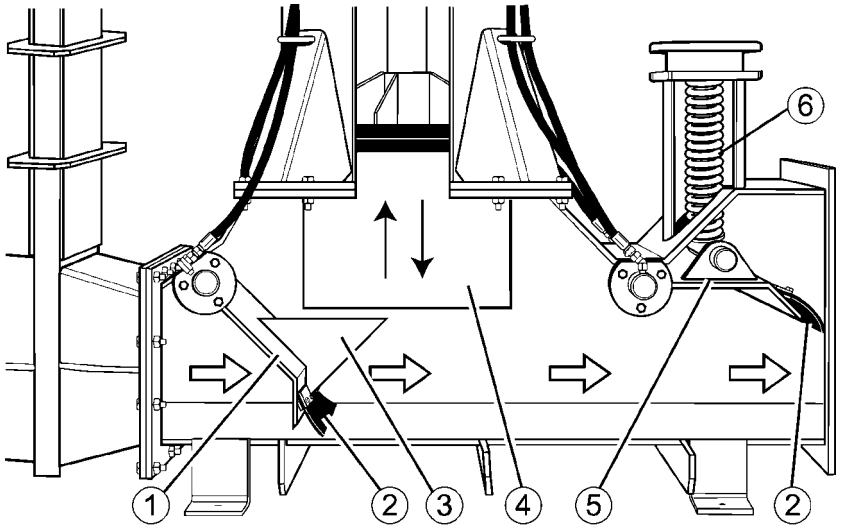
- A manual guillotine shut-off valve on the intake and discharge prevents flow through the pump when not in use and isolates the pump for maintenance. A hydraulic control for the guillotine valves is available as an option.
- The intake of the pump can be connected to a hopper or a short suction pipe to a reception pit.

3.5 Main View

3.5.1 Futuro Pump

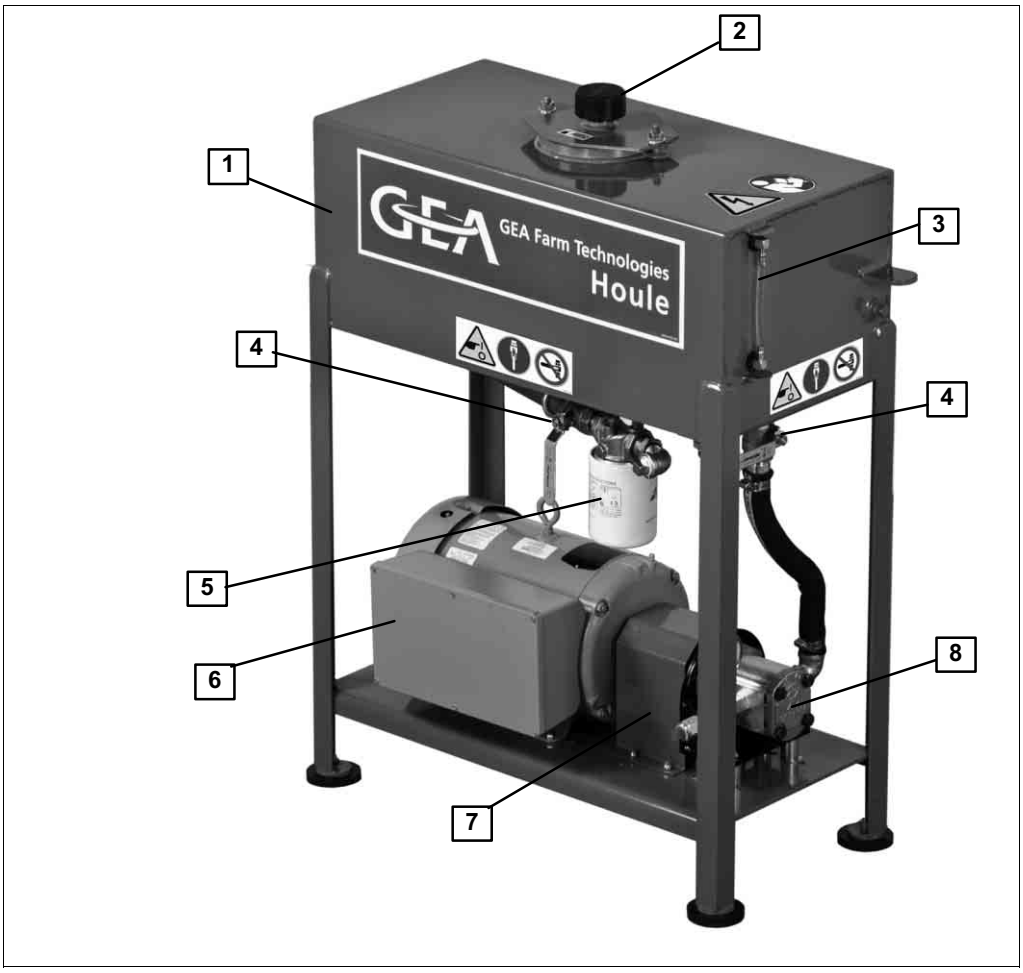


Legend:			
1	Hydraulic cylinder	**2**	Grease lines
3	Manual lever (guillotine valve)	**4**	Reversing mechanism
5	Pumping Tube	**6**	Discharge guillotine valve
7	Spring housing	**8**	Access door
9	Intake guillotine valve	**10**	Air drain pipe
11	Manual lever (guillotine valve)		



Legend:			
1	Intake flapper valve	**2**	Flapper door seal
3	Downstroke lever	**4**	Piston
5	Discharge flapper valve	**6**	Discharge valve spring

3.5.2 Hydraulic Power Unit



Legend:			
1	Oil reservoir	**2**	Reservoir cap
3	Oil sight gauge	**4**	Ball valve
5	Oil filter	**6**	Motor
7	Chain joint guard	**8**	Hydraulic Pump

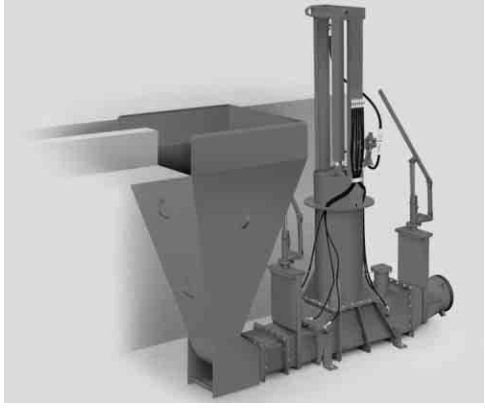
3.5.3 Accessories and optional equipment

Intake options

Hopper

A hopper is attached to the intake of the pump when the pump is to be fed by a gutter from a floor scraper or with a skid-steer loader.

Various hopper models are available.

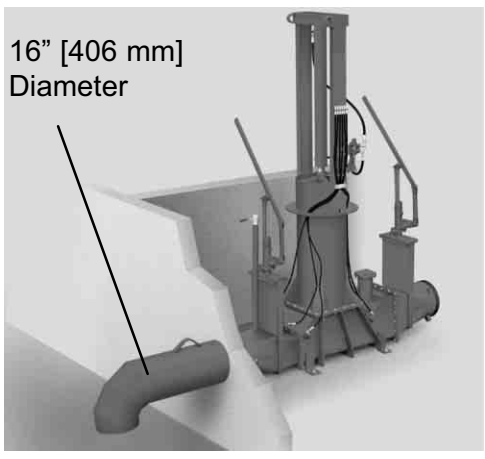


Suction pipe

A suction pipe is attached to the intake of the pump when the pump is to be fed from a reception pit.

The length of the suction pipe is limited and based upon the consistency of the manure slurry.

The suction pipe elbow may be position up or down depending on the relationship between the elevation of the reception pit and the pump.

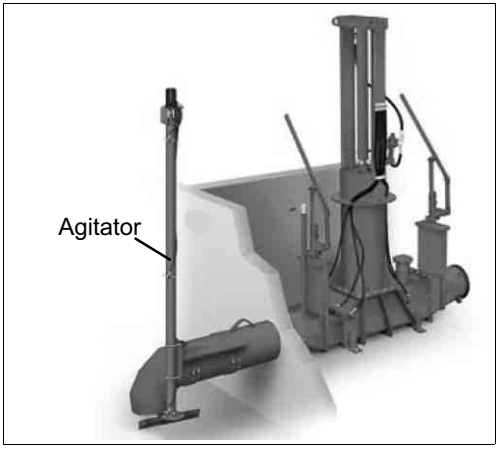


Attention!
In sand bedding operations, the suction pipe must be turned down with the hydraulic option added to prevent plugging.

The maximum length of the suction line is based upon the slurry. Refer to section on Performance charts

Hydraulic agitator

Reduces the accumulation of solids and the risk of obstruction at the inlet of the suction pipe.

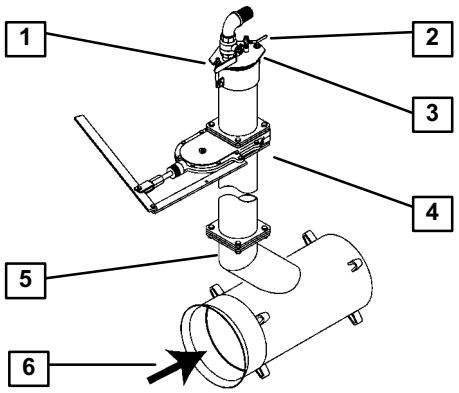


Air flush

In sand bedding operation, the air flush option is mandatory to push the sand out of the evacuation line.

The evacuation line should be flushed periodically using air pressure only and/or air pressure and a straw bullet.

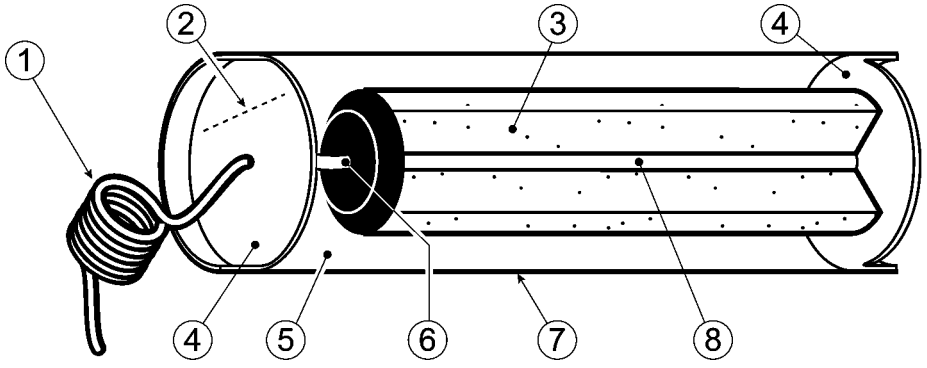
If the top of the manure reservoir is higher than the cap on the air flush riser pipe, a gate valve must be installed to prevent manure flow into the air line.



Legend:			
1	Air valve 2” [50 mm]	**2**	Relief valve ¼” [6 mm]
3	Cap 6” [150 mm]	**4**	Gate valve 6” [150 mm]
5	Air flush riser	**6**	Flow direction

Sacrificial anode

Connected to buried steel evacuation lines, it protects them against corrosion.

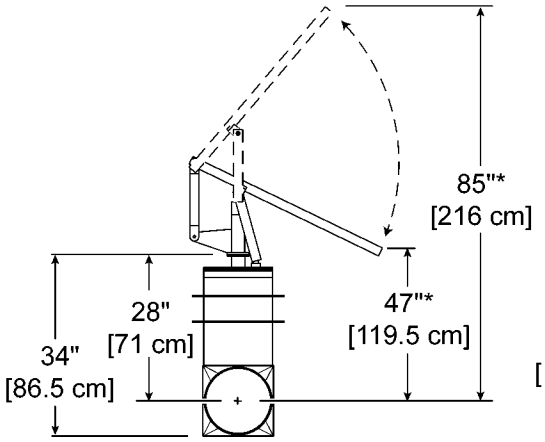


Legend:			
1	Anode copper wire AWG #12/7	**2**	Cut in plastic cap*
3	High purity magnesium bar	**4**	Plastic cap
5	Conductive powder	**6**	Insulated welded connection
7	Galvanized steel sheet	**8**	Cardboard tube

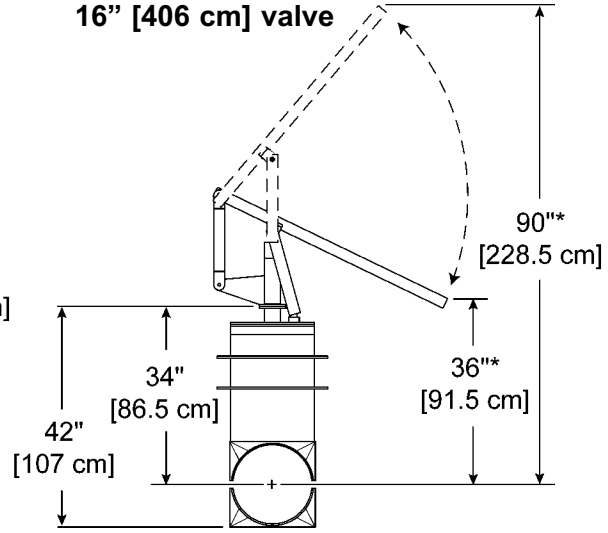
* Cut is made at time of installation to fill the tube with water for activation.

Guillotine valve configurations

12” [305 cm] valve

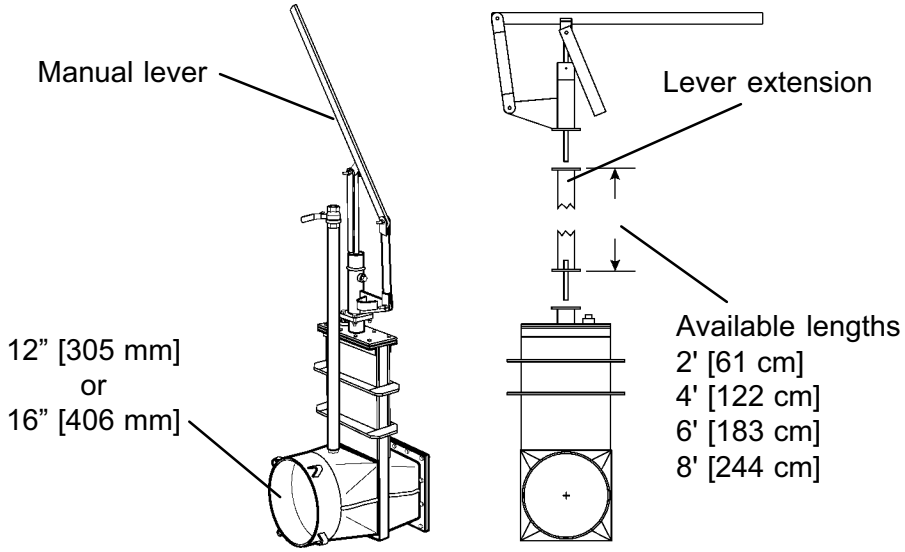


16” [406 cm] valve

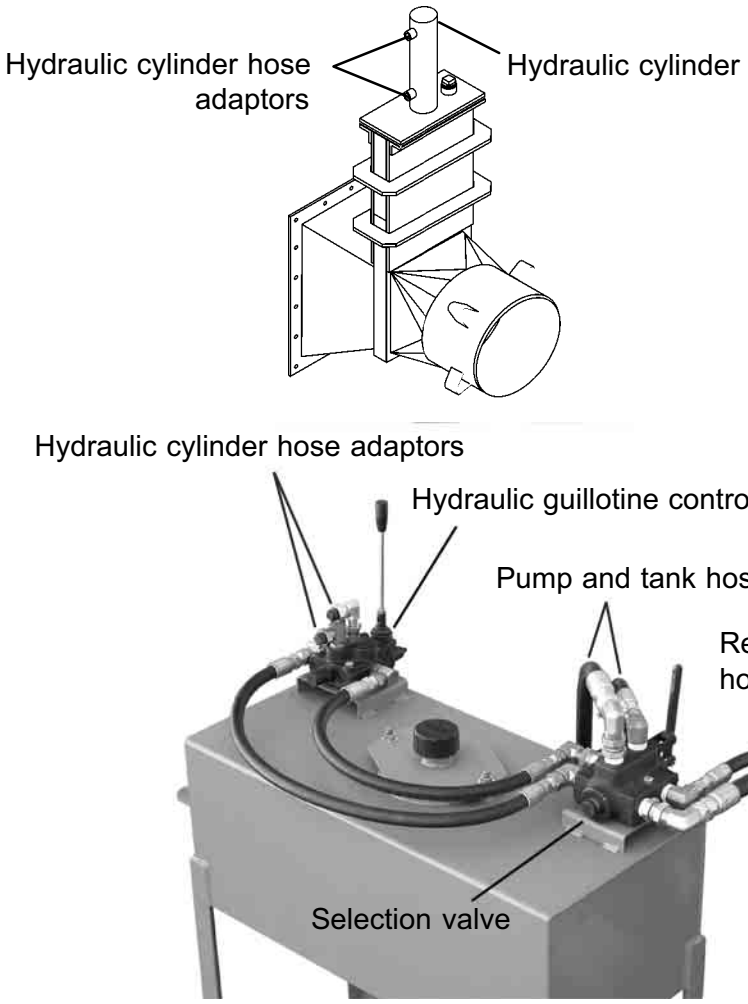


* Dimensions do not include lever extensions. If lever extensions are used, add the extension length to these dimensions.

Manual lever and lever extension



Hydraulic guillotine valve (optional)

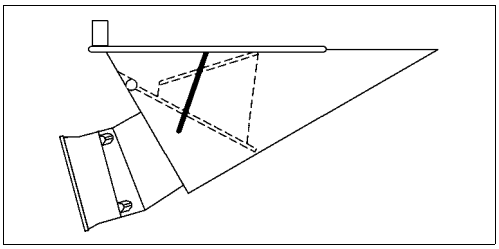


Flapper valves

Note!
The flapper valve prevents manure flow back as long as manure remains consistent enough to seal the flapper. The flapper valve may leak if manure becomes watery, or if a piece of material gets stuck between the flapper and the valve housing. The flapper valve should be preceded by a gate valve to ensure that the evacuation line can be shut off in case of emergency.

The flapper valve is a check valve attached to the end of the evacuation line to prevent manure from flowing back into the evacuation line.

Available for 12-¾ ” [315 mm] or 16” [406 mm] evacuation lines.



3.6 Technical Data

3.6.1 Geometric data

Futuro pump	
Hydraulic cylinder diameter	4” [102 mm]
Length*	49” [124.5 cm]
Width*	27½” [69.9 cm]
Height*	140” [355.6 cm]
Weight*	1422 lbs [645 kg]
Intake diametre	16” [406 mm]
Discharge diametre	12¾” [305 mm] or 16” [406 mm]
Maximum evacuation line length**	Varies based on manure consistency
Maximum length of suction pipe**	Varies based on manure consistency

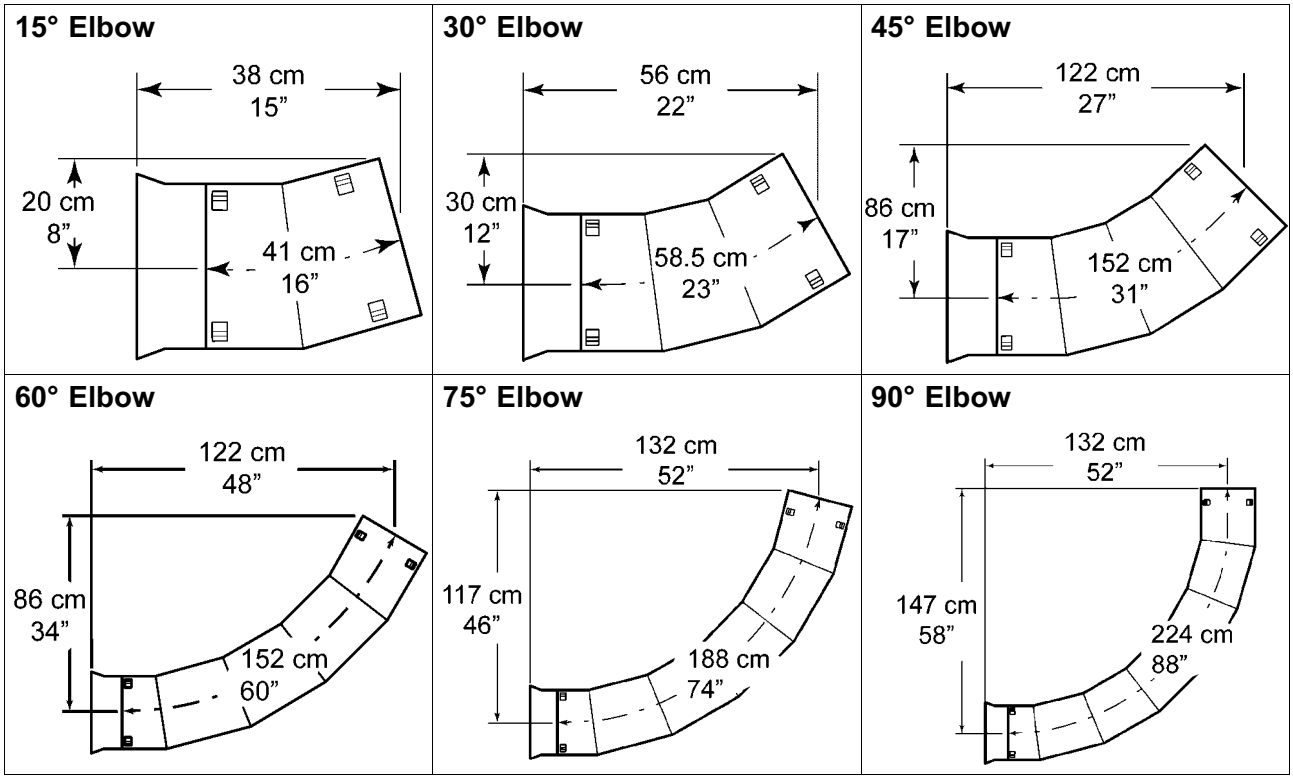
* Pump without intake or discharge accessories.

** Perform a manure consistency test.

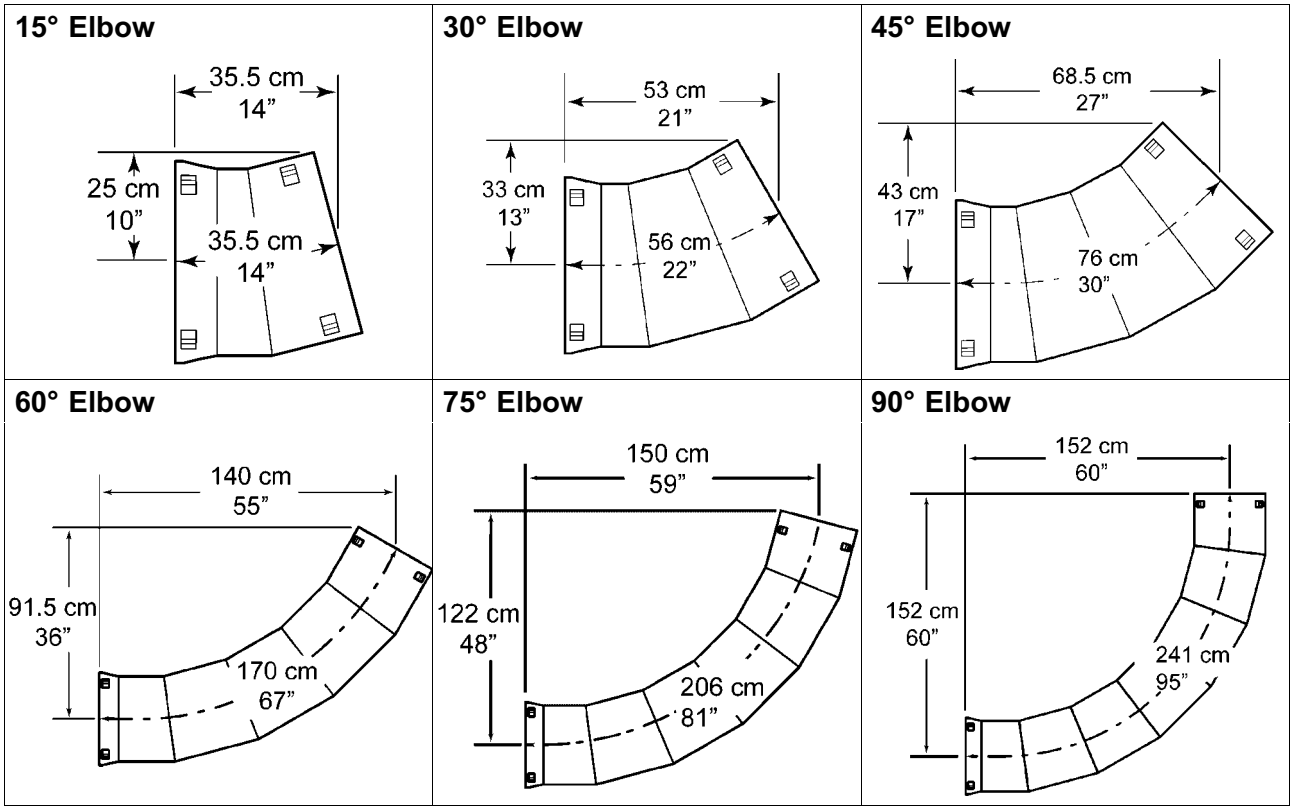
Hydraulic Power Unit	
Length	33” [83.8 cm]
Width	14½” [36.8 cm]
Height	42” [106.7 cm]
Weight (full of oil)	423 lbs to 540 lbs [192 kg to 245 kg]

Hydraulic hoses			
I.D.	1/4”	1/2”	3/4”
O.D.	0.58”	0.86”	1.10”
Quantity of braids	2	2	2
Service pressure	400 bar (5,800 psi)	276 bar (4,000 psi)	207 bar (3,000 psi)

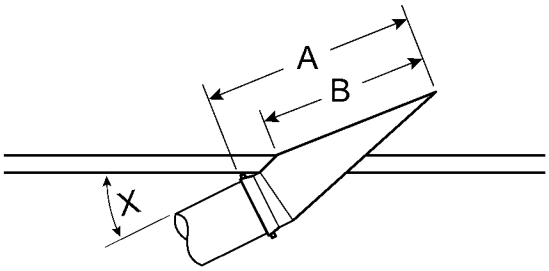
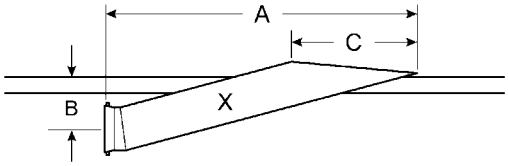
12¾” [315 mm] steel elbows

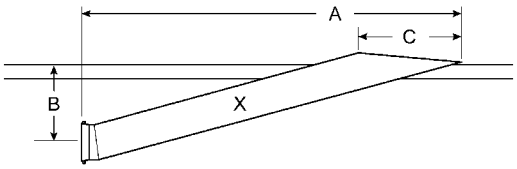
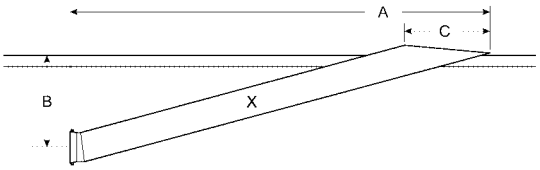


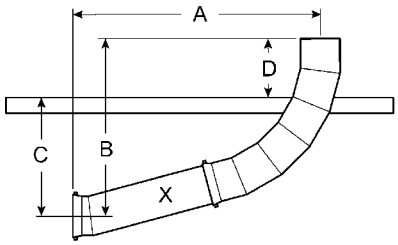
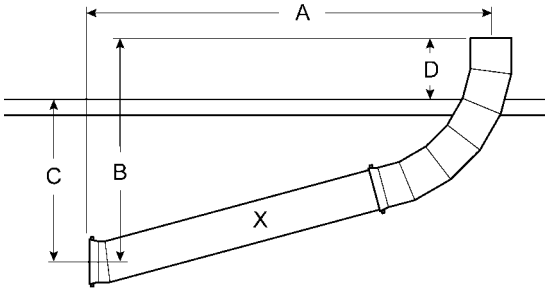
16” [406 mm] steel elbows

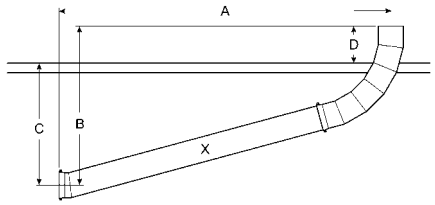
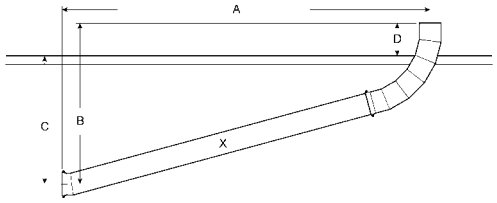


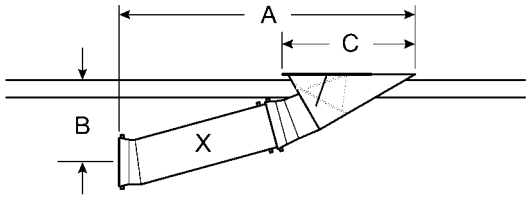
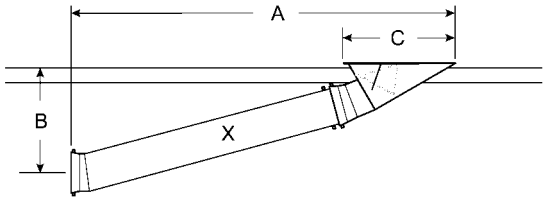
16” [406 mm] discharge pipe

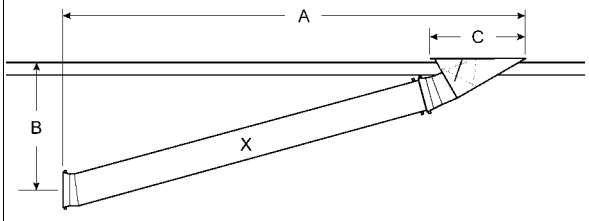
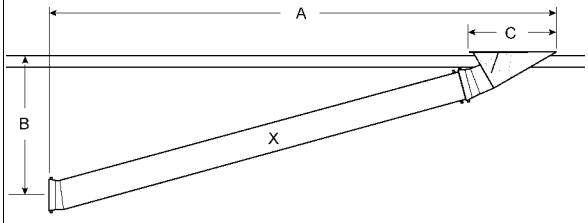
5' [1.52m] needle		10' [3.05m] needle	
			
A	60” (1.52 m)	A	120” (3.05 cm)
B	48” (1,22 m)	B	21” (53.3 cm) and less
X	20° and more	C	48” (1,22 m)
		X	15°

15' [4.57m] needle		20' [6.1m] needle	
			
A	180” (4.57 m)	A	240” (6.1 m)
B	37” (93.99 cm) and less	B	53” (1.35 m) and less
C	48” (1.22 m)	C	48” (1.22 m)
X	15°	X	15°

75º long radius elbow with rising pipe (15º X 5' long)		75º long radius elbow with rising pipe (15º X 10' long)	
			
A	102” (2.59 cm)	A	159” (4.04 m)
B	72” (1.83 cm)	B	88” (2.24 m)
C	48” (1.22 cm) and less	C	64” (1.63 m) and less
D	24” (61 cm) and more	D	24” (61 cm) and more
X	15°	X	15°

75º long radius elbow with rising pipe (15º X 15' long)		**75º long radius elbow with rising pipe (15º X 20' long)**	
			
A	216” (5.49 m)	A	276” (7.01 m)
B	104” (2.64 m)	B	120” (3.05 m)
C	80” (2.03 m) and less	C	96” (2.44 m) and less
D	24” (61 cm) and more	D	24” (61 cm) and more
X	15°	X	15°

75º Flapper valve with rising pipe (15º X 5' long)		**75º Flapper valve with rising pipe (15º X 10' long)**	
			
A	108” (2.74 m)	A	168” (4.27 m)
B	32” (81.3 cm) and less	B	48” (1.22 m) and less
C	48” (1.22 m)	C	48” (1.22 m)
X	15°	X	15°

75º Flapper valve with rising pipe (15º X 15' long)		**75º Flapper valve with rising pipe (15º X 20' long)**	
			
A	222” (5.64 m)	A	282” (7.16 m)
B	63” (1.6 m) and less	B	78” (1.98 m) and less
C	48” (1.22 m)	C	48” 91.22 m)
X	15°	X	15°

3.6.2 Performance data

Futuro pump performance charts

S.A.E. chart			
Slurry consistency		**Maximum evacuation distance**	**Maximum length of suction pipe**
Normal	2”	600'	40'
Maximum	5”	200'	10'

Maximum evacuation line length*	Varies based on manure consistency
Maximum length of suction pipe**	Varies based on manure consistency
Maximum manure consistency	5”
Temperature range	minimum 41°F
Maximum outlet pressure	54 PSI (1200 PSI in hydraulic circuit)
Noise level	62 dBA

* Pump without intake or discharge accessories.

** Perform a manure consistency test.

Metric chart			
Slurry consistency		**Maximum evacuation distance**	**Maximum length of suction pipe**
Normal	50 mm	183 m	12 m
Maximum	127 mm	61 m	3 m

Maximum evacuation line length*	Varies based on manure consistency
Maximum length of suction pipe**	Varies based on manure consistency
Maximum manure consistency	38 mm
Temperature range	minimum 5°C
Maximum outlet pressure	3.7 bar (82.7 bar in hydraulic circuit)
Noise level	62 dBA

* Pump without intake or discharge accessories.

** Perform a manure consistency test.

Hydraulic Power Unit performance charts

Power unit configuration				Flow rate		Max. Pressure	
Motor	Freq.	RPM	Pump	GPM	LPM	PSI	BAR
3.7 kW	50 Hz	1450	PLP 20-14	5,5	20,7	1800	124,1
			PLP 20-16	6,3	24	1440	99,3
			PLP 20-20	8	30,3	1200	82,7
5 HP	60 Hz	1740	PLP 20-14	6,6	24,8	1500	103,4
			PLP 20-16	7,6	28,8	1200	82,7
			PLP 20-20	9,6	36,3	1000	68,9
5.5 kW	50 Hz	1450	PLP 20-25	9,9	37,5	2800	193,1
7.5 HP	60 Hz	1740	PLP 20-20	9,6	36,3	3000	206,8
			PLP 20-25	11,8	44,7	2500	172,4

Temperature range	minimum 5°C [41°F]
Noise level	85 dBA

3.6.3 Electrical motor specifications

Electrical data	
Rated Motor Voltage	As per local requirements
Frequency	50Hz or 60Hzas per local requirements
Rated Motor Power	5HP to 7.5HP [3.7KW - 5.5KW]
Rated Motor Speed	50Hz@1450rpm 60Hz@1760rpm
Rated Motor Torque	No special requirements
Rated Motor Current	No special requirements
Efficiency	min. 80%
Power Factor	No special requirements

General data		
Standard specifications	NEMA	IEC
Frame sizes required**	184T, 213T, 215T	112, 132
Type of construction	B3	
Weight	No special requirements	
Frame material	No special requirements	
Degree of protection	IP 55	
Method of cooling	TEFC, IC 411 (Totally Enclosed, Fan Cooled)	
Vibration class	No special requirements	
Insulation	155(F) to 130(B)	
Duty type	S1(continuous operation)	
Direction or rotation	Bi-directional	

** Motor frame sizes allowed to be fitted on the motor support.

3.6.4 Control panel specifications

The control panel must:

- comply with the following requirements:
  - 2006/95/CE directives (Electrical equipment designed for use within certain voltage limits)
  - 92/31/CEE directives (Electromagnetic compatibility)
- comply with the following harmonized standards:
  - EN 60204-1 (Safety of machinery - Electrical equipment of machines);
  - EN 61082-1 (Documents used in electrotechnology);
  - EN 60617 (Graphical symbols).
- be equipped with an emergency stop.
- be protected by a lockable disconnect switch (cut-off switch).
- meet all motor specifications provided in this manual.
- meet local electrical requirements.

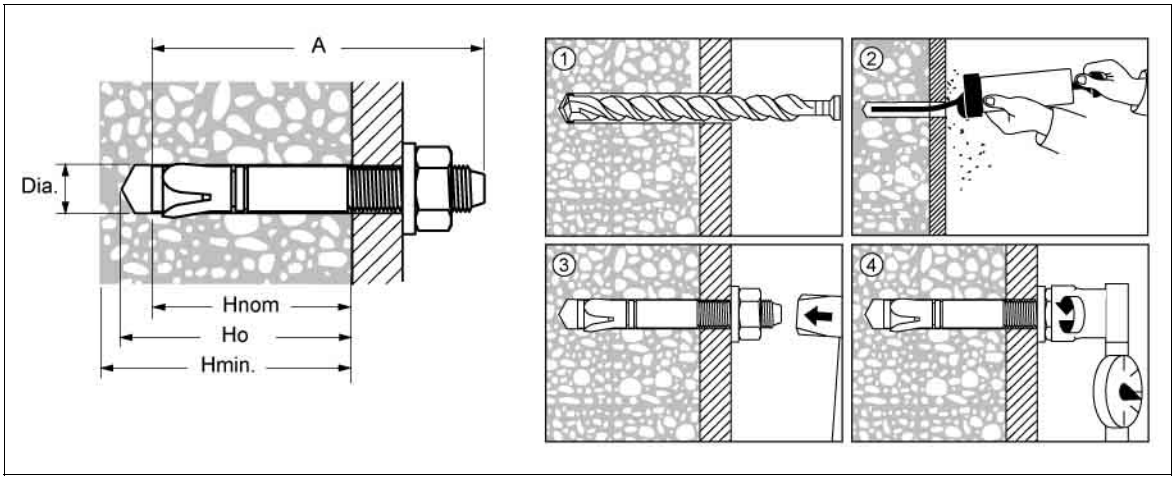
Special specifications:

- The control panel protection devices must be designed to avoid any unexpected start.

3.6.5 Lubricant specifications

Lubricant Type	Brands / Specifications	Purpose
Hydraulic oil	Use these brands (or equivalent) ● Petro-Canada AW 32 ● Shell Tellus 32 ● Exxon Nuto H32 ● Mobil AW Hydraulic Oil 32	Fill Hydraulic Power Unit tank. Fill Insulated gate valve tube.
Biodegradable oil	Required specifications: ● Kinematic Viscosity 60-100 cSt @ 40°C [100°F] ● Pour point: below -10°C [14°F] ● Oil must not contain any additives that may damage piston gasket.	Lubricate piston pump seal.
General Purpose Grease	Use these brands (or equivalent) ● EP2 mineral grease	Lubricate the equipment.

3.6.6 Concrete anchor bolts specifications



Bolt Diametre	3/8” [10mm]	1/2” [13mm]			3/4” [19mm]
Bolt Length **(A)**	3” [76mm]	2 3/4” [70mm]	3 3/4” [95mm]	3 3/4” [95mm]	5 1/2” [140mm]
Material	Steel	Steel	Steel	SS 304	Steel
Minimum hole depth **(Ho)**	Hnom + 1/4” [6mm]	Hnom + 1/4” [6mm]	Hnom + 3/8” [10mm]	Hnom + 1/4” [6mm]	Hnom + 1/4” [6mm]
Hnom	2 3/8” [60mm]	1 3/4” [45mm]	2 1/4” [57mm]	2 1/4” [57mm]	4 1/4” [108mm]
Hmin	4” [101mm]	4” [101mm]	4” [101mm]	4” [101mm]	6” [152mm]
Concrete drill bit diametre **(Dia.)**	3/8” [10mm]	1/2” [13mm]	1/2” [13mm]	1/2” [13mm]	3/4” [19mm]
Torque	25Nm (20ft-lb)	54Nm (40ft-lb)	54Nm (40ft-lb)	54Nm (40ft-lb)	150Nm (110ft-lb)

3.6.7 Bolt torque chart

Bolt	**Mat.**	**Bolt diametre**									
		1/4”	5/16”	3/8”	7/16”	1/2”	9/16”	5/8”	3/4”	7/8”	1”
SAE 2	LCS	8Nm (6ft-lb)	16Nm (12ft-lb)	27Nm (20ft-lb)	44Nm (32ft-lb)	64Nm (47ft-lb)	94Nm (69ft-lb)	130Nm (96ft-lb)	210Nm (155ft-lb)	279Nm (206ft-lb)	420Nm (310ft-lb)
SAE 5	MCS HT	14Nm (10ft-lb)	26Nm (19ft-lb)	45Nm (33ft-lb)	73Nm (54ft-lb)	106Nm (78ft-lb)	155Nm (114ft-lb)	209Nm (154ft-lb)	349Nm (257ft-lb)	518Nm (382ft-lb)	796Nm (587ft-lb)
SAE 8	MCAS	19Nm (14ft-lb)	39Nm (29ft-lb)	64Nm (47ft-lb)	106Nm (78ft-lb)	161Nm (119ft-lb)	229Nm (169ft-lb)	312Nm (230ft-lb)	515Nm (380ft-lb)	814Nm (600ft-lb)	949Nm (700ft-lb)
Socket Head Cap Screw	AS HT	22Nm (16ft-lb)	45Nm (33ft-lb)	73Nm (54ft-lb)	114Nm (84ft-lb)	170Nm (125ft-lb)	244Nm (180ft-lb)	339Nm (250ft-lb)	542Nm (400ft-lb)	868Nm (640ft-lb)	1315Nm (970ft-lb)

3.6.8 Manufacturer's plate

The manufacturer's plate is attached to the equipment.

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.

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:

- Sharp edges may cause injuries.
- Suspended loads can fall resulting in severe injuries or even death.
- 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.
- 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

Attention!
To lift the equipment, use a lifting device with a minimum capacity of:

2000 lb [1500 kg].

Chain Hoist

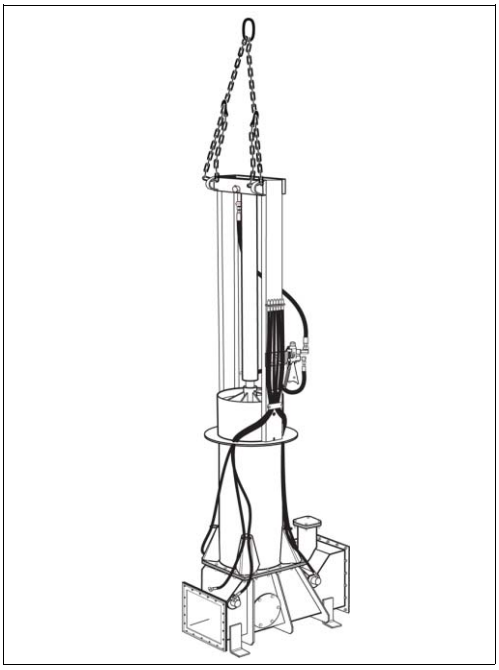
Safety Chain

Fork lift truck

4.4 Lifting and moving the pump

Using safety chains

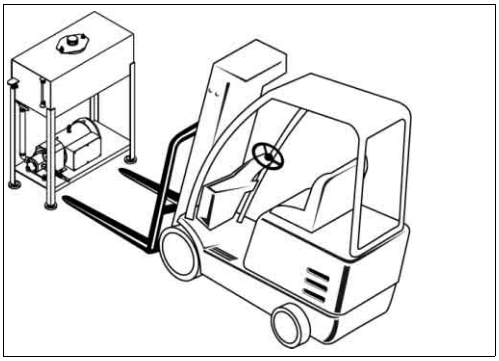
- Attach safety chains to the lifting rings as illustrated below.
- To lift the pump in a vertical position, use the lifting rings located on the top of the pump.



4.5 Lifting and moving the hydraulic power unit

Using a fork lift

- Insert forks under the power unit motor base to lift it.



4.6 Storage conditions

Attention!
Risk of corrosion!

When storing the goods supplied, the location must provide protection against:

- Moisture
- Frost
- External damage (jolts, knocks, rodents, insects, . . .)
- Direct sunlight

4.7 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

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

Caution!
When electrical motors and/or control panels come from a supplier other than the manufacturer, it is mandatory to verify components compatibility. Make sure motors and/or control panels match the equipment specifications.

Also read the chapter on ”Safety”.

- Observe any national standards and requirements during installation.
- Before installation, look for any damage caused during transport. Do not use damaged components!
- Use only the special tool indicated for assembly.

Special hazards during installation:

- Injury can be caused by electrical current from live cable ends and components.
- There is a fire hazard associated with welding work.
- 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.
- Leaking lubricants, solvents,... could cause injury if they come into direct contact with the skin and could make the floor surface slippery which could result in dangerous fall.
- Serious injury to personnel or damage to property can be caused if the incorrect torque is applied when tightening screws.

5.3 Assembly preparations

Necessary documents

- Electrical wiring diagrams
- Foundation plan

Special tools

	Description	Purpose
	Fork lift truck	To lift the equipment
	Chain hoist	To lift the equipment
	Safety chains	To lift the equipment
	Hammer drill	To make holes in the concrete floor
	Concrete drill bit	To make holes in the concrete floor
	Hammer	To insert anchor bolts

	Wrench set	To tighten bolts and anchor bolts
	Ratchet tool set	To tighten bolts and anchor bolts
	Allen wrenches Pulleys installation	To tighten set screws on pulleys
	Torque wrench	To tighten bolts and anchor bolts at the specified torque

Local purchased items

Provided by the owner:

- Safety fences installed around the equipment/reservoir to prevent fall.
- PVC pipe rated at 150 psi [10.3bar] minimum.
- An electric motor meeting technical specifications as provided in this manual. Refer to the Technical Data section on Electrical motor specifications.
- A control panel meeting local regulations and motor specifications. Refer to the Technical Data section on Control panel specifications. This apply only when this item is not supplied by the manufacturer.

5.3.1 Minimum pit dimensions for installing the pump in a service pit

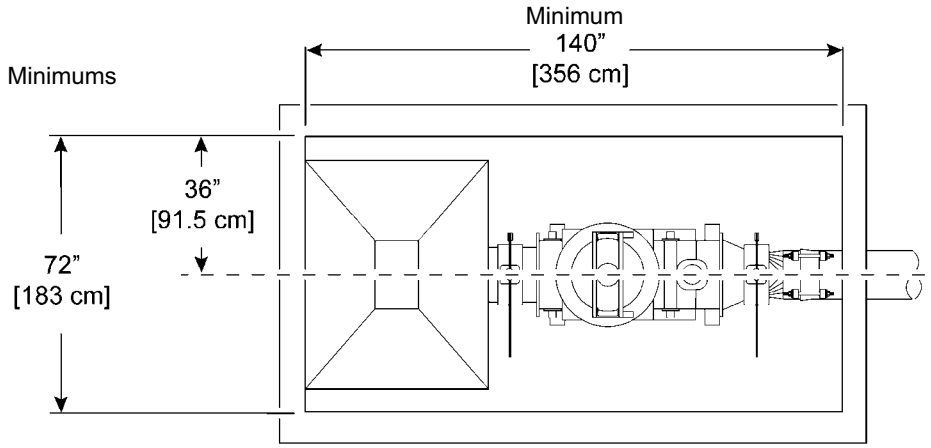
Attention!

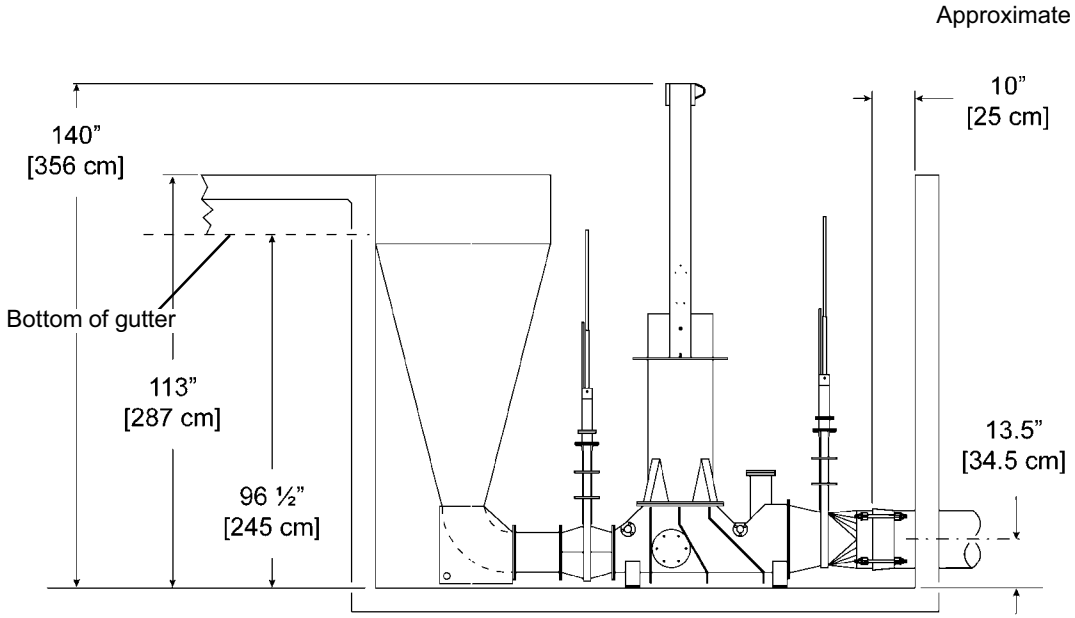
- The minimum pit dimensions vary depending on the accessories that will be installed with the pump in the pit.
- Minimum dimensions of the pit do not include a stairway for pump maintenance. Refer to your engineer or architect in order to design a stairway that gives access to the pit.

Note!
Evacuation pipe must be installed through the concrete wall forms before pouring concrete.

Pit for pump with a hopper and without an air riser

The length of pit is applicable to all configurations of intake and discharge adaptors, with or without guillotine valve.

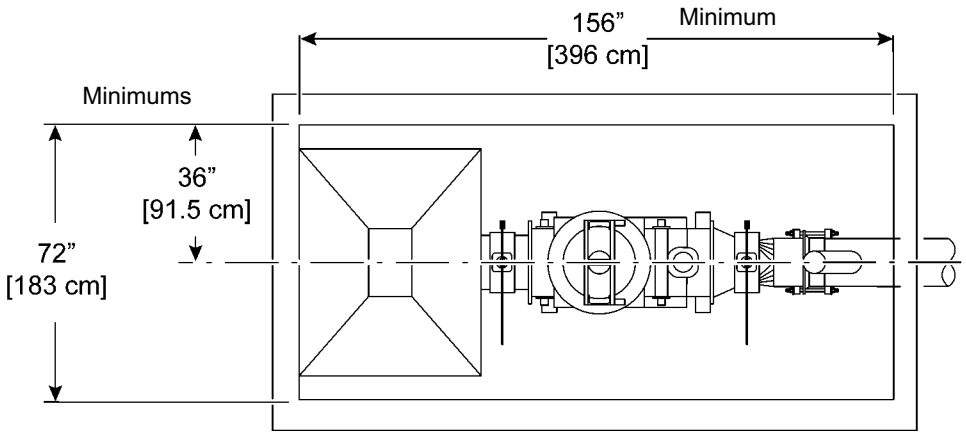


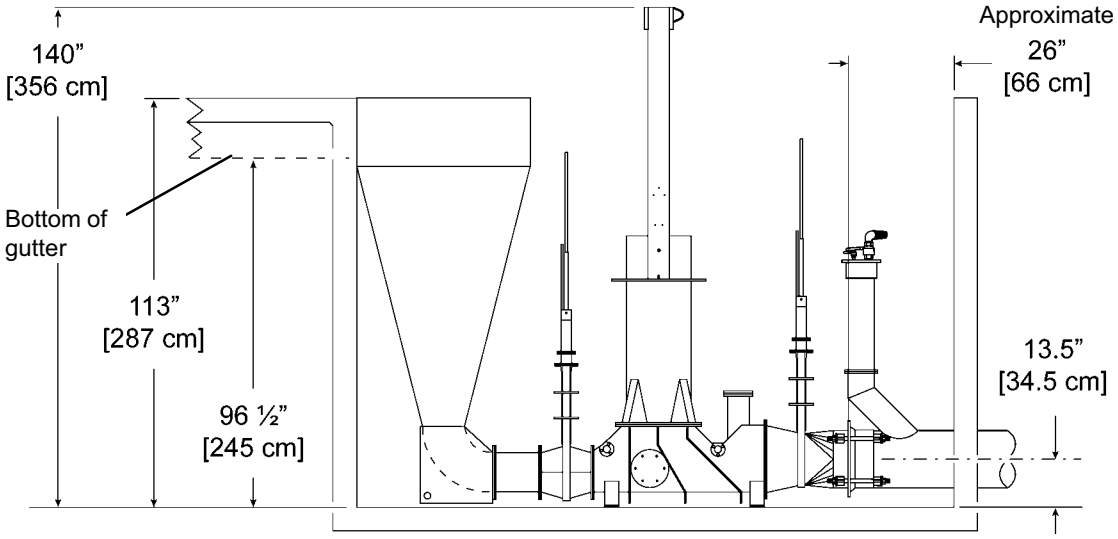


Pit for pump with a hopper and with an air riser

Refer to section on Installing a 6” [15 cm] riser for air flush

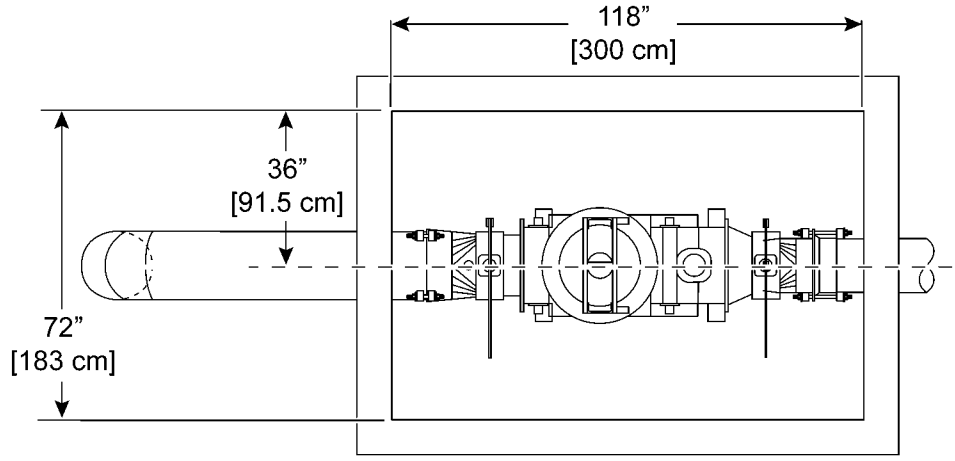
The length of pit is applicable to all configurations of intake and discharge adaptors, with or without guillotine valve.

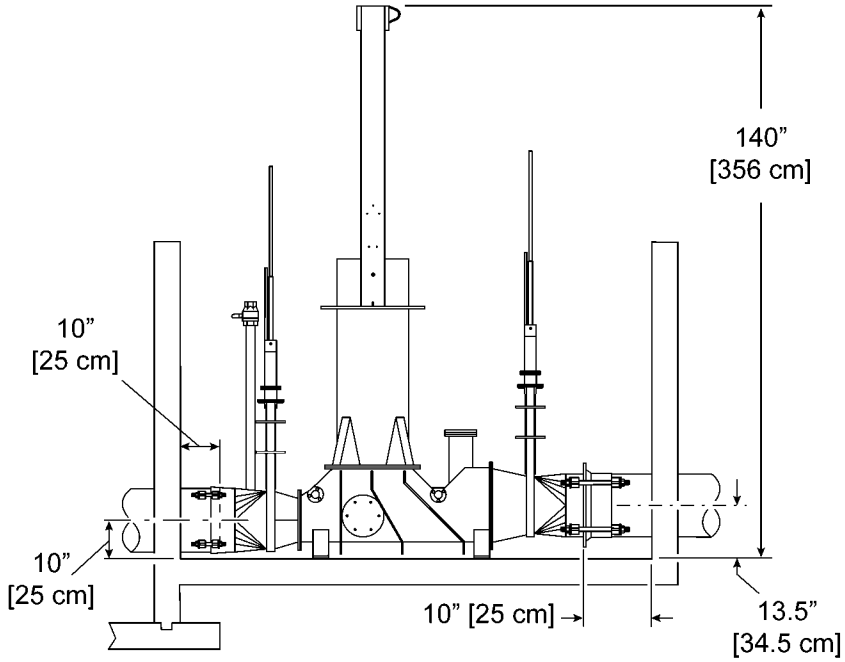




Pit for pump with a suction pipe and without an air riser

The length of pit is applicable to all configurations of intake and discharge adaptors, with or without guillotine valve.

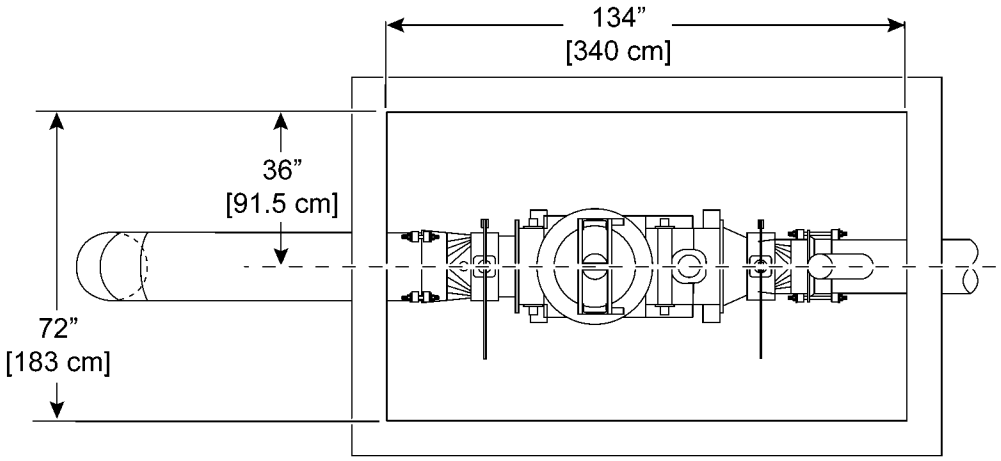


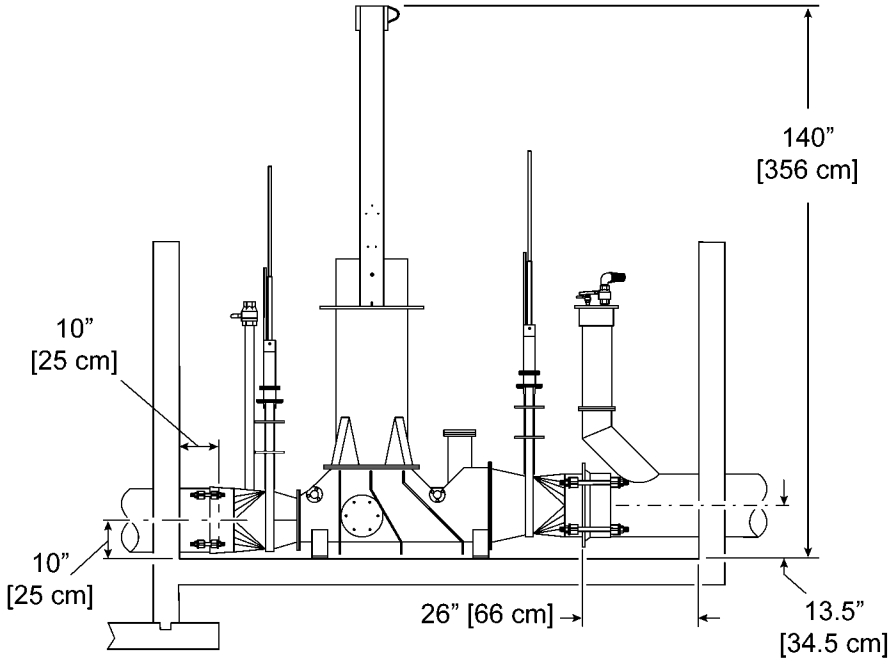


Pit for pump with a suction pipe and with an air riser

Refer to section on Installing a 6” [15 cm] riser for air flush

The length of pit is applicable to all configurations of intake and discharge adaptors, with or without guillotine valve.





5.4 Environmental prerequisites for setting up

- The product must be installed in a well ventilated frost-free environment.

5.5 Installing the pump

Warning!
Always shut off and lock the power supply before installing the equipment.

Caution!
Never allow bystanders to stay close to the pump when it is lifted.

Caution!
Sharp edges may cause cuts.

To install concrete anchor bolts properly, refer to the Technical Data Section on Concrete Anchor Bolt.

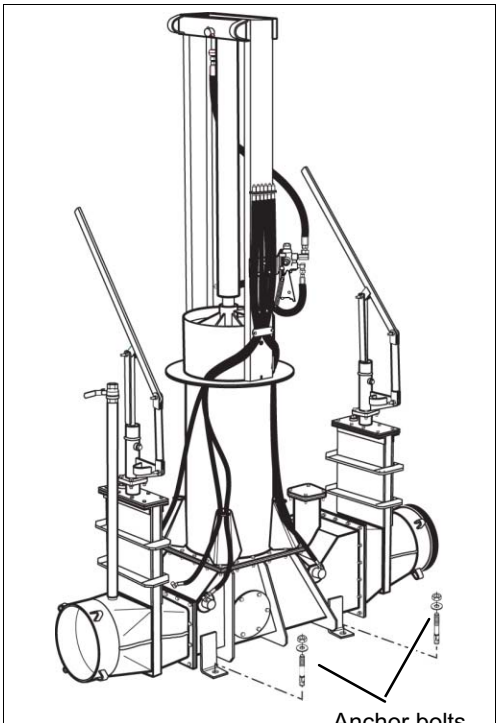
To tighten bolts adequately, refer to the Technical Data Section on Bolt Torque Chart.

5.5.1 Positioning the pump

- Lift the pump and position it in the pit according to the minimum dimensions for the particular installation configuration.

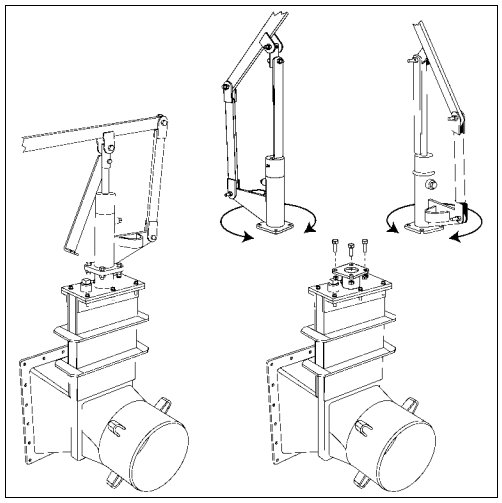
Refer to section on Minimum pit dimensions for installing the pump in a service pit.

- Anchor the pump to the fit floor with 4 anchor bolts (1/2" x 3¾" [13 x 95mm] stainless steel bolts). Refer to section on Concrete anchor bolts specifications.



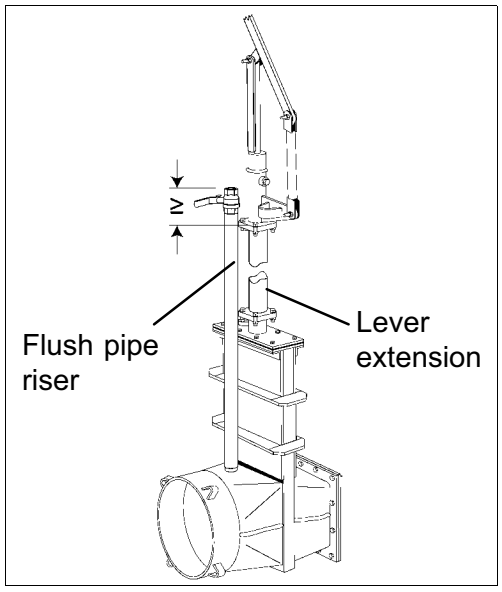
5.5.2 Installing guillotine shut-off valves on the intake and discharge of the pump

- The lever is mounted parallel to the guillotine housing (perpendicular to the line).
- The lever can be rotated, in 90° increments, by re-assembling the upper bolt and the flange accordingly.
- Chose the position which provides unimpeded lever movement and operator convenience.



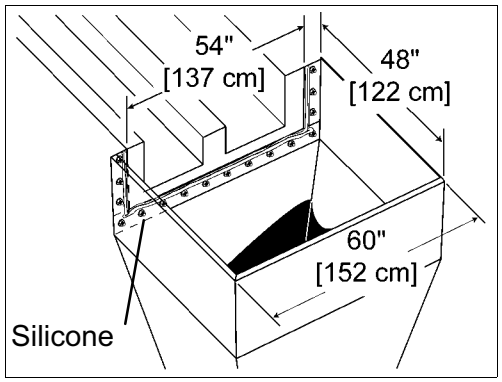
Lever extension

- The pump pit can be covered for added safety and convenience. In this case, the valve levers are raised above the floor by using a lever extension.
- The height of the flush pipe riser must be equal to or higher than the flange on top of the lever extension.



5.5.3 Installing a hopper intake

- The hopper is flanged in order to be anchored to the wall of the pit using 2 3/4” [7 cm] anchor bolts.
- Seal the gap between the wall and the hopper by applying a silicone joint.



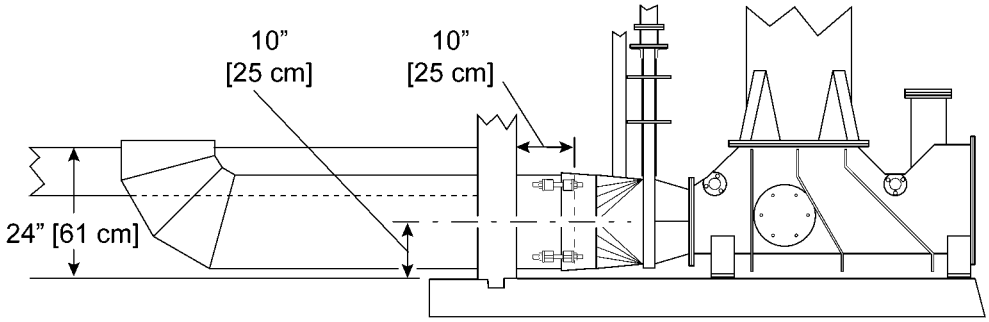
5.5.4 Installing a suction pipe through a wall (pump in a service pit)

Attention!
In sand bedding operations, the suction pipe must be turned down with hydraulic agitation option added to prevent plugging.

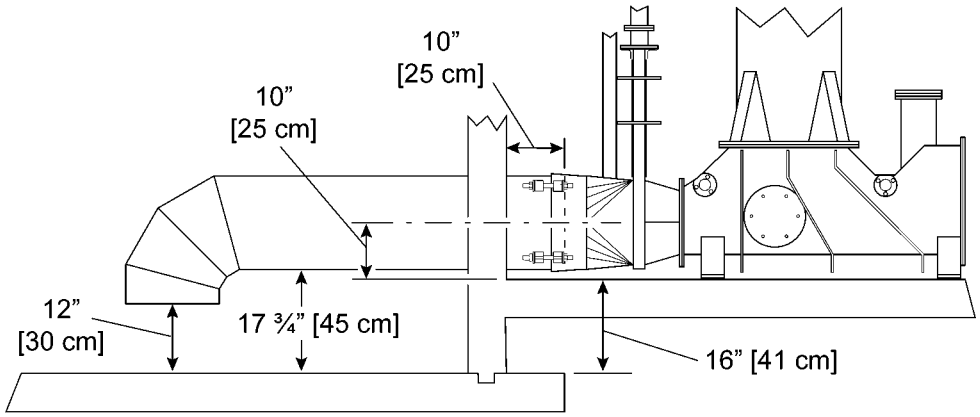
Refer to section on Minimum pit dimensions for installing the pump in a service pit

The maximum length of the suction line is based upon the manure consistency.
Refer to the section on consistency test.

Reception pit higher than the pump pit (suction pipe up)



Reception pit lower than the pump pit (suction pipe down)

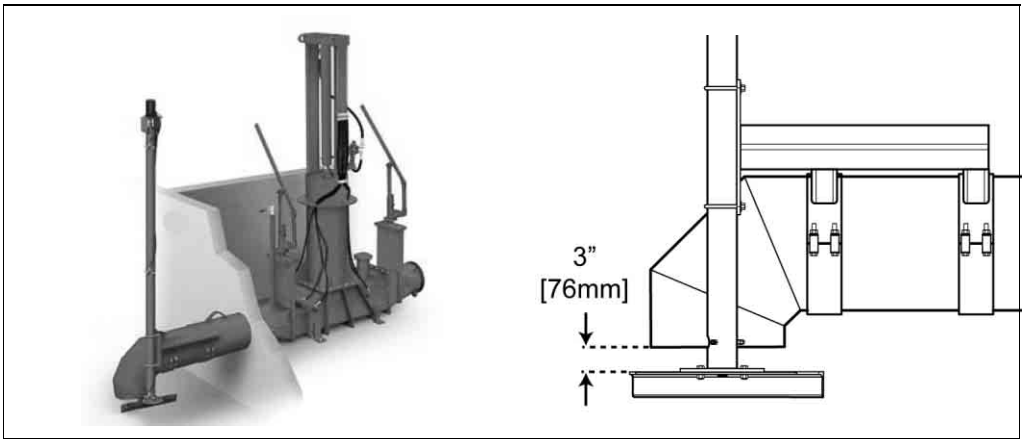


5.5.5 Installing a hydraulic agitator on the suction pipe

Attention!
For a safe handling when installing the hydraulic agitator, use a lifting equipment having a minimum capacity of 200 lbs (90 kg) to hold the hydraulic agitator.

- Using 2 U-bolts (7/16” x 3.5” x 4.375” round U-bolts), install the agitator on support.
- Position the agitator to get 3” [76mm] between the end of the suction pipe and the agitator blade.
- Connect hydraulic hoses.

Refer to Appendix on Hydraulic schematic

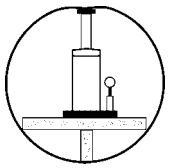


5.6 Installation of the evacuation line

Inspection of the steel pipes before installation

Make sure the steel pipes have not been damaged during transportation.

Note!
If some pipe ends are out of shape, use a hydraulic jack to correct them.



Connecting pipes and components

Attention!
When maneuvering the steel pipes, inspect the pipe for any scratches in the coating. Coat all scratches with tar to protect from corrosion;

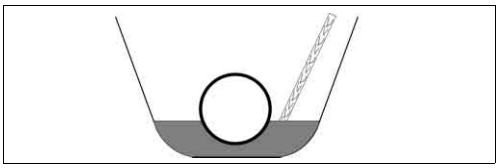
Attention!
Pipes must be surrounded with sand and carefully backfilled under the frost level.

Attention!
All gate valves with insulated rod and PVC elbows must be embedded in concrete to avoid pipe dislocation.

Refer to section on Protection against corrosion of the steel evacuation line

The complete evacuation line must be buried in fine compacted sand. Sand protects PVC pipes from rock piercing and protects against corrosion.

- Lay the pipes on 6” [15cm] of compacted sand.
- Perform a leak test according to the local regulation.
- Surround pipes with sand and compact it using a piece of wood as illustrated.



Assembling evacuation pipe joints

Functions of the evacuation pipe joints

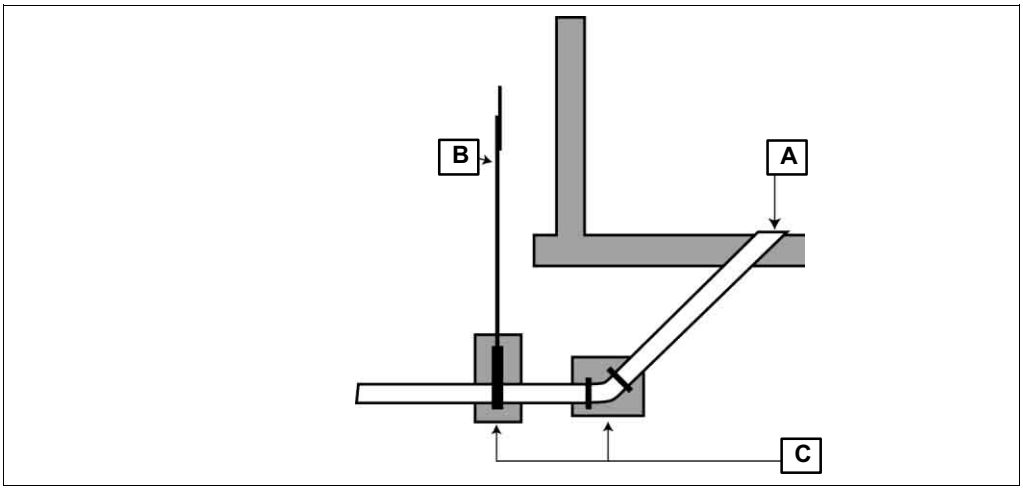
Evacuation line joints have three functions:

- To seal the junction of two pipes of the same diameter;
- To hold the pipe sections together;
- To withstand the pressure of manure inside the line.

Types of evacuation pipe joints

GEA Houle manufactures 8 different types of joints for quick assembly of PVC and steel pipes. GEA Houle joints cannot dislocate when properly installed.

The installer who chooses to use concrete thrust blocks must refer to local authorities for proper specifications regarding the size, the orientation and the spacing of the blocks.



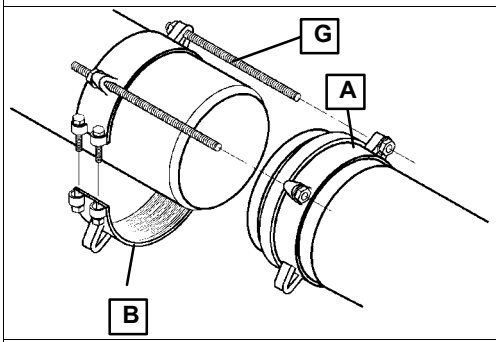
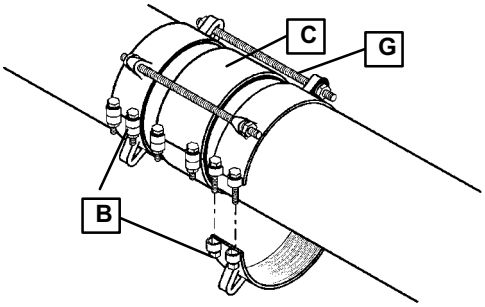
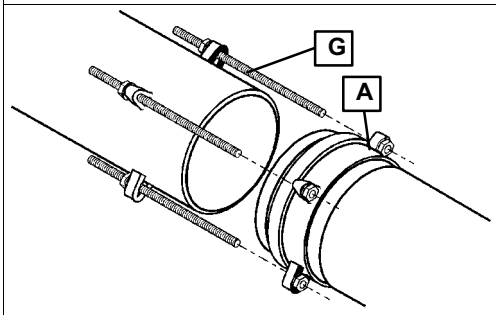
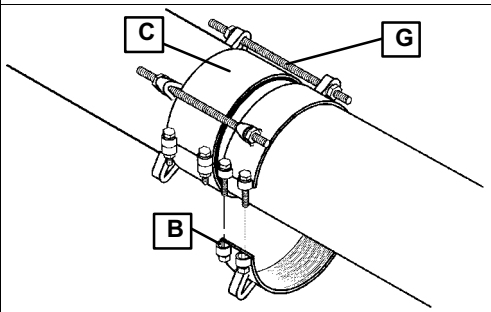
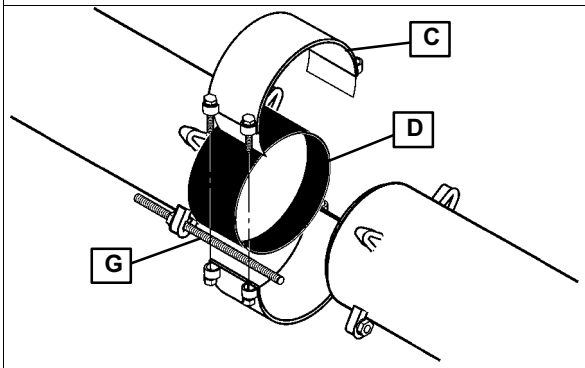
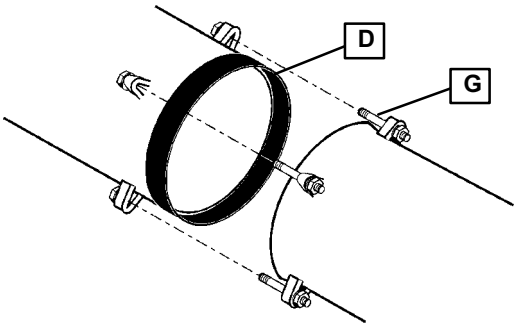
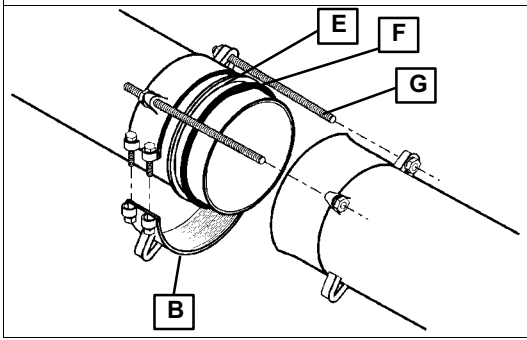
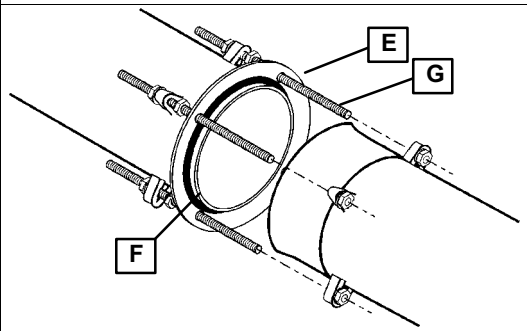
A	Evacuation line inlet
B	Insulated gate valve
C	Concrete thrust block

- Before connecting pipes, apply vegetable grease inside each female pipe end;
- According to the joint type, use all components required to assemble pipes together;

Note!
Refer to the drawing in the following table that corresponds to your assembly.

- Once pipe joints assembled, tighten moderately the 4 threaded rod nuts to prevent the joint from dislocating. Tighten each nuts at the same torque.

Warning!
Do not overtight threaded rod nuts. Overtight nuts will damage the pipe joint sealing. The threaded rods function is to prevent pipe joint from dislocating, not to tight them together.

Male PVC to female PVC	Male PVC to male PVC
	
Male steel to female PVC	**Male steel to male PVC**
	
Male steel to male steel	**Male steel to female steel****
	
Male PVC to female SS*	**Male steel to female SS***
	

Legende:					
A	PVC pipe collar	**G**	Threaded rods	**F**	O-ring
C	Split coupler	**B**	Anti-slip collar		
E	Retaining ring	**D**	Seal		

* only available on 12 ¾" [315mm] O.D. pipe.

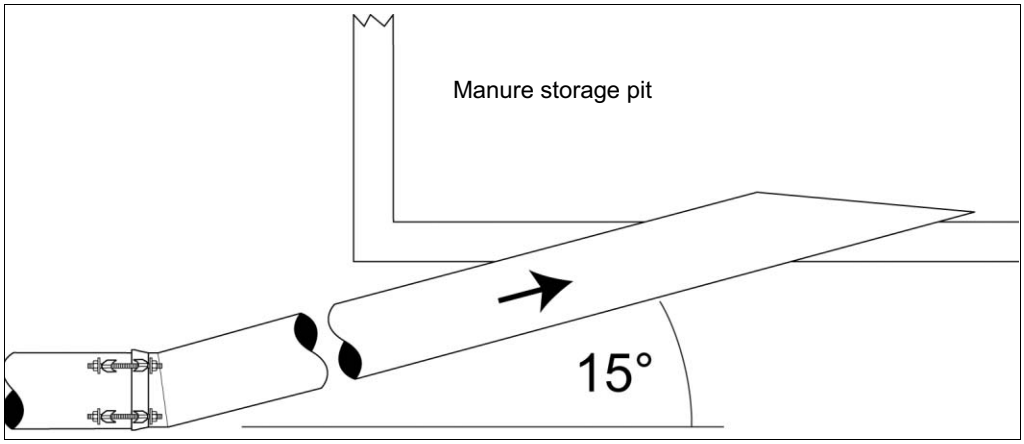
** only available on 16" [406mm] O.D. pipe.

5.6.1 Installing a discharge pipe on the end of the evacuation line

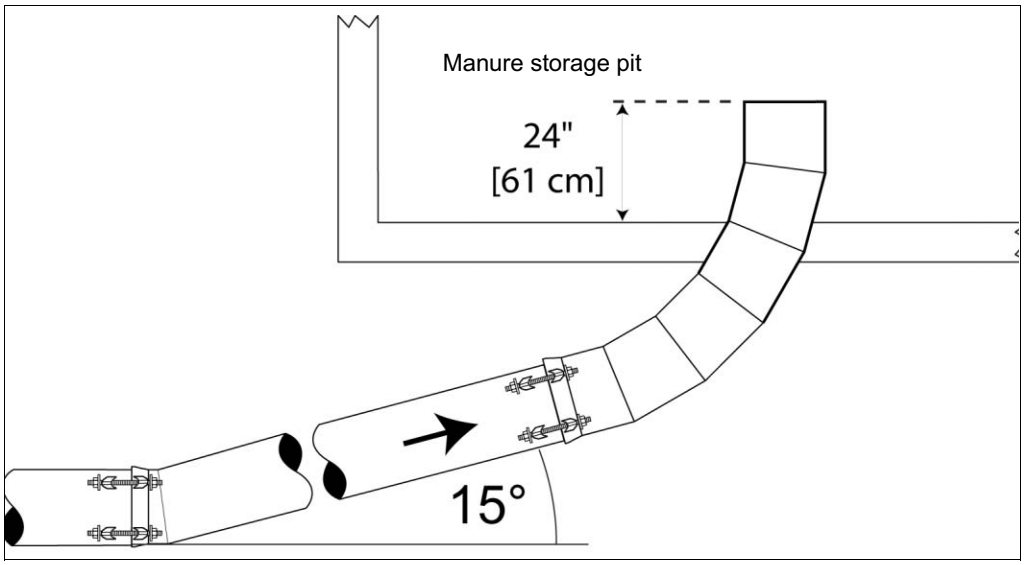
Refer to section on Dimensions of GEA Houle steel components prior to install the discharge pipe.

- Install the discharge pipe in the bottom of the manure storage pit according to the model.
- Attach the discharge pipe to the evacuation line.

Needle model

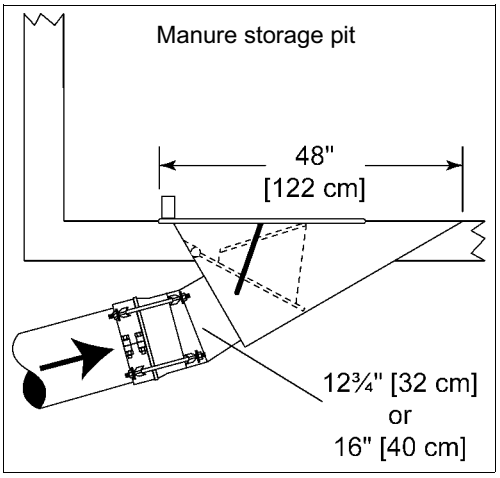


75º Elbow model

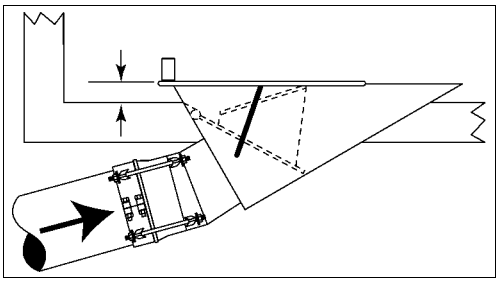


5.6.2 Installing a flapper valve on the end of the evacuation line

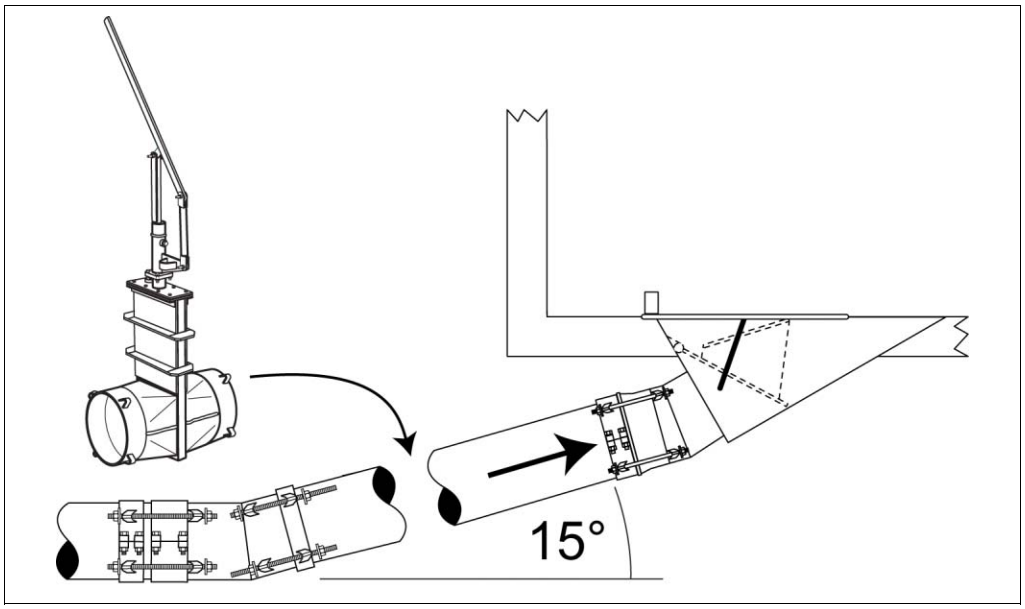
- Install the flapper valve in the bottom of the manure storage pit.
- The flapper valve prevents manure flow back as long as manure remains consistent enough to seal the flapper.
- The flapper valve may leak if manure becomes watery, or if a piece of material gets stuck between the flapper and the valve housing.



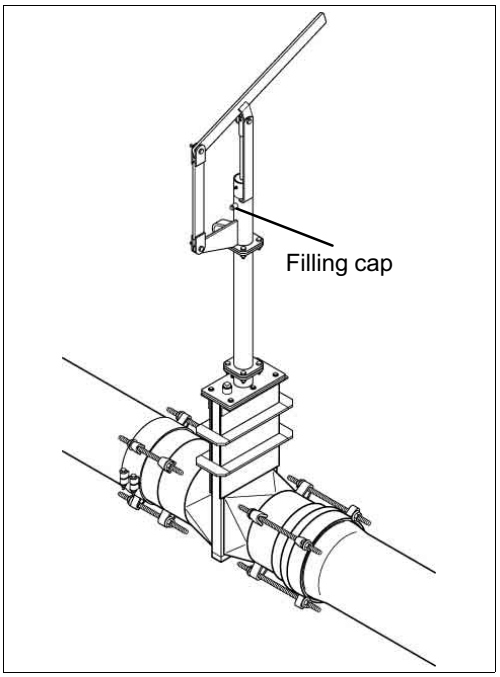
- In a sand bedding operation, if the risk of freezing is low, the flapper valve can be installed higher than the bottom of the pit in order to prevent sand from accumulating on top of the flapper.



- The flapper valve should be preceded by a manual safety guillotine to ensure that the evacuation line can be shut off in case of emergency.

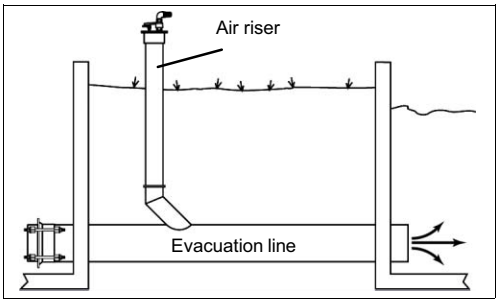


- Remove the filling cap of each insulated gate valve and fill the tube with hydraulic oil to protect it against frost and to prevent corrosion. Then put the cap back on.

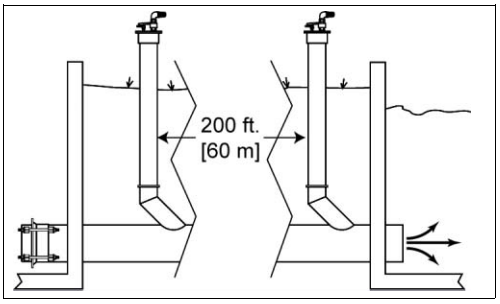


5.6.3 Installing a 6” [15 cm] riser for air flush

- The riser is mandatory in sand bedding operations to flush sand from the evacuation line using air pressure and a straw bullet.

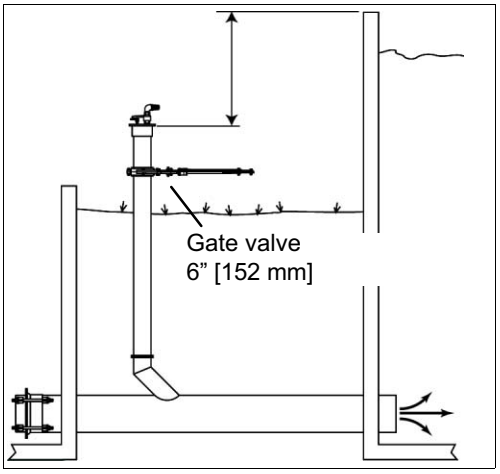


- One riser is required every 200' [60 m].

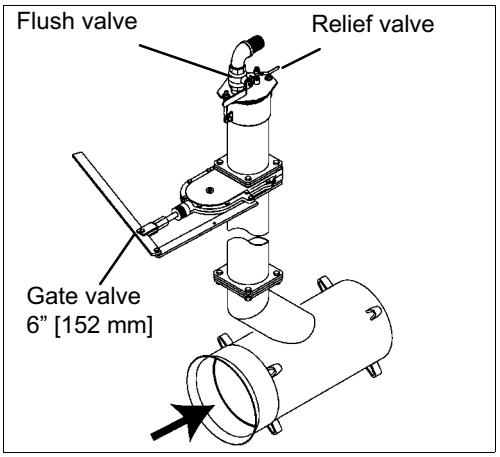


Note!
Some evacuation lines require extra risers where potential plugging can occur (i.e. sharp bend, long ascendant slope, etc.)

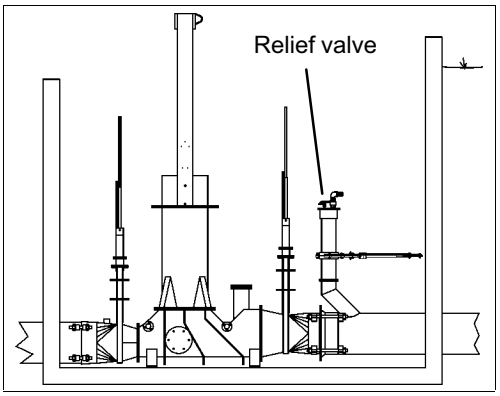
- A gate valve is mandatory if the top of the manure reservoir is higher than the cap of the riser.



- The air flush valve must be connected to an air tank.
- All connections to the valves on the air riser cap should be made with flexible hoses to allow removal of the cap.



- If the air flush riser is installed indoors the relief valve must plumbed to exhaust manure gases outdoors.



Air tank requirements

Note!
To flush the full length of evacuation line, it needs a certain volume of compressed air. Refer to the table below to find appropriate air tank size required to flush the full length of evacuation line.

12 3/4” [315 mm] evacuation line											
Air Pressure	**Length of evacuation line.**										
	100' 30 m	**150' 46 m**	**200' 60 m**	**250' 76 m**	**300' 91 m**	**350' 107 m**	**400' 122 m**	**450' 137 m**	**500' 152 m**	**550' 168 m**	**600' 183 m**
	Minimum size of air tank										
125 psi [8.6 bar]	175g 665 L	265 g 998 L	350 g 1334 L	440 g 1667 L	530 g 2000 L	615 g 2332 L	705 g 2665 L	790 g 2998 L	880 g 3330 L	970 g 3663 L	1055 g 3999 L
100 psi [6.9 bar]	220 g 832 L	330 g 1247 L	440 g 1667 L	550 g 2083 L	660 g 2499 L	770 g 2914 L	880 g 3330 L	990 g 3746 L			
75 psi [5.2 bar]	295 g 1111 L	440 g 1667 L	590 g 2223 L	735 g 2775 L	880 g 3330 L	1025 g 3886 L					

16” [406 mm] evacuation line											
Air Pressure	**Length of evacuation line.**										
	50' 15 m	**80' 25 m**	**110' 34 m**	**140' 3 m**	**170' 52 m**	**200' 60 m**	**230' 70 m**	**260' 79 m**	**290' 88 m**	**320' 98 m**	**350' 107 m**
	Minimum size of air tank										
125 psi [8.6 bar]	210 g 790 L	335 g 1263 L	460 g 1739 L	585 g 2211 L	710 g 2684 L	835 g 3160 L	960 g 3633 L	1085 g 4105 L	1210 g 4581 L	1336 g 5058 L	1460 g 5534 L
100 psi [6.9 bar]	260 g 987 L	420 g 1580 L	575 g 2170 L	730 g 2763 L	885 g 3357 L	1040 g 3946 L	1200 g 4540 L				
75 psi [5.2 bar]	350 g 1315 L	555 g 2105 L	765 g 2895 L	975 g 3686 L	1180g 4476 L						

5.6.4 Protection against corrosion of the steel evacuation line

How to delay underground corrosion

Very low-voltage electricity travels through the ground. The amount of electricity that can be carried by the ground depends on the type of soil. For example, damp hard clay soil has a high conductivity potential and dry coarse sand has virtually no conductivity potential.

As electricity travels through the ground, if it finds a steel evacuation line, it will use it for whatever distance suits it. Then, where electricity leaves the steel evacuation line, a chemical reaction occurs. This chemical reaction is the underground corrosion, which can be fast or slow depending on the type of soil in the area.

The steel evacuation line, as well as the Futuro pump, can be protected against corrosion by installing sacrificial anodes at specific points along the buried line. The following instructions prolong the life of the steel equipment significantly:

Each steel pipe must be free of scratches on its coating:

- Scratches greatly amplify the corrosion process since electricity concentrates on the scratches to leave the steel pipe, creating hot spots that corrode fast.
- Scratches must be coated with tar.

It is mandatory to bury the whole steel evacuation line in sand:

- Sand is the best material to prevent scratches on the steel pipe coating at the time of installation.
- Sand is also the least conductive material for electricity.
- Sand must be well compacted around the equipment and the anodes in order to avoid later soil movement that could break the copper wire.

Installation of sacrificial anodes:

(Part # 2007-8007-370 15 Kg Sacrificial Anode)

- Sacrificial anodes are made of a material that corrodes faster than steel. It is designed to protect steel pipes and elbows against corrosion.
- Anodes gradually corrode away over many years instead of the evacuation line.
- Once corroded away, if the anodes are not replaced, the corrosion will start its process on the evacuation line.

Insure fully dedicated protection from the sacrificial anodes:

- To prolong the life of the anodes, it is imperative that they only protect the pump and the evacuation line.
- At the time of installation, you must ensure that no ground wire is attached directly or indirectly to the equipment protected.
  For example, if the concrete floor wire mesh, the stalls and the evacuation line are linked together to the same ground wire, sacrificial anodes will have to protect a much larger mass of steel and will therefore corrode much faster.
- Properly installed, sacrificial anodes may last up to 20 years.

Quantity of anodes required to protect the steel evacuation line

Length of evacuation line	Quantity of anodes
up to 120' [36 m]	1
up to 240' [73 m]	2
up to 360' [110 m]	3
up to 480' [146 m]	4
up to 600' [183 m]	5

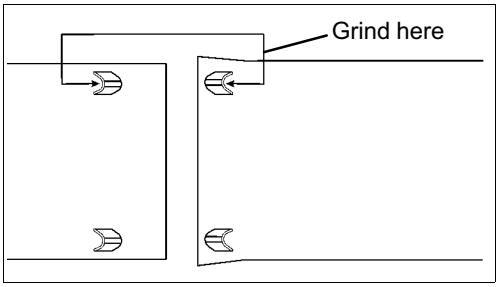
Connection of sacrificial anode

Attention!
Anodes must be connected and activated before they are buried.

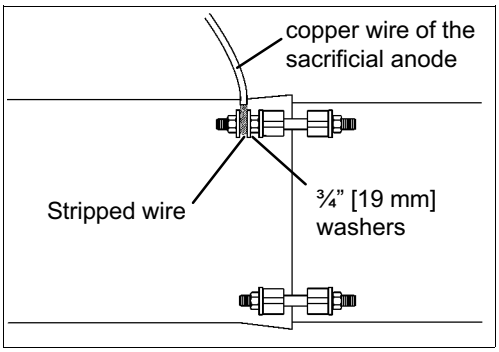
Hardware supplied with each sacrificial anode:

1 - ¾-10 NC x 2” [19 mm X 5 cm]	bolt
2 - ¾” [19 mm]	washers
1 - ¾-10 NC [19 mm]	nut

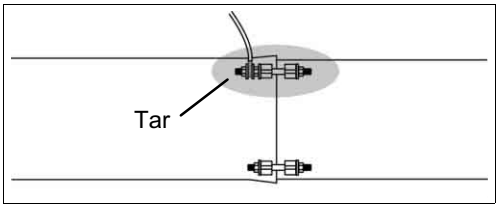
- Grind the sides of the joint brackets to remove coating and expose bare metal;



- Strip the length of wire required to make a single loop around the bolt;
- Hook the stripped wire to the bolt between 2 washers.
- Do not overlap the wire since it may cut itself when tightening the nut;



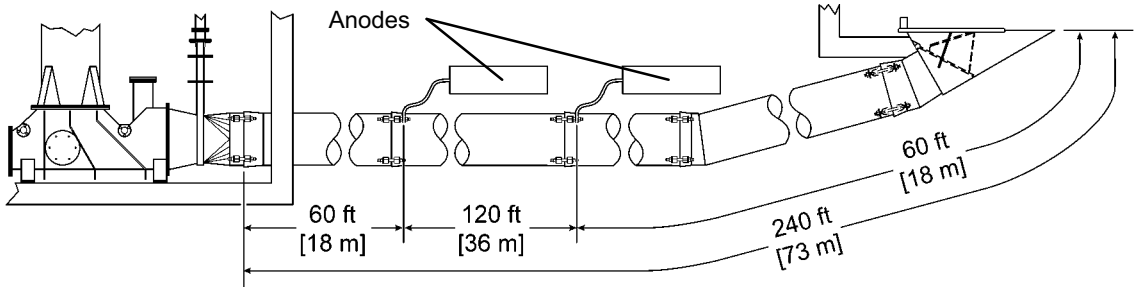
- Cover each wire connection bolt with a thick layer of tar.



Attention!
When maneuvering the steel pipes, inspect the pipe for any scratches in the coating. Coat all scratches with tar to protect from corrosion;

Attention!
The sacrificial anode must be set parallel and at 18” [45 cm] from the component it protects. The anode can be installed above or beside the evacuation line;

Space the anodes along the evacuation line as shown.

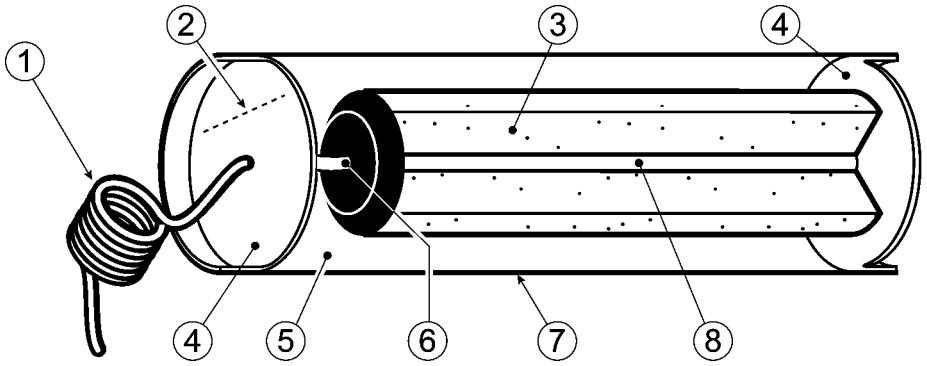


Activation of the sacrificial anode

Attention!
Discard any plastic film that may have been wrapped around the anode cardboard tube for handling. Do not remove the plastic caps from the cardboard tube.

The dry conductive powder in the cardboard tube must be saturated with water before burying the sacrificial anode.

- Using a knife, make a cut in the plastic cap and fill the tube with water.
- The cardboard will disintegrate within months and the natural moisture of the soil will keep the conductive powder humidified through the years.



Legend:			
1	Anode copper wire AWG #12/7	**2**	Cut in plastic cap
3	High purity magnesium bar*	**4**	Plastic cap
5	Conductive powder	**6**	Insulated welded connection
7	Galvanized steel sheet	**8**	Cardboard tube

* This bar will disintegrate slowly over several years.

5.7 Installing the motor on the hydraulic power unit

Warning!
Always shut off and lock the power supply before installing the equipment.

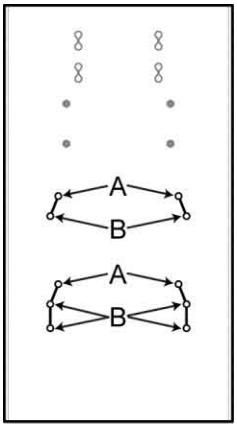
Warning!
Always put back in place the safety guard before starting the equipment.

Caution!
Always open 2 ball valves under the hydraulic power unit before operating the equipment. Operating the hydraulic power unit with closed ball valves will result in failure and/or injuries due to excess of pressure in the oil filter.

Caution!
When electrical motors and/or control panels come from a supplier other than the manufacturer, it is mandatory to verify components compatibility. Make sure motors and/or control panels match the equipment specifications. Refer to the Technical Data section on Motor specifications and on Control panel specifications.

To tighten bolts adequately, refer to the Technical Data Section on Bolt Torque Chart.

- Refer to pictures below to find the motor bolt pattern on the appropriate motor support.

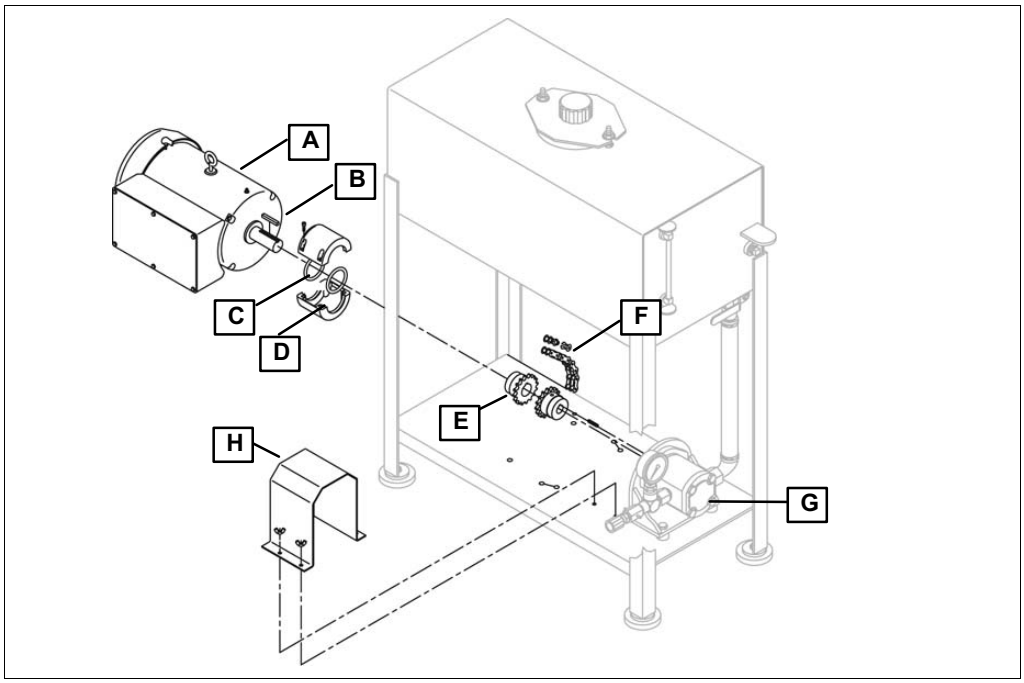
	Motor				Motor support
	Power		Type		Bolt pattern location
	HP	KW	NEMA	IEC	
A	5	3.7	184T	112	
B	7.5	5.5	213T, 215T	132	

- Wire the electrical motor to the control panel.

Attention!
It is mandatory to check motor rotation making sure it turns in the direction indicated on the pump. Inverse rotation may cause a major breakdown. To find the label position, refer to the Appendix.

Note!
In order to fit with the selected motor, it may be necessary to readjust the hydraulic pump position. To readjust it, use appropriate shims and bolt patterns. 2 bolt patterns have been designed on the motor support.

- Assemble the seal, the chain joint gear and key on motor shafts as shown below.
- Using the appropriate bolt pattern, install the motor on the support.
- Position the motor shaft in line with the pump shaft and tighten motor bolts.
- Install the chain to maintain both gears together.
- Tighten both chain gear cap screws.
- Apply grease inside chain half covers and on the chain.
- Using screws, install the chain cover over the joint chain.
- Using 4 bolts, install the chain joint safety guard.



Legende:			
A	Motor	**B**	Key
C	Seal	**D**	Half cap
E	Chain joint sprocket	**F**	Chain
G	Hydraulic pump	**H**	Chain joint safety guard

5.8 Installing the hydraulic power unit

Danger!
Hydraulic fluid under high pressure! Improperly installed hose fittings can separate from the hose or the fitting components can separate from each other unexpectedly while under pressure! To prevent failures, always follow the required fitting installation procedures!

Caution!
Always open 2 ball valves under the hydraulic power unit before operating the equipment. Operating the hydraulic power unit with closed ball valves will result in failure and/or injuries due to excess of pressure in the oil filter.

Attention!
For a safe handling when installing the hydraulic power unit, use a lifting equipment having a minimum capacity of 300 lbs (136 kg) to hold the hydraulic power unit.

Attention!
To ensure a leak tight fit between any type of hose end fitting and the hose, It is critical that the hose is cut clean and square! The use of an electric chop saw is recommended to ensure a clean square cut. The saw must be equipped with a blade capable of cutting through the wire reinforcement layers!

Attention!
Dirt is the worst enemy of any hydraulic system! To prevent dirt from entering into the system during assembly, keep protective caps in place on all component fittings until the hose connections are made! Seal all hose fitting ends with tape if not connected immediately! Securely tape all hose ends being pulled through the conduits!

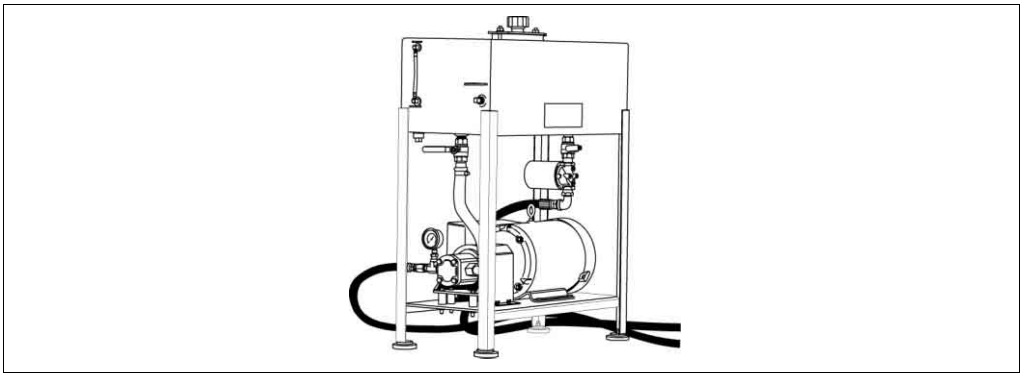
Attention!
Threaded fittings without O-rings require thread sealant. Use only thread sealing compounds that are specified for high pressure hydraulic applications.

Attention!
Do not use Teflon tape for a thread sealant. Teflon tape fragments can contaminate the system and plug the small orifices of control valves!

Attention!
Make sure the oil level in the power unit is at proper level.

Attention!
If there is an electrical interlock in the connection of the different components of the Futuro pump or if these components are connected to a central control panel, any of these machine can start automatically. The owner must have all the machine connected in a lockable main switch. If the machine are not in the same area, every of them must have it own lockable switch.

Positioning the power unit



- Install the hydraulic power unit in a location that will be protected from freezing temperatures.
- Choose a location that will minimize the length of hydraulic lines required.
- Allow sufficient clearance around the hydraulic unit to permit service and routine maintenance as well as ventilation to prevent overheating.
- Choose a location that is relatively clean and not subjected to excess dust.
- Anchor the legs to the floor.

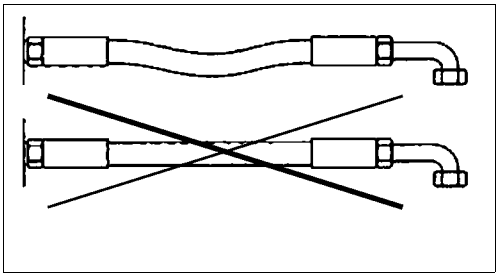
Hydraulic line installation guidelines

Refer to section on hydraulic diagram.

Proper hydraulic hose installation is essential for satisfactory system performance and ensuring the maximum service life from the hose.

Hose assemblies will flex and change in length due to fluid pressure changes and temperature. If hose assemblies are too short to permit adequate flexing and allow for small changes in length, hose service life will be reduced.

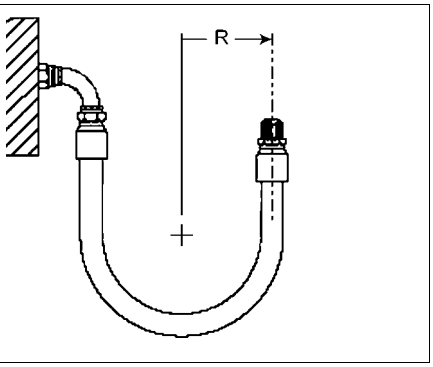
- Leave a slight amount of slack in the hose to allow it to move and dissipate energy when under pressure.
- If the hose is too tight, a tension will be apply to the fitting and connection point.



Where a hose must be bent into a curve, the curve must be smooth with no twists in the hose. It must meet the supplier specifications.

- Each hose size has a minimum allowable bend radius. Bending the hose into a tighter curve can cause flow restrictions, increased pressure, and stress the hose structure at the bend leading to premature hose failure.

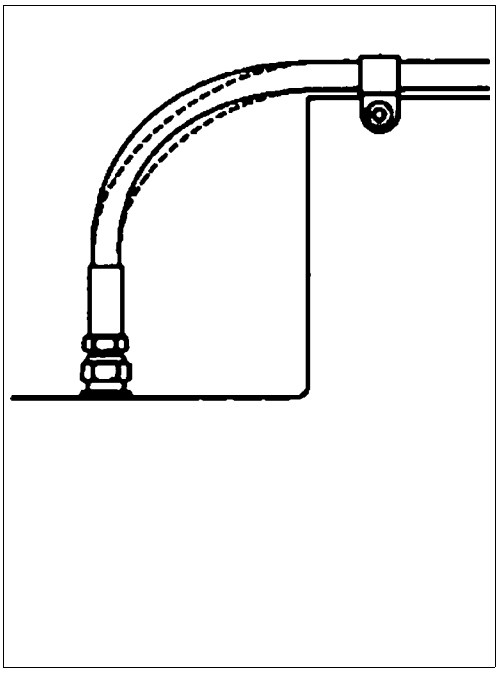
Hose size ID	Minimum radius
¼”	5” [127 mm]
½”	7” [180 mm]
¾”	9.5” [240 mm]



- If a tighter radius is required, use an elbow fitting rather than a straight fitting.
- Use a swivel fitting on at least one end of each hose to prevent twisting the hose while tightening the fitting.

Avoid placing hoses over sharp edges which could cause abrasions to the hose.

- If a hose must be installed over a sharp edge or corner it must be supported to avoid abrasions.
- The illustration shows how to properly support the hose.
- Avoid clamping a hose in a bend as the bend absorbs the energy as the hose moves under pressure.
- Install the two orange non conductive hydraulic hoses between the hydraulic power unit and the equipment.
- The purpose of theses non conductive hoses is to electrically bloc the potential stray voltage transfer between the hydraulic power unit and the equipment.



☞ **Note!**
Some installation may require to use hydraulic hose extensions. In this case, keep the orange hoses in place and connect extensions between equipment and orange hoses.

5.9 Connecting the Futuro to the hydraulic power unit

- Using orange hydraulic hoses from the power unit, connect the Futuro reversing valve.
- Once connected, make sure 2 ball valves under the power unit are opened to allow oil circulation.

5.10 Information on disposing of 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.

6.2 Safety instructions for initial commissioning

Caution!
Always open 2 ball valves under the hydraulic power unit before operating the equipment. Operating the hydraulic power unit with closed ball valves will result in failure and/or injuries due to excess of pressure in the oil filter.

To prevent damage to property and/or life-threatening injury to personnel always follow these instructions:

- Before starting for the first time, check that all tools and other parts have been removed from the danger area.
- Make sure all electrical connections and safety devices are properly installed to meet local and national regulations.
- Check the direction of rotation of the motor before commissioning.

Also read the chapter on ”Safety”.

Special risks involved in initial commissioning:

- Incorrectly wired connections may destroy electrical/electronic components.
- Defective connections can cause the product to start up unexpectedly or make uncontrolled movements.
- Wrong connections will cause the motor to run in the wrong direction - which may cause serious damages to property and/or cause life-threatening injuries.

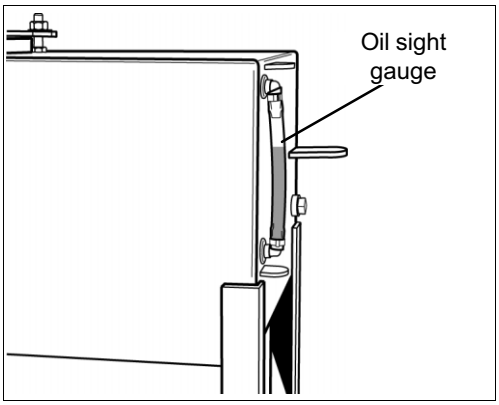
6.3 Checks before initial commissioning

The owner should ensure that:

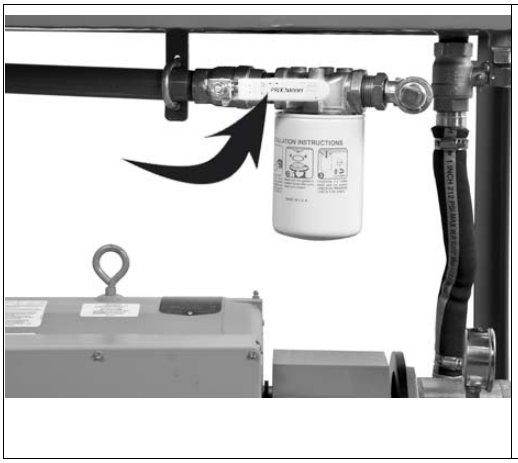
- Each point of the warranty registration form have been met.
- Oil in the hydraulic power unit tank is at proper level.
- 2 ball valves under hydraulic power unit have been opened.
- 2” [5cm] of biodegradable oil is poured above the piston. Refer to section on Lubricant specifications.
- All personnel who perform work on or with the product must carefully read, understand and act in accordance with the instructions.
- All stationary components are securely anchored to the floor.
- All grease zerks have been lubricated.
- All guards and covers are in place.
- All installation materials and debris are cleaned up and removed from the equipment.
- 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.

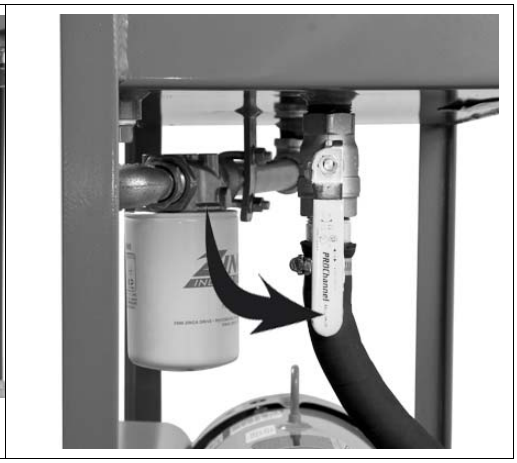
Hydraulic power unit

- Ensure the oil reservoir of the hydraulic power unit is 2/3 full. Refer to section on Lubricant specifications.



- Ensure 2 ball valves have been opened as shown below.



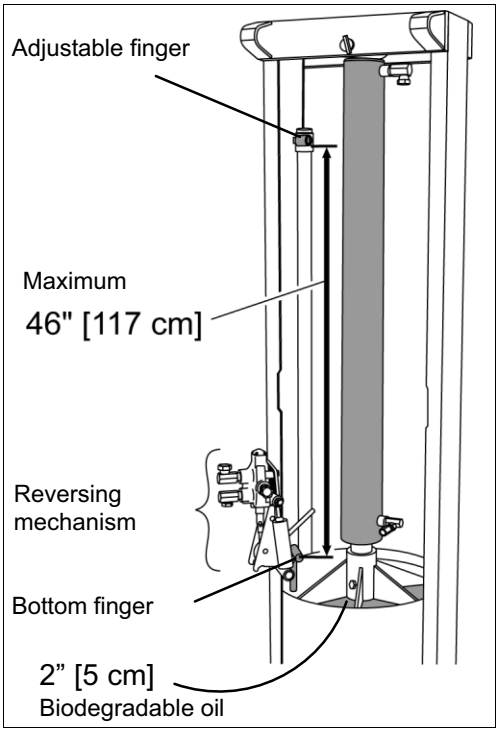


Hydraulic lines

- Confirm that all hydraulic line connections are correct and tight.
- Confirm that all hydraulic lines are properly supported and secured.

Pump

- Clean and lubricate the reversing mechanism with fine oil;
- Make sure the distance between the adjustable finger and the bottom finger does not exceed the maximum. Adjust finger if needed.
- Clean the top of the piston and pour 2” (5 cm) of biodegradable oil on top of the piston. Refer to section on Lubricant specifications.



Verification of the reversing mechanism

Attention!
Beware of reversing mechanism moving parts.

Note!
These steps apply only to reversing valves that are adjustable height wise.

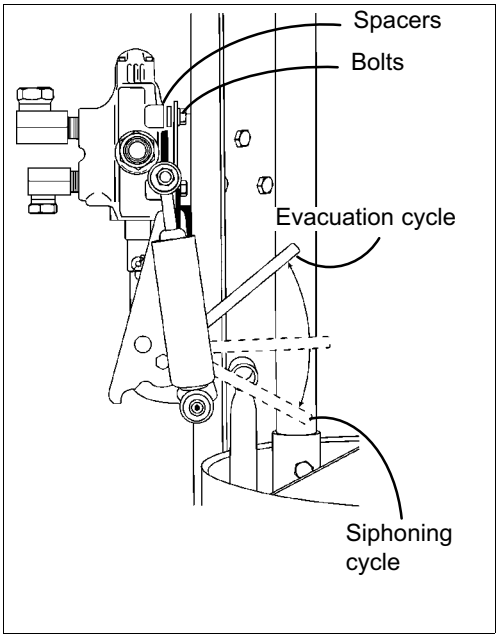
Set the trigger of the reversing mechanism in the up position, then check by hand if the spool of the reversing valve moves up and down easily on approximately 1 mm. If not, loosen the bolts behind the valve and adjust the valve height wise.

Make sure the spacers underneath the valve housing remain in place;

Push the trigger of the reversing mechanism downward until it passes mid-stroke.

From this point, the springs must force the trigger to complete its down stroke.

If the trigger does not complete its stroke automatically, repeat the first step.



Piston seals gradual lubrication

- Open 2 ball valves located under the hydraulic power unit reservoir;
- Ensure the trigger is in position for siphoning cycle (trigger down);
- Start the pump and reverse the piston stroke manually (by pulling the trigger up) after the first 12” [30 cm] of down stroke.
- Let the piston go up and reverse automatically.
- On the following down stroke, reverse the piston stroke manually after the first 24” [60 cm].
- Let the piston go up and reverse automatically.
- On the following down stroke, reverse the piston stroke manually after the first 36” [90 cm].
- Then, let the pump complete a few strokes automatically in order to lubricate the piston seals completely.

6.4 First start

Once the equipment is fully assembled in accordance with instructions and the operating and safety instructions are read carefully, the equipment can be put into operation.

Activate the equipment and check the functions.

 Refer to section on Operation

6.5 Checks after initial commissioning

- Add biodegradable oil to the top of the piston if needed. Refer to section on Lubricant specifications.
- Check the oil level in the hydraulic power unit.
- Inspect all hydraulic fittings for leaks.

If the oil level has dropped, check for leaks. Defective parts may need to be repaired.

 **Note!**
At the first operation, the oil level may have dropped. This will be caused by the first load of hydraulic circuit. Add hydraulic oil accordingly. Refer to section on Lubricant specifications.

6.6 Handing over to the owner

Hand-over warranty registration form

The warranty registration form must be completed and signed by the customer and the dealer. The warranty registration form must be returned back to GEA Houle Inc. to validate the warranty.

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.

The operator may only carry out work on the equipment if trained, instructed and authorized to do so by the owner.

7.2 Safety instructions for operation

Caution!
Always open 2 ball valves under the hydraulic power unit before operating the equipment. Operating the hydraulic power unit with closed ball valves will result in failure and/or injuries due to excess of pressure in the oil filter.

To prevent damage to property and/or life-threatening injury to personnel always follow these instructions:

- Only fit or use the product for its intended purpose.

Also read the chapter on ”Safety”.

Special dangers involved in operation:

- Incorrect use may lead to serious damage to property and/or life-threatening injury to people.
- Operating the hydraulic power unit with closed ball valves could result in serious damage and/or injury.
- The careless use of personal protection equipment could result in serious physical injury.
- Leaking lubricants, solvents,... could cause injury if they come into direct contact with the skin and could make the floor surface slippery which could result in dangerous fall.
- Insufficient ventilation inside buildings surrounding the manure pit could lead to intoxication.

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

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

Carry out the following checks before every start:

- Check and make sure that all of the safety devices (safety guard, emergency-off switches, etc.) are present and working.
- Check the product for visible damage; immediately repair without any delay damage found (note: personnel qualification required) or send to the specialist dealer - the product may only be used if in perfect condition.
- Check and make sure that only authorized personnel are in the work area of the machine and no one will be endangered by the machine starting.
- Check and make sure that there are no unnecessary object or material is located in the working area.
- Check and make sure that the working area has been cleaned from oil, grease, parts...
- Make sure the hydraulic circuit of the hydraulic power unit contains sufficient hydraulic oil.
- Make sure 2 ball valves of hydraulic power unit have been opened.

In normal operation:

- All personnel who perform work on or with the product must carefully read, understand and act in accordance with the instructions.
- Do not remove or deactivate safety devices during operation.
- During operation, it is strictly forbidden to remain within the hazard area!
- Operating personnel must make sure that no unauthorized personnel are in the working area.
- The following checks should be performed at least once a day:
  - Visually check for any damage.
  - Check that all safety devices are working.

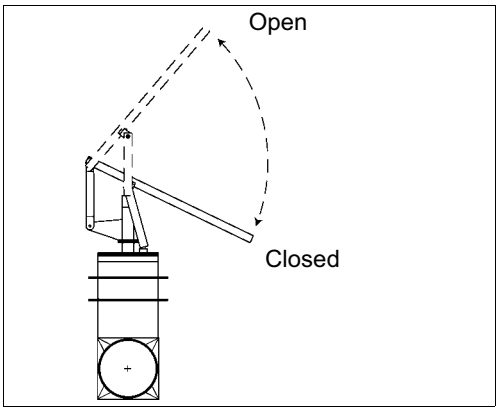
7.3 Description of the operating elements

Note!
The primary operating element for a Futuro pump is the control. (see Control Panel Operator's Manual for details);

7.3.1 Manual lever guillotine valve

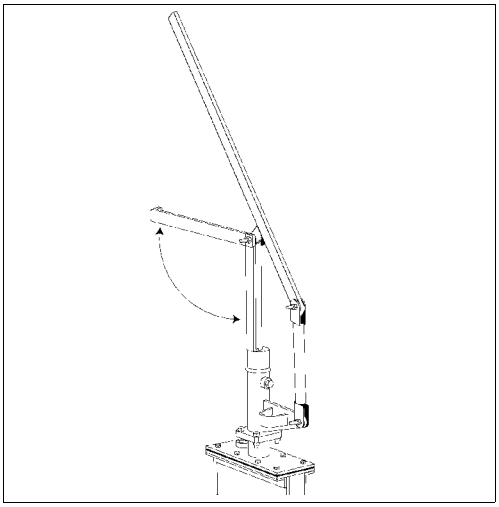
Manual lever

- Raise the lever to open the valve.
- Lower the lever to close the valve.



Lever lock

- To lock the valve in the open position, raise the lever and swing the lock bar down and rest it on top of the cylinder. This will prevent the valve from accidentally closing during operation.



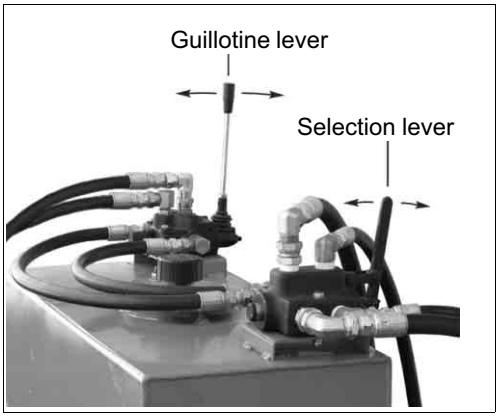
7.3.2 Optional hydraulic guillotine valve

Selection valve lever

- Push the lever to activate the pump.
- Pull the lever to activate the hydraulic guillotine control lever.

Guillotine valve lever

- Push the lever to open the guillotine valve.
- Pull the lever to close the guillotine valve.

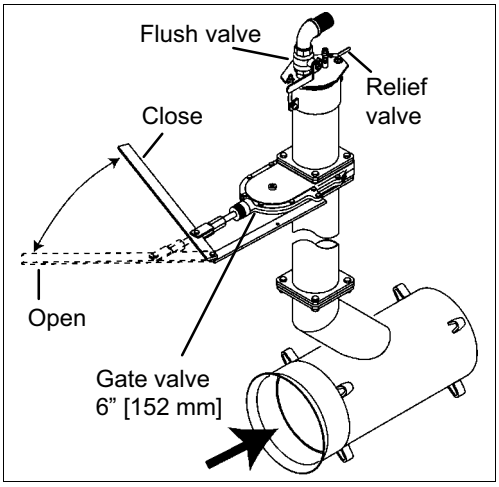


7.3.3 Evacuation line air flush risers

The air flush valve and pressure relief valves are ball type valves.

- The handle rotates 90°.
- The valve is closed when the handle is near to the line.
- The valve is opened when the handle is far from the line.

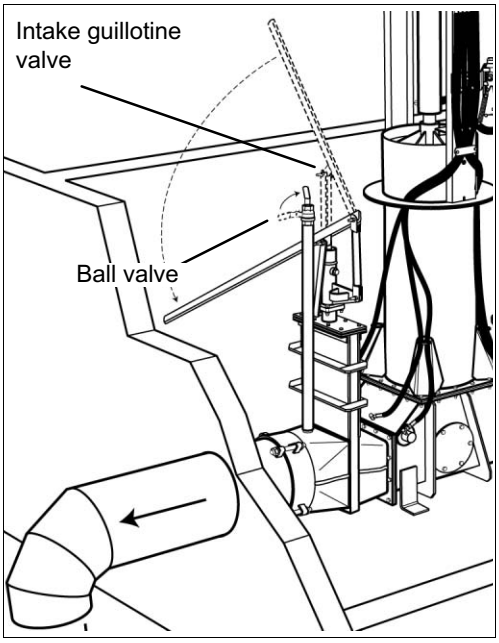
The gate valve is only installed if the elevation of the top of the manure storage reservoir is higher than the cap on the air flush riser.



7.3.4 Suction line air flush pipe

The air flush valve is a ball type valve.

- The handle rotates 90°.
- The valve is closed when the handle is perpendicular to the line.
- The valve is open when the handle is parallel to the line.



7.4 Operating

The Futuro pump may be operated:

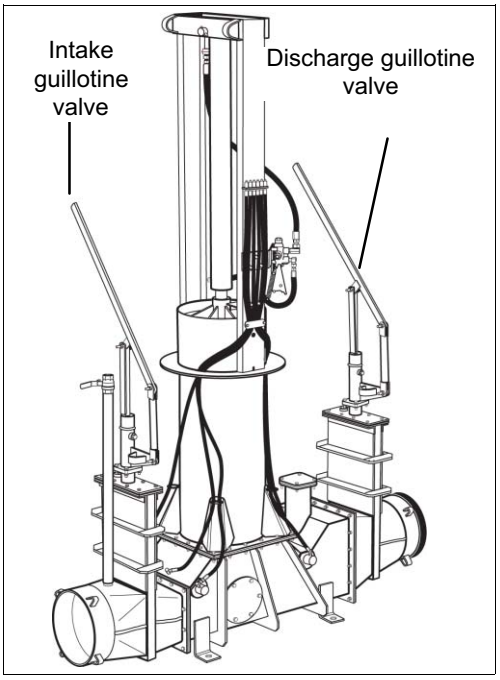
- automatically by controlled time settings of the control panel.
- manually by an operator.

7.4.1 Normal operation

☞ **Note!**
If there less than the equivalent of 30 days of manure accumulated above the evacuation line discharge at the beginning of winter, severe cold can completely freeze the manure pile and stop the pump.

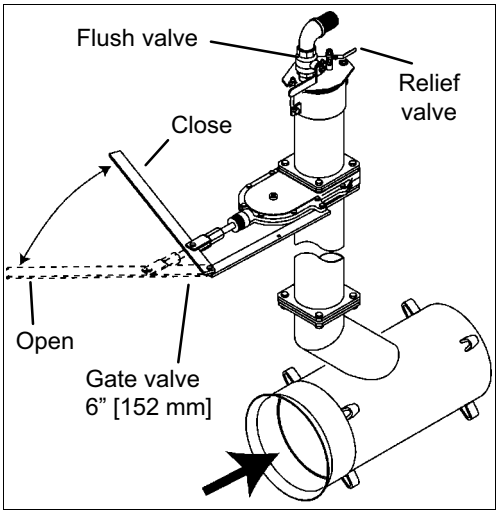
☞ **Note!**
It is recommended to close and open valves periodically to make sure they are in good condition and installed as a safety measure in case of emergency.

- Open the hydraulic guillotine valve using hydraulic control levers (optional).
- Open the intake and the discharge guillotine valves;
- Lock the levers in the open position;
- Start the pump for the wanted time;
- After evacuation is completed, shut off the intake and the discharge guillotine valves.
- Close the hydraulic guillotine valve using hydraulic control levers (optional).



7.4.2 Air flush procedure for the evacuation line.

- Stop the pump and close the discharge guillotine valve;
- Close the gate valve on the riser;
- Relieve gas pressure in the riser by opening the relief valve;

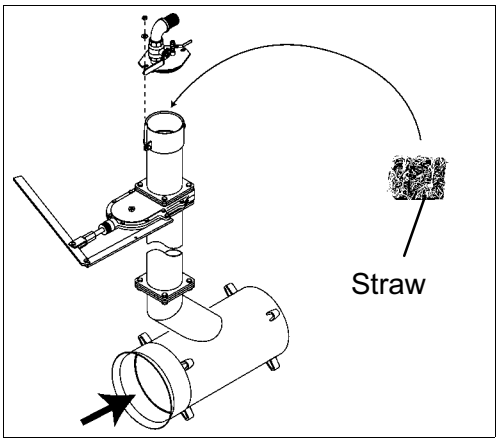


Straw bullet

Warning!
Make sure the pressure is relieved completely before removing the cap. The compressed air inside pipes would propel the cap with force. Before removing the cap, open the ball valve to relieve pressure.

Note!
If you are flushing with air only skip this step.

- Remove the cap and put roughly 2' [60 cm] of straw inside the riser pipe without packing it;
- Reinstall the cap and secure it with nuts;



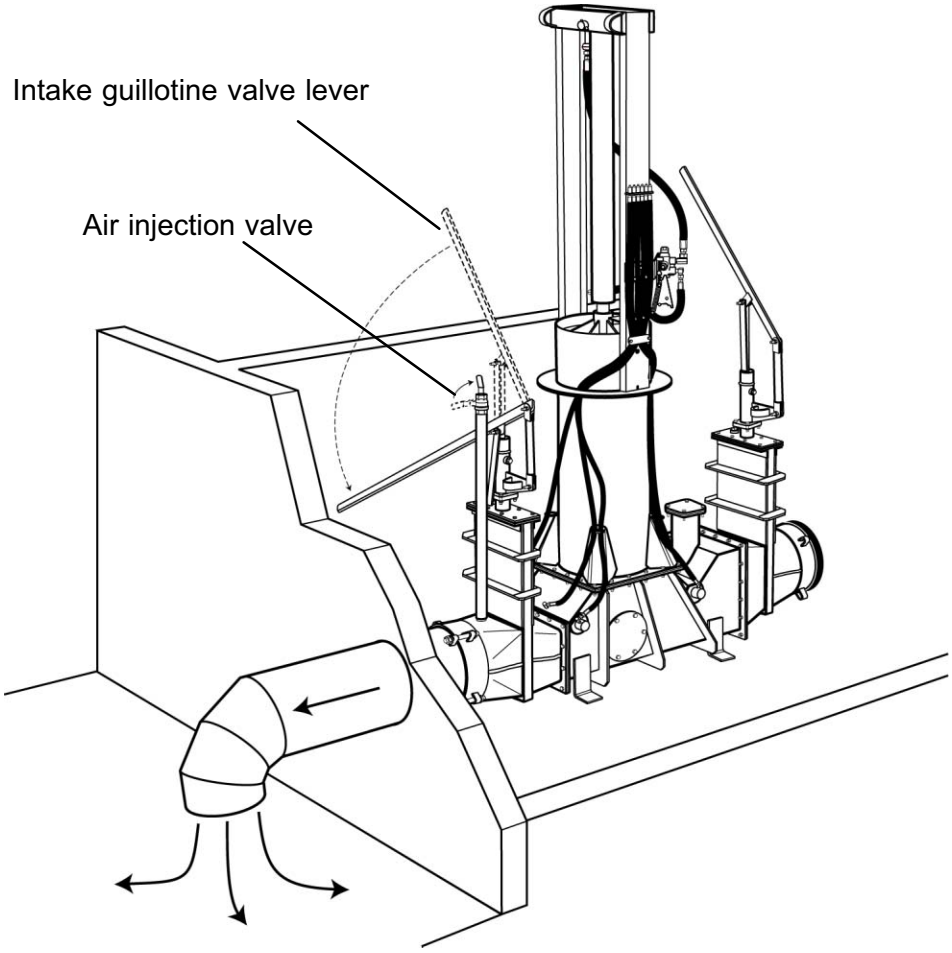
Air flush

- Close the pressure relief valve;
- Open the gate valve;
- Open the air injection valve for 10 seconds;
- Close the air injection valve, then close the gate valve.

7.4.3 Air flush procedure for the suction line.

Note!
Flushing the suction pipe is only required to clear obstructions that have clogged the suction pipe.

- Stop the pump and close the intake guillotine valve;
- Open the air injection valve for 10 seconds;
- Close the air injection valve;
- Open the intake guillotine valve;
- Run the pump to confirm the obstruction has been cleared.



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.

8.2 Safety instructions for troubleshooting

To prevent damage to property and/or life-threatening injury to personnel always follow these instructions:

- First of all, prevent the product from being restarted accidentally.
- Secure the range of action of all moving parts.


Also read the chapter on ”Safety”.

Special dangers involved in troubleshooting:

- The careless use of personal protection equipment could result in serious physical injury.
- Energy sources switched on unintentionally may lead to serious damage to property and/or life-threatening injuries to people and animals.
- Leaking lubricants, solvents,... could cause injury if they come into direct contact with the skin and could make the floor surface slippery which could result in dangerous fall.

8.3 Troubleshooting possible faults

Futuro pump		
Symptom	**Possible cause**	**Remedy**
Pump is not running.	Power supply has been disconnected to the hydraulic power unit.	Check all circuit breakers and fuses
		Check that all wire connections are correct and tight.
	Hydraulic power unit fluid level is low.	Ensure the oil reservoir of the hydraulic power unit is 2/3 full;
Pump is running but not moving any slurry or only a reduced flow of slurry.	Guillotine valve is closed completely or partially.	Open the intake and the discharge guillotine valves; Lock the levers in the open position;
	Evacuation line is clogged	Flush the evacuation line
	Suction line clogged	Flush the suction line
	Intake and or discharge flapper valve not opening and closing properly	Lubricate the valves.
		Inspect the rubber seal on the flapper valves.
		Inspect the evacuation chamber for obstructions
		Inspect the discharge valve spring
	Hydraulic power unit fluid level is low.	Ensure the oil reservoir of the hydraulic power unit is 2/3 full;
	Hydraulic power unit fluid is dirty.	Change the fluid in the reservoir.
	Piston seal is not lubricated.	Lubricate the piston Refer to section on Scheduled Maintenances responsibilities.
	Adjustable finger is out of adjustment, not allowing a full piston stroke.	Reset the adjustable finger. Refer to section on Checks before initial commissioning.
	Reversing valve is sticking.	Clean and lubricate the reversing valve.
	Slurry consistency is too great.	Check the consistency Refer to section on performance data.

Hydraulic fluid		
Symptom	**Possible cause**	**Remedy**
Hydraulic fluid is dirty.	Fluid and/or filters not serviced at the proper intervals.	Perform a fluid and filter change.
	Incompatible fluids mixed in the system.	Do not top off the fluid level if the fluid type in the system is unknown.
	The reservoir fill cap was left off and/or no breather filter in place.	Keep the fill cap and breather filter in place at all times.
Hydraulic fluid has a white milky color	Water in the fluid from condensation. Condensation can occur when the reservoir temperature is cooler than the ambient air.	Allow the fluid to cool and water to settle to the bottom of the reservoir. Drain the water from the reservoir and add fluid if needed. Repeat daily as needed. If the problem persists perform a fluid and filter change.
Hydraulic fluid is foamy, or bubbly.	Pump is cavitating.	See symptom Pump cavitating.

Hydraulic pump		
Symptom	**Possible cause**	**Remedy**
Pump cavitating	Low fluid level in the reservoir.	Add fluid and check the system for leaks.
	Fluid viscosity is too high.	See fluid specifications Refer to section on Scheduled Maintenances responsibilities
	Breather filter in the reservoir fill hole is clogged.	Clean filter with a petroleum based solvent or replace if necessary.
	Pump suction hose restricted or collapsed.	Repair or replace the hose.
	Air leak in the suction line to the pump inlet.	Tighten hose clamps. Replace hose if cracked.
Pump cavitating	Worn pump shaft seal.	Replace the pump.
Noise level of the pump is noticeably increasing but system operation appears to be normal.	Mechanical pump noise caused by worn internal parts.	Replace the pump.
Pump operates with an increased noise level; noise level continues to increase with an increase in system load.	Pump is cavitating.	See symptom Pump cavitating

Symptom	Possible cause	Remedy
Loss of output pressure at the pump.	Leak in the discharge line to the pressure filter.	Repair or replace the defective part.
	Worn pump.	Replace the pump.
Unusually short pump service life.	Fluid and/or filters not serviced at the proper intervals.	Perform a fluid and filter change.
	Wrong fluid type or viscosity.	See fluid specifications Refer to section on Scheduled Maintenances responsibilities
	System operated with burnt, old, or contaminated fluid.	Determine and eliminate the sources of contaminated fluid. Never use used fluid or fluid from dirty, unknown, or open containers.
	Pump cavitating.	See symptom Pump cavitating
Pump not delivering enough fluid volume or no fluid flow.	Low fluid level in the reservoir.	Top off the fluid level and check the system for leaks.
	Fluid viscosity is too low.	See fluid specifications Refer to section on Scheduled Maintenances responsibilities
Pump not delivering enough fluid volume or no fluid flow.	Fluid has thinned out from operating at too high of a temperature.	Perform a fluid and filter change.
	Pump suction hose restricted or collapsed.	Repair or replace the hose.

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 qualified personnel in accordance with the safety instructions.

9.2 Safety instructions for maintenance

Danger!
As manure produces toxic gases that may cause death, it is imperative to follow the safety instructions below before servicing the equipment:

- Access to the main storage must be limited to qualified personnel that perfectly knows and follows safety procedures in confined spaces.
- Permanent ventilation must be active in each structure surrounding the main storage to evacuate toxic gases.
- Make sure all protective devices and signs are kept in place and functional.
- Never attempt to rescue people without the help of qualified personnel. 40% of death caused by intoxication are due to rescue attempts.

Warning!
Always shut off and lock the power supply before working on the equipment.

Caution!
Always open 2 ball valves under the hydraulic power unit before operating the equipment. Operating the hydraulic power unit with closed ball valves will result in failure and/or injuries due to excess of pressure in the oil filter.

To prevent damage to property and/or life-threatening injury to personnel always follow these instructions:

- 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 steps involved in the maintenance work must be done in the order specified.
- The maintenance work specified in the instructions (adjustment, cleaning, lubrication, inspection, etc.) must be performed at the specified frequency.
- Maintenance work should be performed only with the tools designed for this purpose.
- Note the special information in this manual for the individual components.
- All warnings and warning signs must be present and legible.
- Immediately replace 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.
- Always follow the ”Safety Procedures for Confined Spaces” before operating or maintaining the pump. Manure produces toxic gases that can cause a loss of consciousness, asphyxia or death in a few seconds.
- There are suitable hoists and load suspension devices available for changing larger parts.
- That 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 might occur if wrong 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.
- There is a fire hazard associated with welding, cutting and grinding work.
- The careless use of personal protection equipment can result in serious physical injury.
- Leaking lubricants, solvents,... can cause injury if they come into direct contact with the skin and could make the floor surface slippery which could result in dangerous fall.
- Hydraulic hoses failures may cause unexpected movements.
- 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:

- Replace all guards, cover,... removed for maintenance.
- That all safety devices are in good working condition.
- Remove from the working area all the tools, materials and other equipment.
- Remove and clean oil, grease, parts from the working area.
- The operation making sure all is working properly.

9.3 Scheduled maintenance responsibilities

Interval	Description	Action (by)
On regular basis	Check the oil level above pump piston	Check / fill (Operator)
Every 50 hours of operation or weekly	Lubricate the equipment	Lubricate (Operator)
	Operate gate valves	Operate (Operator)
Every 100 hours of operation	Check the hydraulic power unit oil level	Check / fill (Operator)
Every 3 months or sooner	Clean out the top of piston and replace oil	Clean / Replace (Operator)
Every 3000 hours of operation or yearly	Change oil of hydraulic power unit	Check / Replace (maintenance technician)
Every year	Clean the equipment	Clean (Operator)
	Check insulated gate valves oil level	Check / fill (Operator)
	Change oil of hydraulic power unit	Check / Replace (maintenance technician)
	Check the evacuation chamber and flappers	Check / Replace (maintenance technician)

Regular checks on electrical equipment must be carried out by qualified personnel:

- Grease electrical motor bearings as per the recommendations of motor's manufacturer.
- Tighten any loose connections
- Replace damaged lines or cables immediately
- Close-off any cable openings that are not used
- Check all fastening screws after 50 hours of operation to ensure they are securely seated!

Keep records of checks in a safe place so that they can be inspected at any time.

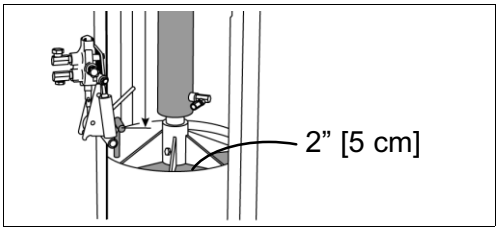
9.3.1 On regular basis

Check the oil level above pump piston

Note!
Use biodegradable oil.

Refer to section on Lubricant specifications.

- Make sure the oil above the pump piston is at proper level.
- Add oil as needed.
- Replace oil when it becomes dirty.



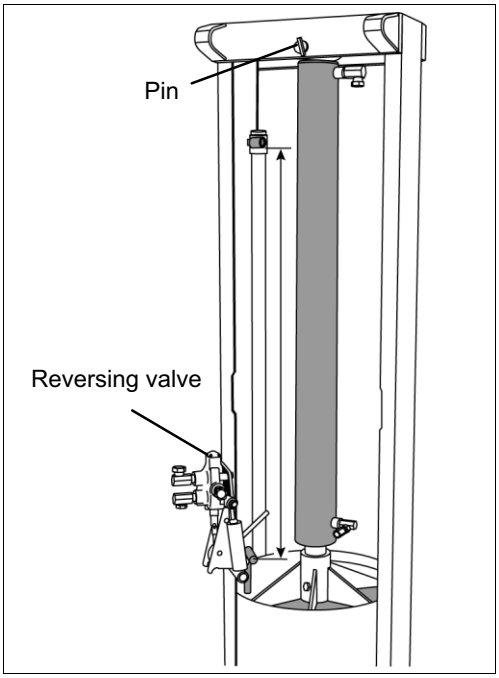
9.3.2 Every 50 hours or weekly

Lubricate the equipment

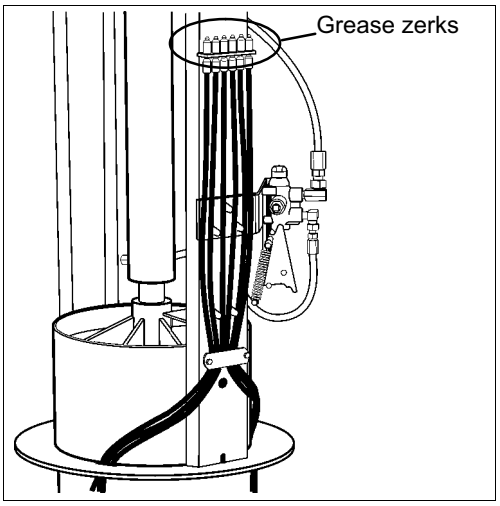
Note!
Use general purpose grease.

Refer to section on Lubricant specifications.

- Using grease zerks on top of cylinder, grease pin fastens the hydraulic cylinder to the pump framework;
- Clean and lubricate the reversing mechanism with fine oil;

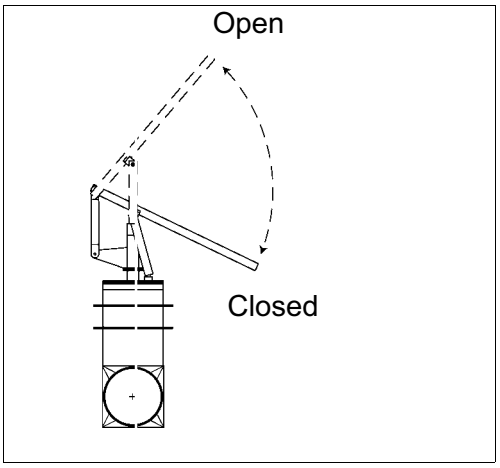


- Use grease zerks to lubricate the flapper door pivot of the Futuro pump.



Operate gate valves

- Operate the gate valves to ensure they open and close easily.



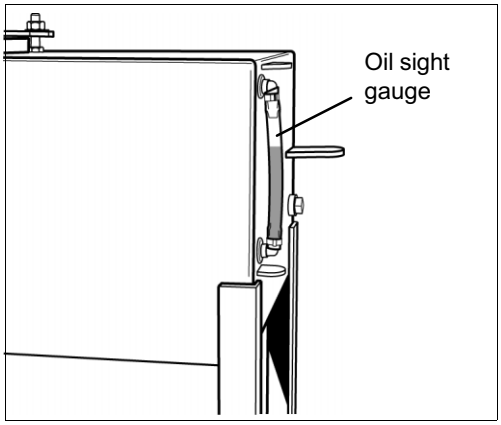
9.3.3 Every 100 hours

Check the hydraulic power unit oil level

Note!
Use hydraulic oil.

Refer to section on Lubricant specifications.

- Ensure the oil reservoir of the hydraulic power unit is 2/3 full.
- If the fluid level drops, check the system for leaks, resolve the problem and add oil as needed.
- Never let the fluid level drop to where it isn't visible in the sight gauge.
- Look for changes in the appearance of the fluid i.e. dark, cloudy, etc...



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

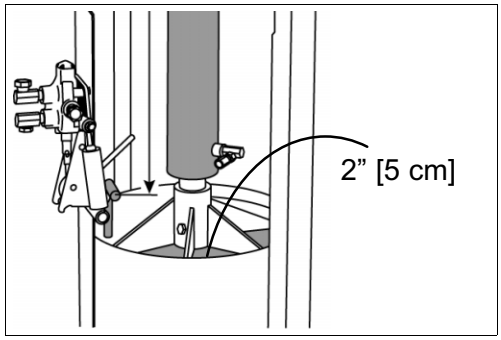
9.3.4 Every 3 month or sooner

Clean out the top of piston and replace oil

Note!
Use biodegradable oil.

Refer to section on Lubricant specifications.

- Remove dirty oil from the surface and clean it.
- Pour 2” [5cm] of biodegradable oil above pump piston.



9.3.5 Every 3000 hours or yearly

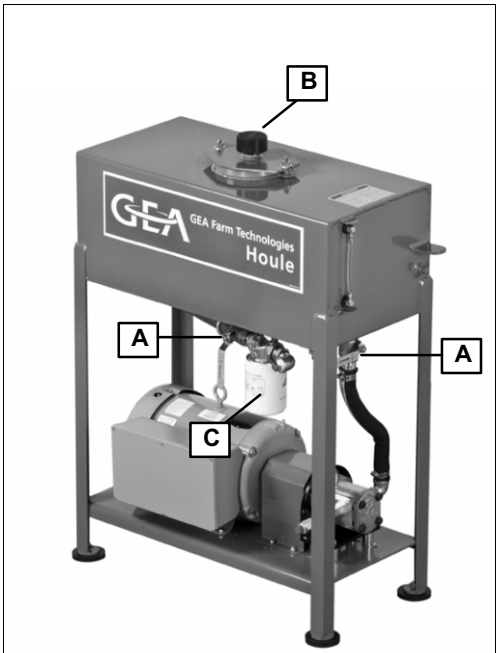
Change oil of hydraulic power unit

Caution!
Ball valves under the reservoir can only be closed for servicing when the power supply have been turned off. When servicing is done, always keep these 2 ball valves opened to avoid damage and/or injuries.

Note!
Use hydraulic oil.

Refer to section on Lubricant specifications.

- Place a large container under the oil filter in order to recuperate oil. (more than 16 US gallons [60 litres])
- Close 2 ball valves under the power unit reservoir.(A)
- Remove the oil filter.(C)
- Open the cap on top of reservoir.(B)
- Open both ball valves to completely drain the oil.(A)
- Clean the oil filter receptacle.
- Using hydraulic oil, lubricate the seal of the new filter and install it on its receptacle.
- Pour 16 US gallons [60 litres] of hydraulic oil in the reservoir making sure is 2/3 full.
- Reinstall the top cap.(B)



Pos.	Part-No.	Description
1	2007-3400-130	Hydraulic power unit oil filter

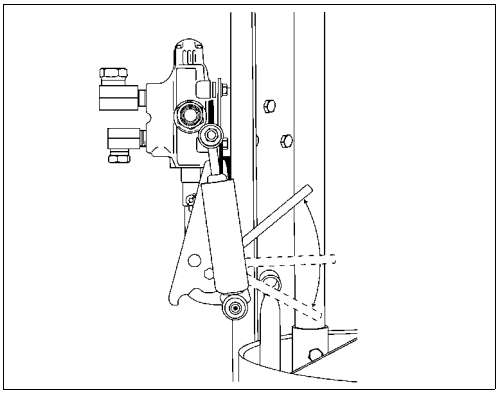
9.3.6 Every year

Clean the equipment

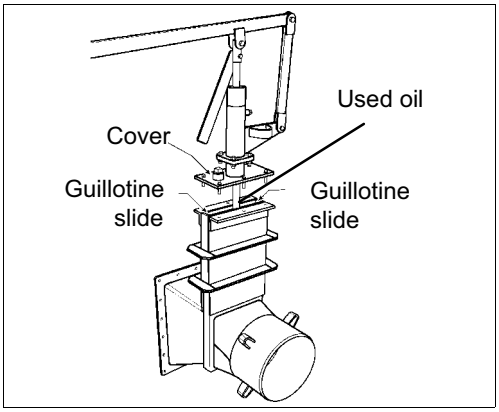
Attention!
Pressure washer may damage the paint if it is not used properly. Use pressure washer not exceeding 2000 psi [105 bar]. Only use cold water when cleaning with a pressure washer. Keep the pressure washer nozzle at least 12” [30 cm] from the surface to be cleaned.

- Clean the Futuro pump with a pressure washer;

- Clean the complete reversing mechanism using degreaser.
- Lubricate all moving parts with fine oil;



- Remove the cover of the guillotine valves and clean the guillotine slides.
- Pour used engine oil over the guillotines, then re-assemble the top covers;

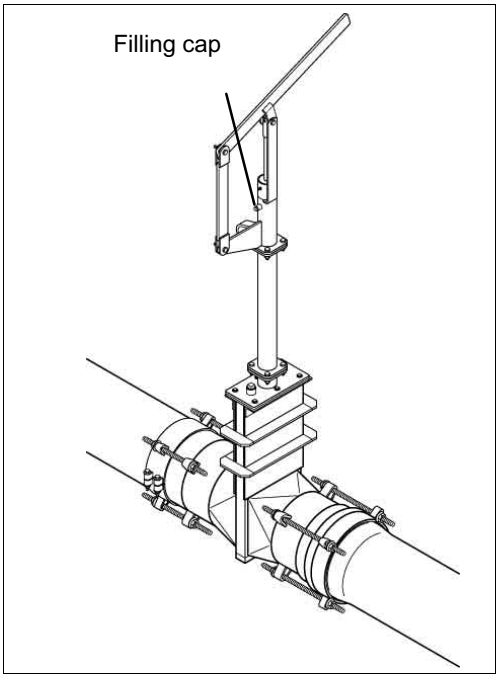


Check insulated gate valve oil level

Note!
Use hydraulic oil.

Refer to section on Lubricant specifications.

- Remove the filling cap of the insulated gate valve.
- Fill up the tube up with hydraulic oil.
- Put the filling cap back on and clean.



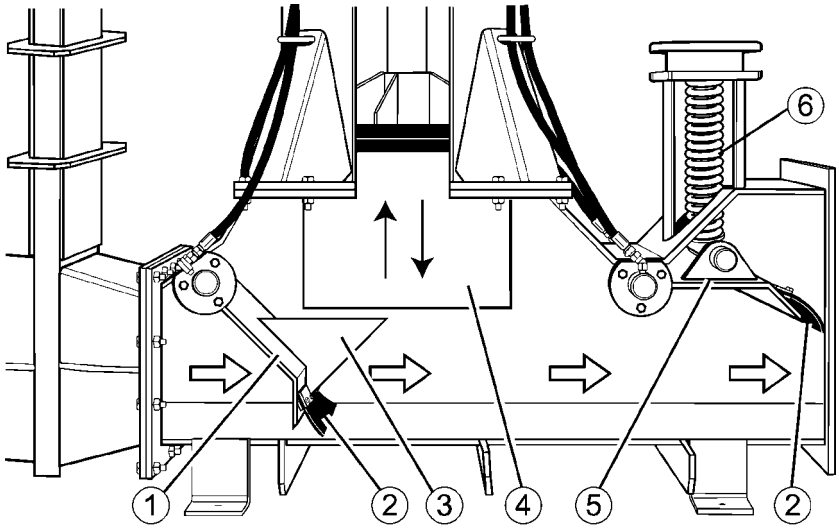
Check the evacuation chamber and flappers

Attention!
Before opening the side doors of the evacuation chamber, make sure to loosen the 4 bolts with care on top of the spring housing in order to relieve tension on the discharge flapper.

Attention!
Take care when loosing the bolts. The spring is under tension and can be expelled the housing cover with force. Always wear proper eye protection. Failure to do so may lead to injury.

Note!
In order to get access to the flapper seals located inside the pump base, it is necessary to remove inspections doors.

- Check the flapper door seals wear. Replace if needed.



Pos.	Part-No.	Description
1	-	Intake flapper valve
2	2007-3904-740	Flapper door seal
3	-	Downstroke lever
4	-	Piston
5	-	Discharge flapper valve
6	2018-4200-430	Discharge valve spring

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

To prevent damage to property and/or life-threatening injury to personnel always follow these instructions:

- The steps involved in the decommissioning work must be done in the order specified.
- The operating area for decommissioning must be safe.


Also read the chapter on ”Safety”.

Special dangers involved in decommissioning:

- Leaking lubricants, solvents,... could cause injury if they come into direct contact with the skin and could make the floor surface slippery which could result in dangerous fall.
- 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!

10.3 Temporary decommissioning

Storage

- Place the equipment on a horizontal flat and firm surface.


Attention!
Pressure washing could damage the paint if it is not done properly. Use a pressure washer not exceeding 2000 psi [105 bar]. Use only cold water when cleaning with a pressure washer. Keep the pressure washer nozzle at least 12” [30 cm] from the surface to be cleaned.

- Pressure wash the entire pump.

Lubricate the equipment

Note!
Use general purpose grease

Refer to section on Lubricant specifications.

- Grease all parts labeled with;

Refer to section on Label position

- To prevent corrosion, spread all moving parts with an environmentally friendly anti-corrosion product;

10.4 Final decommissioning/disposal

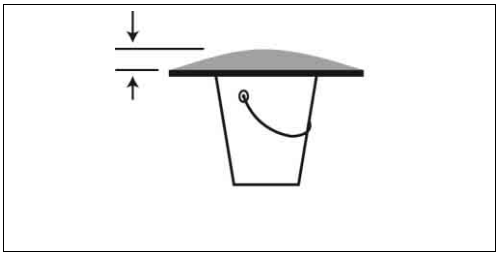
After final decommissioning, handle all components properly and dispose of them in accordance with valid local regulations on waste disposal.

11 Appendix

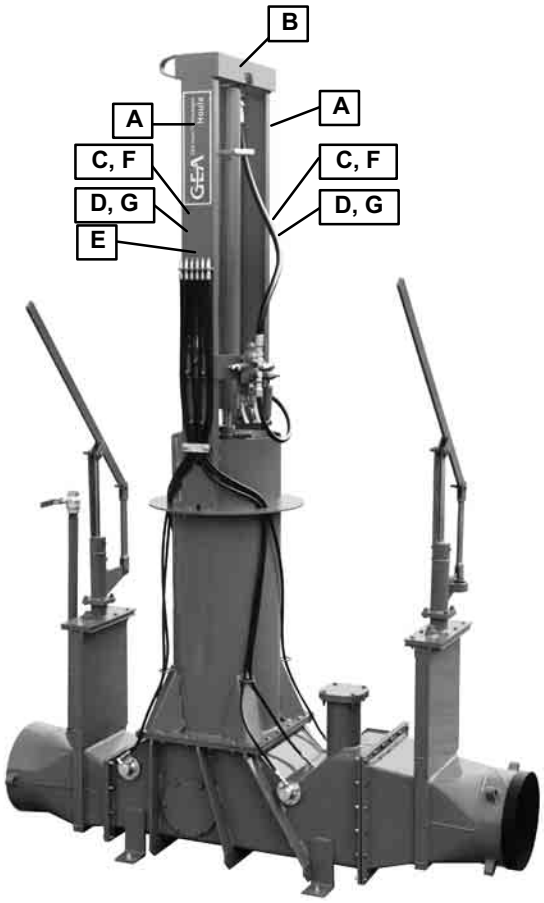
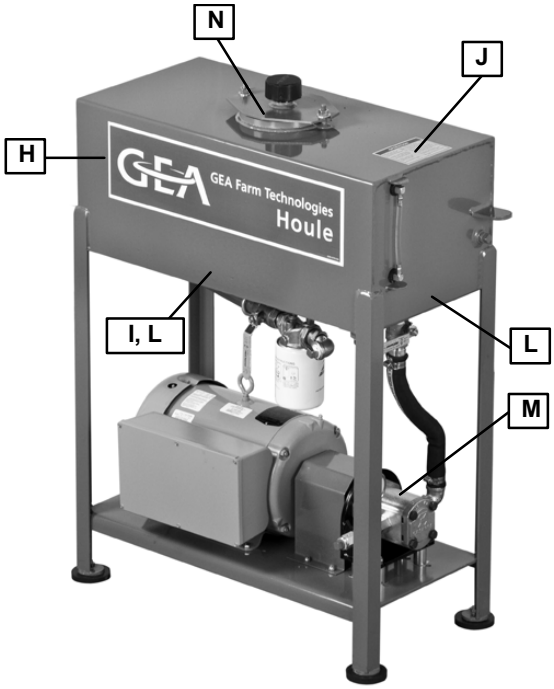
11.1 Consistency test

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

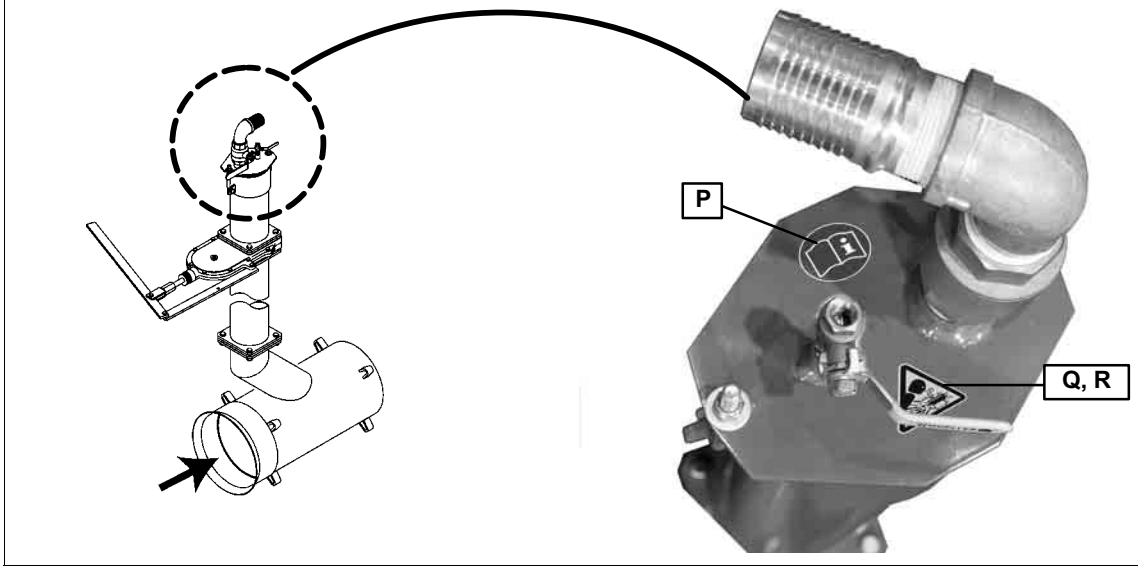
- Set a 24” (60cm) disc over a pail.
- Slowly pour enough slurry to get overflow all around the disc.
- After 1 minute of rest, measure the thickness of slurry at the center of the disc.



11.2 Label position

Futuro pump	Hydraulic power unit
	

Air riser cap

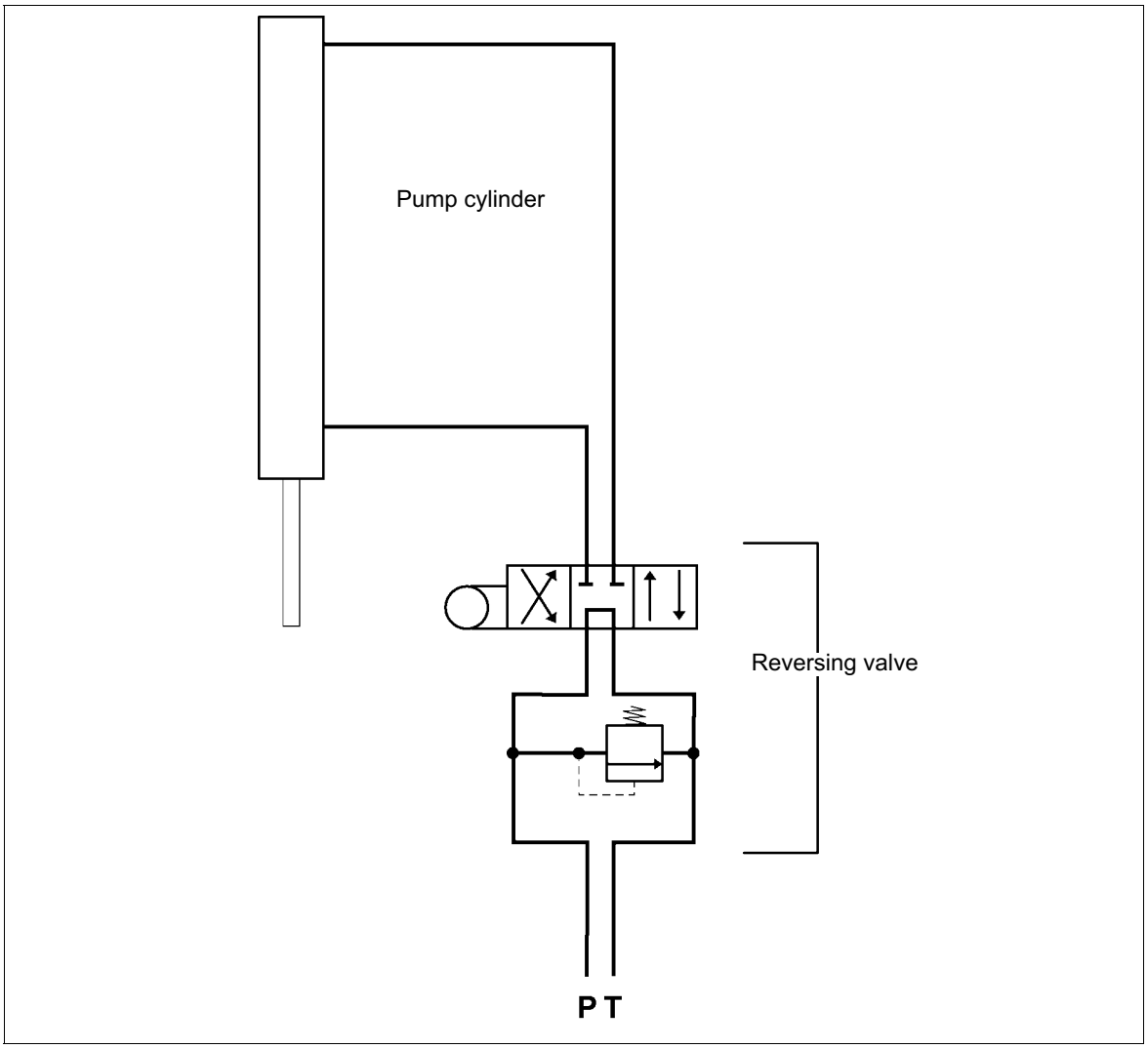


A	US + EU 2010-4700-400	**B**	US 2099-4720-010	**C**	US 2099-4721-010
D	US 2099-4724-010	**E**	US + EU 2099-4701-240	**F**	EU 2099-4725-190
G	EU 2099-4725-130	**H**	US + EU 2005-4703-560	**I**	US 2099-4721-000
J	US 2099-4724-030	**K**	EU 2099-4725-240	**L**	EU 2099-4725-420
M	US + EU 2099-4700-390	**N**	US + EU 2099-4725-360	**P**	EU 2099-4725-470
Q	EU 2099-4725-460	**R**	US 2099-4721-120		

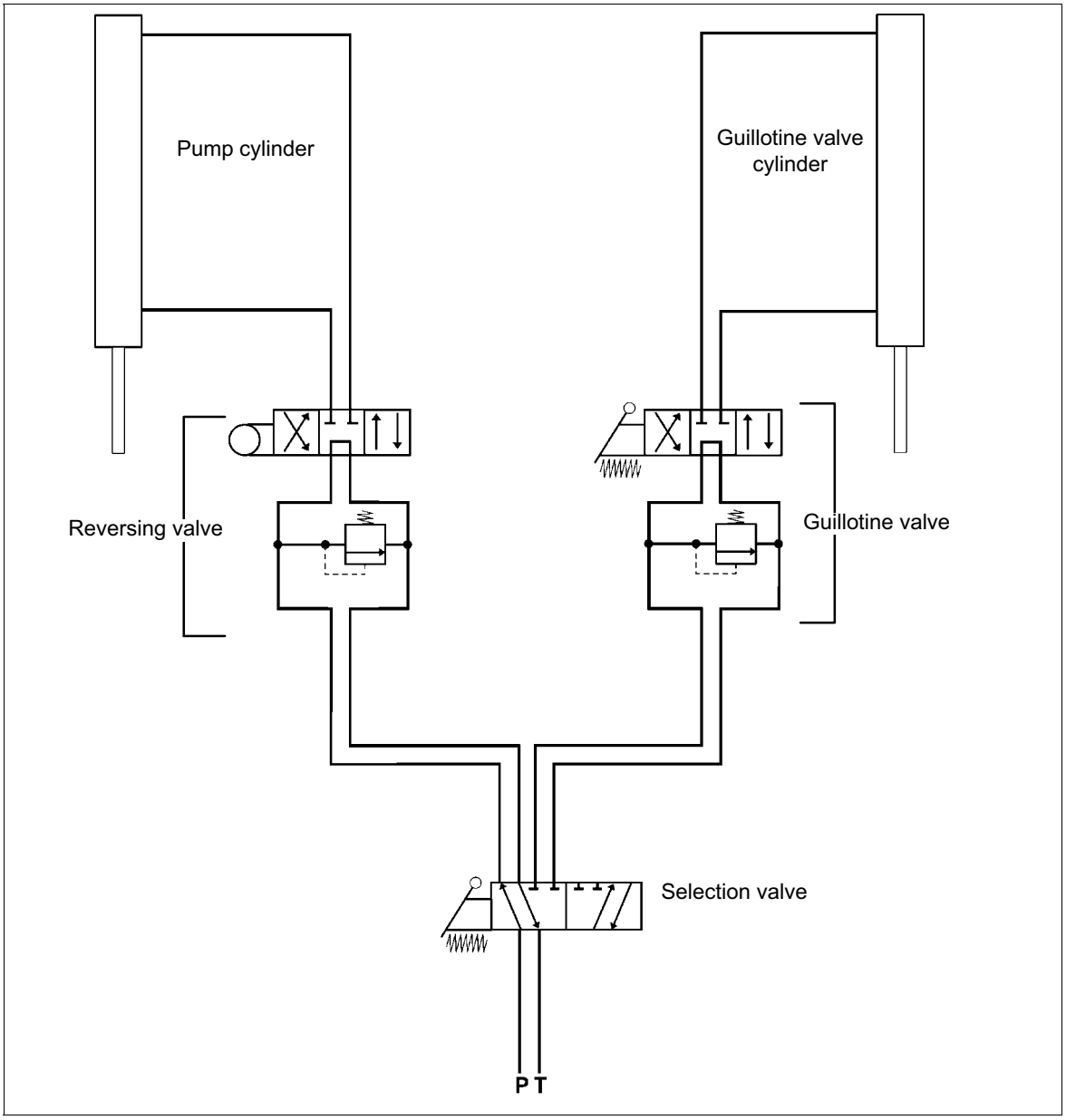
US = American label / EU = European label

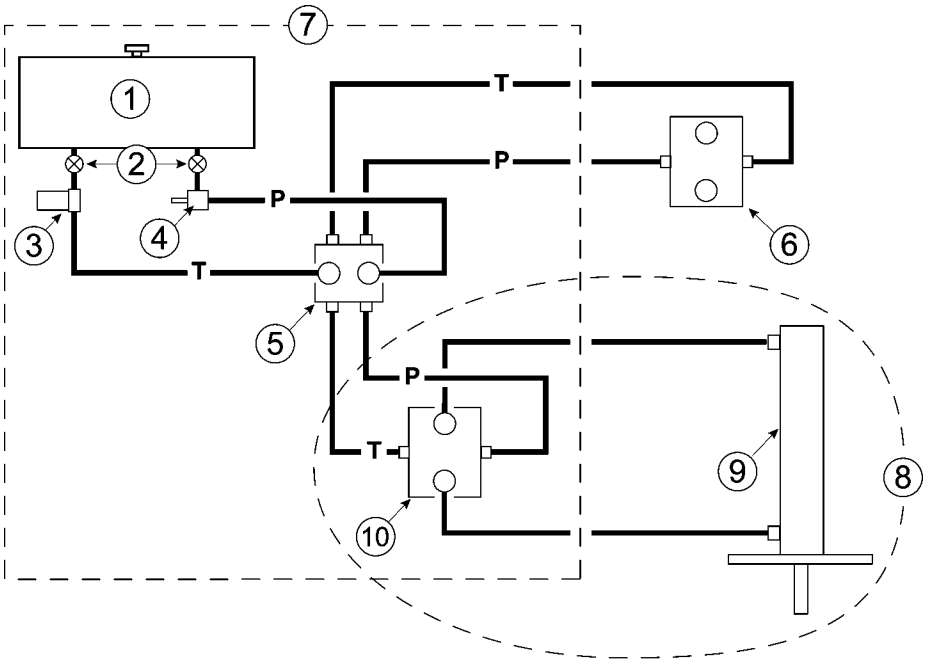
11.3 Hydraulic diagrams

11.3.1 Futuro pump



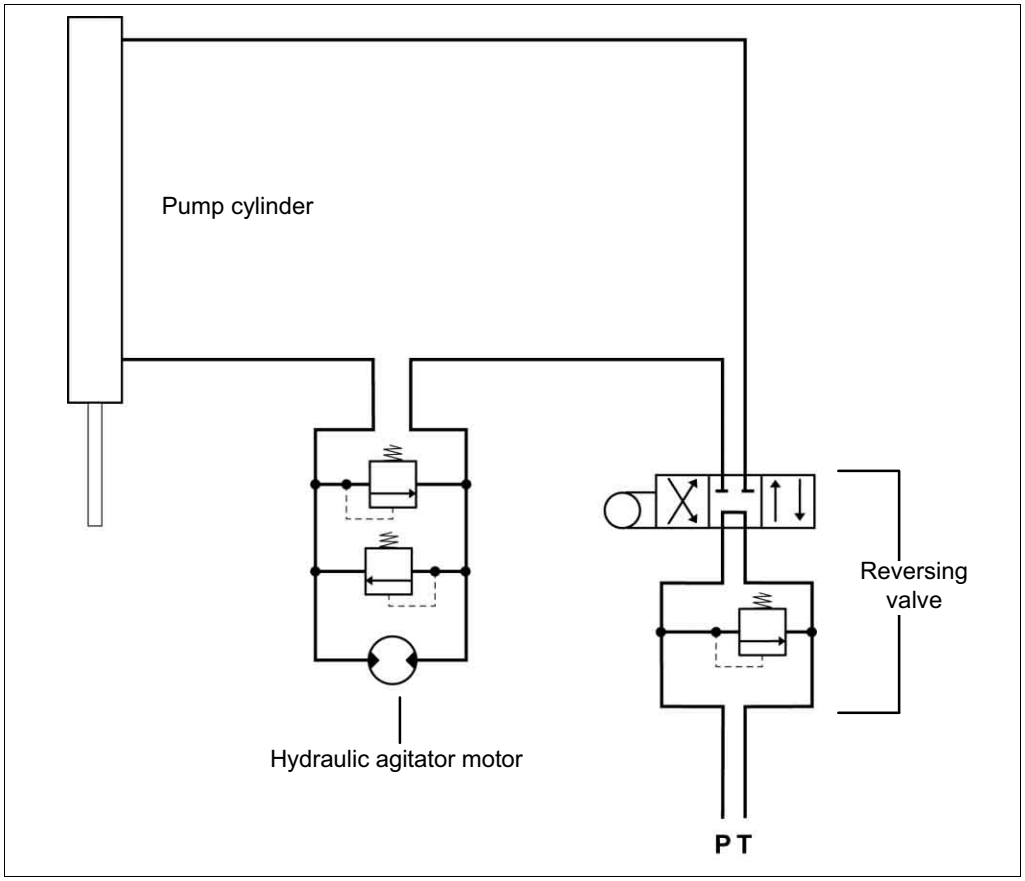
11.3.2 Futuro pump with guillotine valve option





Legend:			
1	Hydraulic reservoir	**2**	Shut-off valves
3	Oil filter	**4**	Hydraulic pump
5	Selector valve	**6**	Reversing valve
7	Power unit	**8**	Optional cylinder on guillotine
9	Cylinder on guillotine valve	**10**	Control valve

11.3.3 Futuro with optional hydraulic agitator



11.4 Abbreviations

Units	Explanation	Units	Explanation
A	Amp (current)	lbs	Pounds
@	at	LPM	Liters per minute
CE/ EC	European Union	min	Minute
cm	Centimeters	m	Meter
°	Degrees (angles)	mm	Millimeters
°C	Centigrade/ Celsius (temperature)	AS	Alloy Steel
°F	Fahrenheit (temperature)	HT	Heat Treated
fax	Facsimile	LCS	Low Carbon Steel
' (ft)	Feet	MCS	Medium Carbon Steel
gal.	Gallon	MCAS	Medium Carbon Alloy Steel
GPM	Gallons per minute	NC	National coarse thread
Hp	Horsepower	O.D.	Outside diameter
hrs	Hours	psi	Pounds per square inch (pressure)
Hz	Hertz	PVC	Poly vinyl chloride
I.D.	Inside diameter	QC	Quebec (Canada)
Inc	Incorporated	RPM	Revolutions per minute
” (in)	Inch (= 25.4 mm)	us/ USA	United States of America
kg	Kilograms	V	Volt (voltage)
kPa	Kilopascal	www	World wide web
kW	Kilowatt		

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