



INSTRUCTION AND USER MANUAL

CENTRIFUGAL PUMPS WITH SPEED INCREASE GEAR FOR TRACTOR PTO ATTACHMENT

SERIES : TNO – MFO

WARNING:

-BEFORE STARTING THE PUMP READ THE CONTENTS OF THIS
MANUAL CAREFULLY.

-CHECK THAT THE PUMP TYPE YOU HAVE PURCHASED IS SUITABLE FOR USE WITH
YOUR TRACTOR

-TECHNICAL SERVICE TO BE PROVIDED EXCLUSIVELY BY OUR ENGINEERS. FOR
ANY REQUESTS FOR TECHNICAL ASSISTANCE PLS. CONTACT OUR TECHNICAL
DEPT. TEL. +39/059/702150



WARNINGS

The pump safety systems are only operational after the pump has been correctly installed: it is strictly prohibited to start the tractor pto before you have terminated pump installation operations (headings 5.0, 5.1, 5.2).

DANGER: only run the pump when the guarding is correctly engaged with the drive shaft shield tube: using the pump without correctly installed guarding may cause serious injury or death.

Use a suitably sized drive shaft in accordance with the power to be transmitted as per CEE 89/392 CEE rules (consult the drive shaft manufacturer).

Before installing the pump make sure it is free running by turning the input shaft: this should be possible without using excess force.

Never run the pump when dry (without water).

ATTENTION: all pumps are supplied without lube oil.

Observe instructions regarding operations for annual storage.

The pump must be used with clean cold water. If you intend to use the pump with sewage, request application of mechanical rotary seal and relative impeller otherwise premature wear of seals and mechanical parts of the pump will result.



KEY :

- 1 - O-Ring
- 2 - Bearing
- 3 - Input Shaft
- 4 - Key
- 5 - Driving Gear
- 6 - Circlip
- 7 - Bearing
- 8 - Bearing
- 9 - Impeller Shaft With Gear
- 10 - Key
- 11 - Bearing
- 12 - O-Ring
- 13 - Water Seal Washer
- 14 - Gland
- 15 - Graphite Coated Cord
- 16 - Nut
- 17 - Stud Screw
- 18 - Impeller
- 19 - Impeller Lock Nut
- 20 - Speed Increase Gear Housing Cover
- 21 - Oil Level Plug
- 22 - Stud Screw
- 23 - Nut
- 24 - Speed Increase Gear Housing
- 25 - Oil Drain Plug
- 26 - Oil Filler Plug
- 27 - Stud Screw
- 28 - Pump Body Support
- 29 - Nut
- 30 - Pump Body
- 31 - Water Drain Plug
- 32 - Pressure Switch Connection Plug
- 33 - Stud Screw
- 34 - Nut
- 35 - Suction Port Cover
- 36 - Safety Guard
- 37 - Shield Tube Attachment Ring
- 38 - Lifting Attachment
- 39 - Suction Port
- 40 - Delivery Port

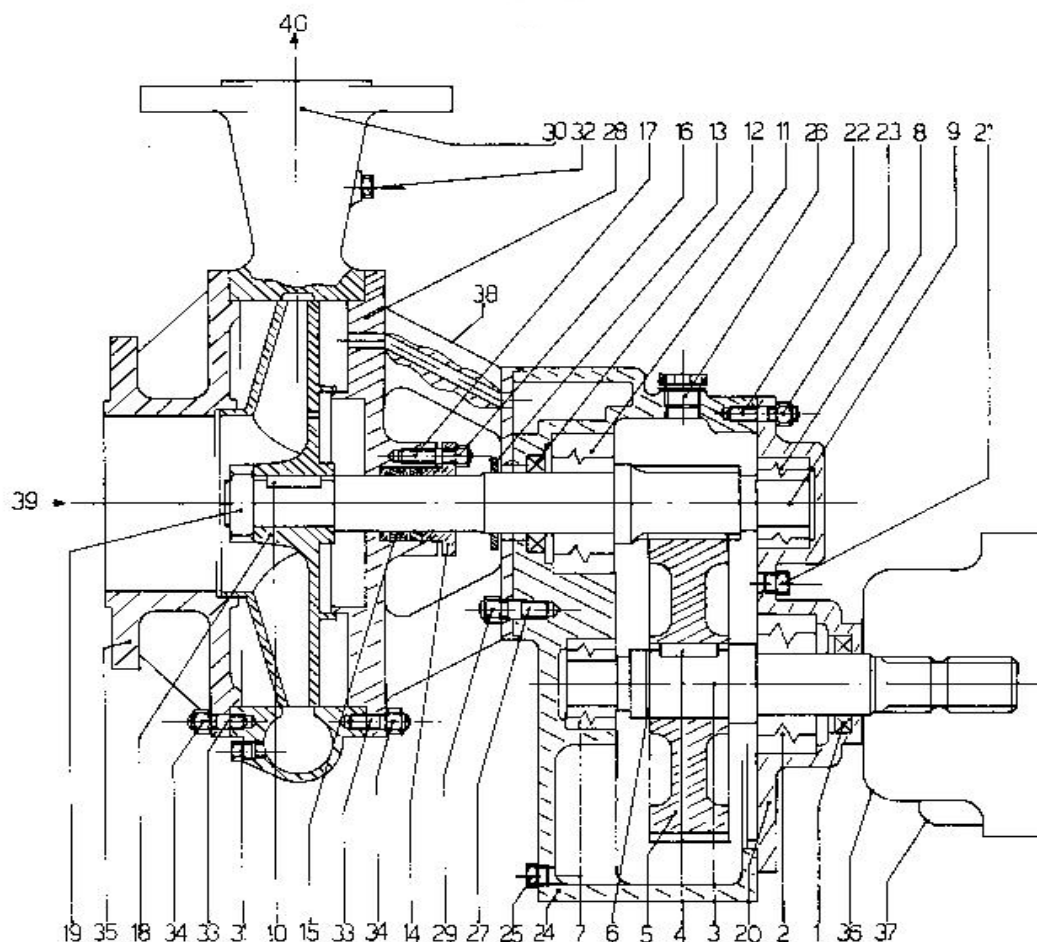
PUMP MODEL - TRACTOR POWER TABLE

TYPE PUMP

TRACTOR RADER POWER

TNO 60	from 18 to 40 HP
TNO 75/80	from 35 to 50 HP
TNO 80	from 45 to 70 HP
TNO 100	from 60 to 90 HP
TNO 120 SP	from 80 to 120 HP
TNO 125	from 110 to 180 HP
TNO 150	from 40 tp 70 HP
TNO 80 SP	from 60 to 90 HP
OF 83/2	from 60 to 90 HP
OF 83/2 SP	from 70 to 110 HP

Figure A



1.0 DESCRIPTION OF PUMP

The saline characteristics of the OCMIS series TNO-MFO pump are its overall compactness, durable high strength and operating reliability.

The pump is in engineering cast iron and can be divided into two basic units:

- speed increase gear
- centrifugal pump

1.1 Speed increase gear

The gear unit is composed by a pair of cylindrical helical tooth gears in case hardened steel mounted on ball or taper roller bearings. The speed increase gear serves to increase the output speed of the tractor PTO to transmit suitable rpm to the impeller shaft in order to obtain the required performance from the pump.

1.2 Centrifugal pump

The pump is composed by a spiral shaped housing within which either one or two impellers rotate; the impellers are integral with the impeller shaft and precision calibrated to avoid unnecessary vibration. The helical centrifuge vanes feature carefully designed profiles to provide the maximum efficiency. The suction port (Fig.A - 39) is located axially on the pump while the delivery port (fig.A - 40) is located radially. Customers may request a hard chrome coating with mirror finish on the impeller shaft in the working area of the seal. The gland seal is made with rings of graphite cord or teflon.

The pump is oil-bath lubricated: oil level is monitored through the level plug located on the pump cover (Fig.A - 21). Cooling is provided by two systems: external fins on the speed increase gear body and water circulation inside the body. The combined effect of these systems assures restricted working temperature (approx. 60° - 70°C) such as to eliminate possible risks of burns to the user.

The pump is supplied with the most suitable transmission ratio, among the various available ratios, for the tractor to which it is to be mounted. This facility eliminates compatibility problems with all tractors made by Italian and International manufacturers, even when the tractor is not equipped with a standard speed PTO.

Check the Pump Model - Tractor Power Table on page 4.

1.3 Auxiliary equipment

Suction and delivery port flanges UNI 2277 PN10

UNI 2277 NP 10 suction and delivery port flanges are supplied for models 100- 125 - 80 SPECIAL - OF 83/2 - OF 83/2 SPECIAL to couple the unit with the suction and delivery lines.

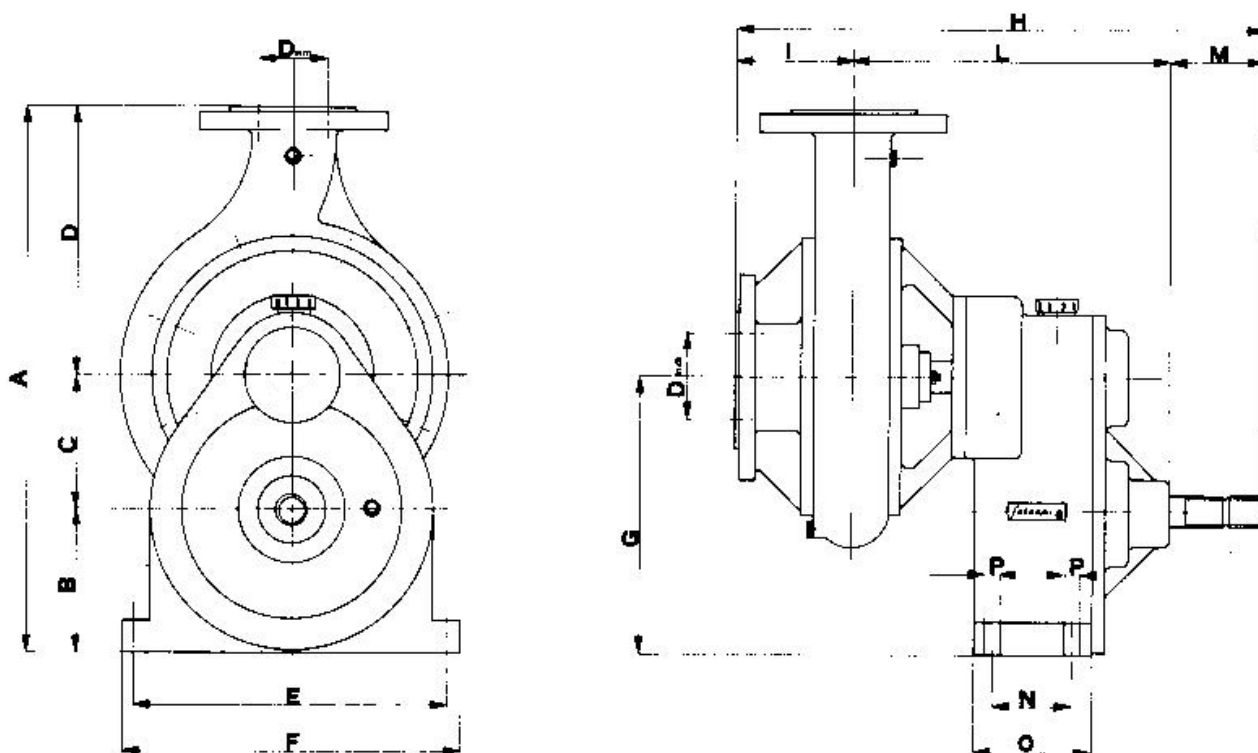
Steel threaded unions are supplied for models 60 / 75 - 80 - 125/150 which cannot be equipt with suction and delivery port flanges.

Complete safety guarding

All pumps are supplied with complete safety guarding, secured with screws to the pump at the area in which it is engaged with the tractor driveline and designed for correct connection with the drive shaft shield tube.

WARNING: THE PUMP MUST NOT BE USED UNTIL THE SAFETY CHAIN OF THE DRIVE SHAFT SHIELD TUBE IS PROPERLY SECURED TO THE RELATIVE RING ON THE PUMP SAFETY GUARDING (Fig.A - 37) IN SUCH A WAY AS TO ASSURE THAT THE DRIVELINE IS COMPLETELY SHIELDED.

2. TECHNICAL DATASHEET



DIMENSION AND WEIGHT																		
Type Pump	A	B	C	D	E	F	G	H	I	L	M	N	O	P	Dna	Dnm	Hole	Weight
TNO 60	410	120	101	189	121	475	221	560	160	315	85	95	110	15	3"	2"1/2	-	46
TNO 75/80	465	139	126	200	285	310	265	500	105	310	85	75	115	15	3"1/2	3"	18	58
TNO 80	479	139	126	214	285	310	265	490	95	310	85	75	115	15	4"	3"	18	62
TNO 100	485	139	126	220	285	310	265	498	103	310	85	75	115	15	115	95	18	81
TNO 125	490	147	123	220	305	335	270	563	118	355	90	90	140	18	115	95	20	96
TNO 125/150	490	147	123	220	305	335	270	584	139	355	90	90	140	18	150	95	20	113
TNO 150	522	110	82	330	192	430	192	430	170	175	85	170	215	14,5	6"	150	-	84
TNO 80SP	505	139	126	240	285	310	265	506	111	310	85	95	115	15	85	65	18	75
TNO 120SP	550	147	123	280	305	335	270	563	118	355	90	90	140	18	115	65	20	86
OF 83/2	558	147	123	288	305	335	270	585	135	360	90	90	140	18	85	65	20	110
OF 83/2SP	558	147	123	288	305	335	270	585	135	360	90	90	140	18	115	65	20	115
TNO 100 L	490	147	123	220	305	335	270	572	127	355	90	90	140	18	150	95	20	90
TNO 100 LK	490	147	123	220	305	335	270	611	166	355	90	90	140	18	200	95	20	97

3.0 PUMP APPLICATION

3.1 PRESCRIBED USE

Series NT pumps can be coupled to tractors with between 18 and 180 HP rated power with PTO speed from 540 to 1000 rpm (See table on page 4).

The pumps are designed to provide constant performance for low, medium and high heads and can be employed for:

- A) Water conveyance for filling reservoirs and canals
- B) Fixed medium-throw irrigation systems
- C) Large irrigation plants: self-propelled irrigators, hillside installations and over particularly long operating distances.

The splined shaft for keying the pump drive shaft to the PTO is 1" 3/8; 1" 3/4 shaft is available on request.

3.2 IMPROPER USE

THE PUMP MUST BE UTILISED EXCLUSIVELY FOR PUMPING CLEAN COLD WATER; ANY OTHER USES WITH DIFFERENT FLUID MEDIA (EXCEPT SEWAGE PUMPING WHEN FITTED WITH MECHANICAL ROTARY SEAL AND SPECIFIC IMPELLER) ARE CONSIDERED IMPROPER AND EXPRESSLY PROHIBITED BY THE MANUFACTURER.

Pump operation will be adversely affected and the seals will be damaged if it is allowed to run dry.

4.0 HANDLING

4.1 Conditions of storage

No particular precautions are necessary for the storage of the pump; simply place it in an enclosed ambient where it is protected from the weather.

The pump is not supplied with any form of packing material and can be placed on the ground without problems of instability.

4.2 Dimensions , weight , centre of gravity.

Data regarding the dimensions and weight of the unit are given .

The centre of gravity is located between the centrifugal pump and the speed increase gear.

4.3 Instructions for handling

The unit is usually handled manually. Two persons may be needed to handle the unit depending on the weight of the particular model .

If you dispose of powered lifting equipment (bridge crane, etc) the unit can be hooked between the pump and speed increase gear using the bracket that joins the two units (Fig.A - 389).

5.0 INSTALLATION

The NT series pump is connected to the tractor PTO by means of a telescoping drive shaft. The pump is generally mounted on a trailer with two tyre-shod wheels which is hitched to the tractor.

The pump can also be fixed to a baseplate mounted on the tractor three point linkage.

For reasons of stability we recommend using the two-wheel trailer for series TNO60, TNO75/80 , TNO80 only; for all other models use the top link baseplate.

5.1 Anchoring the pump

The pump must be fixed to its baseplate with steel bolts fitted with plain washers and self-locking nuts.

For pumps series **TNO/MFO 60, 75, 80, 80SP** and **150** use bolts size **14 mm** resistance class **R 8.8**.

For pumps series **TNO/MFO 100, 120SP, 125, 83/2, 83/2SP** use bolts size **16 mm** resistance class **R 8.8**.

The bolts must be torqued gradually adopting a diagonally opposite tightening sequence.

5.2 Mounting suction and delivery connections

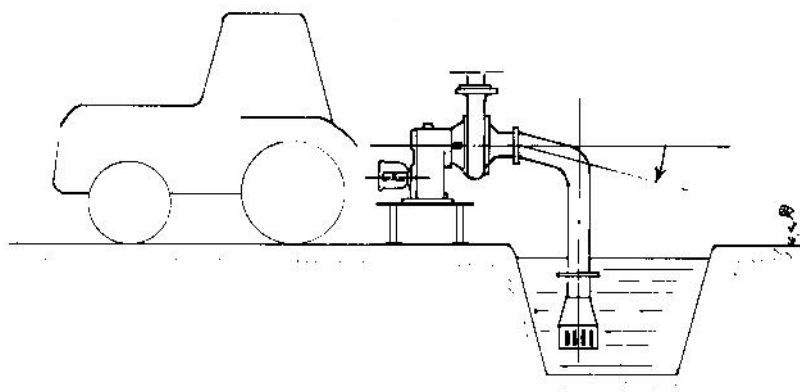
The suction (Fig.A 39) and delivery (Fig.A 40) connections are fixed to the relative suction and delivery flanges using the screws supplied and torquing gradually using a diagonally opposite tightening sequence.

5.3 Suction piping

In order to prevent the formation of air pockets in the suction pipeline, which must be as short as possible and of a diameter no less than the suction connection, the pipeline must be positioned so that it follows a downward gradient toward the point of water intake (see figure B) (not applicable in the case of flooded suction).

Our Engineering Department is at your disposal for **NPSH** values.

FIGURE B



5.4 Foot valve

The foot valve, suitably protected against the ingress of foreign material that could result in blockages, must be positioned vertically without resting on the bottom of the water basin and with a dip of at least 0.5 m.

5.5 Delivery connection

A handwheel operated gate valve can be fitted on the delivery connection to optimise pump adjustment and avoid the risk of overloading the tractor engine and possible cavitation of the pump.

It is also possible to install a pressure gauge on the delivery to monitor the performance of the plant.

6.0 START- UP

When you have finished installing the pump unit, fill the speed increase gear unit with oil through the filler hole (fig.A 26): **use specific SAE 90 gear oil.**

Check the oil level through the level plug (Fig.A 21) located on the cover of the speed increase gear unit and pour in oil until it reaches the level plug. When you have finished filling the speed increase gear unit, refit all the plugs and tighten them fully down.

ATTENTION: THE PUMP IS ALWAYS SUPPLIED WITHOUT OIL; RUNNING THE PUMP WITHOUT OIL WILL CAUSE SERIOUS DAMAGE TO ITS MECHANICAL PARTS.

After 40 hours of duty (running-in period) change the oil. Proceed thus: unscrew the oil filler plug (Fig.A 26) and the oil drain plug located on the rear of the speed increase gear unit (Fig.A 25). When the used oil has drained out completely, refit the drain plug and tighten it and then fill the unit with new oil in accordance with the procedure outlined above.

Subsequent oil changes must be executed every 200 - 250 hours of duty.

The pump must be primed so as to avoid the formation of air pockets inside the suction pipeline.

6.1 Coupling the pump to the driveline

Couple the pump input shaft to the drive shaft joint making sure that the locking pins located on the drive shaft joint are correctly in position; the locking pins should snap into the grooves in the pump drive shaft thereby locking the drive shaft coupling to the pump drive shaft.

Make sure the drive shaft is correctly sized in relation to the transmitted power and equipped with suitable shield tubes that, when engaged with the pump guarding, prevent possible contact of the operator with moving parts of the driveline.

Attention: the maximum safety angle for a drive shaft CV joint is 10° so make sure the driveline is as close to the horizontal as possible by keeping the tractor PTO and the pump input shaft on the same level (consult the drive shaft manufacturer).

7.0 ADJUSTING THE PUMP

The pump **FLOW RATE Q (l/min)** and **HEAD H (m)** are defined at a given rotation **SPEED of the impeller (RPM)**; therefore, referring to the tables supplied by our Engineering Department on request, in order to calculate plant performance you need only know the **diameter (mm)** of the jet nozzle and the **pressure head (BAR)** at which you are working.

8.0 USING THE PUMP

When the pump is primed (see heading 6.0)

- a) start the unit keeping the gate valve (if fitted) almost completely closed;
- b) gradually bring speed up to operating RPM.
- c) open the gate valve until you obtain the required working conditions.

ATTENTION: when the pump is running there must be water dripping from the cord gland so that the seal is kept lubricated and remains at working temperature. If too much water drips from the seal, tighten the adjustment nuts working alternately until you obtain the correct amount of leakage.

DO NOT TRY TO STOP WATER LEAKING FROM THE GLAND: IF YOU RUN THE PUMP WHEN THE GLAND IS PACKED TOO TIGHT THE IMPELLER SHAFT WILL BE DAMAGED.

On the contrary, there should be zero water leakage if the pump is equipped with a MECHANICAL ROTARY SEAL.

ATTENTION: THE PUMP MUST NEVER BE RUN DRY. IF THE PUMP IS RUN WITHOUT WATER SERIOUS DAMAGE TO ITS MECHANICAL PARTS WILL RESULT.

9.0 SEASONAL STORAGE

When the irrigation season comes to a close, before storing the pump:

- a) make sure it is completely empty of water by removing the water drain plug (Fig.A 31);
- b) lubricate the pump by flushing it with a mixture of naphtha and oil instead of water; this precaution will prevent the internal parts of the pump from corroding.

ATTENTION: if you empty the speed increase gear unit of oil make a note to remind you to fill it before re-using.

10.0 MAINTENANCE AND REPAIR

10.1 Changing speed increase gear oil

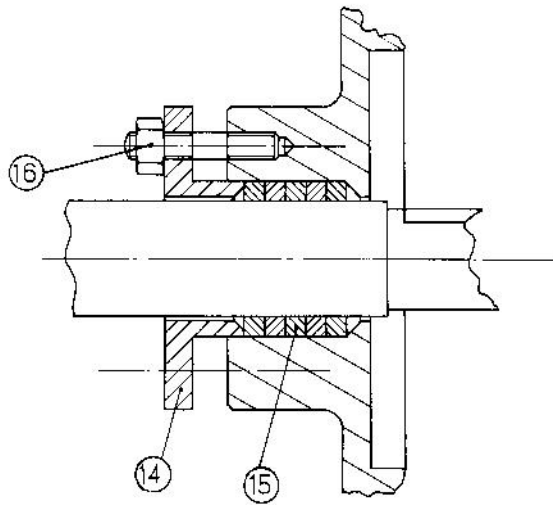
Perform oil changes following the procedure and at the intervals prescribed in heading 6.0 (Start-up).

10.2 Gland seal

Change the gland packing cord when it proves impossible to reduce the leakage of water, even when the adjustment nuts are fully tightened (Fig.C 16).

When fitting new sealing rings (Fig.C 15) make sure that the joins in the rings are offset by 180° on adjacent rings.

FIGURE C



10.3 Renewing the impeller

During the working life of the pump it may become necessary to fit a new impeller due to mechanical wear of the original component.

Make sure the pump unit is disengaged from the driveline and proceed thus:

- a) remove the suction port cover (fig.A - 35)
- b) unscrew the self-locking ring nut
- c) withdraw the impeller
- d) fit the new impeller
- e) refit and tighten the self-locking ring nut
- f) refit the cover seals (renew if necessary)
- g) refit the suction port cover

REPAIRS MUST BE CARRIED OUT USING EXCLUSIVELY GENUINE POMPE OCMIS SPARE PARTS, IF NON-ORIGINAL PARTS ARE FITTED THE MANUFACTURER DECLINES ALL LIABILITY FOR POSSIBLE MALFUNCTIONS OR DAMAGE

11.0 EXTRAORDINARY MAINTENANCE WORK

Extraordinary maintenance work refers to operations regarding the repair of parts that have a prescribed dimensional tolerance including: bearings (seats and supports), gears (and gear C/C distances), sealing surfaces. **Such operations must be performed by OCMIS technical personnel.**

12.0 RISKS RELATED TO MAINTENANCE AND REPAIR WORK

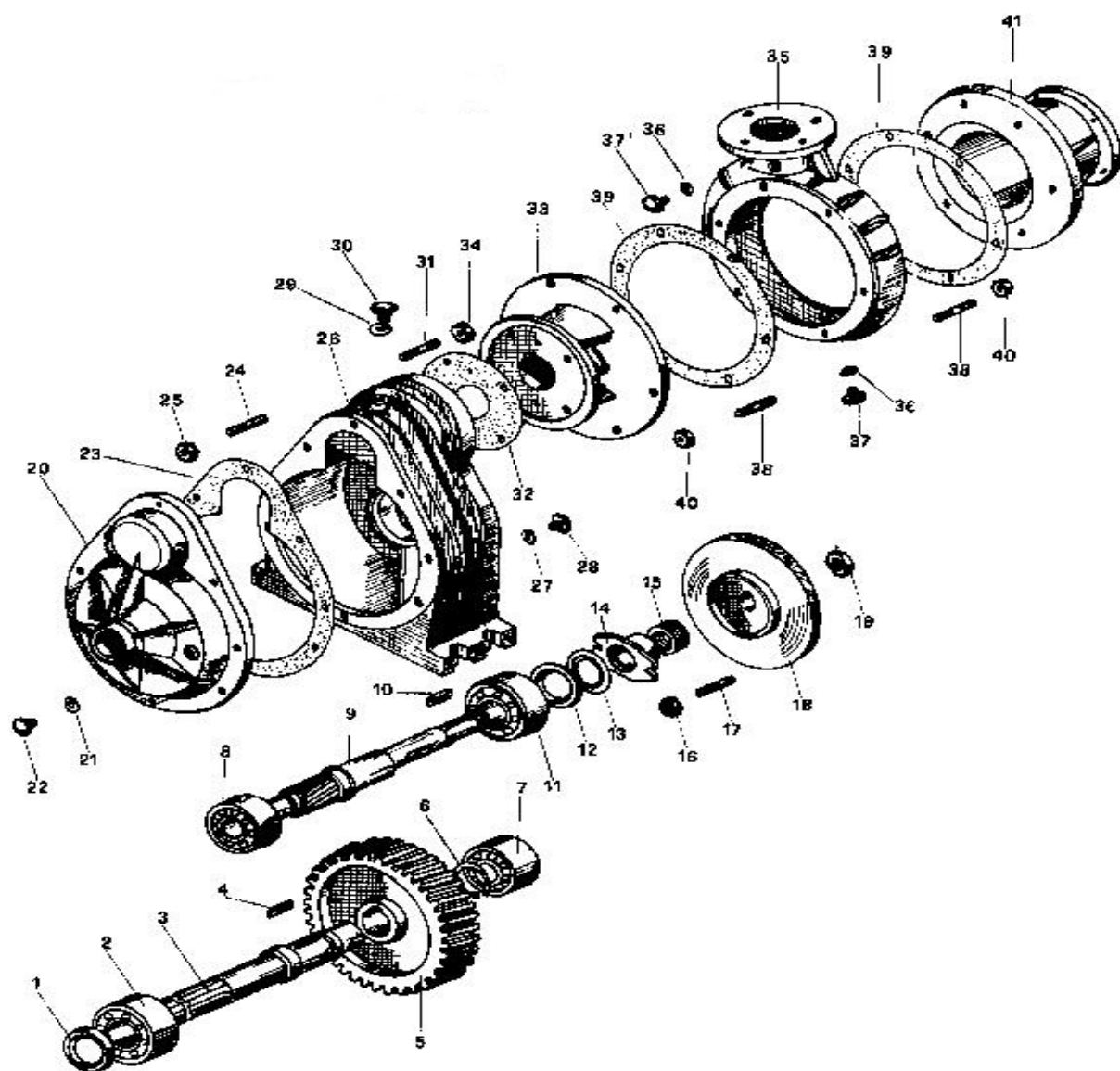
Routine maintenance and repair work do not involve risks provided they are carried out when the **unit is stopped (disengaged from the driveline)**.

Unskilled repairs can result in damage to mechanical parts including bearings, screw threads, sealing surfaces, support seats, drive shafts, etc. although there is no risk for the operator during the maintenance work or successively when the unit is used after the maintenance work has been carried out.

13.0 AIRBORNE NOISE LEVELS

The unit must be used exclusively coupled to a tractor PTO or a combustion engine designed for normal use outdoors; the noise levels produced by the prime mover are significantly higher than the very low noise levels generated by the pump.

FIGURE D



14.0 SPARE PARTS LIST

In response to orders from our Customers we can supply the following spare parts:

POSITION	DESIGNATION	N.ITEMS
1 -	O-RING	n.1
2 -	BEARING	n.1
3 -	DRIVE SHAFT	n.1
4 -	KEY	n.1
5 -	DRIVING GEAR	n.1
6 -	CIRCLIP	n.1
7 -	BEARING	n.1
8 -	BEARING	n.1
9 -	IMPELLER SHAFT WITH GEAR	n.1
10 -	KEY	n.1
11 -	BEARING	n.1
12 -	O-RING	n.1
13 -	WATER SEAL RING	n.1
14 -	GLAND	n.1
15 -	GRAPHITE COATED CORD	n.4
16 -	NUT	n.2
17 -	STUD SCREW	n.2
18 -	IMPELLER	n.1
19 -	IMPELLER LOCK NUT	n.1
20 -	SPEED INCREASE GEAR UNIT COVER	n.1
21 -	WASHER	n.1
22 -	OIL LEVEL PLUG	n.1
23 -	SEAL	n.1
24 -	STUD SCREW	n.8
25 -	NUT	n.8
26 -	SPEED INCREASE GEAR UNIT HOUSING	n.1
27 -	WASHER	n.1
28 -	OIL DRAIN PLUG	n.1
29 -	WASHER	n.1
30 -	OIL FILLER PLUG	n.1
31 -	STUD SCREW	n.4
32 -	SEAL	n.1
33 -	PUMP BODY SUPPORT	n.1
34 -	NUT	n.4
35 -	PUMP BODY	n.1
36 -	WASHER	n.2
37 -	PLUG	n.1
37 '-	PRESSURE SWITCH CONNECTION PLUG	n.1
38 -	STUD SCREW	n.12
39 -	SEAL	n.2
40 -	NUT	n.12
41 -	SUCTION PORT COVER	n.1

15.0 FAULT FINDING : PROBLEMS AND PROBABLE CAUSES

With the aim of facilitating the installation and use of the pump, the following chart illustrates the most common problems you may encounter when using the pump together with an indication of the probable causes; if in doubt, contact our Engineering Department for information.

FAULT FINDING : PROBLEMS AND PROBABLE CAUSES

NO WATER FROM PUMP DELIVERY SIDE

- 1) Pump and suction pipeline have not been properly filled during priming so they contain pockets of air
- 2) Foot valve is clogged with mud, leaves or other debris
- 3) Pump fills with water but faulty foot valve opens and empties it before it can be started.
- 4) Suction lift is excessive.

PUMP FLOW RATE IS INSUFFICIENT

- 5) Air is leaking past the shaft seal
- 6) Speed is too low
- 7) Incorrect direction of rotation
- 8) Foreign matter in the impeller passages
- 9) Worn seals on pump body or impeller

PUMP POWER ABSORPTION IS TOO HIGH

- 10) Speed is too high
- 11) Shaft is deformed
- 12) Abnormal internal friction (rotary parts are rubbing against fixed parts of the assembly)
- 13) Replacement seals that have been fitted are unsuitable for the application
- 14) Gland is packed too tightly

BEARING LIFE IS EXCESSIVELY SHORT

- 15) Insufficient lubrication
- 16) Contaminants inside bearings
- 17) Bearings have rusted due to the ingress of water or formation of condensate from moist air in the bearing shell

PUMP OVERHEATS AND SEIZES

- 18) Excessive friction resulting from mechanical faults or worn seals
- 19) Pump bearing fatigue