

FLOMOTION FS SERIES

HOSE PUMPS

INSTRUCTION MANUAL

FLOMOTION FS PERISTALTIC PUMP

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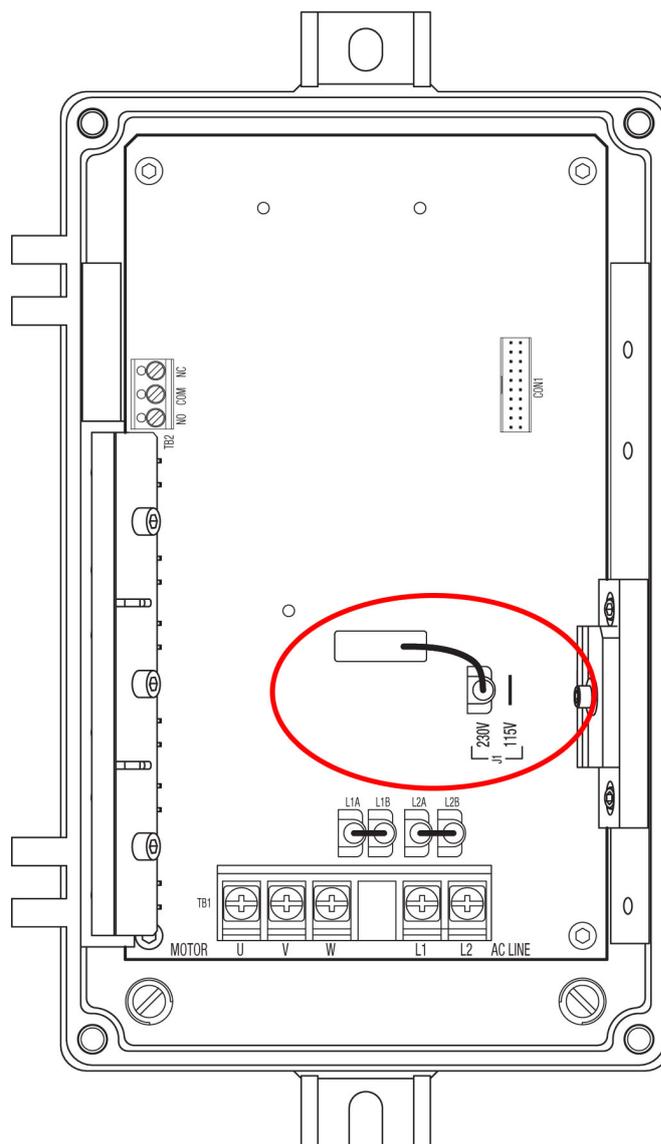
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Important Information!

Please read before wiring KBDA-SERIES VFD MOTOR DRIVE

The KB Drives are factory set from Flomotion Systems to be wired with 115 volts AC Power.

If 230 Volts AC is required then the “Jumper” wire or J1 connection must be moved to the proper position; see illustration below for the location of J1 Jumper.



FLOMOTION FS PERISTALTIC PUMP

1/ HOW TO USE THIS MAINTENANCE MANUAL

This manual is specific to FLOMOTION SYSTEMS FS and FSS series hose pumps. It allows the users to install, to start and to carry out maintenance on these pumps. All persons, fitters and users must read this maintenance manual in its entirety. The FS series are provided with a gearmotor and the FSS series are bare shaft pumps. All dimensions, spare parts, materials and characteristics are the same for the two series unless specified. Documents concerning the gearbox, the electrical motors as well as all other options (pulsation dampener, hose rupture detector etc) are provided in annex. Refer to in these documents to know the specific details of every apparatus.

Your local FLOMOTION SYSTEMS distributor is at your disposal for the information that you would not find in this manual. For short reply, please indicate the following information:

- Type of pump
- Pump serial number
- Reference of order

You can also visit our website fломotionsystems.com for further information.

2/ SECURITY AND GARANTEES

2.1 - USE OF THE PUMP

The pump was defined for a specific application. Any other use which does not comply with envisaged use is not guaranteed.

FLOMOTION SYSTEMS cannot be held responsible for damage or possible wounds produced during the use of the pump. The pump was designed in accordance with EU norms and applicable directives. Use the pump only for applications represented above. If you want to change your application, first contact your FLOMOTION SYSTEMS distributor.

2.2 - RESPONSIBILITY

FLOMOTION SYSTEMS, Inc. will be under no circumstances responsible for damage or wounds caused by non respect of security directives and maintenance instructions contained in this manual, or by negligence during the installation, use, service or repair of FLOMOTION hose pumps. Moreover, additional directives of security can be necessary according to working conditions or according process. Contact your FLOMOTION SYSTEMS distributor if you notice a potential danger during the use of the pump.

2.3 - TRAINING OF THE USER AND INSTRUCTIONS

Every person who installs, uses or performs any operations of maintenance on the pump must be qualified and must have previously read this technical manual. Any temporary personnel must be supervised by skilled users.

The order of execution of operations defined in this manual must be absolutely respected. Store this manual next to the pump so that it can be consulted at any time.

2.4 - CONDITIONS OF GUARANTEE

FLOMOTION SYSTEMS offers a guarantee of 2 years on the pump's parts. FLOMOTION SYSTEMS, Inc. promises to repair or to replace for free all damaged parts except if their deterioration came from a poor use of the pump. This concerns all parts except for the hose, the clamps, the sleeves, seals, bushings and bearings as well as the pump shoes.

FLOMOTION SYSTEMS, Inc. will not be able to accept a request of guarantee under no circumstances if the used parts are not of FLOMOTION SYSTEMS origin.

Any damaged parts covered by guarantee must be returned to the FLOMOTION SYSTEMS factory or to the local FLOMOTION SYSTEMS distributor. The returned parts must be accompanied with the duly filled and signed security form. A copy of this form is at the end of this manual. It must be appended in a visible way outside the packing. The potentially dangerous parts for health must be cleaned before returning them to the producer. It must be pointed out on the security form how parts were cleaned and those that have been decontaminated.

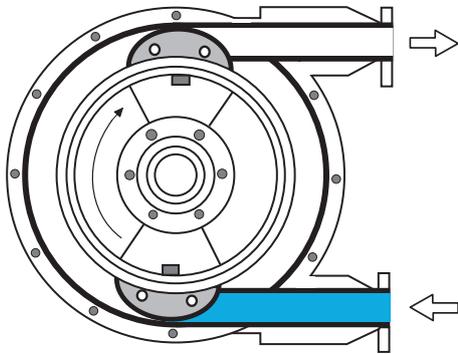
FLOMOTION SYSTEMS, Inc. is under no circumstances urged to respect guarantees given in its name by a third, whatever it is, representatives of FLOMOTION SYSTEMS, Inc. , subsidiaries and representatives including unless a specific agreement is written by a manager of FLOMOTION SYSTEMS, Inc.

3/ DESCRIPTION

3.1 - IDENTIFICATION OF THE PUMP

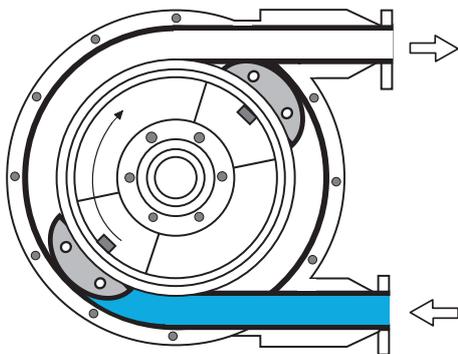
FLOMOTION SYSTEMS are identifiable by the pump plate located on the upper bracket. This one includes the type and serial number of the pump. This serial number leads to all information concerning building materials, nature of the hose, characteristics of the gearbox and characteristics of the motor. The gearbox as well as the motor include their own descriptive plate on which you can read the reduction ratio, power and electrical voltage etc.

3.2 - OPERATION PRINCIPLE



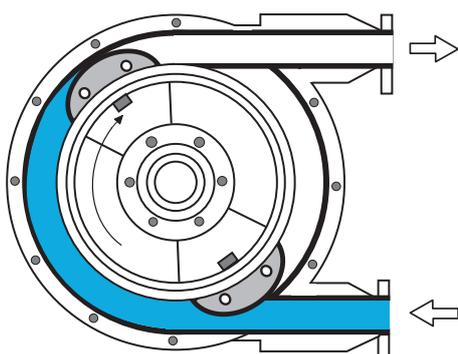
PHASE 1

The pump hose is compressed successively by two pressing shoes assembled on a rotating wheel. The first shoe, by pressing the walls of the hose, will create a vacuum and attract the pumped liquid into the hose.



PHASE 2

The pumped liquid has now entered the hose. The second shoe will compress the hose and push the liquid towards the pump outlet.

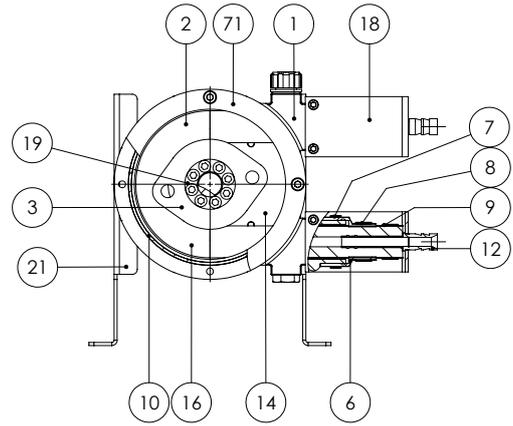
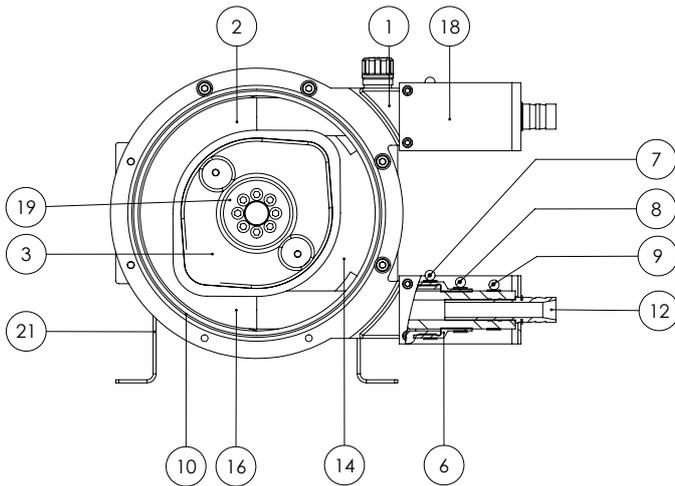


PHASE 3

As soon as, at the discharge side, the shoe is detached from the hose, the other shoe diametrically opposite is already in compression thus avoiding an internal product leakage. The product is then successively sucked and pushed due to the wheel rotation.

3.3 - PUMP CONSTRUCTION

3.3.1 - PUMPS FS10 TO FS20

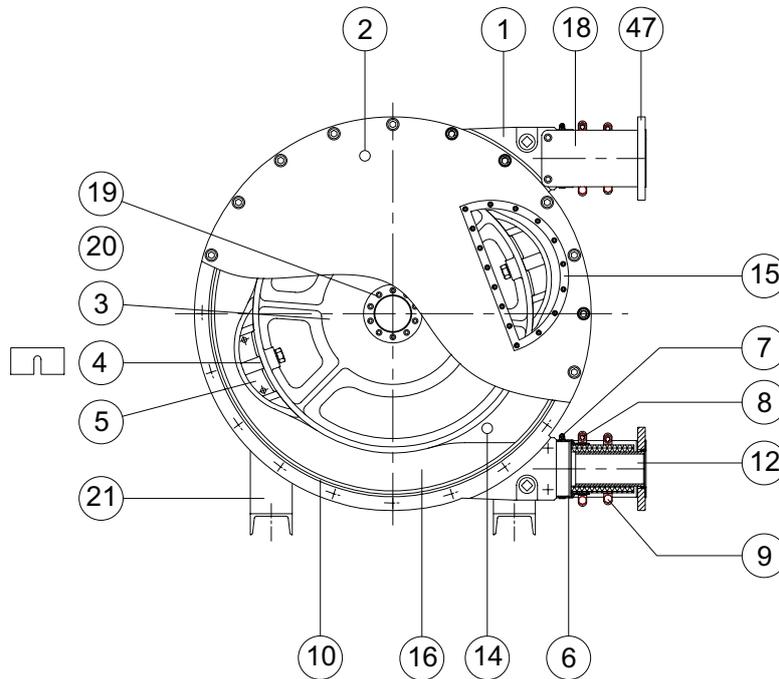


PUMP FS15

PUMP FS10

PART NO	DESIGNATION	FS10	FS15
1	CASING	CAST IRON	CAST IRON
2	COVER	LEXAN	LEXAN
3	WHEEL	CAST IRON	CAST IRON
6	SLEEVE	EPDM	EPDM
7	CLAMP ON CASING	STAINLESS STEEL	STAINLESS STEEL
8	CLAMP SLEEVE / HOSE	BICHROMATED STEEL	BICHROMATED STEEL
9	CLAMP ON HOSE	BICHROMATED STEEL	BICHROMATED STEEL
10	SEAL COVER	NITRILE	NITRILE
12	INSERT	STAINLESS STEEL/PPH/PVDF	STAINLESS STEEL/PPH/PVDF
14	LUBRICANT	GLYCERIN BLEND	GLYCERIN BLEND
16	HOSE	NR/NBR/EPDM/NBR food/Viton/Hypalon	NR/NBR/EPDM/NBR food/Viton/Hypalon
18	BRACKET	ELECTROPLATED STEEL	ELECTROPLATED STEEL
19	HUB	STEEL	STEEL
21	FRAME	ELECTROPLATED STEEL	ELECTROPLATED STEEL
71	COVER FLANGE	ELECTROPLATED STEEL	WITHOUT FLANGE

3.3.2 - PUMPS FS25 TO FS65



PART NO	DESIGNATION	FS 25 - 32 - 40	FS 50 - 65
1	CASING	CAST IRON	CAST IRON
2	COVER	ELECTROPLATED STEEL	STEEL
3	WHEEL	CAST IRON	CAST IRON
4	SHIM	GALVANIZED STEEL	GALVANIZED STEEL
5	SHOE	ALUMINIUM	CAST IRON
6	SLEEVE	EPDM	EPDM
7	CLAMP ON CASING	STAINLESS STEEL	STAINLESS STEEL
8	CLAMP SLEEVE / HOSE	STAINLESS STEEL	STAINLESS STEEL
9	CLAMP ON HOSE	STAINLESS STEEL	BICHROMATE STEEL
10	SEAL COVER	NITRILE	NITRILE
12	INSERT	STAINLESS STEEL/PPH/PVDF	STAINLESS STEEL/PPH/PVDF
14	LUBRICANT	GLYCERIN BLEND	GLYCERIN BLEND
15	SIGHTGLASS SEAL	LEXAN	LEXAN
16	HOSE	NR/NBR/EPDM/NBR food/Viton/Hypalon	NR/NBR/EPDM/NBR food/Viton/Hypalon
18	BRACKET	ELECTROPLATED STEEL	ELECTROPLATED STEEL
19	HUB	STEEL	STEEL
21	FRAME	STEEL	STEEL
46	SIGHT GLASS SEAL	NITRILE	NITRILE
47	INLET/OUTLET FLANGE	STAINLESS STEEL	STAINLESS STEEL

3.4 - HOSE

The FLOMOTION hoses are manufactured according to very strict specifications to acquire the best performances of the pump and to assure an optimum hose life. They are available in six materials : Natural Rubber (NR), perbunan (NBR), EPDM, NBR food, Hypalon, and viton. The material of the hose must be compatible with the pumped liquid. Consult an FLOMOTION distributor to define the best hose for your process or consult the chemical resistance table on our website fломotionsystems.com.

HOSE DIMENSIONS (dimensions in in)

PUMP	DISTANCE (L)
FS10	16
FS15	20
FS20	20
FS25	31
FS32	39
FS40	39
FS50	55
FS65	55

PUMP	Ø INSIDE	THICKNESS	LENGTH
FS10	0.39	0.43	22.4
FS15	0.59	0.43	32.7
FS25	0.98	0.57	42.9
FS32	1.26	0.61	51.2
FS40	1.50	0.53	51.2
FS50	2.01	0.59	71.7
FS65	2.36	0.53	72.8

3.5 - GEARBOX

Our standard gearboxes are coaxial gearboxes for pumps FS10 to FS40 and planetary for pumps FS50 to FS65. They have been sized according to the important radial loads of the pump. Consult the gearbox maintenance manual provided with the pump to know the quantity of lubricant requested as well as the periodicity of oil change.

3.6 - ELECTRICAL MOTORS

The standard motors provided on our pumps are squirrel-cage motors and have a 220/400 & 400/660V 50Hz tri-phase voltage. If the pump has to work in a potentially explosive environment, please refer to the complementary information on ATEX compliances and contact your FLOMOTION distributor.

3.7 - AVAILABLE OPTIONS

FLOMOTION offers several options for their pumps :

- Hose rupture detector.
- Revolution-counter.
- Pulsation dampener.
- Air vacuum assistance (for highly viscous liquids).

Please contact your FLOMOTION SYSTEMS distributor for any information about these different options.

4/ INSTALLATION

4.1 - UNPACKING AND CONTROL

During the reception of the pump, please follow the indications pointed out on the packing. Undertake a visual control to be sure that no damage happened during the transport. If this is the case, please contact your FLOMOTION SYSTEMS distributor as soon as possible.

4.2 - CONDITIONS OF USE

FS pumps can work in atmospheres where the temperature is situated between -20°C and $+45^{\circ}\text{C}$. Pumps are delivered painted with a 150μ polyurethane paint which allows them to resist to certain aggressive ambiences. They are designed for indoor and outdoor setups.

4.3 - SET UP

Before installing the pump, check the following points :

- The pump is delivered with a frame provided with four anchoring holes. It must be fixed on a solid base with a slope which does not exceed 5mm for 1m and must be firmly fastened to this one.
- Require enough space around the pump to carry out maintenance. If such was not possible, consider moving of the pump to a space provided for this purpose.
- Make sure that the room is adequately ventilated to relieve the heat generated by the pump. Leave a space behind the motor ventilator hood so as not to obstruct air intake.

4.4 - PIPING

Suction line piping :

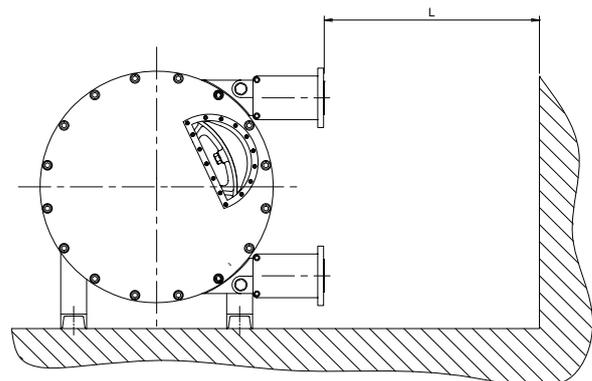
- The internal diameter of the piping must be superior to that of the pump hose (see §3.4.).
- It must be the shortest and most direct possible to avoid suction loss.
- Install a valve on the suction line especially if the pump is on load.
- Limit the presence of bends and make sure that they are as large as possible.
- Make sure that piping can support the service pressure of the pump.

Discharge line piping :

- The internal diameter of piping must be superior to that of the pump hose (see §3.4.).
- It must be the shortest and most direct possible to avoid discharge pressure loss.
- Limit the presence of bends and make sure that they are as large as possible.
- Provide a space for a pulsation dampener (see picture below).
- If there is a valve on the discharge line, install a pressure valve or a over pressure protection gauge to avoid any possible damage to the pump and to the installation.
- It is recommended to install a Dillatoflex® pipe to absorb vibrations created by the pump pulsations.

During the pump ground study, provide enough space for the hose change as well as the possible installation of a pulsation dampener.

Distance (L) is the required length for hose removal.



4.5 - LIFTING THE PUMP

Pumps are provided with two lift rings fitted on the upper part of the frame. While lifting the pump, respect the following points :

- Lift the complete hose pump using the lifting rings plus additional support on the gearbox and the motor using suitably rated straps or slings.
- Never exceed the upper limits of lift and control the motorized pump weights in the table below.
- The motorized pump, given its centre of gravity, will tend to overbalance on the pump head side. Make sure that the persons are at a security distance of the pump to avoid any risk of wound.
- Never raise the pump otherwise than by the pump's lifting rings.
- Never raise the pump by its orifices nor by its brackets.

PUMP	FS10	FS15	FS25	FS32	FS40	FS50	FS65
WEIGHT LBS	55	77	176	287	320	694	739

5/ PUMP START-UP

5.1 - PREPARATIONS

- Connect the electrical motor in accordance with the local rules and regulations. Perform this work by qualified personnel.
- Make sure that the lubricant level arrives at the level of the sight glass. Add lubricant if required by the breather or by the sight glass (see §6.1.).
- Make sure the shimming of the pump is according to the pump process (see §6.5 shoe shimming).
- Check the direction of rotation of the pump. It is recommended to install a rotation inverter on the motor for the hose change.

5.2 - START-UP

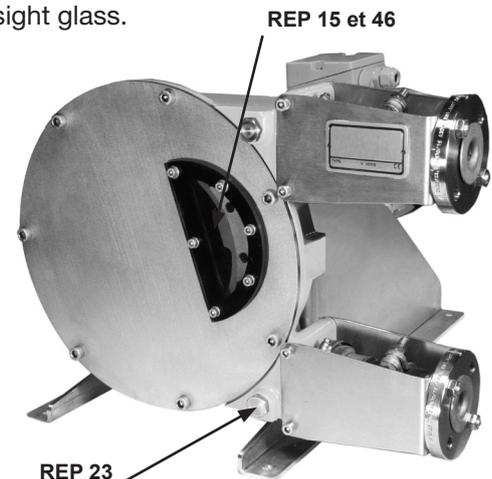
- Install piping at the inlet and outlet of the pump.
- Make sure that valves at the inlet and outlet are opened.
- Start the pump by checking its direction of rotation by the sight glass.

6/ MAINTENANCE

6.1 - EMPTYING AND FILLING OF THE LUBRICANT

Refer to §6.6 to know the periodicity of lubricant change.

- 1 - Stop the pump.



- 2 - Place a tray underneath the drain plug REF23.
- 3 - If necessary, install a tap and a drain circuit instead of the drain plug REF23.
- 4 - Make sure that this tray can contain the quantity of lubricant during the drainage process (see lubricant volume table §9.5).
- 5 - Unscrew the plug REF23 and undertake emptying.
- 6 - Position and tighten the plug REF23 by applying Teflon® band or waterproof paste or close the drain tap.

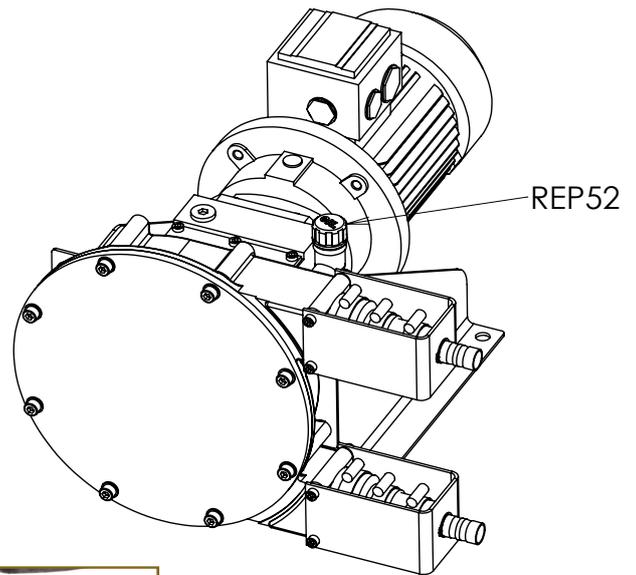
NOTE : If the pump is mounted with the inlet/outlet positioned upwards, lubricant drainage is obtained by unscrewing some cover screws in the lower part.



- 7 - Remove the sight glass REF15 as well as its seal REF46 and fill the casing with the FLOMOTION lubricant (see lubricant table §9.5.). You can also fill the casing by the breather cap REF52 situated at the back of the pump casing. The required lubricant level is underneath the bottom edge of the sight glass (see photo beneath).

FOR MODELS FS10, 15 & 20 :

Unscrew higher breather plug REF52 of the pump. Place a funnel inside the plug hole and fill the casing with the FLOMOTION lubricant (see lubricant table §9.5.). The necessary volume of lubricant is just underneath the shaft line.



- 8 - Check the state of the seal REF46 and reassemble the sight glass REF15 or tighten the breather cap REF52.

MAX LEVEL



6.2 - HOSE CLEANING

The hose cleaning can be done without removing the hose. It can be done with water or with a cleaning liquid (check compatibility with hose material). With numerous products, it is necessary to clean the hose after every pumping in order to avoid the hardening of the product inside this one.



CAUTION ! Make sure that the cleaning liquid temperature is adapted to the hose material.

6.3 - HOSE REPLACEMENT



CAUTION ! Before any hose change, check the following points :

- a. This service has to be performed by skilled personnel that is acquainted with this manual.
- b. Isolate the pump from the power supply. Inlet and outlet valves have to be closed to minimize product loss.
- c. Always carry clothes and necessary protection according to the pumped product.
- d. Respect all security and environmental rules necessary for the manipulation of the pumped product.

6.3.1 - HOSE REMOVAL

- 1 - Disconnect and remove the suction and discharge piping.
- 2 - Drain the lubricant as explained in §6.1.
- 3 - At the suction end, loosen clamps REF8 and 9 (photo 1).
Extract the insert REF12 and remove the flange REF47 (photo 2).

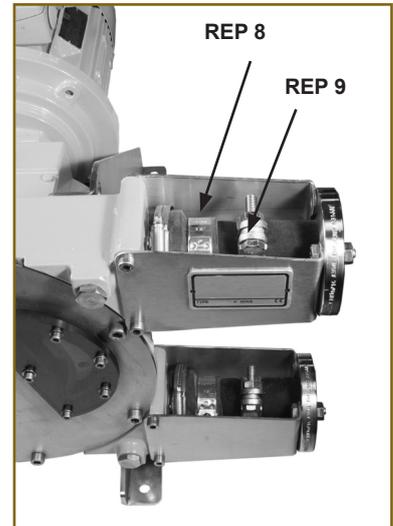


PHOTO 1

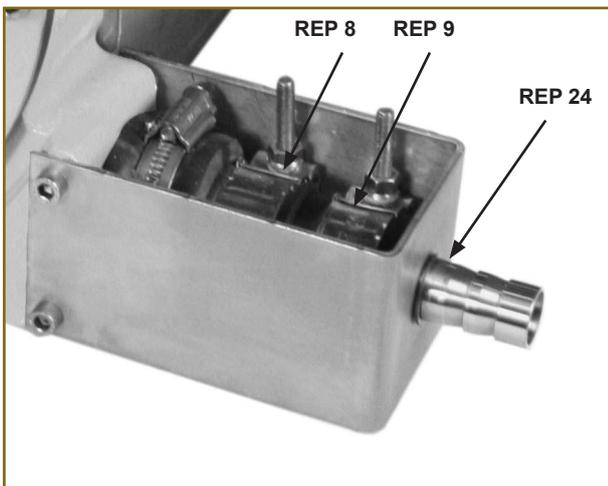


PHOTO 3

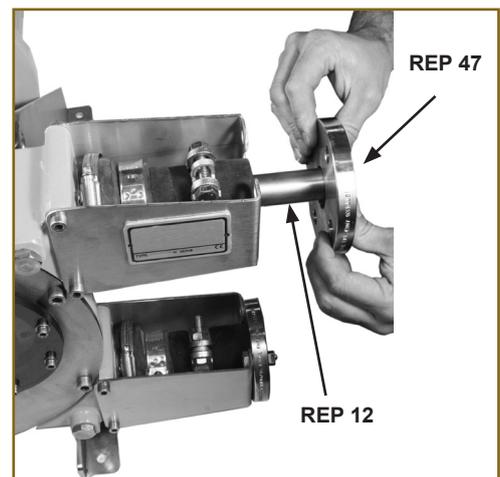


PHOTO 2

FOR MODELS FS10, 15 & 20 :

Remove circlips REF24 and dismantle bracket REF18. Extract insert REF12.

4 - At the discharge end, loosen clamps REF8 and 9. Extract the insert REF12 and remove the flange REF47 as well as the brackets REF18 (photograph 4). Remove clamps REF8 and 9 (photograph 5).

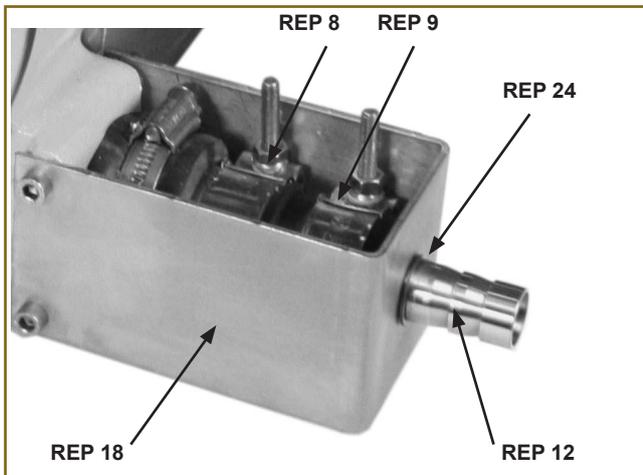


PHOTO 7

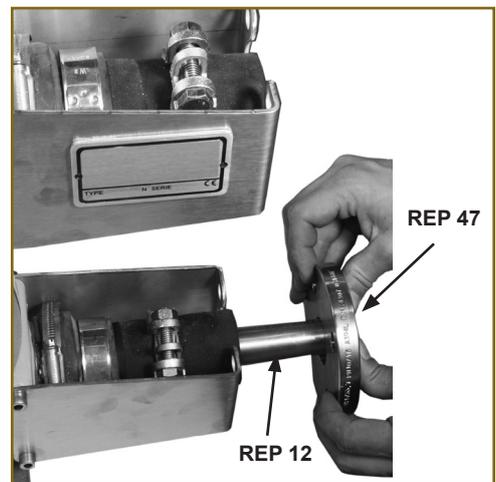


PHOTO 4

FOR MODELS FS10, 15 & 20 :

At the pump outlet, loosen clamps REF8 and REF9. Remove circlips REF24 and dismantle bracket REF18. Extract insert REF12. Remove clamps REF8 and REF9.

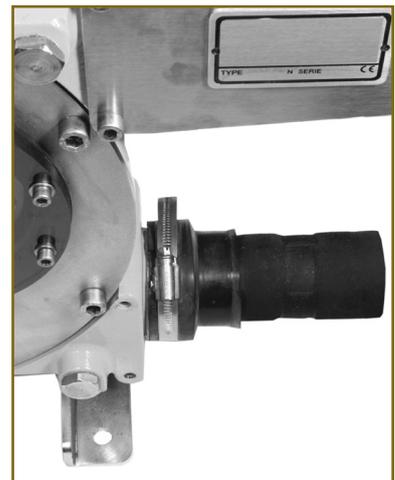


PHOTO 5

5 - Jog run the motor to deliver the hose from the pump casing at the outlet side.



WARNING ! The hose can come out of the pump casing very fast and cause harm. Check that nobody is in front of the pump's orifices while removing the hose.

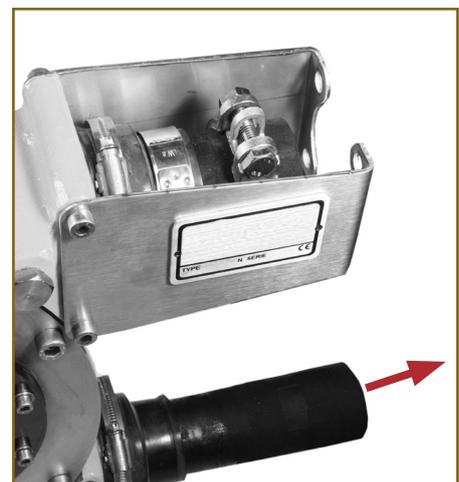


PHOTO 6

6.3.2 - PUMP CASING CLEANING

This operation is necessary when a hose has burst and when the product has contaminated the inside of the pump casing.

1 - Unfasten cover screws by leaving two screws partly fastened to the casing. Slightly withdraw the cover from the casing and fix a shackle in one of the cover's highest fastening holes (see picture below). Pumps FS80, 100 and 125 are equipped with a lifting ring. Install a lift equipment in this shackle and slightly raise the cover. Unfasten the remaining screws and withdraw the cover.

2 - Check the state of the cover seal REF10 and replace if necessary.

3 - Check the state of wear of the pressing shoes REF5 and replace them if necessary (see §6.4 Replacement of spare parts).



CAUTION ! A wear of shoes can cause problems to the pump and provoke abnormal hose lifetime.

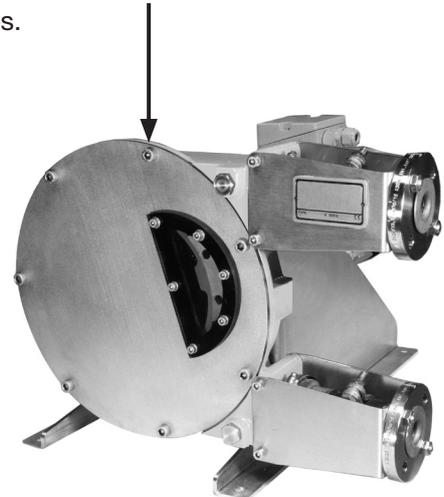
4 - In the case of a hose burst, it is possible that the shaft seal REF26 as well as the seal ring REF27 have been notably damaged when pumping an abrasive liquid. Relate to §6.4 if a replacement of these parts is necessary.

5 - Wash the casing with clear water and withdraw any residues.

6 - Dry the pump casing entirely.

7 - Replace the cover seal in its groove.

8 - Reassemble the pump cover.



6.3.3 - REASSEMBLY OF THE HOSE



WARNING ! You should never assemble a new hose without a mounted cover.

1 - Pre-assemble the flange REF47 at the inlet port with two bolts (photo 1).

FOR MODELS FS10, 15 & 20

Temporarily mount the bracket REF18 at the inlet port.

2 - Clean the new FLOMOTION hose carefully. Slightly coat it with FLOMOTION lubricant. Slightly lubricate the inside of the sleeve REF6

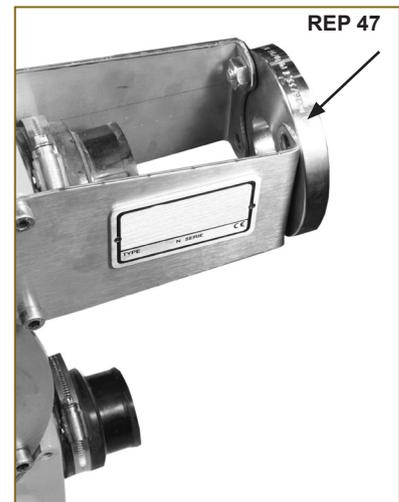


PHOTO 1

3 - Insert the hose by the outlet port REP6 (Photo 2).

4 - Reverse the direction of rotation of the motor.

5 - While pushing on the hose, jog run the motor and check the direction of rotation.

6 - The shoes mounted on the wheel are going to “swallow” the hose and push it out of the inlet port. Always by giving jolts, bring the hose against the flange REF47 (photo 3).

7 - Assemble the clamps REF8 and 9 on the inlet side. Mount the insert REF12 into the hose. Tighten clamps REF8 and 9.

FOR MODELS FS10, 15 & 20

Dismantle the bracket REF18. Mount clamp REF8 and 9 on the hose. Mount the insert REF12 into the hose. Fix bracket REF18 and block the insert with circlips REF24. Tighten the clamp REF 8 and 9.

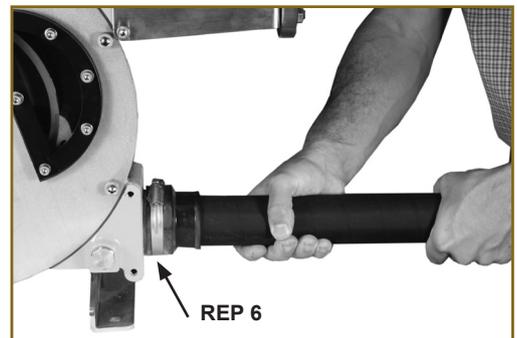


PHOTO 2



If you meet difficulties in introducing inserts into the pump hose, coat them slightly with FLOMOTION lubricant. Never use another lubricant.

8 - Assemble the brackets REF18 and pre-assemble flange REF47 on the outlet side with two temporary bolts.

FOR MODELS FS10, 15 & 20

Assemble the bracket REF18 at the outlet side.

9 - Reverse the direction of rotation of the motor.

10 - Jog run the motor to bring the hose against the discharge flange.

11 - Undertake operation 7 at discharge side.

12 - Fill the pump with the necessary quantity of FLOMOTION lubricant (see §6.1. and §9.5.).

13 - Take away the temporary flange bolts and fix the piping on both suction and discharge sides.

14 - Open the valves at the suction and discharge sides.

15 - Check the direction of rotation of the pump. Check for any possible lubricant leakage by the inserts, sleeves or cover.



PHOTO 3

6.4 - REPLACEMENT OF SPARE PARTS

6.4.1 - REPLACEMENT OF PUMP SHOES (EXCEPT FS10, FS15, FS20)

- 1 - Jog run the motor and position one of the shoes in front of the sight glass.
- 2 - Cut the power supply.
- 3 - Drain the lubricant (see §6.1).
- 4 - Remove the pump cover REF2 as well as the cover seal REF10.
- 5 - Disassemble the shoe which is not in contact with the hose and put aside the shims if any. Check that the pin REF30 is still on the wheel (FS25 to FSX80).
- 6 - Mount a new shoe on the wheel (do not to forget the washer REF29). Slide the shims between the shoe and the wheel before tightening.



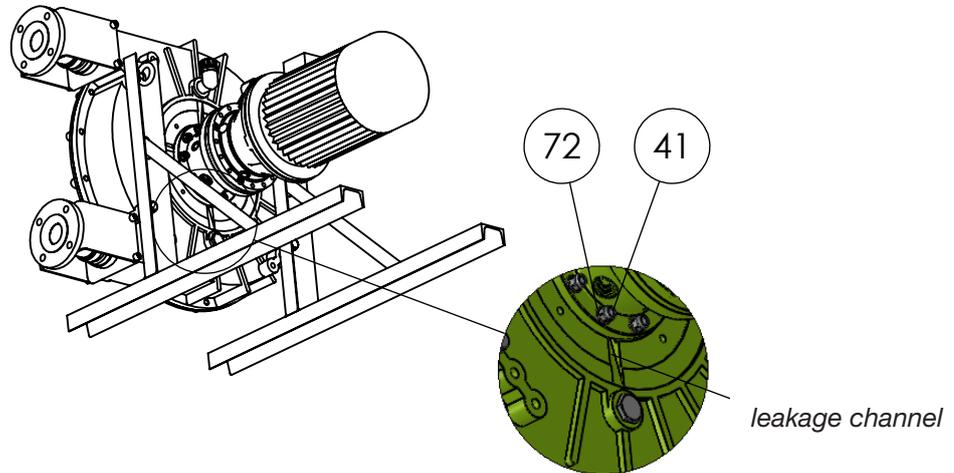
CAUTION ! Be careful of the position of the shoe with the centring pin REF30 (FS25 to FSX80).

- 7 - Tighten the shoe onto the wheel.
- 8 - Reassemble the cover with 3 temporary bolts disposed at about 120° between each other.
- 9 - Jog run the motor 180° to bring the second shoe in front of the sight glass.
- 10 - Remove the cover once again and undertake operations 5 - 7.
- 11 - Reposition the cover and tighten all cover screws.



6.4.2 - REPLACEMENT OF THE SEAL RING REP27 AND THE SHAFT SEAL REP26

FLOMOTION hose pumps are equipped with a leakage channel that allows to see the wear of the seal ring or the shaft seal. This channel is at the back of the pump casing underneath the gearbox flange. It also protects the gearbox seals by leaving the lubricant or the product to pass freely at the back of the pump casing.



PUMPS FS05 & FS65

(refer to the nomenclature §9.3. for the landmarks of parts).

- 1 - Isolate the pump from the power supply.
- 2 - Empty the lubricant and clean out the pump (see §6.1).
- 3 - Remove the pump hose (see §6.3.1).
- 4 - Disassemble the pump cover and withdraw the cover seal REF10.
- 5 - Disassemble the wheel by unscrewing the expansible hub REF19. Refer to section 9.10 for expansible hub assembly and disassembly.
- 6 - Withdraw the wheel of the pump shaft with a suitable lifting equipment.
- 7 - Support the gear motor with a suitable lifting equipment.
- 8 - Unscrew the nuts REF41 and withdraw the gearbox from the pump casing.
- 9 - Extract the damaged seal ring REF27.
- 10 - Slip on the spacer ring REF73 if necessary and glue to the shaft. Position the new seal ring REF27 against the spacer ring or the gearbox shaft's shoulder. Fill the gap between the keyway and the seal ring with silicone mastic to ensure correct.

 For Pumps FS100 and FS125 the wheel is automatically positioned by the spacer ring and seal ring. Therefore, no adjustment is necessary.

- 11 - Withdraw the shaft seal REP26 with a drift punch.
- 12 - Replace a new shaft seal REF26 with an appropriate tool (wooden or plastic cylinder). Check the mounting position of the seal (opened side turned to the cover).

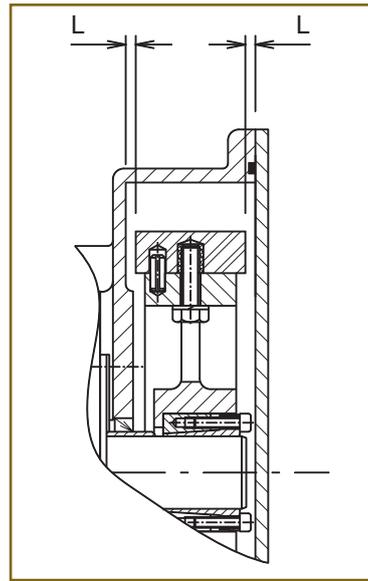


13 - Mount the gear motor on the casing being careful not to damage the shaft seal. Tighten the nuts REF41 with their washers REF72.

14 - Mount the wheel and hub on the pump shaft by positioning it referring to the table and the drawings below



REP 19



PUMP	FS 10	FS 15	FS 25	FS 32	FS 40	FS 50 - 65
Distance (in) casing / shoe (L)	0.16	0.11	0.22	0.24	0.10	0.12
Tolerance (in) + or -	0.02	0.02	0.02	0.02	0.02	0.02

15 - Cross tighten the expansible hub with a dynamometric spanner to the correct torque figures- Check the wheel position once again and re-adjust if necessary. Refer to section 9.10 for expansible hub assembly and disassembly.



PUMP TYPE	TORQUE Nm
FS10-15	12
FS25-32-40	13
FS50-65	35

16 - Mount the cover seal REF10 in its groove and mount the cover.

17 - Mount the pump hose as stated in §6.3.3.

PUMPS FSX80 A FS125 (refer to the nomenclature for the landmarks of parts §9.3.)

1 - Undertake the same operations 1 to 10 as for pumps FS05 to FS65.

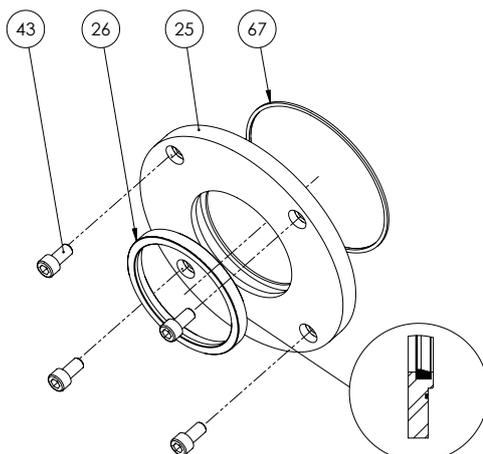
2 - Disassemble the seal flange REF25 and withdraw the damaged shaft seal with a screwdriver or a similar tool.

3 - Take the new shaft seal REF26 between the thumb and the index and by tightening your fingers, form an "8" figure. The seal can now be inserted into its groove by respecting the mounting position (see drawing).

4 - Mount the gear motor on the pump casing (see operation 13).

5 - Replace the O ring REF67 if necessary and reassemble the seal flange.

6 -For pumps FSX80 and FS80, undertake operations 14 to 17 of previous chapter. For pumps FS100 and FS125, undertake operation 14 of previous chapter. Then block the wheel with the washer REF60 and the screw REF59 and finish with operations 16 and 17 of previous chapter.



6.5 - SHOE SHIMMING



NOT : this paragraph does not concern pumps FS10 to FS20.



CAUTION ! The shimming of shoes is an operation which consists in adding shims under the shoe to stop any internal leakage. An internal leakage considerably reduces the life time of the hose as well as the flow. As a result, it is essential to adjust the shoe's shimming according to the rotation speed of the pump, the desired discharge pressure and the liquid viscosity.



WARNING ! Never run the pump without the sight glass.

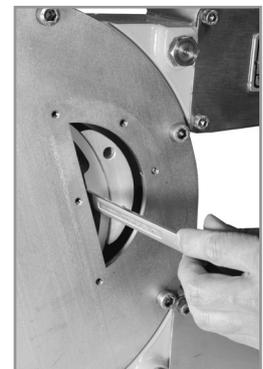
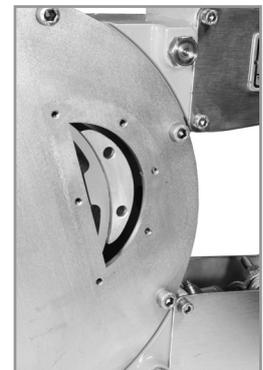
The shoe shimming can be made without disassembling the hose or the cover. Shims are inserted or withdrawn by the sight glass as pointed out below :

- 1 - Jog run the motor and bring a shoe in front of the sight glass.
- 2 - Cut the power supply of the pump.
- 3 - Unscrew the sight glass bolts and withdraw taking care in not damaging the seal.
- 4 - Slightly unscrew the shoe's fastening bolt(s) and lift the shoe off the wheel with a screwdriver or a similar tool.
- 5 - You can now either slide in or withdraw the necessary number of shims under the shoe.



Consult the shimming table §9.6 to determine the precise number of shims according to your application.

- 6 - Tighten the shoe bolts.
- 7 - Reassemble the sight glass with its seal.
- 8 - Re-connect and jog run the motor to bring the second shoe in front of the sight glass.
- 9 - Cut the power supply of the pump.
- 10 - Repeat operations 3, 4, 5, 6 and 7. Replace the sight glass seal REF46 if necessary.



6.6 - MAINTENANCE AND PERIODIC INSPECTIONS FS SERIES

1	Pump hose replacement.	In prevention, change the pump hose after 90 % of the life time of the first hose.	see §6,3
2	Lubricant replacement.	At the end of two hose changes or 5000 hours of functioning. Otherwise, in every hose break.	see §6,1
3	Gearbox oil replacement.	Refer to the gearbox maintenance manual provided with the pump.	
4	Replacement of the seal ring REF27.	In case of presence of lubricant in the leak channel.	see §6,4,2
5	Replacement of the shaft seal REF26.	In case of presence of lubricant in the leak channel.	see §6,4,2
6	Replacement of the shaft seal REF105 and REF106 (FSS series).	In case of presence of oil in the leak channel or at the lip seals.	see §6,4,2 and §6,6
7	Replacement of the shoes.	If these are worn on the contact surface.	see §6,4,1
8	Replacement of the cover seal REF10.	In the case of a leak around the pump cover.	see §6.3.2
8	Replacement of the sleeves REF6.	If these are damaged.	Refer to §6,3. Perform operations 1, 2, 3 and 4 of §6,3,1 and change sleeves. Respect directives of security.
9	Replacement of the bearings REF103 and REF104 (FSS series)	If there are abnormal noises coming from the bearing case.	see §6,4 and §6,6
9	Check the lubricant level.	Before starting the pump and periodically during the pump service.	see §6,1
10	Check for lubricant leakage at the leakage channel.	Before starting the pump and periodically during the pump service.	see §6,4
11	Check the pump casing to discern possible leakages around the cover, the sight glass, the flanges and the sleeves.	Before starting the pump and periodically during the pump service.	
12	Check for wear on the shoe's pressing surface.	At every hose change.	see §6,4
13	Check the presence of a gearbox oil leakage.	Before starting the pump and periodically during the pump service.	see §3.5
14	Check for strange noises coming from the pump, gearbox and bearing case or abnormal pump casing temperature.	Periodically during the pump service.	

7/ STORAGE

7.1 - STORAGE OF THE PUMP

Store the pump in a sheltered and dry place and ensure that the storage room temperature is between - 20°C and +45°C. Protect the pump if necessary and block the inlet and outlet orifices : if the pump stays without working more than 1 month, withdraw the hose from the pump or withdraw one of the shoes as well as its centring pin and position the wheel so that the second shoe can be seen through the sight glass. For models FS05-10-15-20, position the wheel so that one of the cam lobes remains submerged in the lubricant. If you can neither withdraw the hose or one of the shoes, run the pump 5 min a week.

7.2 - STORAGE OF THE PUMP HOSES

Hoses must be stored sheltered from light in a cool place. Their life is reduced after two years. The performance of hoses is reduced at the end of this expiry date due to the ageing of rubber.

8/ TROUBLESHOOTING

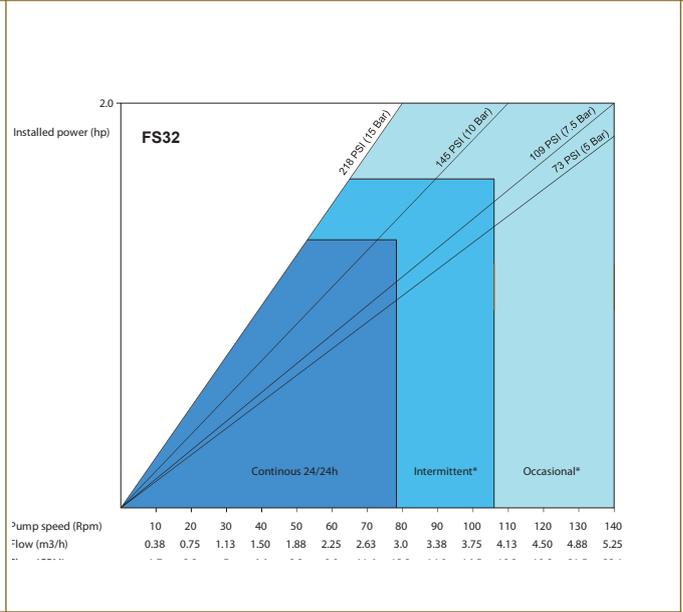
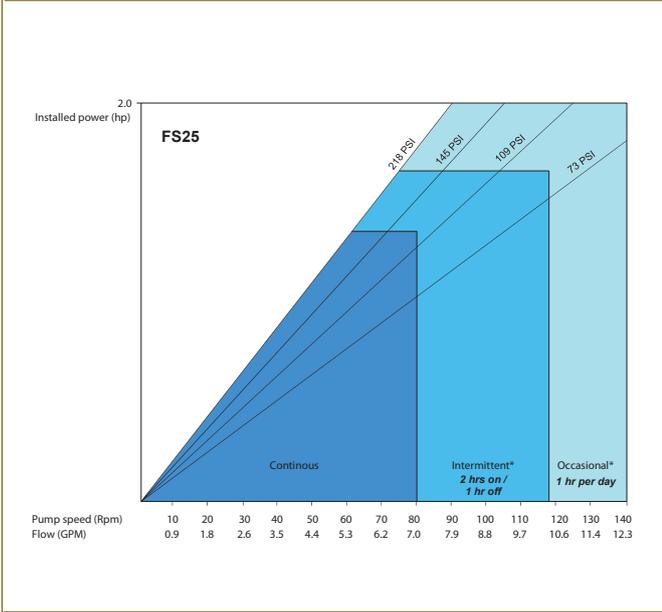
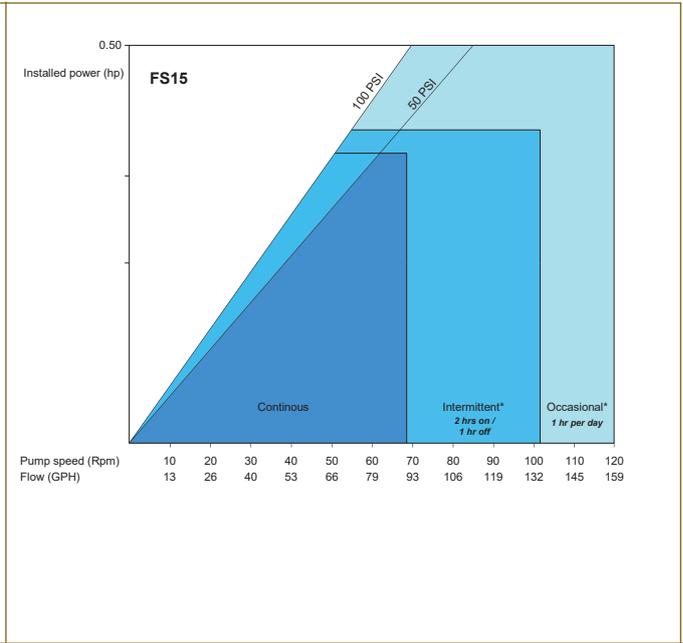
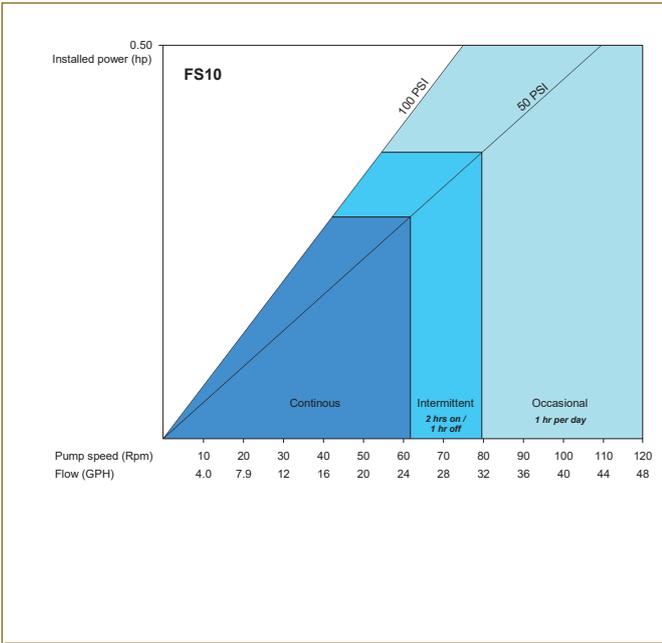
PROBLEM	POSSIBLE REASON	RESOLUTION
The pump does not work	No power supply.	Check that the pump power switch is on position "ON".
		Check the connection of the motor.
	The wheel of the pump stalls.	Check the fixing of the hose.
		Check that the discharge pressure is not too high.
		Check that the product hasn't sedimentated in the hose.
	The lubricant level detector has been operated.	Check the reason for which the level detector has been operated. Check the correct functioning of this one. If the pump hose has bursted, undertake the replacement of the pump hose.
Low capacity or pressure	Not enough Shims under shoes.	Add the sufficient number of shims.
	Air leak at the inlet of the pump.	Check the tightening of the clamps of the pump and the sealing of the inlet piping.
	Valve closed or partly closed at inlet.	Fully open the valve.
	Wear of the hose.	Replace the hose.
	Product too viscous or too high pump speed in comparison with the product viscosity.	Ask for advice from your FLOMOTION distributor.
	Piping blocked or partly blocked at inlet.	Unblock piping at inlet and make sure of the good flow of the product.

(8/ TROUBLESHOOTING.)

PROBLEM	POSSIBLE REASON	CORRECTION
Hose life is too short.	Incompatibility of the hose with the pumped product.	Make sure the compatibility of the hose with your product and contact your FLOMOTION distributor.
	Discharge pressure too high.	Check that the discharge pressure of the pump does not exceed 15 bars (or 8 bars for FS05 to FS20). Check that the outlet piping is not blocked up and that all valves are opened. Make sure that the security valve works correctly. Make sure that the piping friction losses do not exceed the value requested for an appropriate functioning of the pump.
	Pump speed too high.	Reduce the pump speed.
	Wrong shimming.	Check the shimming.
	Too high temperature of the product.	Contact your FLOMOTION distributor.
Lubricant leakage around the cover	Deficient tightening of cover bolts. Wear of the cover seal.	Tighten cover bolts. Replace cover seal.
Lubricant leakage in the leakage channel (underneath the gearbox flange)	Wear of the shaft seal or the seal ring.	Replace these parts.
Lubricant leakage at the sleeves	Deficient tightening of clamps or spoilt sleeve (s).	Tighten clamps or replace sleeves.
Pulsations in piping.	Deficient fastening of the piping.	Fix piping correctly.
	Process creating important pulsations due to the product, the speed of the pump, discharge pressure or the sizing of piping.	Contact your FLOMOTION distributor.

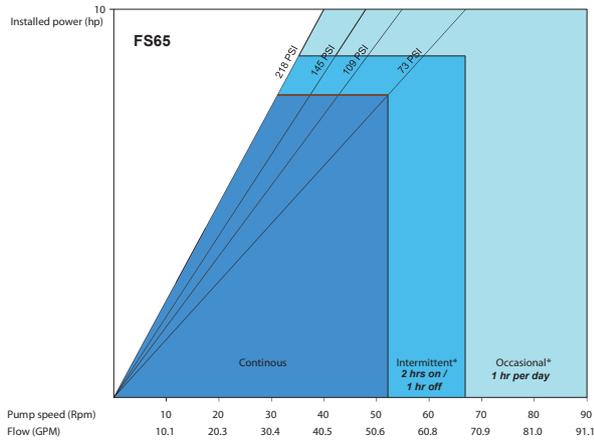
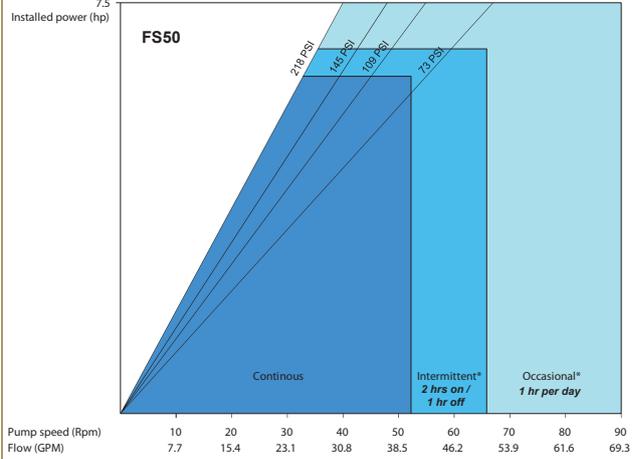
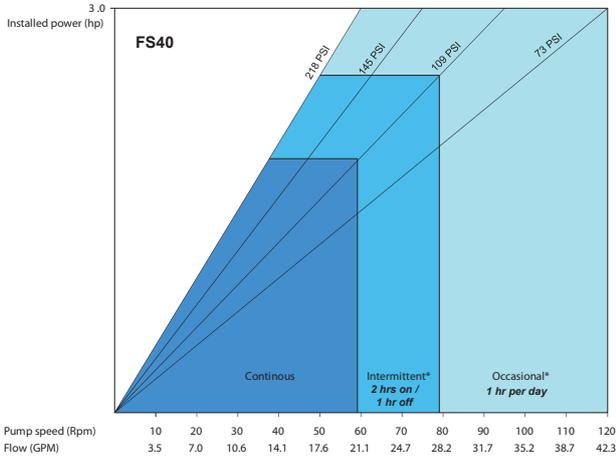
9/ CHARACTERISTICS AND TECHNICAL SPECIFICATIONS

9.1 - PERFORMANCES CURVES



(9/ CHARACTERISTICS AND TECHNICAL SPECIFICATIONS)

9.1 - PERFORMANCES CURVES



9.2 - FLOMOTION DIMENSIONS FS10 TO FS65 FLANGED GEAR MOTOR AND FSS SERIES

PUMP FS10

GEARMOTOR

1/2HP, 230 VAC, 3-PH, TEFC, INVERTER DUTY WITH CORROSION RESISTANT EPOXY COATED FINISH

PUMPHEAD

DUCTILE IRON AND PAINTED WITH INDUSTRIAL GRADE CORROSION RESISTANT PAINT

PUMP ROTOR

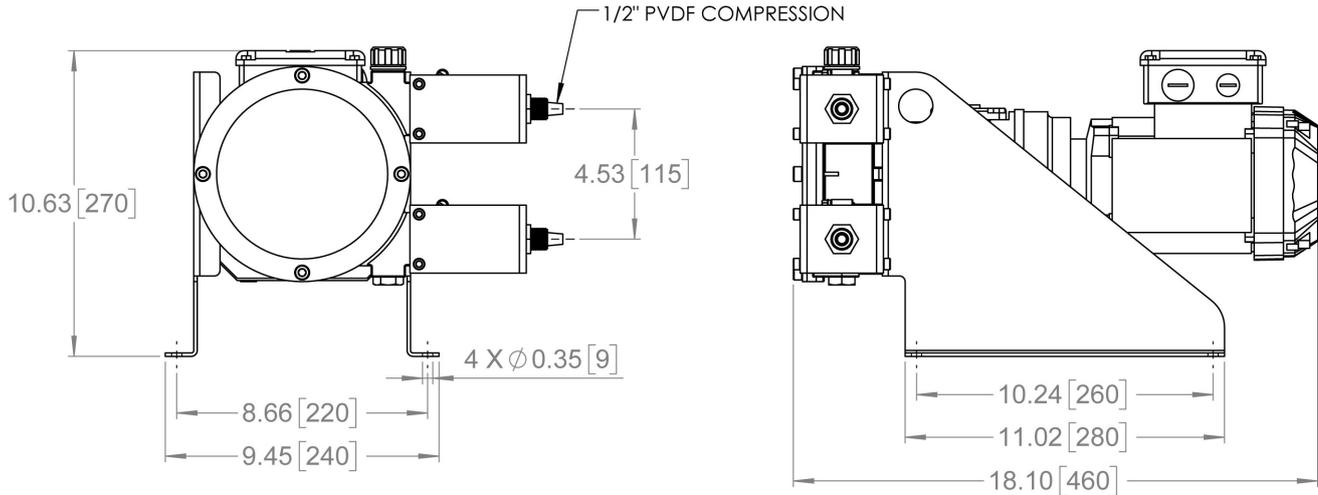
ASTM CLASS 45B CAST IRON WITH TWO INTEGRALLY CAST LOBES LOCATED 180° APART

PROCESS CONNECTIONS

1/2" PVDF COMPRESSION

HOSE MATERIAL

NATURAL RUBBER
EPDM
BUNA-N
HYPALON
VITON



PUMP FS15

GEARMOTOR

1/2HP, 230 VAC, 3-PH, TEFC, INVERTER DUTY WITH CORROSION RESISTANT EPOXY COATED FINISH

PUMPHEAD

DUCTILE IRON AND PAINTED WITH INDUSTRIAL GRADE CORROSION RESISTANT PAINT

PUMP ROTOR

ASTM CLASS 45B CAST IRON WITH TWO INTEGRALLY CAST LOBES LOCATED 180° APART

PROCESS CONNECTIONS

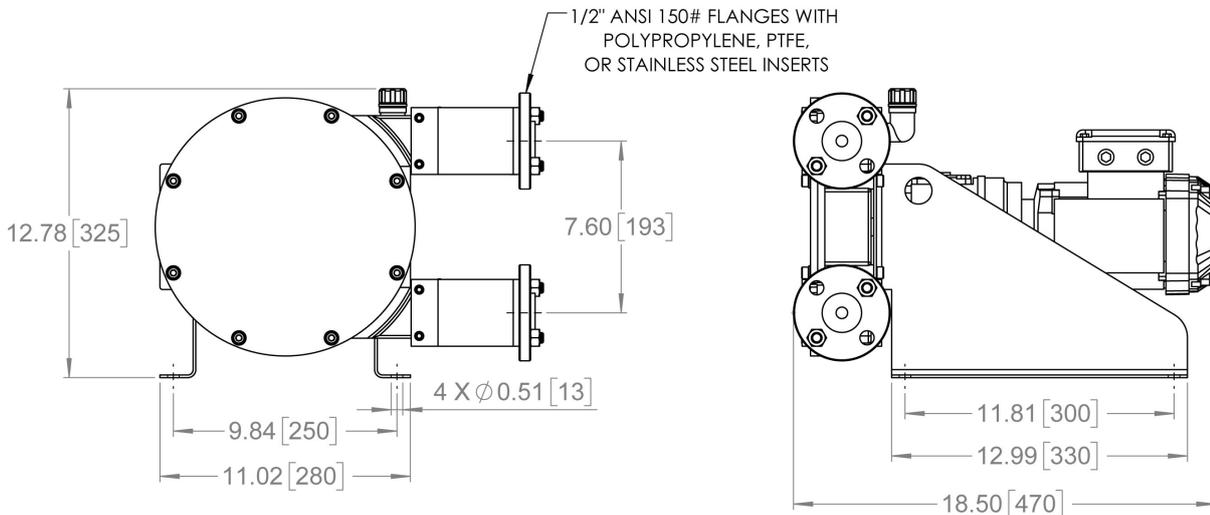
1/2" ANSI 150# FLANGES 316 STAINLESS STEEL

PROCESS CONNECTION INSERTS

POLYPROPYLENE
PTFE
316 STAINLESS STEEL

HOSE MATERIAL

NATURAL RUBBER
EPDM
BUNA-N
HYPALON
VITON



PUMP FS25

GEARMOTOR

2HP, 230 VAC, 3-PH, TEFC,
INVERTER DUTY WITH
CORROSION RESISTANT
EPOXY COATED FINISH

PUMPHEAD

DUCTILE IRON AND PAINTED
WITH INDUSTRIAL GRADE
CORROSION RESISTANT PAINT

PUMP ROTOR

ASTM CLASS 45B
CAST IRON WITH TWO
INTEGRALLY MOUNTED
SHOES WITH SHIMS
LOCATED 180° APART

PROCESS CONNECTIONS

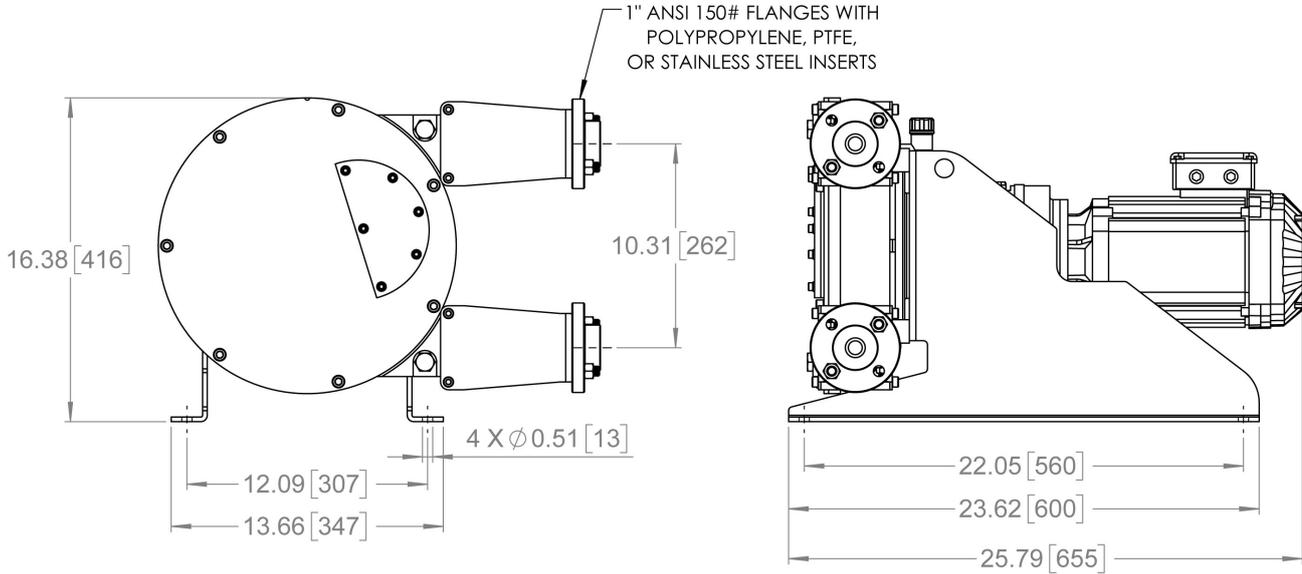
1" ANSI 150# FLANGES
316 STAINLESS STEEL

PROCESS CONNECTION INSERTS

POLYPROPYLENE
PTFE
316 STAINLESS STEEL

HOSE MATERIAL

NATURAL RUBBER
EPDM
BUNA-N
HYPALON
VITON



PUMP FS32

GEARMOTOR

2HP, 230 VAC, 3-PH, TEFC,
INVERTER DUTY WITH
CORROSION RESISTANT
EPOXY COATED FINISH

PUMPHEAD

DUCTILE IRON AND PAINTED
WITH INDUSTRIAL GRADE
CORROSION RESISTANT PAINT

PUMP ROTOR

ASTM CLASS 45B CAST IRON WITH
TWO INTEGRALLY MOUNTED SHOES
WITH SHIMS LOCATED 180° APART

PROCESS CONNECTIONS

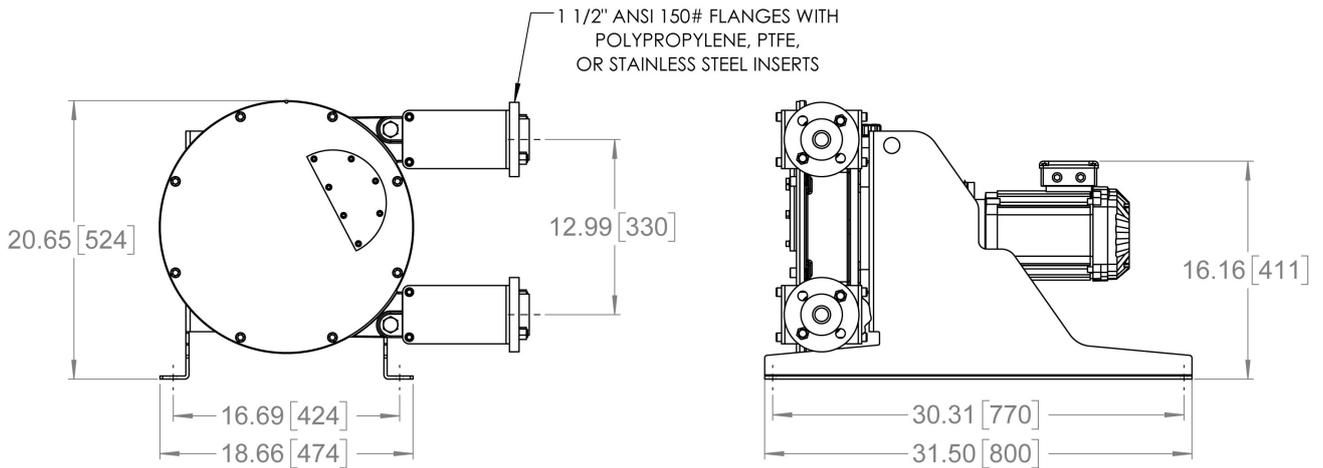
1 1/2" ANSI 150# FLANGES
316 STAINLESS STEEL

PROCESS CONNECTION INSERTS

POLYPROPYLENE
PTFE
316 STAINLESS STEEL

HOSE MATERIAL

NATURAL RUBBER
EPDM
BUNA-N
HYPALON
VITON



PUMP FS40

GEARMOTOR

3HP, 230 VAC, 3-PH, TEFC,
INVERTER DUTY WITH
CORROSION RESISTANT
EPOXY COATED FINISH

PUMPHEAD

DUCTILE IRON AND PAINTED
WITH INDUSTRIAL GRADE
CORROSION RESISTANT PAINT

PUMP ROTOR

ASTM CLASS 45B CAST IRON WITH
TWO INTEGRALLY MOUNTED SHOES
WITH SHIMS LOCATED 180° APART

PROCESS CONNECTIONS

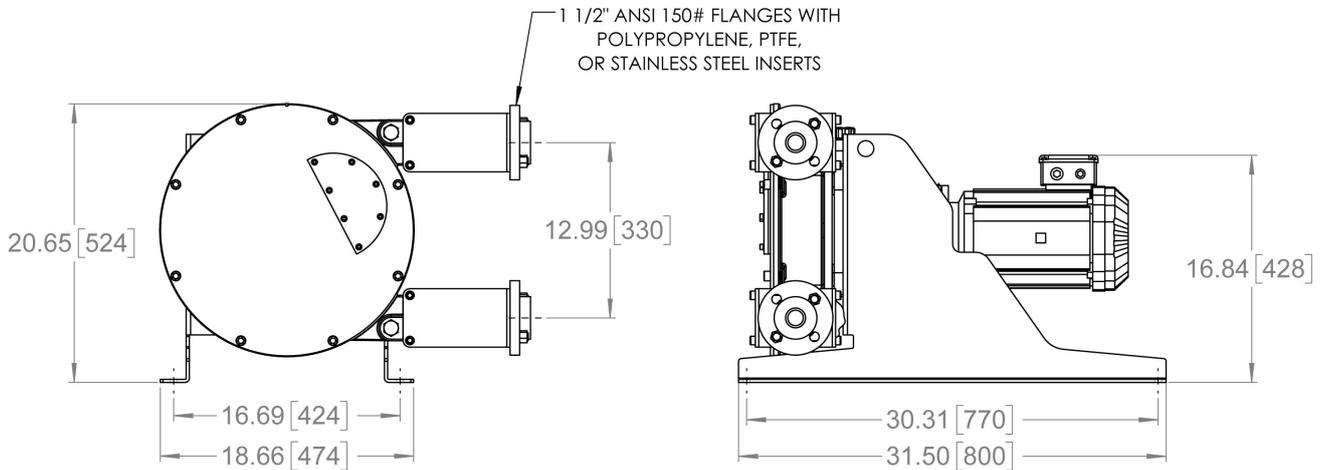
1 1/2" ANSI 150# FLANGES
316 STAINLESS STEEL

PROCESS CONNECTION INSERTS

POLYPROPYLENE
PTFE
316 STAINLESS STEEL

HOSE MATERIAL

NATURAL RUBBER
EPDM
BUNA-N
HYPALON
VITON



PUMP FS50

GEARMOTOR

7.5HP, 230 VAC, 3-PH, TEFC,
INVERTER DUTY WITH
CORROSION RESISTANT
EPOXY COATED FINISH

PUMPHEAD

DUCTILE IRON AND PAINTED
WITH INDUSTRIAL GRADE
CORROSION RESISTANT PAINT

PUMP ROTOR

ASTM CLASS 45B CAST IRON WITH
TWO INTEGRALLY MOUNTED SHOES
WITH SHIMS LOCATED 180° APART

PROCESS CONNECTIONS

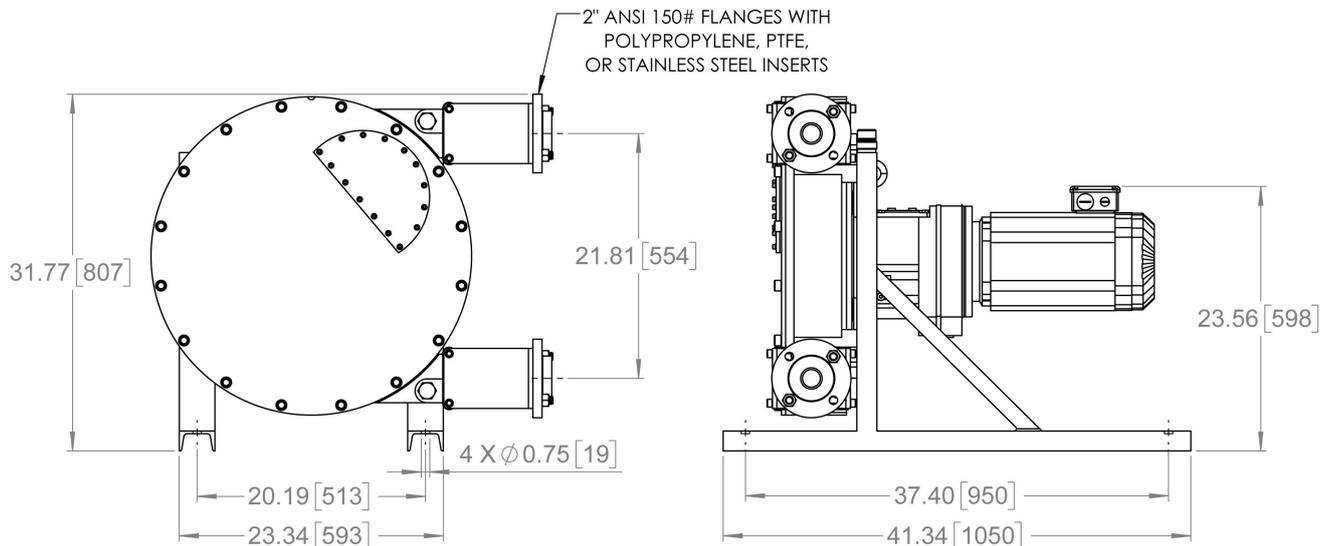
2" ANSI 150# FLANGES
316 STAINLESS STEEL

PROCESS CONNECTION INSERTS

POLYPROPYLENE
PTFE
316 STAINLESS STEEL

HOSE MATERIAL

NATURAL RUBBER
EPDM
BUNA-N
HYPALON
VITON



PUMP FS65

GEARMOTOR

7.5HP, 230 VAC, 3-PH, TEFC,
INVERTER DUTY WITH
CORROSION RESISTANT
EPOXY COATED FINISH

PUMPHEAD

DUCTILE IRON AND PAINTED
WITH INDUSTRIAL GRADE
CORROSION RESISTANT PAINT

PUMP ROTOR

ASTM CLASS 45B CAST IRON WITH
TWO INTEGRALLY MOUNTED SHOES
WITH SHIMS LOCATED 180° APART

PROCESS CONNECTIONS

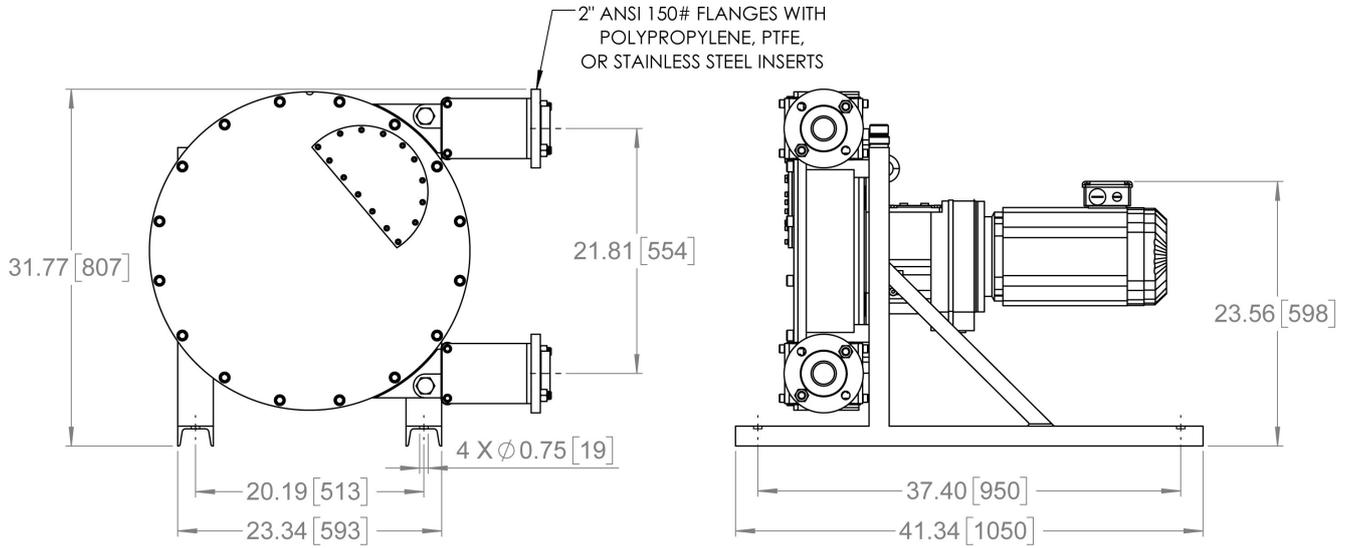
2" ANSI 150# FLANGES
316 STAINLESS STEEL

PROCESS CONNECTION INSERTS

POLYPROPYLENE
PTFE
316 STAINLESS STEEL

HOSE MATERIAL

NATURAL RUBBER
EPDM
BUNA-N
HYPALON
VITON



9.3 - NOMENCLATURE

Exploded view FS05 - FS10

MATERIAL:	WEIGHT:	CUSTOMER:	Code Origin: Serial number:
BRUT:	General clearance: +/-	PROJECT N°:	PUMP TYPE: FS05-10
DIM:			PART NUMBER REP
TITLE: FS05-10 EXPLODED VUE			
SCALE: 1:	DWG N°: EXPLODE FS05-10 IND01 10-2011	SIZE: A3	REV: 1

Wheel #3
3 lobe version

REFER TO FH PUMP PARTS LIST FOR PART DESIGNATION.

(9.3 - NOMENCLATURE)

Exploded view FS15 - FS20

**FS15-20
EXPLODED VUE**

DWG N°: EXPLODE FS15-20 INDO1 10-2011
SCALE: 1:1
SIZE: A3
REV: 1

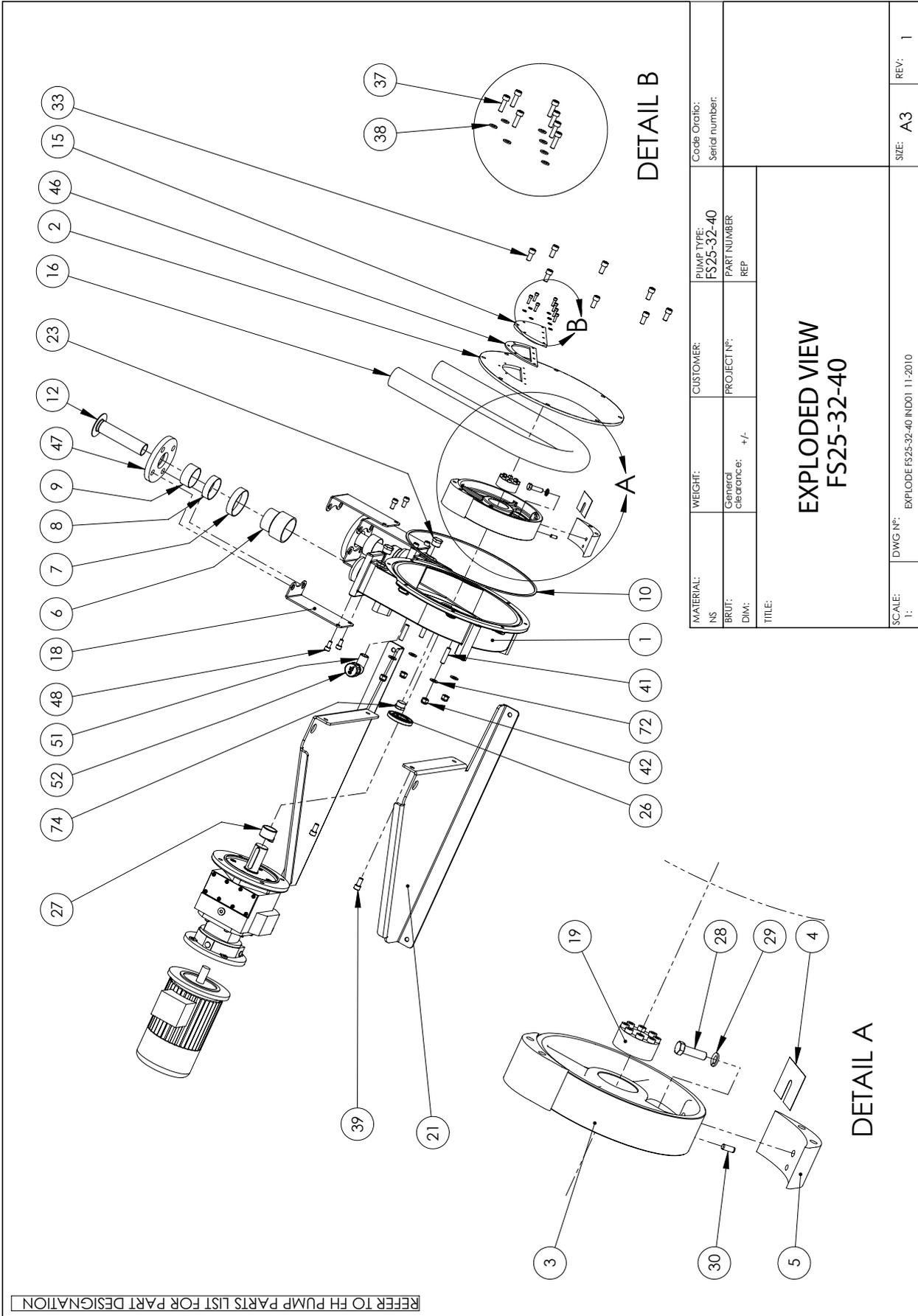
MATERIAL: WEIGHT: CUSTOMER: PUMP TYPE: FS15-20 Code Origin: Serial number:
BRUT: General clearance: +/- PROJECT N°: PART NUMBER REP
DIM: TITLE:

Wheel #3
3 lobe version

REFER TO FH PUMP PARTS LIST FOR PART DESIGNATION.

(9.3 - NOMENCLATURE)

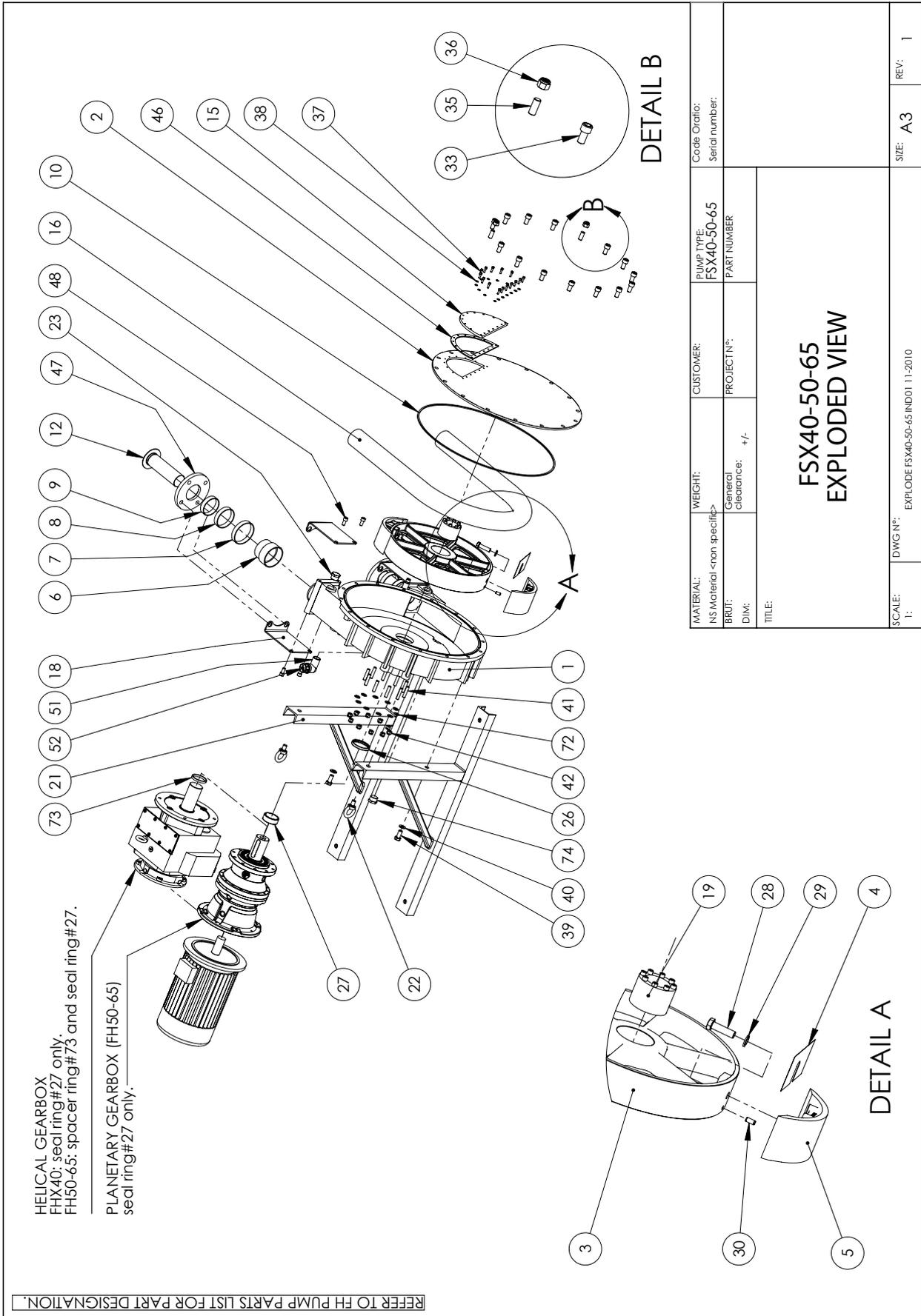
Exploded view FS25 - FS40



MATERIAL:	WEIGHT:	CUSTOMER:	PUMP TYPE:	Code Oracle:
NS			FS25-32-40	Serial number:
BRUT:	General clearance: +/-	PROJECT N°:	PART NUMBER	
DIM:			REP	
TITLE:				
EXPLODED VIEW FS25-32-40				
SCALE:	DWG N°:	EXPLODE FS25-32-40 IND01 11-2010		SIZE: A3
1:				REV: 1

(9.3 - NOMENCLATURE)

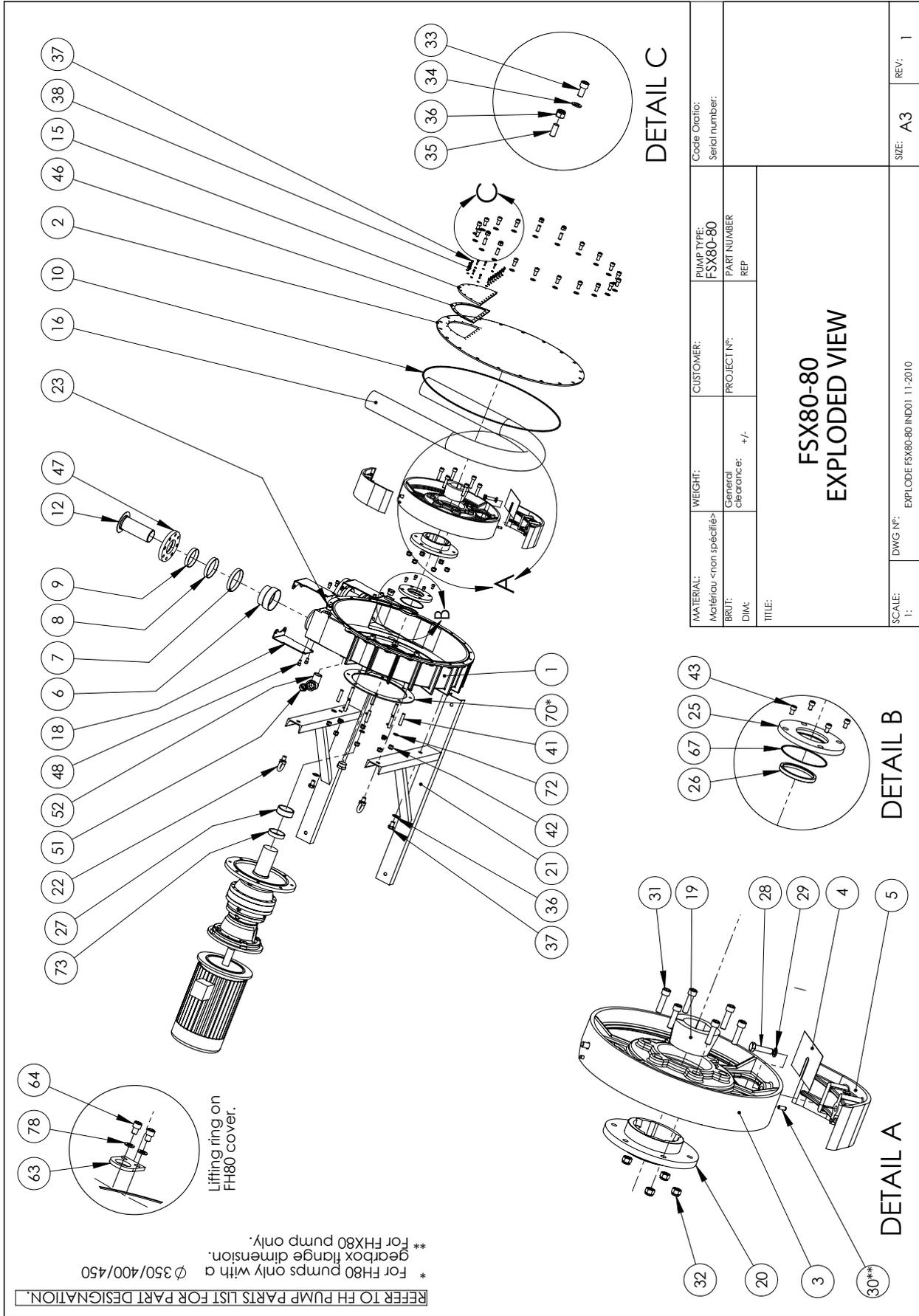
Exploded view FSX40 - FS65



MATERIAL: NS Material <non specific>	WEIGHT:	CUSTOMER:	PUMP TYPE: FSX40-50-65	Code Oratio: Serial number:
BRUT:	General clearance: +/-	PROJECT N°:	PART NUMBER	
<p>FSX40-50-65 EXPLODED VIEW</p>				
SCALE: 1:	DWG N°: EXPLODE FSX40-50-65 IND01 11-2010	SIZE: A3	REV: 1	

(9.3 - NOMENCLATURE)

Exploded view FSX80 - FS80



MATERIAL: Matériau <non spécifiés>	WEIGHT:	CUSTOMER:	PUMP TYPE: FSX80-80	Code Origin:
BRUT:	General clearance: +/-	PROJECT N°:	PART NUMBER	Serial number:
DIM:			REP	
TITLE:				
FSX80-80 EXPLODED VIEW				
SCALE: 1:	DWG N°: EXPLODE FSX80-80 INDO1 11-2010	SIZE: A3	REV: 1	

9.4 - FS PUMP PARTS LIST (see specific exploded view)

REF.	DESIGNATION	FS10	FS15	FS25 TO FS40	FS 65
1	CASING	X	X	X	X
2	COVER	X	X	X	X
3	WHEEL	X	X	X	X
4	SHIM			X	X
5	SHOE			X	X
6	SLEEVE	X	X	X	X
7	CLAMP SLEEVE	X	X	X	X
8	CLAMP ON SLEEVE / HOSE		X	X	X
9	CLAMP ON HOSE	X	X	X	X
10	COVER SEAL	X	X	X	X
12	INSERT	X	X	X	X
14	LUBRICANT	X	X	X	X
15	SIGHT GLASS			X	X
16	HOSE	X	X	X	X
18	BRACKET	X	X	X	X
19	HUB	X	X	X	X
20	BOLT ON PLATE				
21	FRAME	X	X	X	X
22	LIFT RING				
23	OIL PLUG	X	X	X	X
24	CIRCLIPS	X	X		
25	SEAL FLANGE				
26	SHAFT SEAL	X	X	X	X
27	SEAL RING	X	X	X	X
28	SHOE BOLT			X	X
29	SHOE BOLT WASHER			X	X
30	SHOE CENTERING PIN			X	X
31	BOLT ON PLATE SCREW				
32	NUT FOR REF 31				
33	COVER BOLT	X	X	X	X
34	COVER BOLT WASHER				X
35	COVER STUD				X
36	NUT FOR REF 35				X
37	SIGHT GLASS BOLT			X	X
38	WASHER FOR REF 37			X	X
39	FRAME BOLT	X	X	X	X
40	WASHER FOR REF 39	X	X	X	X
41	GEARBOX STUD	X	X	X	X
42	NUT FOR REF 41	X		X	X
43	SEAL FLANGE BOLT				
46	SIGHT GLASS SEAL			X	X

9.5 - LUBRICATION TABLE

The table indicates the quantity of lubricant necessary for every pump size. Employ only the FLOMOTION lubricant for FLOMOTION hose pumps. refer to §6.2 for lubricant emptying and filling.

PUMPS	FS 10	FS 15	FS 25	FS 32	FS 40
QUANTITY OF LUBRICANT (GAL)	0.11	0.21	0.37	0.61	0.61

PUMPS	FS 50	FS 65
QUANTITY OF LUBRICANT (GAL)	2.4	2.4

9.6 - SHOE SHIMMING TABLE

Refer to §6.5 to remove or add shims. The table below points out the necessary number of shims under every shoe according to the speed, pressure and the temperature of the product. Respect these indications scrupulously to optimize the hose life and to avoid a possible deterioration of the internal parts. For temperatures over 60°C, withdraw one shim in comparison with the table below. For viscosities over 3000cP or concentrations exceeding 300g / l, withdraw one shim in comparison with the table below. For a suction lift higher than 4 metres, add one shim to the following figures.



CAUTION : Every shoe must include the same number of shims (0.5mm).

PUMP TYPE FS 25		
Pressure bar (psi)	Speed - Rpm	Number of shims
$\Delta P \leq 5$ (72,5)	0 to 40	0
	40 to 160	0
5 (72,5) $\leq \Delta P \leq 7,5$ (108,75)	0 to 40	2
	40 to 125	1
$7,5$ (108,75) $\leq \Delta P \leq 10$ (145)	0 to 40	3
	40 to 105	2
10 (145) $\leq \Delta P \leq 15$ (217,5)	0 to 40	4
	40 to 90	3

PUMP TYPE FS 32		
Pressure bar (psi)	Speed - Rpm	Number of shims
$\Delta P \leq 5$ (72,5)	0 to 45	0
	40 to 140	0
5 (72,5) $\leq \Delta P \leq 7,5$ (108,75)	0 to 40	2
	45 to 140	1
$7,5$ (108,75) $\leq \Delta P \leq 10$ (145)	0 to 40	3
	45 to 110	2
10 (145) $\leq \Delta P \leq 15$ (217,5)	0 to 40	4
	45 to 80	3

PUMP TYPE FS 40		
Pressure bar (psi)	Speed - Rpm	Number of shims
$\Delta P \leq 5$ (72,5)	0 to 40	0
	40 to 160	0
5 (72,5) $\leq \Delta P \leq 7,5$ (108,75)	0 to 40	2
	40 to 125	1
$7,5$ (108,75) $\leq \Delta P \leq 10$ (145)	0 to 40	3
	40 to 105	2
10 (145) $\leq \Delta P \leq 15$ (217,5)	0 to 40	4
	40 to 90	3

PUMP TYPE FS 50		
Pressure bar (psi)	Speed - Rpm	Number of shims
$\Delta P \leq 5$ (72,5)	0 to 30	0
	30 to 100	0
5 (72,5) $\leq \Delta P \leq 7,5$ (108,75)	0 to 30	2
	30 to 65	1
$7,5$ (108,75) $\leq \Delta P \leq 10$ (145)	0 to 30	3
	30 to 50	2
10 (145) $\leq \Delta P \leq 15$ (217,5)	0 to 30	4
	30 to 42	3

PUMP TYPE FS 65		
Pressure bar (psi)	Speed - Rpm	Number of shims
$\Delta P \leq 5$ (72,5)	0 to 30	0
	30 to 90	0
5 (72,5) $\leq \Delta P \leq 7,5$ (108,75)	0 to 30	2
	30 to 55	1
$7,5$ (108,75) $\leq \Delta P \leq 10$ (145)	0 to 30	3
	30 to 47,5	2
10 (145) $\leq \Delta P \leq 15$ (217,5)	0 to 30	4
	30 to 40	3

9.7 - GENERATED NOISE AND TEMPERATURE

NOISE :

The FLOMOTION SYSTEMS do not generate more than 60dB during their operation.

TEMPERATURE :

The cover and the pump casing can become very hot due to the friction on the hose and liquid temperature. If you need to limit the pump temperature, please contact your FLOMOTION SYSTEMS distributor.

9.8 - EXPANSIBLE HUB ASSEMBLY AND DISASSEMBLY : GENERALITIES

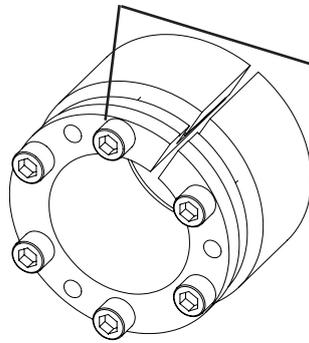
ASSEMBLY :

Slightly grease contact surfaces, threads, shaft and wheel bore and introduce the hub inside the wheel. Pre-tighten the screws and place this unit on the gearbox shaft and position according to the table section 6.4.2. Cross tighten the screws two or three times and tighten to the according torque section 9.11 TORQUES AND FIGURES.

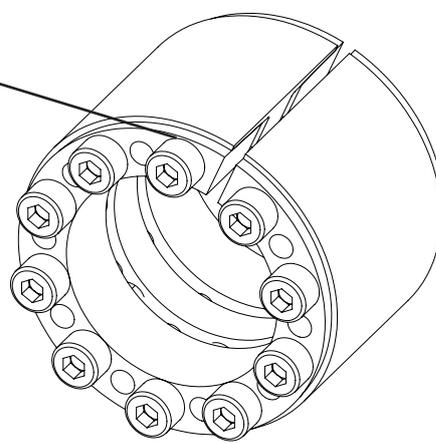
DISASSEMBLY :

Untighten the screws on the hub and place them in the unlock holes. Tighten the screws until the two elements of the hub disassemble and withdraw the wheel hub.

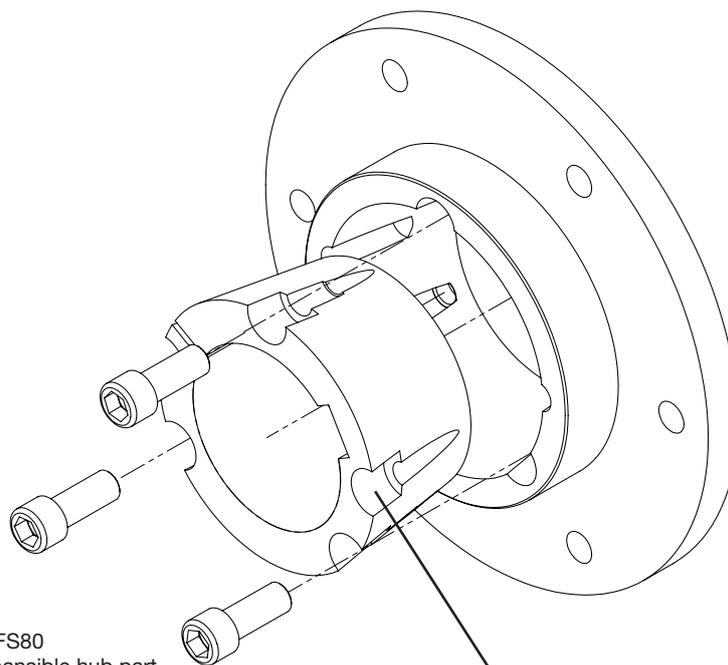
Unlock holes



FS05 & FSX40
2 part expansible hub.part



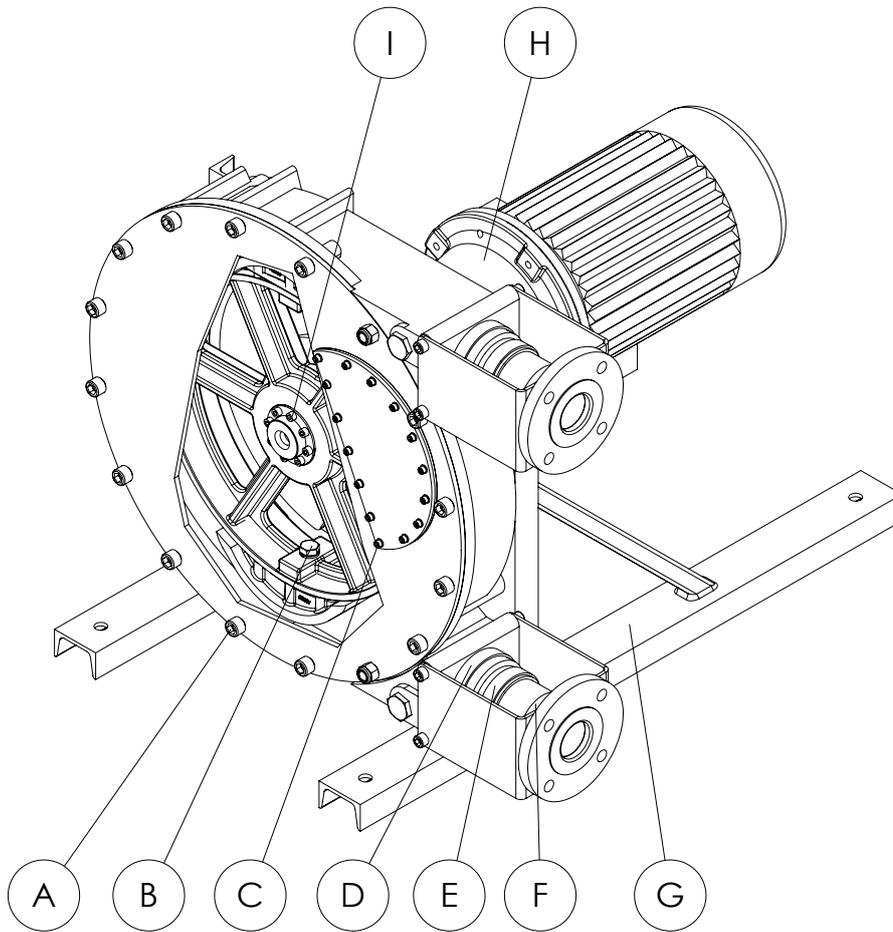
FS50 & FS65
3 part expansible hub.part



FSX80 & FS80
1 part expansible hub.part

Unlock holes

9.9 - TORQUES FIGURES



POS.	DESIGNATION	LBF-FT		
		FS25	FS32 FS40	FS50 FS65
A	COVER	5.75	19.91	47.94
B	SHOE	33.93	58.27	296.50
C	WINDOW	2.43	2.43	2.43
D	CLAMP REF7	2.95	2.95	2.95
E	CLAMP REF8	11.80	22.13	22.13
F	CLAMP REF9	36.88	36.88	36.88
G	FRAME	11.06	19.91	47.94
H	GEARBOX	49.42	85.56	85.56
I	HUB	9.59	9.59	25.81

9.10 - WEIGHTS SERIES FS

ALL WEIGHTS IN LBS															
PART	FS05-10	FS15	FS20	FS25	FS32	FS40	FSX40	FS50	FS65	FSX80	FS80	FS100	FS125		
CASING	11.0	17.6	17.6	35.3	63.9	63.9	94.8	194.0	194.0	308.6	529.1	826.7	992.1		
WHEEL	2.6	6.6	6.6	9.5	17.0	17.0	28.4	60.6	60.6	82.2	137.3	196.2	381.4		
COVER	0.7	1.3	1.3	11.0	22.7	22.7	34.0	51.8	51.8	90.4	132.3	196.2	447.5		
FRAME	2.9 (X2)	3.7 (X2)	3.7 (X2)	13.2 (X2)	27.6 (X2)	27.6 (X2)	29.5 (X2)	35.1 (X2)	35.1 (X2)	56.2 (X2)	105.8 (X2)	137.8 (X2)	604.1		
SHOE				ALU	IRON	ALU	IRON	ALU	IRON	ALU	IRON	IRON	IRON	IRON	IRON
				0.7	2.0	1.2	3.2	1.5	3.9	2.0	5.2	7.1	7.1	7.1	7.1
HOSE	0.9	1.8	3.1	4.4	6.6	6.6	8.8	13.2	13.2	33.1	44.1	66.1	99.2		

10/ MISCELLANEOUS NOTES

1 - Protection of the pumping part

The heating of the pumping part is directly related to the functioning temperature of the hose. The lifespan of the hose, which is the heart of any peristaltic pump, is strongly dependent on the working temperature of the hose : it imposes the working limits of the FLOMOTION peristaltic pumps. Consequentially, the working temperature of the hose (and thus the heating of the pump) must be known and controlled, and it depends on the three following parameters :

- > Temperature of pumped product
- > Number of rotations of the pump
- > Discharge pressure

2 - Protection of the transmission part

The reducer and the motor which motorize the pump must be used within the limits of working defined by the manufacturers of these materials. Going beyond these limits is likely to generate a risk of ignition of the atmosphere surrounding the material.

The FLOMOTION SYSTEMS installations are in particular designed so that the normal working conditions of the pump do not generate an overload of the motor or the reducer.

So that the function limits of these components are not exceeded, even in case of dysfunction of the pump, the motor will have to be protected from the overcurrents, in accordance with the code of practice.

3 - Particular dispositions when using a frequency inverter

The FLOMOTION peristaltic pumps have variable limits of working according to the discharge pressure, number of rotations of the pump and temperature of the pumped product. These working limits are mainly imposed by the heating of the hose, on which the lifespan is strongly dependent.

Within the framework of an application required to change the speed of the pump, the three following points will have to be checked.

- > Temperature of pumped product
- > Number of rotations of the pump
- > Discharge pressure

The maximum values of use will be fixed at the determination of the pump whose copy is in the appendix

4 - Dry running the pumps

The FLOMOTION peristaltic pumps can function in the absence of liquid in the pump, without causing heating of the pump higher than the classified of temperature T, in particular for the period of starting-up of the pump.

In fact, dry running the pump with blocked inlets or outlets generates too high a demand on the pump hose, and can generate high internal temperatures because of the compression and decompression of the air locked up between the pump and the blocked opening.

This type of dysfunction is not controllable by a safety device (of sensor type) because the pump is dry and the mechanical constraints generated on the pump are low. Starting up the pump must thus be done after having checked that the inlet and outlet are not blocked.

Nevertheless, dry running is not a normal function of the pump and if it doesn't directly constitute a risk of ignition, it leads to premature wear and tear of the hose. This type of function must be limited as much as possible.

5 - Replacement of parts

The parts should be replaced only by original FLOMOTION parts which correspond to the configuration of origin of the pump. If necessary, the characteristics of the pump are modified and the ATEX certification of the pump is not applicable any more.

With each hose replacement, the adjustment of compression of the hose must be controlled and adapted to the instructions of adjustment registered in the handbook.

The technicians who intervene on ATEX material must be ATEX trained and approved.

6 - Solvents incompatible with the pump's seals

The user must make sure that the seals and the hose with which the pump is equipped are compatible with the pumped product and the products used in the cleaning of the pump.

7 - Possible leakages of pumped liquid

The possible leakages of liquid by the pump's seals do not generate a risk of ignition as long as the explosive atmosphere surrounding the material corresponds to the type of atmosphere for which it was planned.

You have to check that in contact with the atmosphere surrounding the pump or of a material located near the pump, the pumped liquids are not likely to create an explosive atmosphere for which the material was not envisaged.

The rupture of the hose, which is a wearing part, can involve important leakage of pumped liquid. A hose detector makes it possible to detect these leakages and will stop the pump if necessary.

8 - Checking of the lubricant level in the pump

An insufficient lubricant level in the pump can generate surface temperatures higher than the recommended limit of temperature T of the pump. Stop the pump and check the lubricant level every 1000 working hours.

9 - Replacement of parts

The parts should be replaced only by original FLOMOTION parts which correspond to the configuration of origin of the pump. If necessary, the characteristics of the pump are modified and the ATEX certification of the pump is not applicable any more.

With each hose replacement, the adjustment of compression of the hose must be controlled and adapted to the instructions of adjustment registered in the handbook.

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The user must make sure that the seals and the hose with which the pump is equipped are compatible with the pumped product and the products used in the cleaning of the pump.

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The possible leakages of liquid by the pump's seals do not generate a risk of ignition as long as the explosive atmosphere surrounding the material corresponds to the type of atmosphere for which it was planned.

You have to check that in contact with the atmosphere surrounding the pump or of a material located near the pump, the pumped liquids are not likely to create an explosive atmosphere for which the material was not envisaged.

The rupture of the hose, which is a wearing part, can involve important leakage of pumped liquid. A hose detector makes it possible to detect these leakages and will stop the pump if necessary.

12 - Checking of the lubricant level in the pump

An insufficient lubricant level in the pump can generate surface temperatures higher than the recommended limit of temperature T of the pump. Stop the pump and check the lubricant level every 1000 working hours.

13 - Drive the pump

The maximum speed of rotation of the pumps must be respected (see certification of the pumps). At the start or after any modification of the pumping installation, the speed of rotation of the pump must be controlled and must be lower than the maximum speed indicated in the instructions.

SAFETY AND CONTROL MEASURES TO RESPECT IMPERATIVELY

1 - Mechanical risk

Ensure that all protections (cover, sight glass, ventilator hood, coupling protection) are in place before operating the pump. Disconnect the electricity supply before any mechanical intervention, except during a hose replacement. Hose replacement must be done with the pump cover closed.

While replacing a hose, wear protective gloves and clothes and keep hands away from the brackets, suction and discharge flanges.

During the pump maintenance, check that the lifting points are correctly used.

The frame of the pump must be firmly fastened to the ground.

2 - Electrical risk

Ensure that the electrical installation is conforming to the standards required in the country of use especially regarding earth and thermal protection.

3 - Operational risk

Check the compatibility of the products to be pumped with:

- The peristaltic pump principle.
- The hose material.
- The lubricant.
- The inserts material.
- The shoe material.

FLOMOTION SYSTEMS cannot guaranty the hose lifetime or the product loss due to a hose burst. It is the operator's responsibility to prevent pumped liquid loss with additional hose rupture detectors and or automatic shutdown valves. Check §2.4 conditions of guarantee for further information. Ensure that the pump is compatible with the required process. Ensure that the pressure applied on the suction side is compatible with the pump. The rupture of the hose and its consequences must be taken in account :

- The pump casing can be filled with the pumped product.
- If the suction line is on load, this one can empty into the pump casing and leak out of the pump.
- If the discharge line is under pressure, the pumped product may be forced back into the pump casing and leak out of the pump.

A leakage detector as well as automatic shutdown valves are recommended in order to prevent such consequences.

While draining the pump following a hose rupture, take note of the risk of pollution caused by the lubricant and by the pumped product.

The pump, being volumetric, may suffer dangerously high pressure by even partial blockage of the discharge line.

Ensure that all protections have been made regarding this aspect.

Before each use, check the direction of rotation of the pump. While placing the pump under vacuum, mount window screws using an airtight glue to avoid air leakage.

12 / K4 Series Pump Controller

12.1 Operation

For complete details about the motor drive controller please refer to the included K4 SERIES Operating Instructions booklet.

NOTE: For pumps over 1HP please refer to the Lenze SMVector manual or see customer provided VFD manual. The SMVector VFD manual is available on our website at FlomotionSystems.com/support

Shown below are program settings specific to operation with the FR SERIES Pumps.

12.2 Making Programming Changes

1. Press the Stop key to make sure the pump is stopped. Display will read Stop.
2. Press the Program key.
3. Using the arrow keys, enter the parameter number you would like to change and then press Enter.
4. Using the Arrow keys, enter the desired settings.
5. Press the Program key when all changes have been made.
6. Press the Run key for pump operation.

12.3 K4 Programming Defaults

MENU VALUE	DEFAULT SETTING	DESCRIPTION
0.01	Varies	Set to the motor nameplate rating in Amps . Factory Setting is the drive rated output current.
0.04	0000	GFCI Operation . Set to 0000 if power to VFD is not connected to a GFCI (default). Set to 0001 (standard GFCI) or 0002 for a sensitive GFCI.
1.00	0001	Remote Start/Stop input enabled when using 4-20mA speed control (CHANGE TO 0000 to use 4-20 with manual start/stop)
1.05	0003	Automatically restarts the pump after a power fail or when a fault is cleared (except a short circuit fault).
2.00	0003	Use an analog 4-20mA signal to control pump speed . Uses Analog Input #2 on pins 21(+) and 22(-) of the terminal strip.
2.01	0001	Initiate a manual speed change immediately w/o having to press the Enter key.
2.02	0002	Enable External Local/Remote switching
3.02	60 Hz	Upper Frequency Limit is the max speed for manual control and also corresponds to the 20mA value when using Analog Input speed control. Adjust this value down to control dosing. Consult factory prior to increasing above default value. See the Draw Down/Calibration procedure on following pages to help set this value
3.03	5 sec	Acceleration Speed . Number of seconds to go from stop to set speed.
3.04	5 sec	Deceleration Speed . Number of seconds to go from set speed to stop.
3.10	7 sec	Current Limit trip time in seconds. Increase value a little at a time for situations where current draw briefly exceeds rated motor value while pumping. Example: when pumping into higher pressures or with viscous liquids.

4.00	0002	Display preference. Set to 0000 to display speed in Hz. Set to 0002 to use custom units (GPH).
4.01	Varies	When using GPH setting in 4.00 enter the whole number of your maximum GPH here (GPH at full speed of pump). Example: If full speed GPH is 25.5GPH enter 255 here. Set the decimal place in 4.02 below.
4.02	Varies	When using GPH setting in 4.00 enter the number of decimal places for the value in 4.01 above. Example: If full speed GPH is 25.5GPH enter 255 in step 4.01 above then enter 0001 here so value displayed will be 25.5.
4.03	0001	Determines what is displayed when in Stop Mode: 0000 = last run setting, 0001 = "STOP" (Default), 0002 = "0000".
5.00	0000	Main board RUN relay operation. Set to 0000 to enable relay closure when pump is running. See K4 manual for other choices.
7.03	0010	N.O. Start Start/Stop Input. Terminals 16 & 4 default.
7.04	0013	N.O. Remote/Local Select Input. Terminals 5 & 20 default.
7.05	0008	N.O. Enables External Fault Input. Terminals 7 & 8 default.
8.01	0010	N.O. Fault Status Output. Terminals 24 & 25 default.
8.02	0013	N.O. Remote Status Output. Terminals 26 & 27 default.
8.09	0000	Analog Output type. Set to 0002 When speed feedback 4-20ma output is connected. Use pins pins 17(+) and 18(-)
9.07	20	Analog Input Offset. Set to 20 to scale input to 4-20mA.

12.4 Calibration Procedure for Maximum Pump Output in GPH

A 30-second graduated calibration cylinder should be used to perform a draw-down of actual chemical and including typical system injection pressure to establish the maximum pump output during normal operating conditions.

Using the pump to fill the cylinder, make sure the K4 Drive/VFD is set to the highest possible speed using the 'up' arrow on the keypad. Since there is a short ramp-up time for the pump to reach maximum speed, it is recommended to over-fill the calibration cylinder for higher accuracy. After filling the calibration column, make sure the appropriate valves are open to allow the pump to draw from the calibration column only.

12.5 Draw Down Procedure:

At the same time start the pump and the stop watch. If you slightly over-filled the calibration cylinder, start the pump and then start the watch when the chemical reaches the "0" point on the calibration cylinder.

Once the stopwatch reaches 30 seconds stop the pump. Review the graduated markings on the calibration cylinder to find out how much liquid was pumped in 30 seconds.

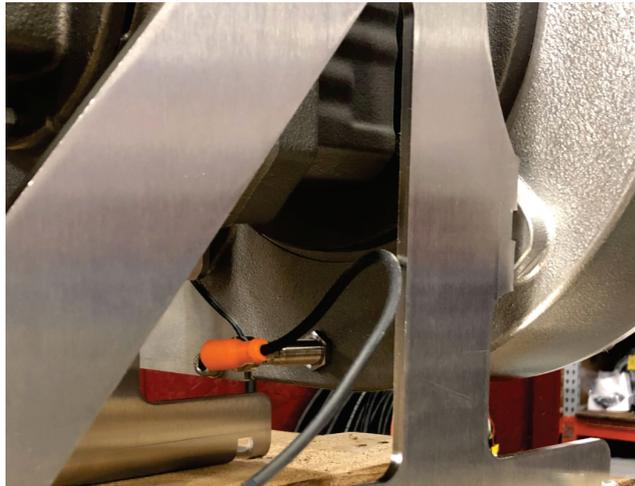
See menu settings 4.00 through 4.03 above for setting the GPH value to be displayed.

The full K4 SERIES Drive Operating & Programming manual may be downloaded from our web site at www.flomotionsystems.com/support

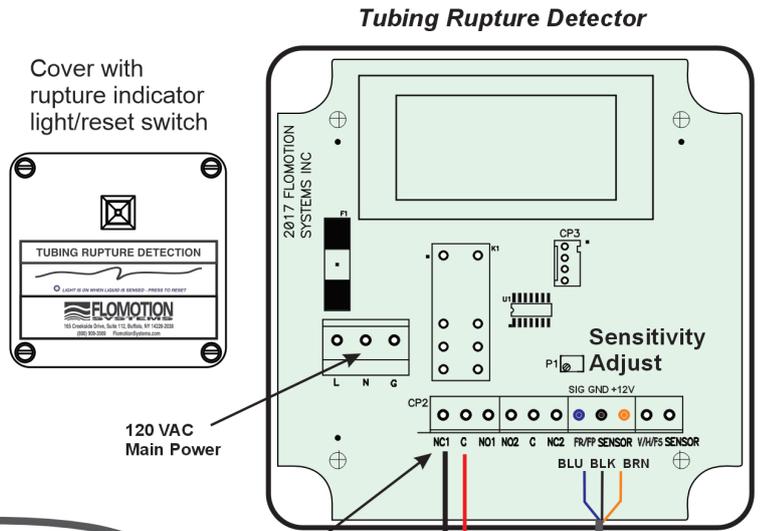
12.6 Important Program Settings for Special Conditions

- **CS-T Fault.**
Set 8.09 = 0000 to avoid CS-T fault when 4-20mA Output is disconnected (when not using 4-20mA output). This sets the analog output to voltage instead of current which stops the error.
- **Manual speed control with remote start/stop.**
set 2.00 to 0000 (keypad speed control)
- **Pump powers back up in manual mode when using auto-restart after power failure.**
Set 7.04 to 0000 if using auto-restart after power failure or else it powers back on in manual mode and does not restart running.
- **For remote (4-20ma) speed control with keypad start/stop.**
Set 1.00 to 0000
- **Large hose pumps struggle to start at low speed.**
Increase Boost Value in menu 3.11 one number at a time until startup is achieved
- **Remote Start/Stop not working.**
Make sure menu 7.00, 7.01, 7.02 and 7.06 are set to defaults (0, 1, 2 & 4)
7.00 = 0000
7.01 = 0001
7.02 = 0002
7.06 = 0004
- **GFCI trips when pump starts running**
Set menu 0.04 = 0001 for typical GFCI or to 0002 for extra sensitive GFCI (some additional noise from the drive is normal)

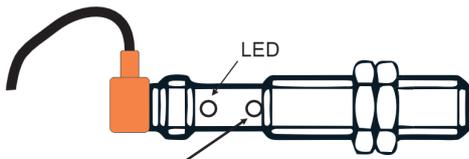
FR Hose Rupture Detector Wiring



Proximity Sensor in Pump

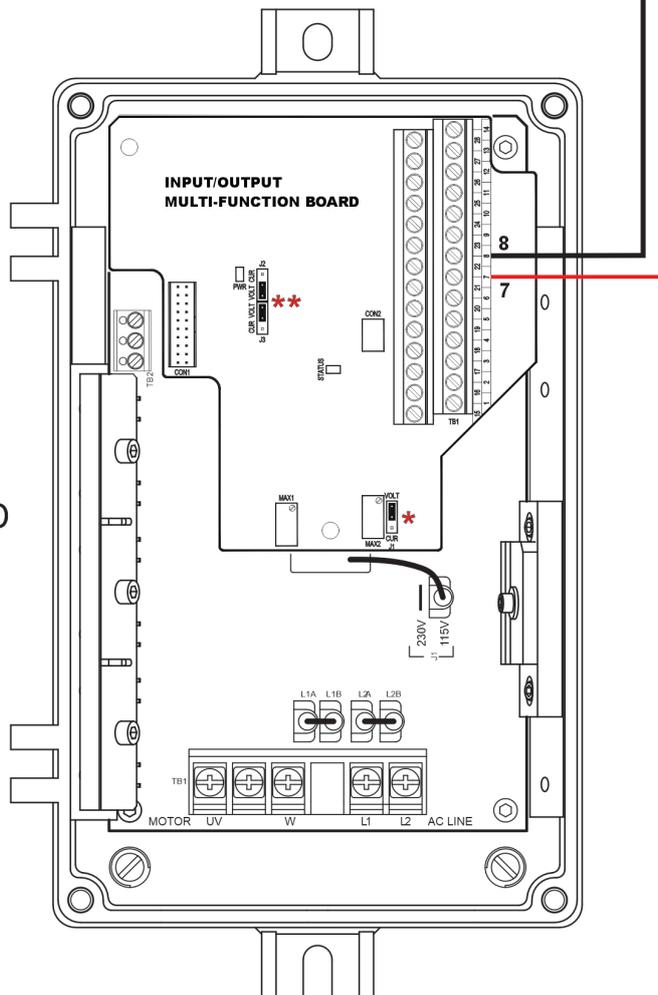


Normally Closed Contacts



Sensitivity Adjust
(Clockwise = more sensitive)

K4 SERIES
Pump Controller VFD



13 / Warranty

Flomotion Systems, Inc. warrants all Flomotion Systems pumps against any defects that are due to faulty material or workmanship for a period of two years from date of shipment.

In the event that a defect is discovered during the warranty period, Flomotion Systems, Inc. agrees that, at its option, it will repair or replace the defective product. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable components of a product such as, but not limited to, hose, tubing, rollers, and fuses.

Contact Flomotion Systems, Inc. or your distributor to initiate warranty support. Products may not be returned without authorization from Flomotion Systems, Inc. All returns shall be freight prepaid.

Limitations

This warranty does not cover:

- Damage caused by acts of God, natural disaster, labor unrest, acts of war (declared or undeclared), terrorism, civil strife, acts of any governmental jurisdiction or any other cause beyond the seller's control
- Damage caused by misuse, neglect, accident or improper application or installation
- Damage caused by any repair or attempted repair not authorized by Flomotion Systems, Inc.
- Any product not used in accordance with the instructions furnished by Flomotion Systems, Inc.
- Any product not paid in full in agreed upon terms.
- Modifications performed on this product by person(s) not authorized by Flomotion Systems, Inc.
- Freight charges to return merchandise to Flomotion Systems, Inc.
- Freight charges on expedited or express shipment of warranted parts or product
- Travel fees associated with on-site warranty repair

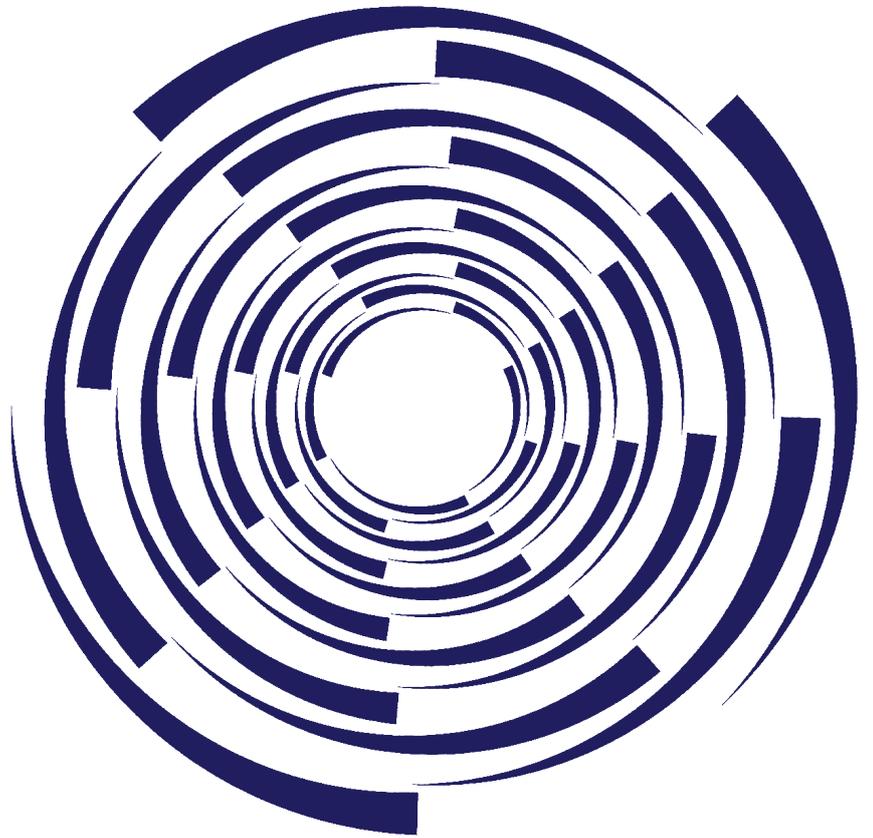
This warranty contains the sole express warranty made by Flomotion Systems, Inc. in connection with its products. All implied warranties, including with limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.

This warranty constitutes the final, complete, and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of Flomotion Systems, Inc.

Limitation of Remedies

The remedies of repair or replacement as stated above are the exclusive remedies for the breach of this warranty. On the basis of strict liability or under any other legal theory, in no event shall Flomotion Systems, Inc. be liable for any incidental or consequential damages of any kind for breach of warranty or negligence.



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