CE

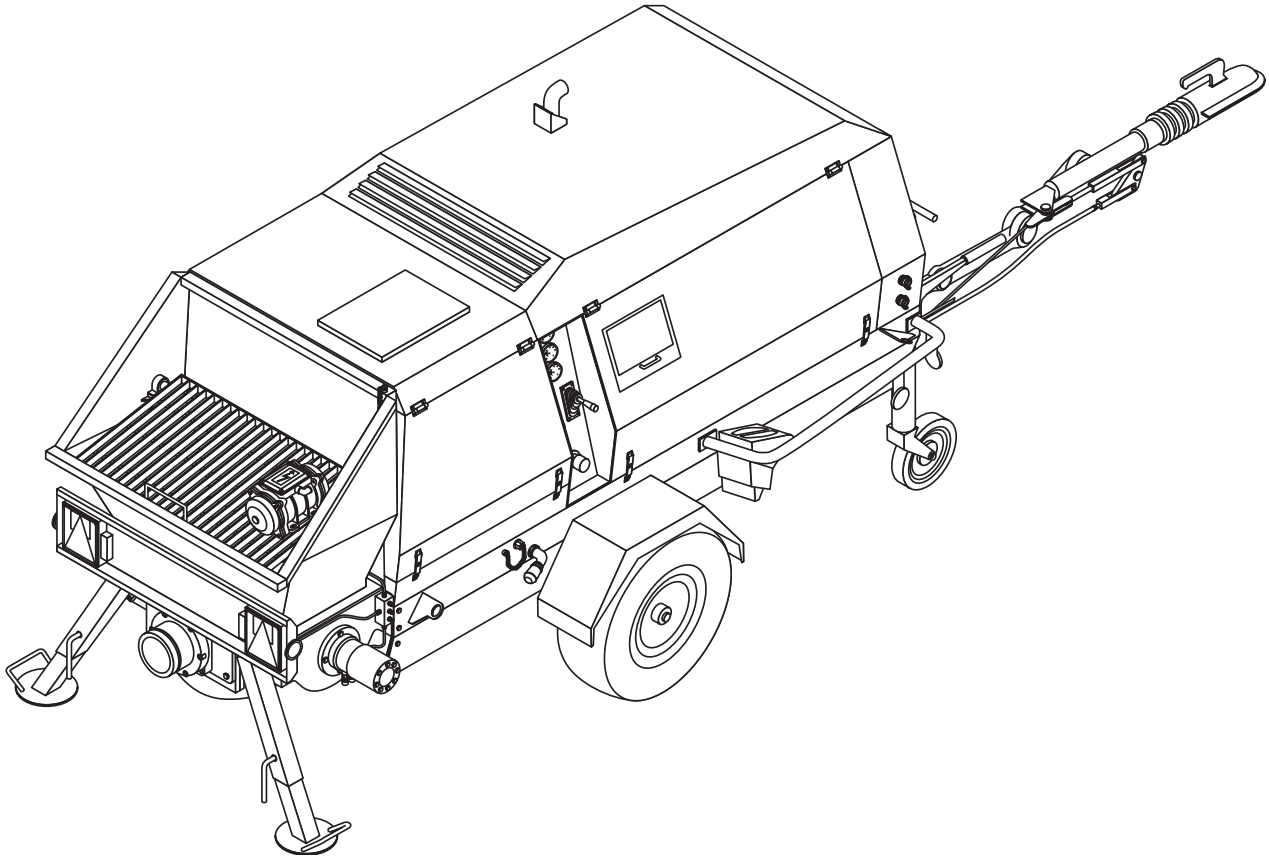
OPERATION AND MAINTENANCE MANUAL

ORIGINALI

EN IT

BETON MASTER

17341 - 561.184



Serial number

						/		

READ THIS MANUAL CAREFULLY BEFORE USING THE MACHINE.
THIS MANUAL IS AN INTEGRAL PART OF THE MACHINE AND MUST BE KEPT FOR FUTURE REFERENCE UNTIL THE MACHINE IS DISPOSED OF

TURBOSOL

TECNOLOGIA DI POMPAGGIO PER L'EDILIZIA

INDEX

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1.1 CE DECLARATION OF CONFORMITY

Dichiarazione CE di conformità - *EC declaration of Conformity* - EG – Konformitätserklärung -
Déclaration CE de conformità - Declaración de Conformidad CE - *Declaração CE de conformidade*

Il fabbricante - *The manufacturer* - Le fabricant - *Der Hersteller* - El fabricante - *O fabricante*

TURBOSOL
PRODUZIONE S.p.A.
Via A. Volta, 1
31030 Pero di Breda
TREVISO – ITALIA

dichiara che la seguente macchina:
declares that the machinery:
déclare que la machine:
erklärt, dass die maschine:
declara que la máquina:
declara que a máquina:

Pompa per calcestruzzo
Concrete pump
Pompe à béton
Betonpumpe
Bomba para hormigón
Bomba para betão

Modello - *Model* - Modèle - *Modell* - Modelo - *Modelo* **MODELLO**

Versione - *Version* - Version - *Version* - Versión - *Versão* **VERSIONE**

Matricola numero - *Serial number* - Numéro de matricule – *Seriennummer* - Número de matrícula - *Número de matrícula* **XXX.XXX**

Anno di fabbricazione - *Year of manufacture* – Année de fabrication – *Herstellungsjahr* – Año de fabricación – *Ano de fabrico* **ANNO**

è conforme alle disposizioni della direttiva 98/37/CE e alle disposizioni nazionali di attuazione;
è anche conforme alle disposizioni delle seguenti direttive europee: 2000/14/CE, 2004/108/CE;
è conforme alle disposizioni delle seguenti norme armonizzate: EN 12100-1/2:2005, EN 294:1993, EN 60204:2006.

fulfils all the relevant provisions of the Directive 98/37/EC;
also fulfils all the relevant provisions of the following European Directives: 2000/14/EC, 2004/108/EC;
fulfils the provisions of the following harmonised standards: EN 12100-1/2:2005, EN 294:1993, EN 60204:2006.

est conforme aux dispositions de la directive 98/37/CE;
est également conforme aux dispositions des directives européennes suivantes: 2000/14/CE, 2004/108/CE;
est conforme aux dispositions des normes harmonisées suivantes: EN 12100-1/2:2005, EN 294:1993, EN 60204:2006.

den Bestimmungen der Richtlinie 98/37/EG;
ebenso den Bestimmungen der folgenden europäischen Richtlinien entspricht: 2000/14/EG, 2006/95/EG, 2004/108/EG;
den Bestimmungen der folgenden harmonisierten Normen entspricht: EN 12100-1/2:2005, EN 294:1993, EN 60204:2006.

es conforme a las disposiciones de la directiva 98/37/CE ;
también es conforme a las disposiciones de las siguientes directivas europeas: 2000/14/CE, 2004/108/CE;
es conforme a las disposiciones de las siguiente normativas armonizadas: EN 12100-1/2:2005, EN 294:1993, EN 60204:2006.

é conforme às disposições da directiva 98/37/CE;
também é conforme às disposições das seguintes directivas europeias: 2000/14/CE, 2004/108/CE;
é conforme às disposições das seguintes normas harmonizadas: EN 12100-1/2:2005, EN 294:1993, EN 60204:2006.

FACSIMILE

An original copy of the CE Declaration of Conformity is supplied separately from the manual.

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2.1 IMPORTANCE OF MANUAL

The present Operation and Maintenance Manual has been prepared following the guidelines contained in the relevant European Directives. Its purpose is to provide a simple and full understanding of the subjects dealt with to the persons authorized to operate and perform maintenance on the machine described. The manufacturer has prepared this manual with the greatest care. However, should any operators find any part of the manual difficult to understand, they should contact the manufacturer immediately and request explanations and/or further information in order to avoid misunderstandings that might compromise the user's safety. Before using the machine, operators are required to read and understand this manual in every part and strictly follow its instructions, in order to ensure their own and others' safety, to make the machine work at its full potential and to ensure a long-lasting and efficient service life to all the machine parts. This manual should be safely stored and kept close to the machine at all times for immediate consultation by operators.

Only specifically trained and authorized personnel may be allowed to operate and perform maintenance on the machine.
Operators must follow all the instructions regarding the prevention of accidents and the regulations on workplace safety in force in the country of use.
The Manufacturer shall not be responsible for any damages resulting from changes made to the machine and/or from unauthorized tampering.
Users are advised to take note of the machine's serial number; it must be presented along with every request for technical assistance or for spare parts, and will facilitate processing such requests.
This manual reflects the latest information available at the time of marketing the machine and should not be considered inadequate only because newly acquired information may require its updating. Reprinting or reproducing this manual, in whole or in part, is not allowed unless authorized by ourselves in writing.

THE MANUFACTURER DECLINES ANY RESPONSIBILITY FOR DAMAGES TO PERSONS, ANIMALS OR PROPERTY CAUSED FAILURE TO OBSERVE THE INSTRUCTIONS AND WARNINGS CONTAINED HEREIN.

2.2 ABBREVIATIONS

ca.	around	**min**	minutes
cap.	chapter	**N.**	number
DPI	device of individual protection	**pag.**	page
DX	right	**par.**	paragraph
h	times	**pos.**	position
EN	European Norm	**RIF.**	reference
Es.	example	**s**	second
FIG.	figure	**SX**	left
max.	maximum	**TAB.**	table
min.	minimum	**v.**	see

TAB. 01

2.3 INFORMATION ON CONSULTING THE MANUAL

Boldface:
Highlights important parts in the text.

2.4 MEANING OF SYMBOLS

Information and warnings that are particularly important are indicated in this manual by the following symbols:

 ***CAUTION: This symbol indicates safety regulations regarding the operator.***

 ***NOTE: This symbol indicates additional information regarding the operation under way.***

 ***DANGER: This symbol indicates an electric shock hazard.***

 ***IMPORTANT: This symbol indicates further useful information.***

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2.5 MACHINE OFF

Before carrying out any kind of maintenance and/or adjustments on the machine the engine MUST be switched off using the ON/OFF button (FIG. 35-REF. 1).

2.6 GENERAL AND CONTACT INFORMATION

The BETON MASTER concrete pump can be supplied with a number of different accessories, therefore not all the parts described in this manual may be actually installed on your machine.

The Customer Service department of Turbosol Production S.p.A. will be glad to provide any information you may need.

Turbosol Produzione S.p.A.
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Fax +39 - 0422 - 90.44.08
website: www.turbosol.it
e-mail: info@turbosol.it

TURBOSOL MACHINES
Turbosol machines are the result of years of experience and constant research. This wealth of expertise, together with a special attention to quality, contributes to guarantee that Turbosol machines are built to last, are highly reliable and work with low operating costs.

MAINTENANCE AND CARE
Proper maintenance and care are essential for the machine to work as designed. It is extremely important that users observe the recommended maintenance intervals and carry out any maintenance required, both to keep the machine in perfect running order and to preserve the validity of the warranty.

SAFETY
The safety rules should also be made known to the maintenance personnel, and the local regulations on safety and accident prevention should be followed at all times.

OPERATOR TRAINING
Operators must receive specific training on the operations to be carried out.

TURBOSOL SERVICE

Please contact your TURBOSOL dealer for any information regarding machine malfunctions or requests for spare parts.

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3.1 NAME OF MACHINE

CE Marking

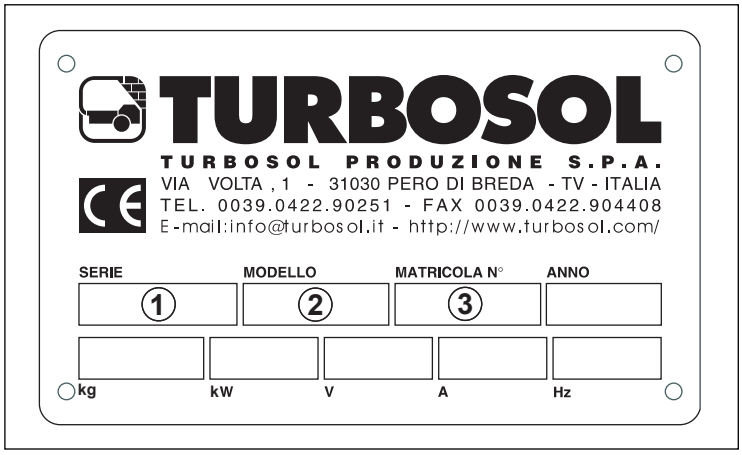

FIG. 01

The machine's series (1), model (2) and serial number (3) are engraved on the nameplate, as well as its power rating.

Position of CE nameplate
The CE nameplate (FIG. 02-REF. 1) is affixed to the machine's casing.

Position of serial number
The machine's serial number (FIG. 02-REF. 2) is punched on the tank cover as well as on the nameplate.

Position of tow-gear plate
Versions equipped with type-approved towing gear have an additional serial number punching (FIG. 03-REF. 1) and a nameplate with the type-approval data (FIG. 03-REF. 2).
The name of the Manufacturer is also punched in (FIG. 03-REF. 3).

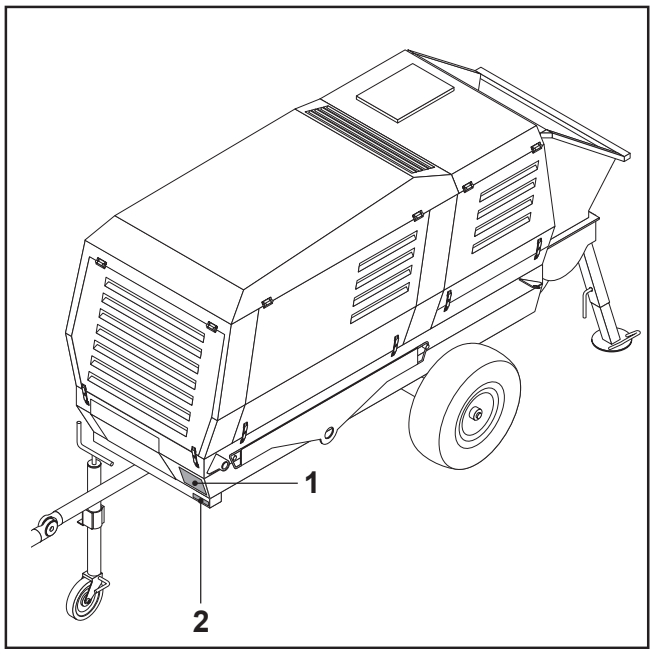

FIG.02

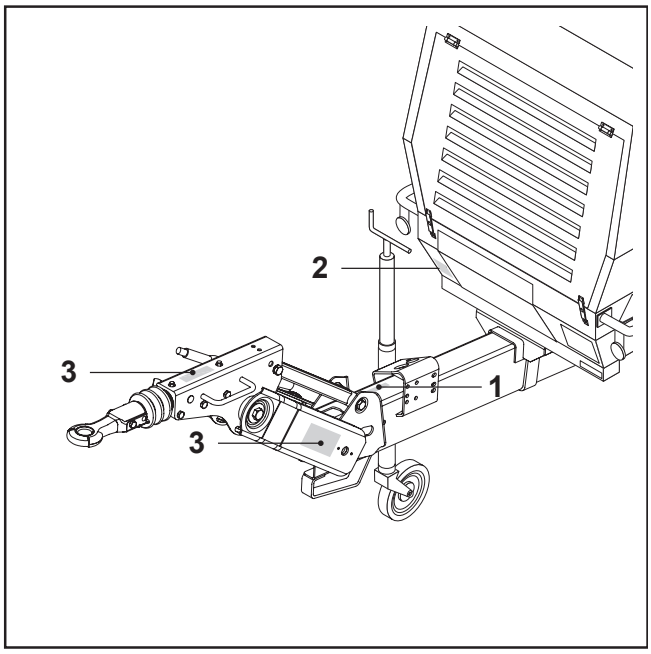

FIG.03

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3.2 DIMENSIONS OF MACHINE

The following are the machine's overall dimensions and gross weight (in working conditions).

BETON MASTER D-E

LENGTH	WIDTH	HEIGHT	WEIGHT*
3335 mm	**1420 mm**	**1600 mm**	**1560 kg**

TAB. 02

BETON MASTER D/T

LENGTH	WIDTH	HEIGHT	WEIGHT*
4555 mm	**1420 mm**	**1600 mm**	**1720 kg**

TAB. 03
*Weight with full fuel tank and hydraulic oil tank and no optional accessories.

3.3 TECHNICAL DATA

Flow rate*	m^3/h	15
Maximum pressure on the concrete	bar	80
Maximum number of cycles per minute	-	30
Pumping cylinders (diameter x stroke)	mm	120 x 700
Input power	kW	37.3
Electric control plant power supply	V	12 AC
Main hydraulic circuit maximum pressure	bar	240/190
Auxiliary hydraulic circuit maximum pressure	bar	180
Maximum particle size that can be pumped**	mm	25÷30
Maximum useful distance***	m	150÷200
Maximum useful height***	m	100÷120
Flow collector	inches	4.5
Hopper capacity	litres	200
Diesel tank capacity	litres	27
Oil tank capacity (hydraulic plant)	litres	75
Hydraulic oil (recommended)	ELF OLNA DS 46	
Maximum height above sea level of the place of installation without sensitive loss of the power	m	1000
Acceptable environmental temperature	°C	-5° ÷ 35°
Guaranteed sound power level LwA	dB	108

Endothermic motor: PERKINS 404D-22			
Power		kW	37.3
Motor rpm	minimum	rpm	1550
	maximum		2900
Motor oil (recommended)		TOTAL RUBIA TIR 7400	

TAB. 04
* Theoretical.
** Maximum particle size 25 mm if aggregates obtained by crushing; maximum particle size 30 mm in case of spheroidal aggregates.
*** Maximum values not simultaneously obtainable.

3.4 INTENDED USES

The machine has been designed and built for the following use:
FIELD OF USE: CONSTRUCTION WORK.
INTENDED USE: PUMPING SHOTCRETE AND CONCRETE

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3.5 MATERIALS USED

- Concrete with maximum particle size 25 mm if aggregates obtained by crushing; maximum particle size 30 mm in case of spheroidal aggregates.
- Shotcrete.

3.6 NAME OF MACHINE PARTS

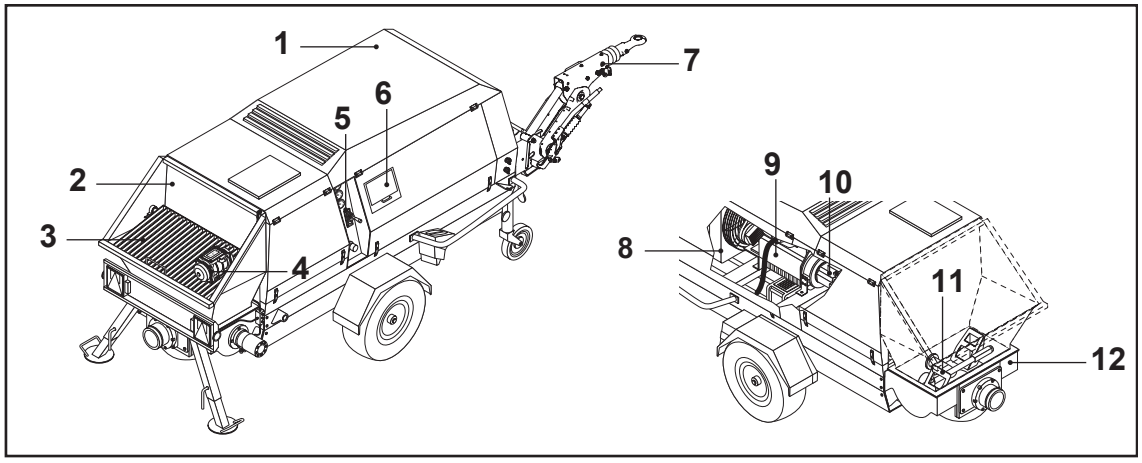

FIG. 04 *Figure shows towing gear.

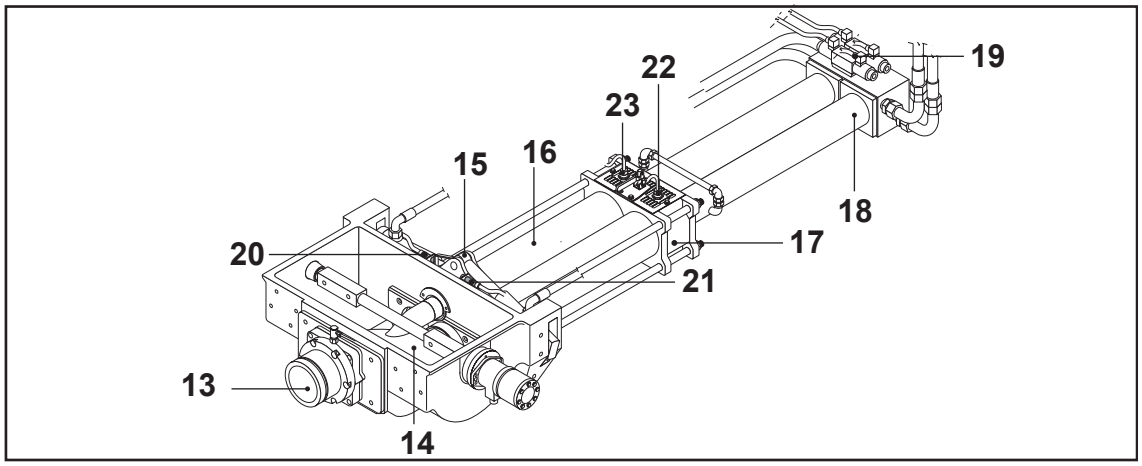

FIG. 05

LEGEND

FIG. 04-REF. 1 - Casing
FIG. 04-REF. 2 - Upper hopper
FIG. 04-REF. 3 - Grid
FIG. 04-REF. 4 - Vibrator
FIG. 04-REF. 5 - Control column
FIG. 04-REF. 6 - Control panel
FIG. 04-REF. 7 - Towing gear*
FIG. 04-REF. 8 - Exchanger
FIG. 04-REF. 9 - Engine
FIG. 04-REF. 10 - Hydraulic pump assembly
FIG. 04-REF. 11 - Mixer
FIG. 04-REF. 12 - Lower hopper
FIG. 05-REF. 13 - Delivery flange
FIG. 05-REF. 14 - S-valve
FIG. 05-REF. 15 - S-valve switching jack
FIG. 05-REF. 16 - Pumping tube
FIG. 05-REF. 17 - Water tank
FIG. 05-REF. 18 - Hydraulic pumping cylinder
FIG. 05-REF. 19 - Solenoid valves
FIG. 05-REF. 20 - Switching jack control sensor
FIG. 05-REF. 21 - Switching jack control sensor
FIG. 05-REF. 22 - Pumping control sensor
FIG. 05-REF. 23 - Pumping control sensor

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4.1 TRANSPORTING THE MACHINE AS A VEHICLE TRAILER

Only machines with a frame equipped with vehicle towing gear are allowed to circulate on public roads.

Always respect the rules of the road when towing the machine.

The machine cannot be used for carrying loads of any kind, not even the removable accessories used for its operation (pipes, fittings, gaskets, etc.).

What to do before towing the machine
- Make sure the diesel engine is switched off.
- Remove all pipes and hoses connected to the machine.
- Close and fasten the casing and check the fasteners.
- Lower the towing wheel and raise the support legs (FIG. 06).
- Fasten the light bar in its towing position (FIG. 06).

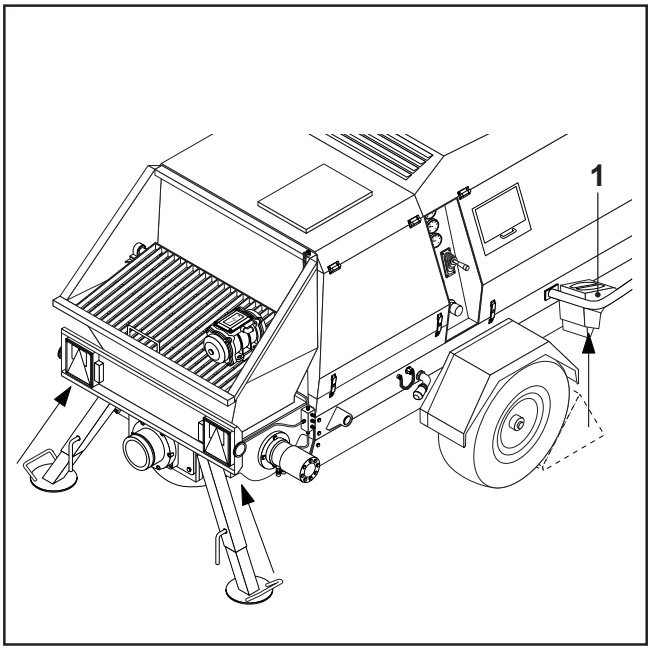

FIG.06

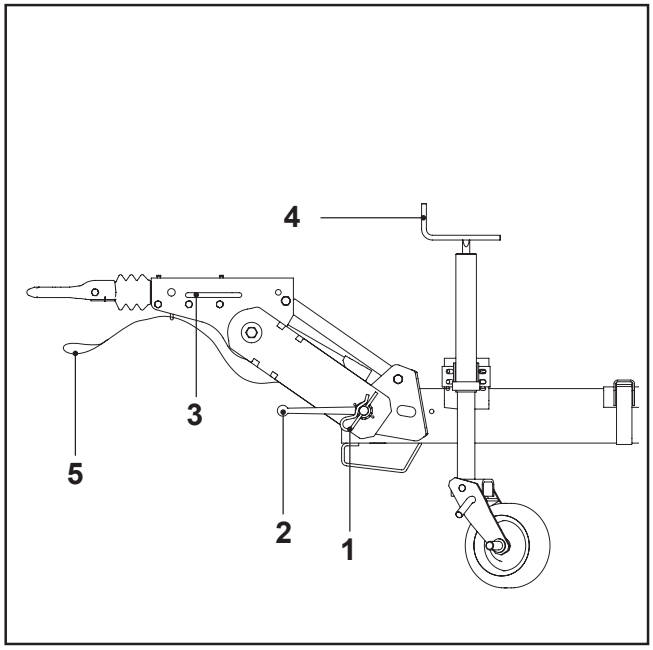

FIG.07

- Check the efficiency of the drawbar, the hook on the vehicle and the coupling mechanism.
- Remove the safety pin (FIG. 07-REF. 1)
- Unscrew the handle (FIG. 07-REF. 2) completely.
- Pull the "stickers" off the side discs (with a strong upward pull, to the left and to the right). Use only the handle (FIG. 07-REF. 3) to adjust the height.
- The middle section can be adjusted upward by 50° and downward by 10° until it reaches the limit.
- Tighten and lock the handle.
- Insert the safety pin.
- Turn the lever to raise the towing wheel (FIG. 07-REF. 4).
- After approximately 50 km, stop and tighten the handle again.

- Connect the light bar cable and make sure it works.
- Insert the snap cable through the eyelet welded on the side (guide cable grommet) (FIG. 08-REF. 1) and fasten the snap hook to the hole (FIG. 09).

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Make sure the cable is long enough to handle bends in the road. If the cable is too short it might accidentally pull the brake.

If there is no eyelet on the towing vehicle, wrap the cable around the stem of the trailer hitch and attach the snap hook to the cable itself. If the trailer is accidentally detached from the vehicle, the cable will pull the parking brake (emergency brake).

The cable must be correctly passed through the cable guide grommet in order for the emergency brake to work properly.

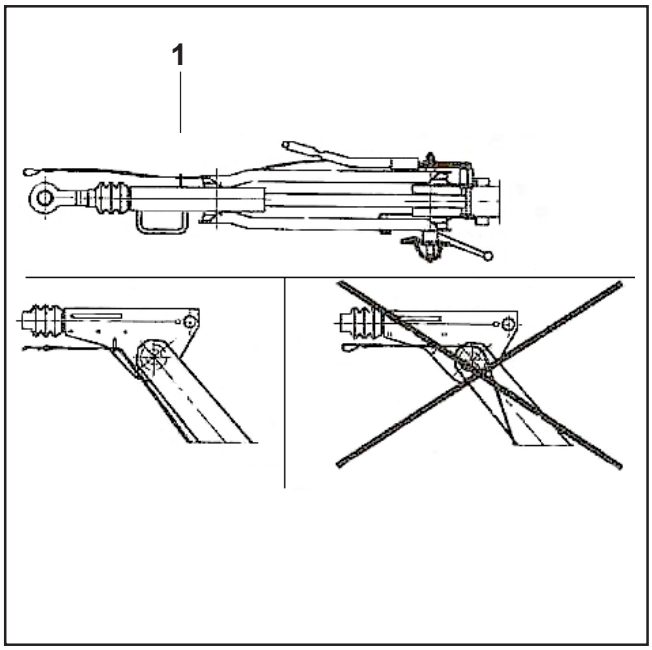

FIG.08

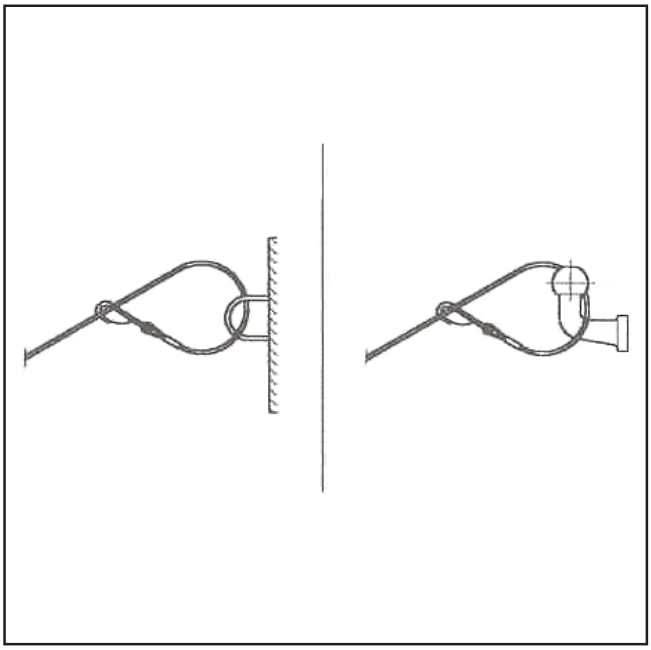

FIG.09

- Release the parking brake and remove the chocks (FIG. 06-REF. 1).

Unhitching the machine from the towing vehicle
- Lower and block the towing wheel.
- Pull the parking brake.
- Unhitch the machine from the towing vehicle.

When unhitching on a slope, block the machine using the parking brake and the chocks so that it won't move after unhitching.

BETON MASTER can also be carried on motor vehicles; loading, securing and transporting the machine on a motor vehicle should always be done in compliance with the rules of the road. See paragraph 4.2, LIFTING, for information on using lifting apparatus to load BETON MASTER on a vehicle.

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4.2 LIFTING

BETON MASTER is provided with four lifting points and supplied with a lifting beam (FIG. 10).
- Fasten the ropes to the lifting beam (FIG. 10-REF. 1) and to the four lifting points, attaching the shorter ropes to the hooks shown in FIG. 10-REF. 2 and the longer ropes to the hooks shown in FIG. 10-REF. 3.

Use the lifting beam only for the lifting of Beton Master.
Don't use the lifting beam to lift any other load.
Before using the lifting beam, check its integrity and in case replace it.

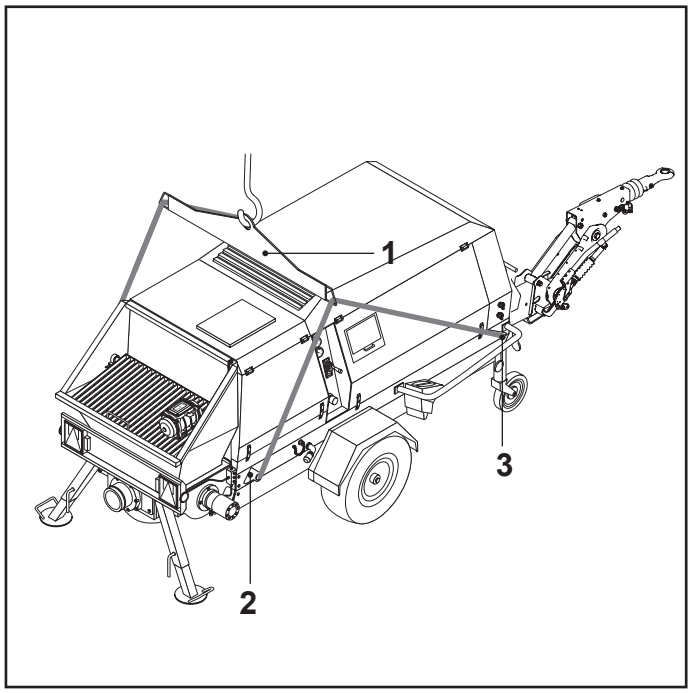

FIG. 10

Lifting should be carried out in strict observance of all the relevant safety rules, and the equipment used must be in good order and conforming to regulations. The lifting apparatus must be operated by specifically trained and authorized personnel.

Use only hooks and ropes certified for lifting 2000 kg.

Make sure the area is clear of any bystanders before lifting the machine.
Do not stand under suspended loads.
To prevent damages to the machine, do not lift or lower it with abrupt movements.
Do not change the lifting hook's anchoring point.
Move the machine only over level surfaces; avoid sloping surfaces to prevent the risk of being hit by the machine or crushed between the machine and fixed obstacles.

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5.1 POSITIONING THE MACHINE

Place the machine in a horizontal position; the maximum allowed gradient is 5°, both lengthwise and crosswise (FIG. 11).

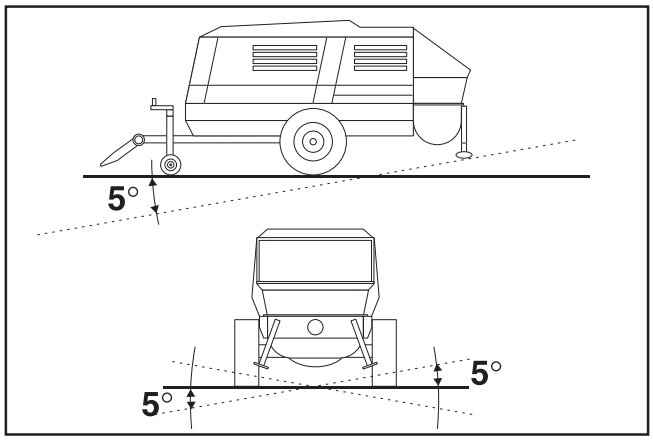

FIG.11

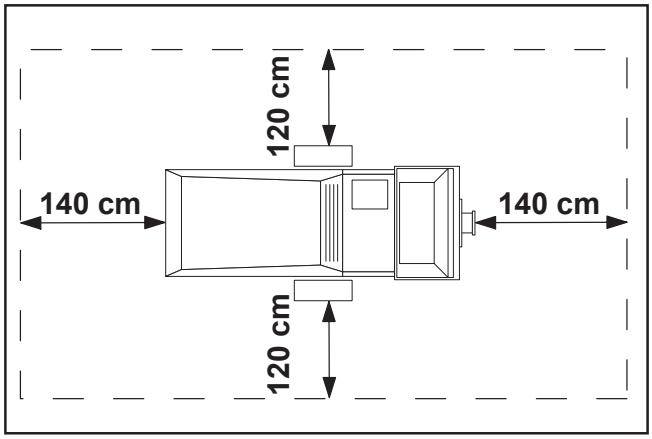

FIG.12

- Place BETON MASTER at the point of the worksite where you can use the pipes and hoses to their full extension.
- Brake the machine and block the wheels using the chocks supplied.
- Make sure the machine is resting on its side support legs and then raise the wheel.

Be sure to leave a passageway all around the machine (FIG12) clear of any obstacles and with no potholes or hazardous projections.

Do not use the towing wheel to support the machine during operation; the machine should rest on the side support legs and the main wheels in a stable manner.

5.2 PIPING

Lay out the piping using the shortest lengths possible (to reduce handling time and limit wear) and make sure the pipes are in good conditions.

Use rubber hoses only for the last section of the piping and for lengths no longer than 4 metres. using rubber hoses elsewhere along the piping may compromise pumpability (causing water to separate from the concrete) and increase the risk of clogging.

Use only original pipes and fittings. The pipes should be fitted by TURBOSOL PRODUCTION S.p.A. or by companies expressly authorized by TURBOSOL.

TURBOSOL PRODUCTION S.p.A. shall not be held responsible for damages to persons or property caused by using non-original piping or fittings.

Before starting to pump, make sure the hoses show no cracks or deformations on their inner surface. Deformations on the inner surface of rubber hoses can lead to dangerous clogging.

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5.2.1 Piping layout

BETON MASTER can pump slurries horizontally, upwards or downwards. Here below are a few general rules that should be followed when setting up the various layouts.

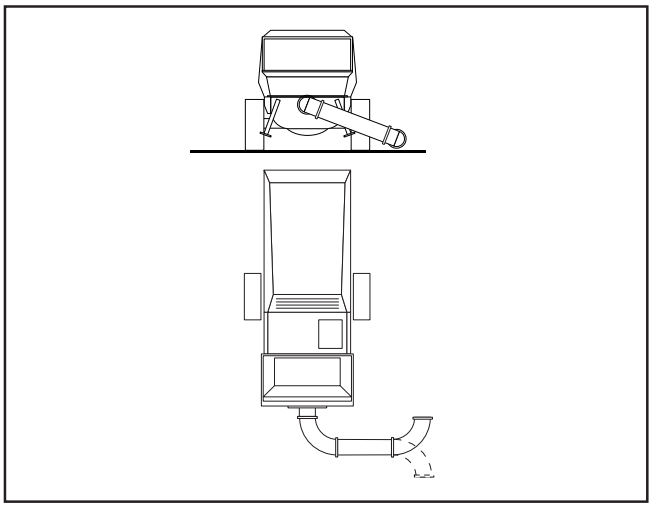

FIG.13

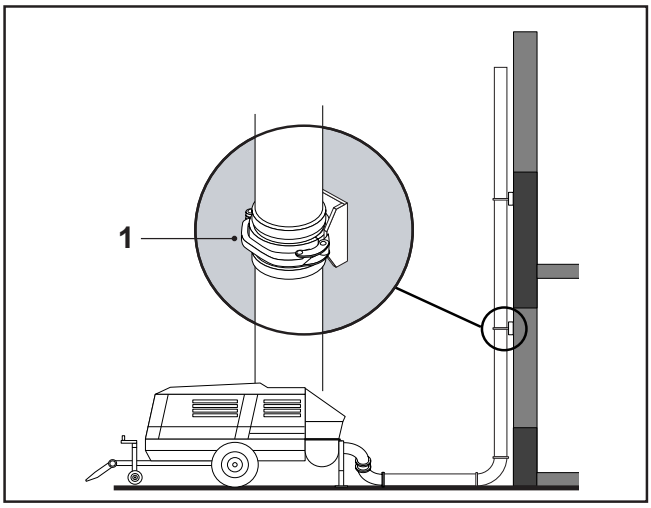

FIG.14

- **Horizontal pumping**

In case of horizontal pumping simply lay out the pipe in the desired layout and connect it to the first section described above.

- **Vertical pumping**

Vertical sections should be fastened and supported by collars (FIG. 14-REF. 1).

- **Downward pumping**

Downward sections should be fastened and supported by collars (FIG. 15-REF. 1).
Measures should be taken to prevent the concrete from dropping too fast along downward sections, for example by installing a curve and a reverse curve as in FIG. 15 or by laying out a sloping section.
With this kind of layout lubricating the pipes with slurry should be carried out as follows:
- introduce two pipe sponges into the first section of the piping (FIG. 16)
- pump the slurry
This will lubricate the entire downward section. If the downward section is very long, we recommend pumping additional sponges and slurry.

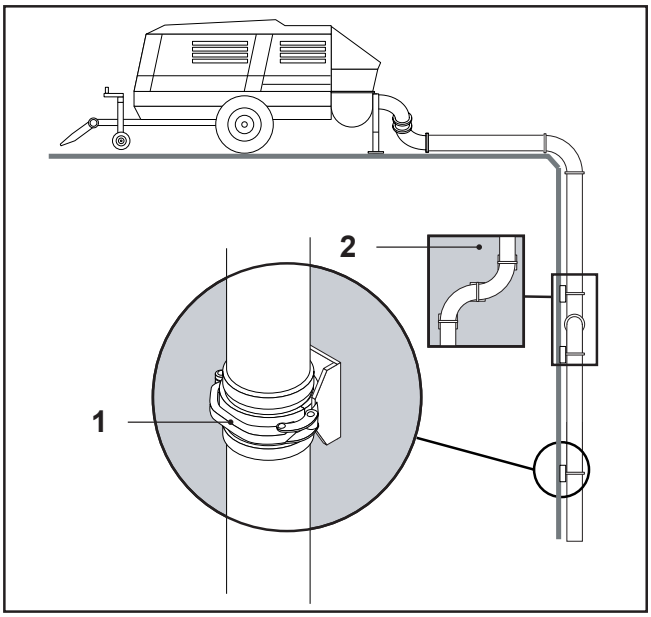

FIG.15

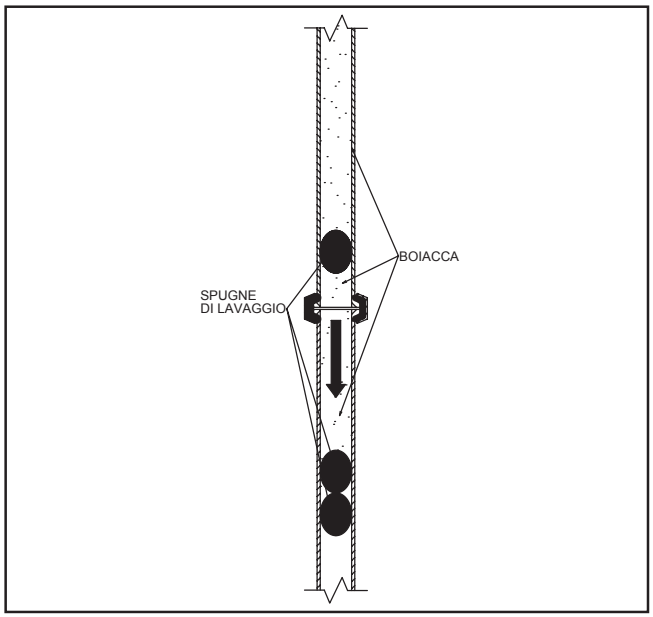

FIG.16

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5.3 FITTINGS

Make sure the fittings are clean and in good order at all times.

5.3.1 Victaulic couplings

When coupling pipe sections, make sure the rubber gasket is in place (FIG. 17-REF. 1) and tighten the levers all the way (FIG. 17-REF. 2).

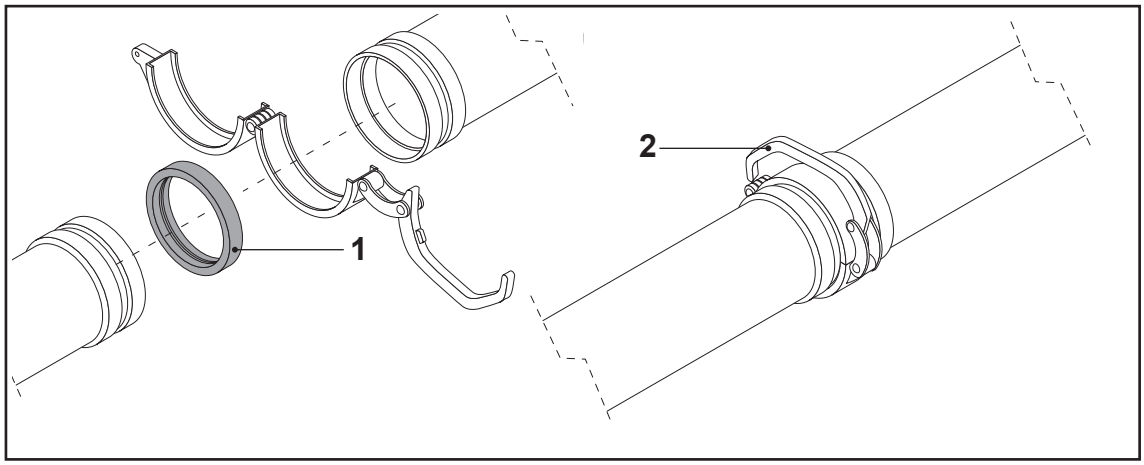

FIG. 17

5.4 CONNECTIONS

5.4.1 Concrete grid and vibrator

Open the small door (on the side where the electronic control panel is located), connect the electric vibrator's plug (FIG. 19-REF. 1) to the machine's socket (FIG. 19-REF. 2) located on the hydraulic oil tank and close the door.

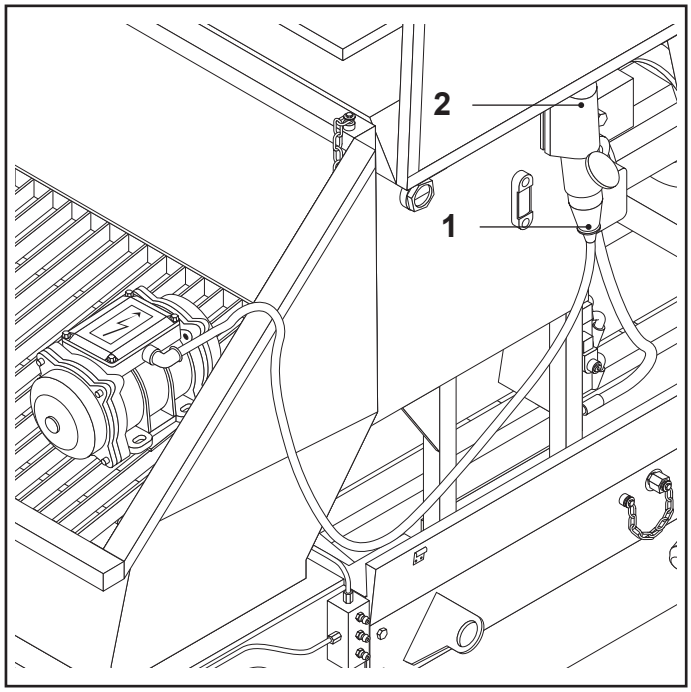

FIG. 19

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5.4.2 Remote control

The machine is supplied with a cable remote control. Plug the cable (FIG. 20-REF. 1) into the connector socket (FIG. 20-REF. 2) located on the machine's casing.
Turn the selector (FIG. 20-REF. 3) to 1 to start the mortar pump, to 0 to stop pumping and to 2 to reverse the direction of rotation.

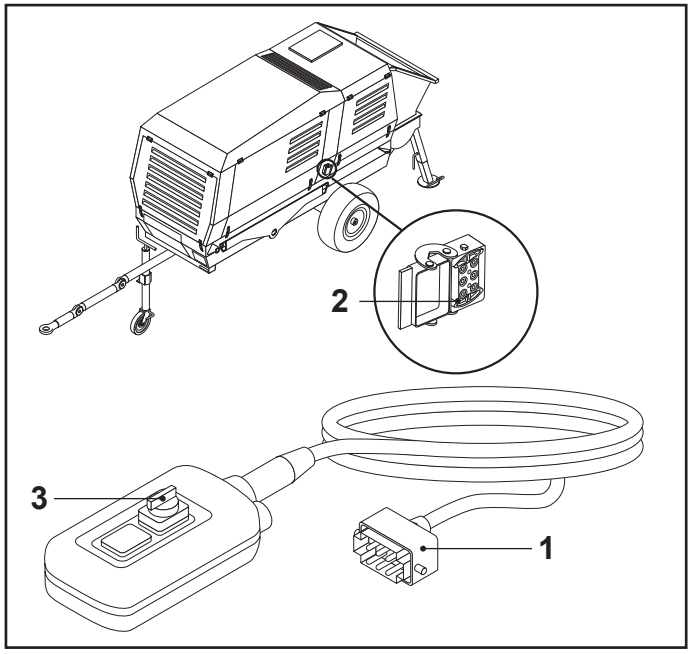

FIG. 20

5.4.3 Connections on shotcrete version

When pumping shotcrete you will need to use the shotcrete nozzle and the 15 mm slotted grid with the electric vibrator.
- Unscrew the shock absorber's anchoring bolts (FIG. 21.REF. 1).
- Remove the concrete grid, replace it with the shotcrete grid and fasten it to the shock absorbers using the bolts.
- Open the small door (on the side where the electronic control panel is located), connect the electric vibrator's plug (FIG. 22-REF. 1) to the machine's socket (FIG. 22-REF. 2) located on the hydraulic oil tank and close the door.
- Connect the slurry delivery hose (FIG. 23-REF. 1) to the shotcrete nozzle and the air delivery hose (FIG. 23-REF. 2) to the nozzle and to the auxiliary compressor.

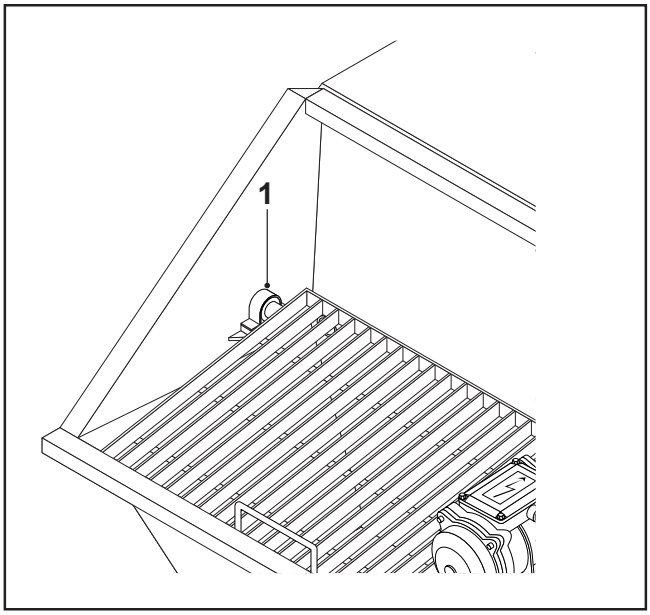

FIG.21

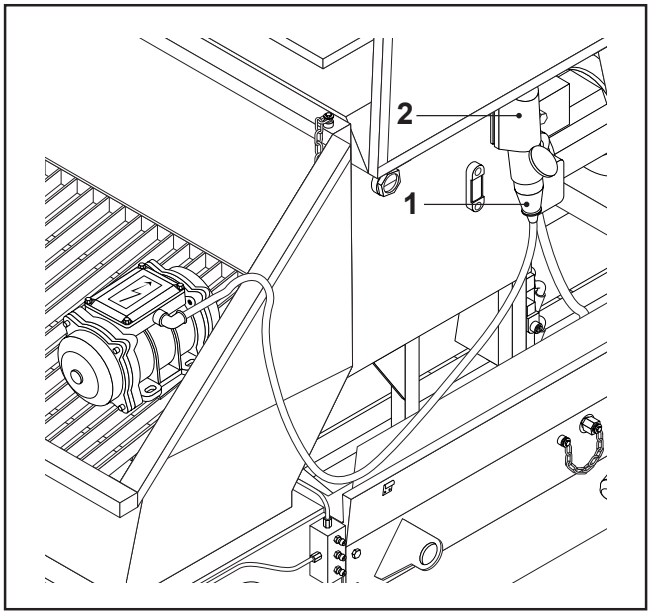

FIG.22

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Accelerating additives are harmful. Protect any exposed surfaces adequately. Handle additives with care and follow the manufacturer's instructions.

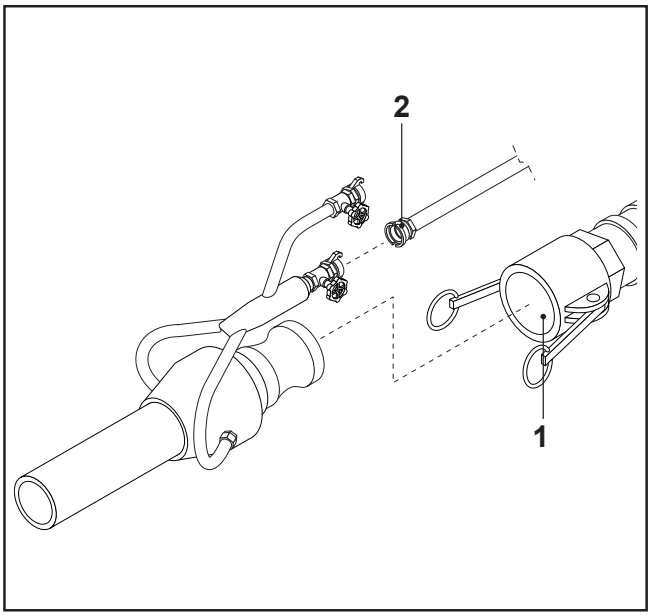

FIG.23

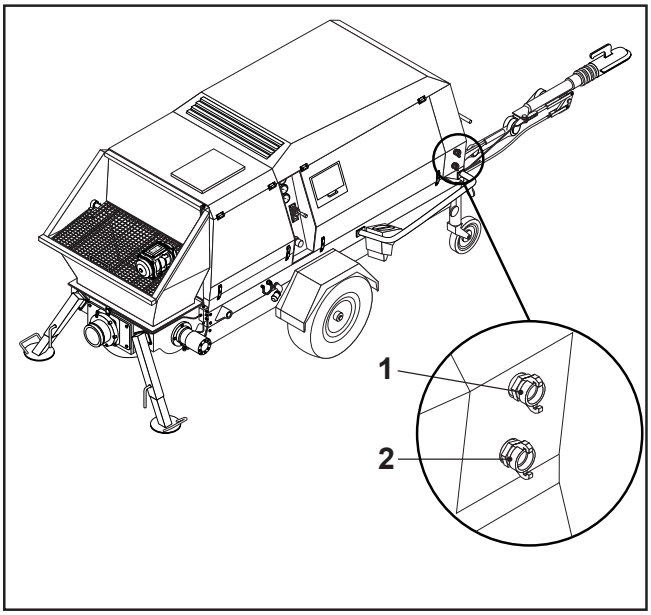

FIG.24

- Connect the accelerator delivery hose to the upper quick-release coupling (FIG. 24-REF. 1) on the side of the machine; connect the other end of the hose to the tank containing the accelerator.
- Make sure the accelerator drawing point is at least 50 cm above the coupling (FIG. 24-REF. 2).
- Connect the accelerator delivery hose to the quick-release coupling (FIG. 24-REF. 2) to the nozzle coupling (FIG. 25-REF. 1).
- Prime the accelerator pump as follows. Press AUTO/MAN (g1) on the control panel and select manual operation (the light (g3) turns on to indicate manual operation). Press ON/OFF (g2) to prime the pump; stop it when the silicate appears inside the hose (see par. 7.4 for a description of the controls).

5.4.4 Connecting the radio control (optional)

- Connect the plug (FIG. 27-REF. 1) to the connector socket (FIG. 27-REF. 2).
- Press the button (FIG. 27-REF. 3) to switch the remote control on and off.
- Press the button (FIG. 27-REF. 4) to start pumping. Press the button again to stop pumping.
- To reverse pumping (i.e., sucking the mix from the pipe on the hopper), make sure the button (FIG. 27-REF. 4) is turned to ON and press the button (FIG. 27-REF. 5) for the time required.

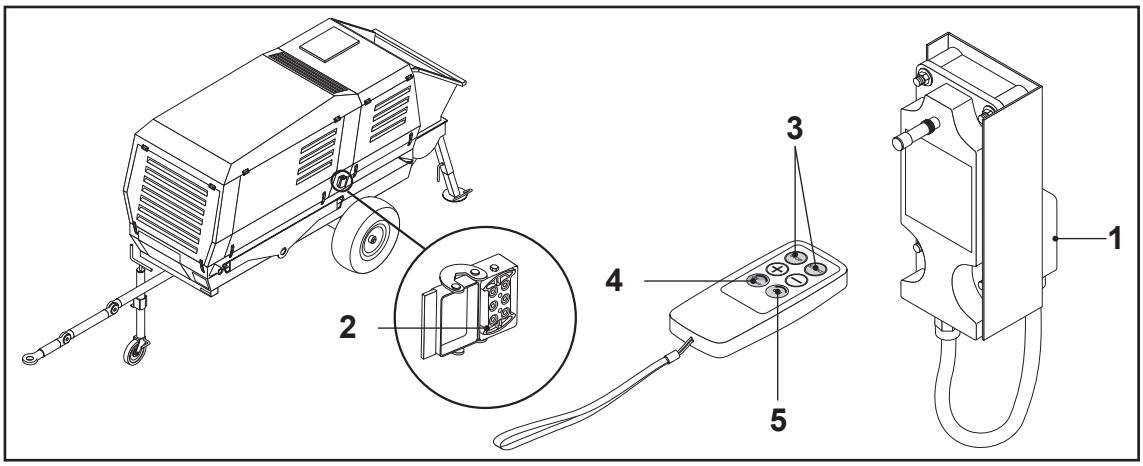

FIG. 27

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6.1 SAFETY DEVICES

GRIGLIA DI PROTEZIONE ALL'INTERNO DELLA TRAMOGGIA SUPERIORE
All'interno della tramoggia superiore è presente la griglia che, oltre ad impedire l'accesso all'aggregato di dimensioni eccessive, impedisce il contatto con la valvola a S. L'apertura della griglia arresta il pompaggio di calcestruzzo ed il movimento della valvola a S.
GRIGLIA DI PROTEZIONE VENTOLA DI RAFFREDDAMENTO
All'interno del vano motore è montata una griglia di protezione della ventola di raffreddamento fissata con viti.
CARROZZERIA
La carrozzeria protegge dal contatto con le parti calde interne ed i componenti in pressione del circuito oleodinamico.
VALVOLA DI MASSIMA PRESSIONE DEL CIRCUITO OLEODINAMICO PRINCIPALE
Sulla pompa oleodinamica è presente una valvola di massima pressione che serve a limitare la pressione massima del pompaggio e del movimento della valvola ad S.
VALVOLA DI MASSIMA PRESSIONE DEL CIRCUITO OLEODINAMICO AUSILIARIO
Sull' elettrodistributore è presente una valvola di massima pressione che serve a limitare la pressione massima del circuito ausiliario.
MANOMETRO PRESSIONE DEL CIRCUITO OLEODINAMICO PRINCIPALE
Il manometro è posto nella zona di comando e serve ad indicare all'operatore la pressione di esercizio del pompaggio e del movimento della valvola ad S.
MANOMETRO PRESSIONE DEL CIRCUITO OLEODINAMICO AUSILIARIO
Il manometro è posto nella zona di comando e serve ad indicare all'operatore la pressione di esercizio del circuito ausiliario.
PIEDINI DI STAZIONAMENTO
I piedini di stazionamento sono necessari per garantire una posizione stabile a macchina piazzata.

DO NOT UNDER ANY CIRCUMSTANCES TAMPER WITH, DISCONNECT AND/OR REMOVE ANY SAFETY DEVICES FROM THE MACHINE.

DO NOT UNDER ANY CIRCUMSTANCES REPLACE ANY SAFETY DEVICES OR PARTS OF A SAFETY DEVICE WITH NON-ORIGINAL SPARE PARTS.

CONSTANTLY CHECK THE PROPER OPERATION OF ALL THE SAFETY DEVICES INSTALLED ON THE MACHINE.

MALFUNCTIONING OR DAMAGED SAFETY DEVICES MUST BE REPLACED IMMEDIATELY.

6.2 SAFETY SIGNS

The safety signs are adhesive labels affixed outside and inside the machine.

The safety signs must be kept clean and clearly visible at all times.
E' obbligatorio sostituire la segnaletica di sicurezza deteriorata, facendone richiesta al fabbricante.
E' assolutamente vietato rimuovere o danneggiare la segnaletica di sicurezza applicata alla macchina.

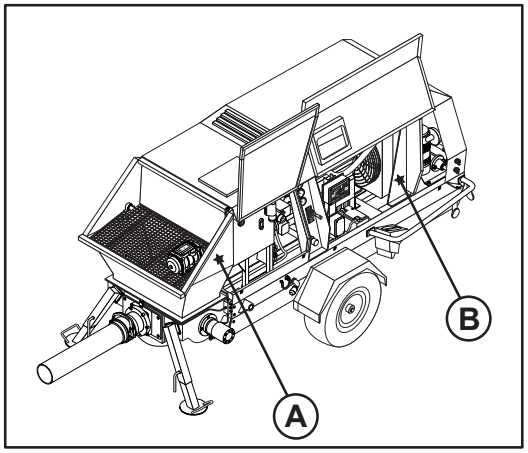

FIG.28

REF.	LABEL	DESCRIPTION
A		**Danger** Moving parts
B		**Danger** High temperatures

TAB.07

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6.3 PERSONAL PROTECTIVE EQUIPMENT

Wearing personal protective equipment is mandatory, in compliance with the workplace health and safety regulations in force in the country of use.
Employers, directors and operators must be acquainted with and enforce these regulations.

USING THE PROTECTION DEVICES INDICATED BY THE MANUFACTURER IS MANDATORY (TAB. 08).

MANDATORY SIGNS	DESCRIPTION
	IT IS MANDATORY TO PROTECT THE EYES..
	IT IS MANDATORY TO PROTECT HEARING.
	IT IS MANDATORY TO PROTECT THE HANDS.
	IT IS MANDATORY TO PROTECT THE FEET.

TAB. 08

6.4 RESIDUAL RISKS

Following the instructions and recommendations contained in this manual will allow you to use the machine correctly and reduce any residual risks.

IN PARTICULAR:
Read the operation and maintenance manual before starting the machine.
Operators on the machine and on the slurry delivery end must be trained to carry out their work following the instructions contained in this manual.
All maintenance must be carried out with the machine switched off.

PARTS UNDER PRESSURE::
Inspect the piping and make sure there are no signs of damage.
Make sure all the quick-release couplings and pipe joints are tight.
Make sure the vertical piping fasteners are securely fastened.
Do not open pipe fittings when the pipe is under pressure.

HOT PARTS:
Do not open the casing while the machine is running.
Do not touch the diesel engine silencer.

MOVING PARTS:
Do not open the casing while the machine is running.
Do not lift the hopper protection grid while the machine is running.
Do not introduce foreign matter through the grid.

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7.1 OPERATING PRINCIPLE

At the core of the BETON MASTER is the pumping assembly, consisting of: the lower hopper (FIG. 29-REF. 1), which containes the S-valve (FIG. 29-REF. 2), and the mixer (FIG. 29-REF. 3). Behind the hopper are two oil-hydraulic jacks (FIG. 29-REF. 4) that operate the S-valve; two pumping cylinders take in the concrete aspirated from the hopper. A rubber piston inside each pumping cylinder aspirates/pumps the concrete. The alternating motion of the rubber pistons is produced by two hydraulic cylinders (FIG. 29-REF. 6) controlled by a solenoid valve (FIG. 29-REF. 7); the valve is located above a hydraulic unit coupled to the bottom of the pistons. Above the hydraulic unit there is also the solenoid valve that controls the jacks (FIG. 29-REF. 8). Between the pumping cylinders and the hydraulic cylinders there is a small tank (FIG. 29-REF. 9) containing water for cooling and lubricating the pistons during their stroke.
The fresh concrete is poured into the hopper; the grid inside the hopper prevents the entrance of larger particles and is equipped with an electric vibrator to facilitate the passage of the concrete. The concrete is first aspirated from the hopper and then pumped towards the conveying pipes. The alternated sucking and pumping is governed by the S-valve, which puts the pumping cylinders in communication with the conveying pipe, alternately. The pumping is oil-hydraulically operated with a variable-displacement hydraulic pump. This type of pump makes it possible to change the concrete's flow rate through a manually-operated oil-hydraulic control.
Pumping is monitored by sensors that send their readings to the electronic control panel; the panel controls the pumping assembly's switching sequence.
There are four sensors: two control the jacks and are located next to them and two control the hydraulic cylinders and are located inside the tank. The pumping phase under way is indicated by a stylized image of the pumping assembly on the electronic control panel.
The electronic control panel controls the BETON MASTER's main functions, including selective access to the machine through a numeric code.
The machine can be equipped with an (optional) metering pump for adding a set accelerator. The metering pump is operated by the same hydraulic system and therefore its flow is always proportional to the flow of concrete. A number of settings must be entered to achieve the proper dosage (e.g., the additive's density).
Pumping can be started, stopped or reversed by the operator using a cable remote control (supplied) or a radio control (optional).

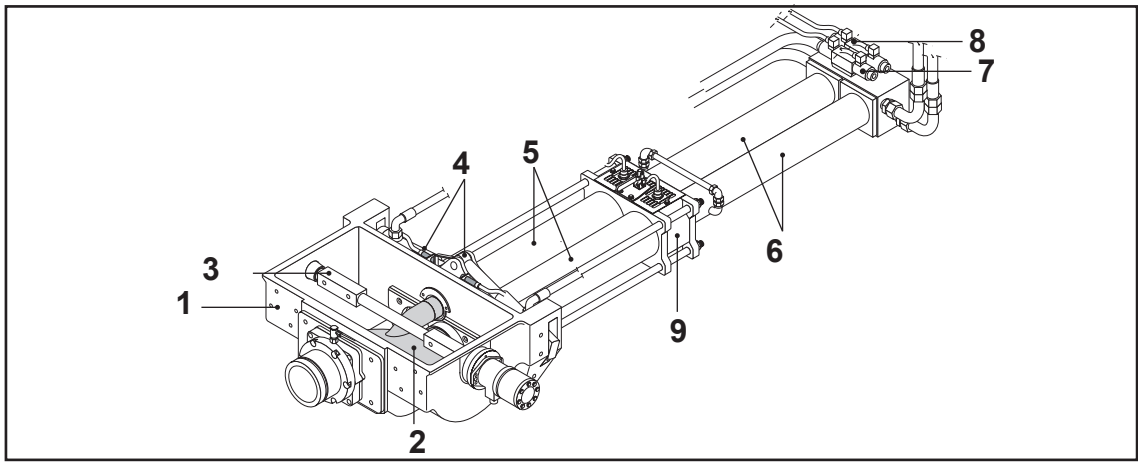

FIG. 29

7.2 PUMPABLE SLURRIES

BETON MASTER works with two kinds of slurries:
- Pumping: general-purpose concrete, normal or controlled-shrinkage micro-concrete, mortar for micropiles, common mortars, muds and bentonite.
- Spraying: micro-concrete (shotcrete) for lining and consolidating tunnels, slopes, embankments, swimming pools, canals.

All pumpable mixes can be reinforced with flexible or rigid fibres and sprayed together with set accelerators.
The composition of the concrete or shotcrete is based on supply agreements that do not depend on the machine.
In order to avoid problems during pumping, the following conditions must be respected:
- the maximum particle diameter should be between 1/3 and 1/4 the diameter of the hose;
- the grading envelope of the mix must be suitable for pumping;
- the sand's fineness modulus should be between 2.4 e 3;
- high slump values should be used to facilitate pumping of non-segregable mixes.

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7.3 CHECKS BEFORE START-UP

The oil level and the coolant level should be checked with the machine switched off.

- Check the level of the liquid inside the expansion vessel (FIG. 30-REF. 1) above the heat exchanger. To top up the liquid unscrew the cover (FIG. 30-REF. 2) on the machine casing above the tank.

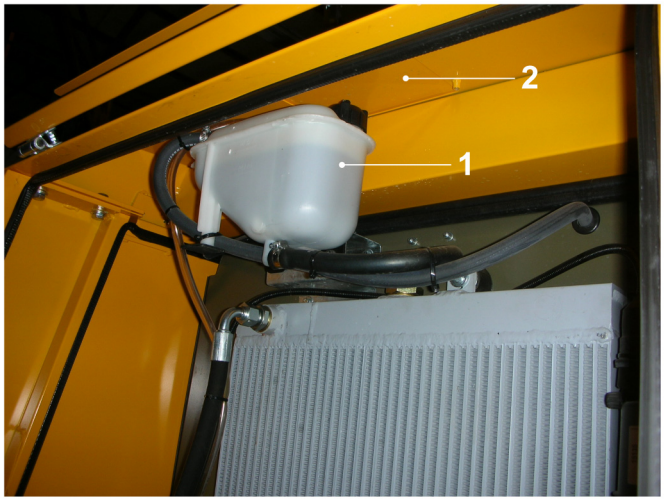

FIG. 30

- Check the motor oil level (FIG. 31-REF. 1); the level should be close to the maximum mark. The motor oil refilling cap (FIG. 31-REF. 2) is located on the cylinder head; to add oil unscrew the cover on the machine casing above the engine.

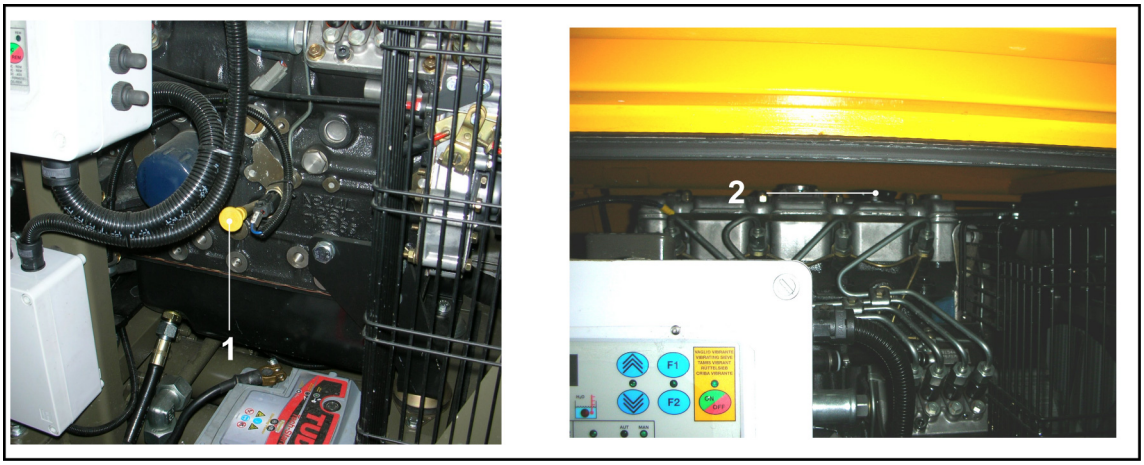

FIG. 31

- Check the hydraulic oil level through the inspection window (FIG. 32-REF. 1); as a rule, the oil level should reach the middle of the window (with the machine switched off and cooled down). The refilling cap (FIG. 32-REF. 2) is located above the tank. To add oil, unscrew the cover on the casing above the hydraulic oil tank.

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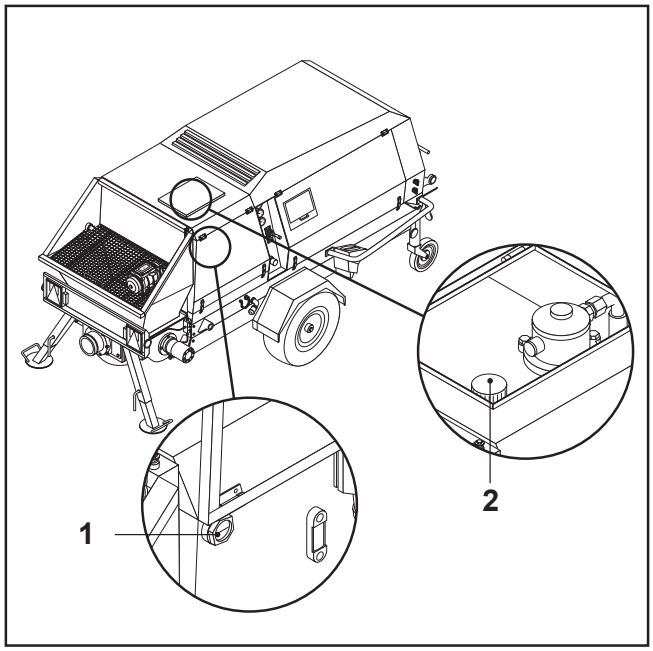

FIG.32

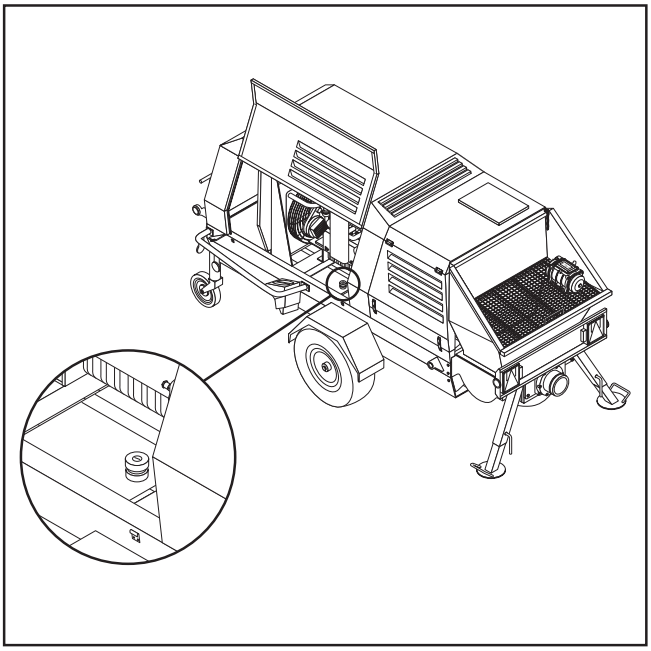

FIG.33

- Top up the diesel fuel tank (FIG. 33) at the end of every work session to avoid the forming of condensate inside the tank when the machine cools down.

- Make sure there is water inside the tank (FIG. 34-REF. 1).

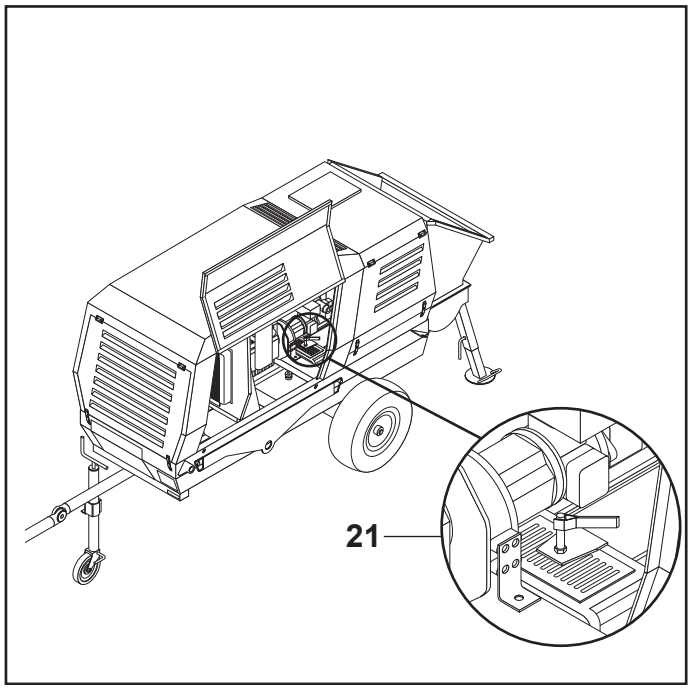

FIG. 34

The water in the tank may freeze at low temperatures. Add a small amount of liquid antifreeze to the water to prevent ice from forming inside the tank and in the parts close to it.

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7.4 CONTROLS

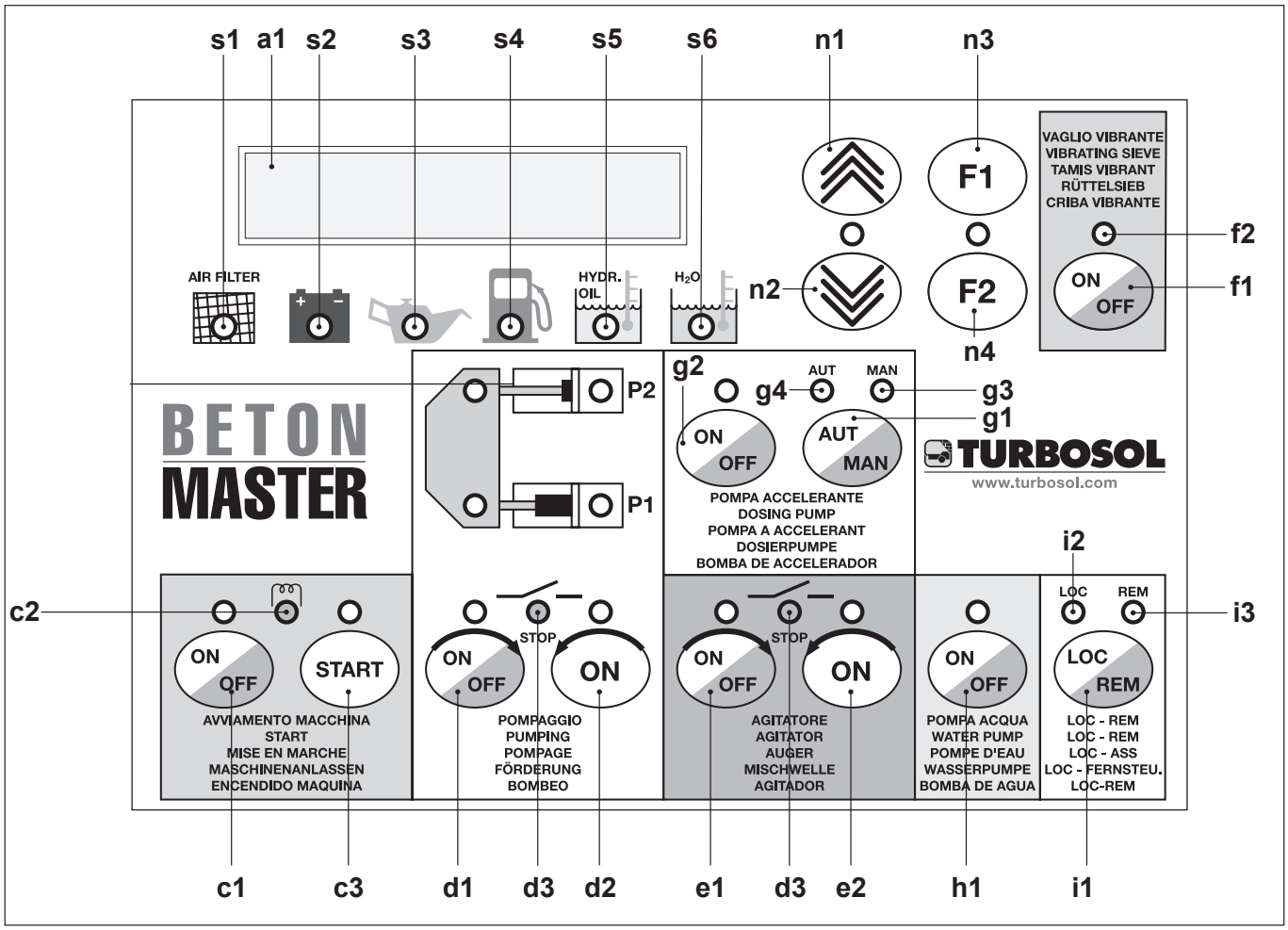

FIG. 35

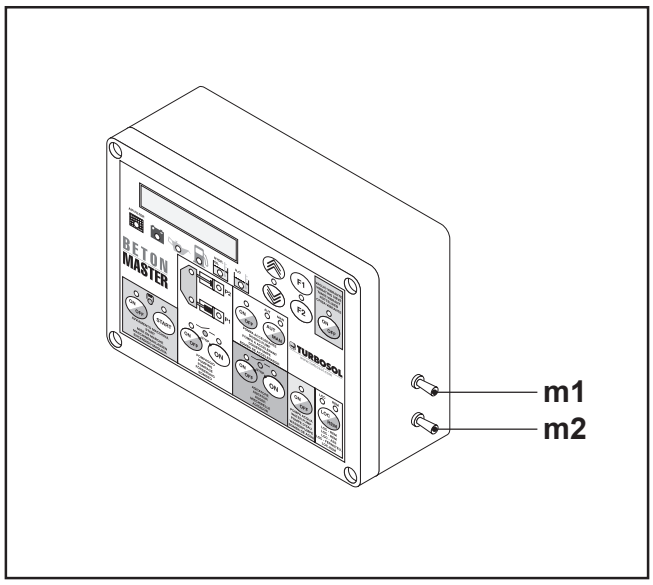

FIG.36

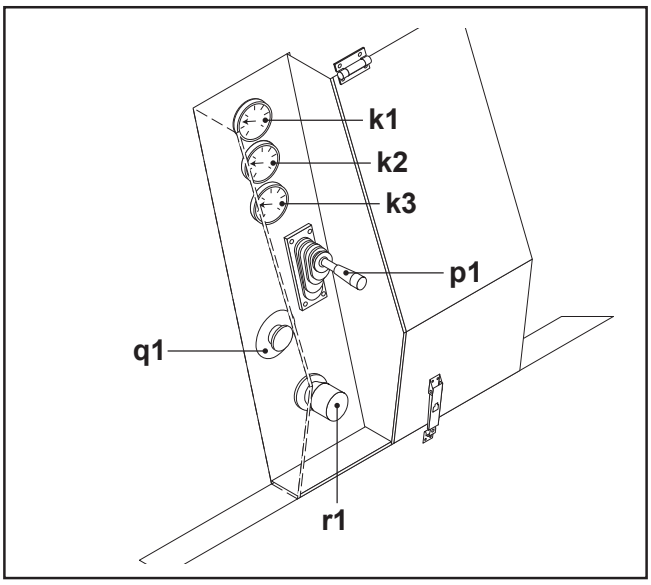

FIG.37

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FIG.	REF.	DESCRIPTION
35	a1	Display
35	c1	Machine switch-on/motor switch-off
35	c3	Motor start-up
35	d1	Pump start/stop
35	d2	Reverse pumping start/stop
35	e1	Mixer start/stop
35	e2	Mixer reverse
35	f1	Vibrating sieve start/stop
35	g1	Accelerator pump activation mode
35	g2	Accelerator pump start/stop
35	h1	High-pressure water jet start/stop
35	i1	Machine control mode
35	n1	Selector switch
35	n2	Selector switch
35	n3	Insertion confirmation
35	n4	Menu escape
36	m1	S-valve and pumping cylinders manual control
36	m2	Pumping cylinders and S-valve control
37	k1	High-pressure water pump manometers
37	k2	Pumping circuit manometer
37	k3	Auxiliary circuit manometer
37	p1	Accelerator
37	r1	Flow rate adjuster
37	q1	Emergency stop button

INDICATORS (on status)

FIG.	REF.	DESCRIPTION
35	c2	Spark plugs pre-heat
35	d3	Safety grid intervention
35	e3	Safety grid intervention
35	f2	Activate vibrating sieve
35	g3	Activate manual mode
35	g4	Activate automatic mode
35	i2	Local control mode active
35	i3	Remote control mode active
35	s1	Air filter blockage
35	s2	Alternator breakdown
35	s3	Insufficient motor oil pressure
35	s4	Reserve diesel tank
35	s5	High hydraulic oil temperature
35	s6	High motor refrigerant liquid temperature

TAB. 08

The control panel includes the following controls and indicators.

- Depending on the situation, the display (FIG. 35-REF. r1) shows:
  - machine operating time (hours-minutes-seconds);
  - battery voltage (state-of-charge check);
  - access code setting;
  - engine off alarm;
  - maintenance request.

- Alarms
The machine is provided with a number of sensors designed to indicate any malfunctions that might damage the machine.

- Machine start-up (c)
With buttons for enabling and disabling the controls
(ON/OFF), engine starter button (START) and a LED indicating the preheating of the glow plugs.

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- Pumping (d)
The left-side button (ON/OFF) starts and stops forward pumping, the right-side button (ON) reverses the pumping flow, and the light (STOP) indicates the opening of the safety grid in the hopper.
When the light is on, pumping is stopped.

- Mixer (e)
The left-side button (ON/OFF) starts and stops the mixer's forward operation.
The right-side button (ON) reverses the mixer's direction of rotation and maintains it as long as the button is held down; when the button is released the mixer resumes its normal direction of rotation.
The light (STOP) indicates that the safety grid in the hopper is open. When the light is on the mixer is stopped.

- Vibrating grid (f)
Button for switching on and off the vibrating grid.

- Accelerator pump (g)
Press (AUTO/MAN) to choose automatic or manual operation. The lights on the button indicate which operation mode is currently selected. In manual mode (MANUAL) the pump is started and stopped by pressing (ON/OFF).
In automatic mode (AUTOMATIC) the pump is enabled by pressing (ON/OFF) and then starts and stops automatically depending on the pumping.

- Water pump (h)
Button for starting and stopping the water pump (optional).

- Local/remote controls (i)
The button (LOC/REM) lets you choose whether to use the keyboard controls (local) or a remote device (radio control).

- Access code enable/disable buttons (n)
Use these buttons to enter the access code and to reset a maintenance request after servicing the machine.

- Air filter alarm (FIG. 35-REF. s1)
This alarm appears on the panel only. Clean or replace the filters.

- Battery charge alarm (FIG. 35-REF. s2)
Once this alarm goes off, the machine will continue to work for a maximum of 200 minutes (about 4 hours) so that you have time to finish the job under way. After this period no further work will be possible because the engine will automatically switch off after being started. Reset the battery charging system to prevent the battery from discharging completely.
(Request assistance from an authorized service centre).

- Motor oil pressure alarm (FIG. 35-REF. s3)
This alarm will automatically switch the engine off after a period of 1 to 100 seconds. Top up the oil level and look for any leaks.

- Diesel fuel level alarm (FIG. 35-REF. s4)
This alarm is set off when the diesel fuel tank level drops below the minimum.
The engine will switch off automatically after 10 minutes.
You can restart the engine but you will risk burning all the remaining fuel and having trouble starting the engine again, even after refuelling.

- Hydraulic oil temperature alarm (FIG. 35-REF. s5)
This alarm will automatically stop the pumping.
The machine will keep running to allow the oil to cool.

- Engine coolant temperature alarm (FIG. 35-REF. s6)
This alarm will automatically switch the engine off after a period of 1 to 100 seconds.

When the engine is switched off because of an alarm the situation will be shown on the display as follows:

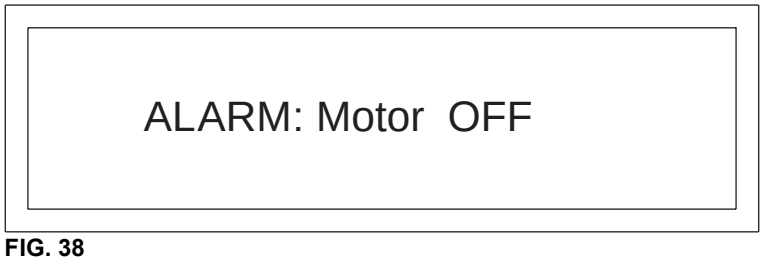

FIG. 38

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The engine is switched off by the diesel fuel solenoid valve, while all other functions remain active. You can then identify and remove the cause of the engine's stopping. Press ON/OFF to return to the initial screen.

Enabling/disabling the activation code
The access code can be disabled, and then enabled, by the operator directly.
The operator shall be responsible for any consequences arising from disabling the access code, e.g. the machine being used by any other user.
To enable/disable the code proceed as follows:
- Enter the access code to access the operations section. The display will appear as follows:

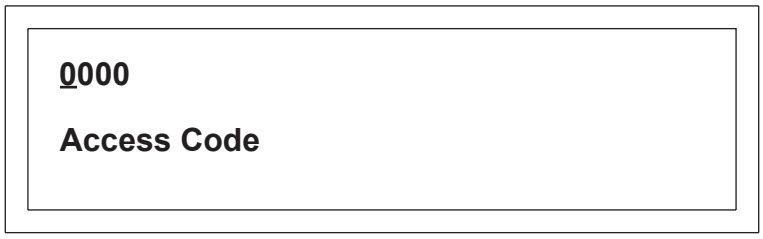

FIG. 39

- Press F1.
- The display will show a window where you can enable/disable the access code.

Press (n1-n2) in that order. To enable/disable the access code:
0 = access code disabled
1 = access code enabled
Press F2 to save the changes and exit.

7.5 STARTING THE MACHINE

- Prepare an adequate amount of slurry (water and cement):
  - pumping up to 20 metres - 40/50 litres
  - pumping over 20 metres - 50/80 litres

- Make sure the emergency button (q1) has not been pressed.
- Press ON/OFF (c1) to start the machine.
- Enter the 4-digit access code (supplied together with the machine) to start using BETON MASTER. Once a correct access code has been entered it will remain valid for about 3 hours after the last time the machine is used. To enter the code (example: 5678) proceed as follows:
• Enter the first number (5) using the buttons (n1) and (n2).
• Press (n1) to increase the value of the number highlighted by the cursor; press (n2) to decrease the value of the number highlighted by the cursor.
• Press (n3) to store the number; the cursor will move to the next number on the right.
• Repeat these steps for all the remaining numbers.
• After entering the last number the system will automatically verify the access code.

If you entered a wrong access code the system will revert to the start and you will have to enter the code again.
• If you entered the right access code the system will proceed to the next step, i.e. preheating the glow plugs and starting the engine.

Preheating begins automatically after entering the access code. The LED (c2) on the panel will light up, meaning the glow plugs are being heated. Wait until the LED turns off. To exit this step and go back press ON/OFF (c1). This step is set to last 11 seconds regardless of the environmental conditions. Once preheating is finished you can start the engine. The display will show the following:

FIG. 40

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The battery voltage appears at the top of the display so that you can check the state of charge. To start the machine press and hold the START button (c3) until the engine turns on. The display will show the following:

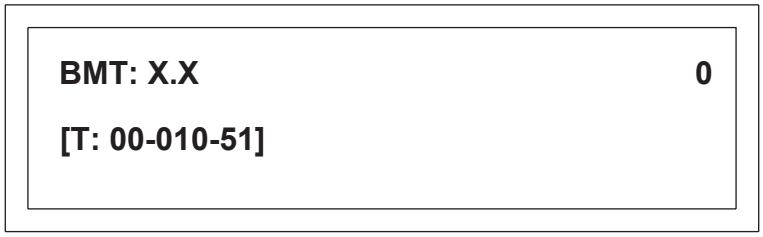

FIG. 41

When pumping is under way, the flow-rate index (number of pumpings per minute) is shown in the top right corner. This index provides important information in case of malfunctions.
The partial running time of the work session under way appears at the lower left of the display.

- Pour the slurry into the hopper.
- Press ON/OFF (e1) to start the mixer. The mixer's direction of rotation can be reversed. To do so, press and hold ON (e2) with the ON/OFF button ON; when you release the button the mixer will resume its normal direction of rotation.

Before starting the pumping, be sure that, in the zone of unloading of the material, this operation doesn't create danger or surprise.

- Slide (slightly) the manual throttle (57) to full scale to speed up the engine and press ON/OFF (d1) to start pumping, if necessary move again the manual throttle.
Press (d2) to aspirate the mix: the mix will be aspirated from the piping and returned to the hopper. This feature is useful when you need to depressurize the piping, e.g.,. in case of clogging. Press d2 again to resume pumping.
- Turn the handwheel (26) on the hydraulic pump until the rate is about 6 - 10 pumpings per minute (shown in the top right corner of the display on the control panel).
- If the (e3) and (d3) STOP lights turn on it means that the safety grid on the hopper is open and the safety device on the grid has interrupted the hydraulic power supply and disabled the controls. Close the grid and press (d1) ON/OFF to resume pumping.

During the first pumping cycles the operator should check the pressure gauge (k2) to properly assess the ratio between the actual working pressure and the maximum pressure.
The actual working pressure (of the oil in the hydraulic circuit) should be less than 190 bar and change according to the mix being used and to the piping layout. During pumping, the pressure gauge (k2) shows the operating pressure of the hydraulic cylinders. When the S-valve switches, the pressure gauge shows the operating pressure of the hydraulic jacks (which control the S-valve); when the jacks reach the end of the stroke the pressure gauge shows a brief pressure peak.

- When the wear plate and/or the openings of the pumping tubes appear inside the hopper full of slurry, pour the concrete and start pumping at a low rate.
- Press ON/OFF (f1) to start the grid vibrator. The light (f2) turns on when the electric vibrator is running.

When the concrete starts to come out of the pipe turn the handwheel (r1) to increase the flow rate as desired.
The pressure gauge (k3) shows the pressure of the mixer's hydraulic pump, which should be lower than 180 bar; if the pressure gauge shows 180 bar check the hopper and make sure there is nothing inside that is obstructing the mixer.

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Remote controls
If you are using the cable remote control, plug the cable into the connector socket on the machine's casing (see par. 5.4.2).
The LOCAL/REMOTE button lets you choose whether to use the pumping controls on the control panel (i1) (local) or on a remote device (i2), i.e., a remote control (supplied) or a radio control (optional). The corresponding LEDs above the button (i1)-(i2) will light up.
When using the cable remote control, turn the selector (FIG. 42-REF. 1) to 1 to start pumping, to 0 to stop pumping and to 2 to reverse pumping.
If the machine is equipped with a radio control, connect it to the connector socket (see par. 5.4.5).

If the machine remains idle for more than 15 minutes it will automatically go on standby. The liquid crystal display and all the LEDs will switch off to minimize energy consumption. Press any button on the control panel to exit standby mode.

7.5.1 Accelerator pump

The machine can be equipped with a metering pump for adding set accelerators. The metering pump is operated by the same hydraulic system and synchronized with the pumping pistons. Hence, the flow rate is always proportional to the settings made.
Press AUTO/MAN (g1) to choose automatic or manual operation. The lights AUT (g4) and MAN (g3) indicate which operation mode is currently selected.
In MANUAL mode the pump is started and stopped by pressing ON/OFF (g2) and does not depend on the pumping of concrete. This feature is meant to be used mainly for priming the pump and for cleaning.
In AUTOMATIC mode the pump is enabled by pressing ON/OFF (g2) and then starts and stops automatically depending on the pumping.

If an accelerator pump is present, the display will show the following screen when you start the machine:

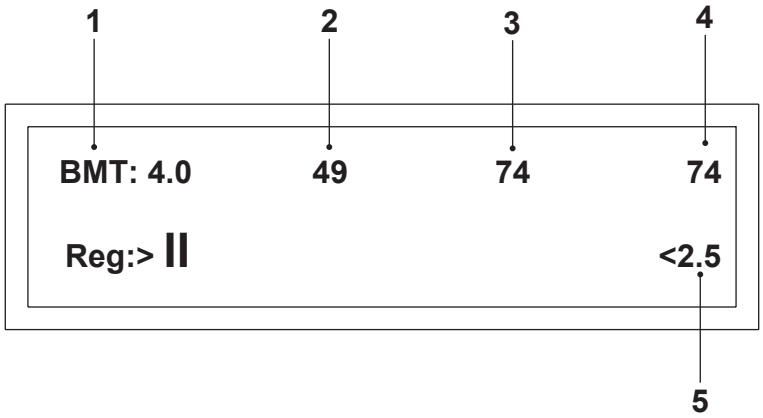

FIG. 43

FIG. 43-REF. 1: Software version
FIG. 43-REF. 2: Flow-rate index
FIG. 43-REF. 3: Revolutions of accelerator pump (theoretical)
FIG. 43-REF. 4: Revolutions of accelerator pump (actual)
FIG. 43-REF. 5: Predetermined percentage of accelerator

To allow the machine to accurately dose the accelerator, set the following data on the control panel:
- P07 Wc = kilos of cement dosed per each cubic metre of concrete.
- P08 Density = density of accelerator (typically 1.4 kg/l for silicate additives and 1.365 kg/l for alkali-free additives; in any event always check the information provided by the manufacturer).

To set these parameters proceed as follows:
- Press ON/OFF (c1) to start preheating the glow plugs and, during heating, press (n3).

The following screen will appear:

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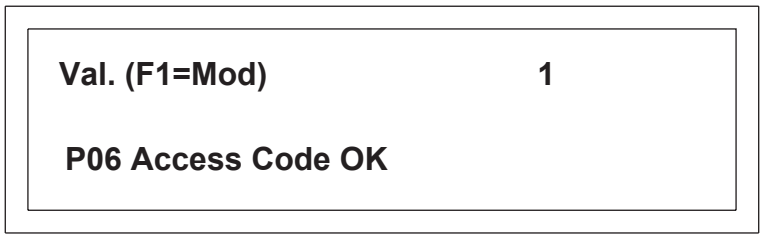

FIG. 44

- Press (n1) to go to the next parameter, P07: The following screen will appear:

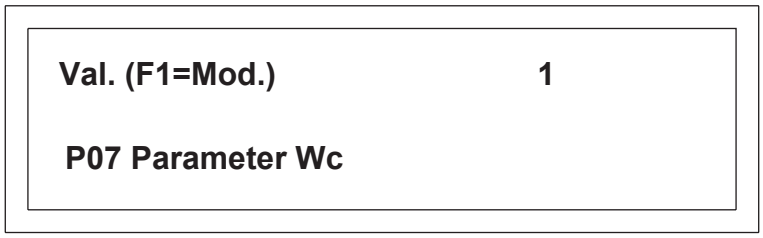

FIG. 45

- Press F1 (n3) to edit the number of kilos of cement. The screen will change as follows:
[Note: 50 means 500 kg of cement per cubic metre of concrete; the value may vary between 30 (= 300 kg/m3) and 70 (= 700 kg/m3)]

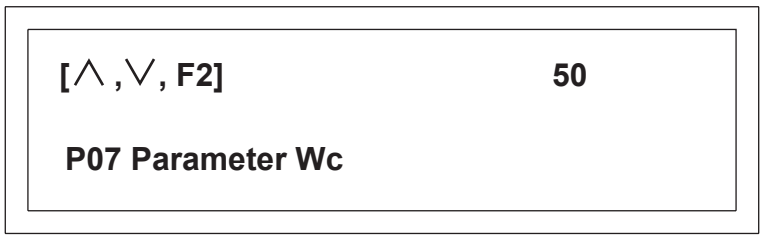

FIG. 46

- Press (n1) and (n2) to edit the value. Press (n1) to increase the value of the number highlighted by the cursor. Press (n2) to decrease the value of the number highlighted by the cursor.
Press F2 (n4) to exit the screen.
- Press (n1) to go to the next parameter, P08. Press F1 (n3) to edit the density of the accelerator. The screen will change as follows:
Example: 140 indicates a density of 1.4 kg/l (the value may vary between a minimum of 130 (1.3 kg/l) and a maximum of 150 (1.5 kg/l).

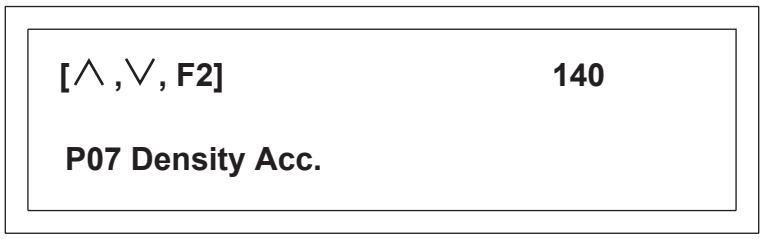

FIG. 47

- Press (n1) and (n2) to enter the desired value. Press (n1) to increase the value of the number highlighted by the cursor. Press (n2) to decrease the value of the number highlighted by the cursor.
- Press F2 (n4) to exit the screen.

In case of a failure in an electric or electronic component you can manually set the accelerator flow-rate by unplugging the connector (FIG. 48-REF. 1) from the solenoid valve and turning the knob (FIG. 48-REF. 2) on the solenoid valve. However, in this case the flow rate will not be synchronized with the variations in the concrete's flow rate.

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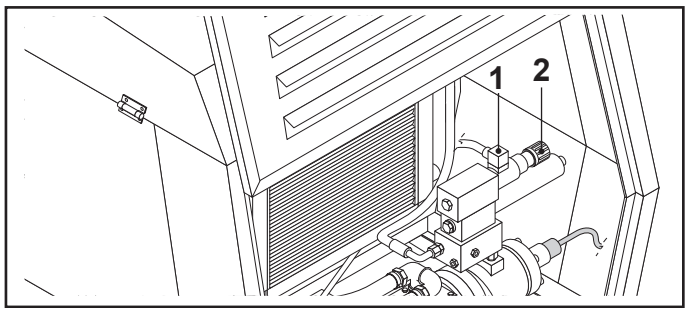

FIG. 48

7.6 CLEANING THE MACHINE AFTER A WORK SESSION

The following operations should be carried out only by specifically trained personnel. In particular, before breaking a joint make sure there is no residual pressure inside the piping and that no one is standing nearby. This operation is potentially dangerous and should always be performed with caution and by qualified personnel only.

For safety reasons, no one should be allowed to stand close to the hoses during cleaning operations.

When pumping is finished stop the mixer (FIG. 35-REF. e1), the pumping assembly (d1) and the electric grid vibrator (FIG. 35-REF. f1) by pressing the respective ON/OFF buttons. Also stop the accelerator pump, if present, by pressing its ON/OFF button (g2).

- Before disconnecting the pipes, press (d2) to reverse the direction of pumping. Carry out 4-8 pumpings in reverse to depressurize the piping, especially the sections near the front delivery flange.
- Disconnect the pipes from the front delivery flange.

- Open the hopper discharge chute (FIG. 50-REF. 1) to discharge the remaining slurry and then wash down the inside of the hopper with water.
- Introduce the water hose into the delivery conduit (FIG. 50-REF. 2) for about 15-20 centimetres, start pumping in reverse (button (d1)) and draw the water out of the S-valve. Continue until you see only clear water coming out of the hopper.

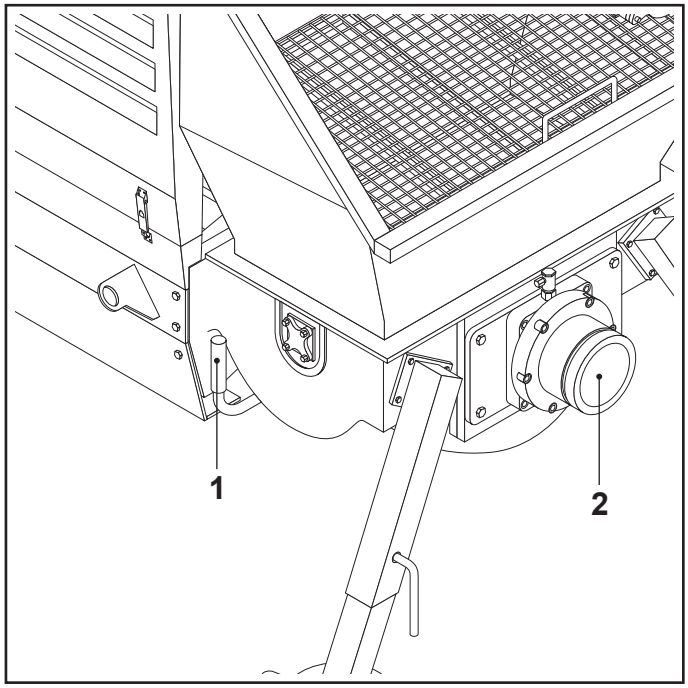

FIG. 50

- Press ON/OFF (d1) to stop pumping and close the discharge chute.
- Let the diesel engine idle for 2-3 minutes, then press ON/OFF button (c1) to stop the engine.
- Make sure no residues of concrete remain inside the hopper, the S-valve and the front delivery flange.

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- Lubricate the hopper walls and the S-valve with oil or other lubricants. This will reduce the chances of deposits forming inside the hopper after the next work session.
- We recommend covering the hopper with a piece of material to prevent foreign matter from falling inside.

The machine can be equipped with a high-pressure water-jet cleaner (optional).

Use the high-pressure cleaner as follows:
- Connect the water supply hose to the coupling on the machine. The water mains should be able to supply at least 10 l/min.
If you are drawing water from a container, make sure that:
  - the water is clean
  - the drawing point is at least 50 cm above the coupling (FIG. 51-REF. 1)
  - the pump has been primed beforehand
- Connect the nozzle together with its delivery hose to the coupling (FIG. 51-REF. 2).
- Press ON (FIG. 35-REF. h1) on the control panel to start the water pump. The pressure gauge (FIG. 37-REF. k1) shows the pressure in the water-jet cleaner (i.e., 100-120 bar).
- Make sure the mixer's control button (FIG. 35-REF. c1) is OFF when using the water pump.
- Proceed to wash.

Never direct the water jet at people. Wear appropriate protection, in particular for your hands and eyes. Do not direct the water jet at electric or hydraulic components.

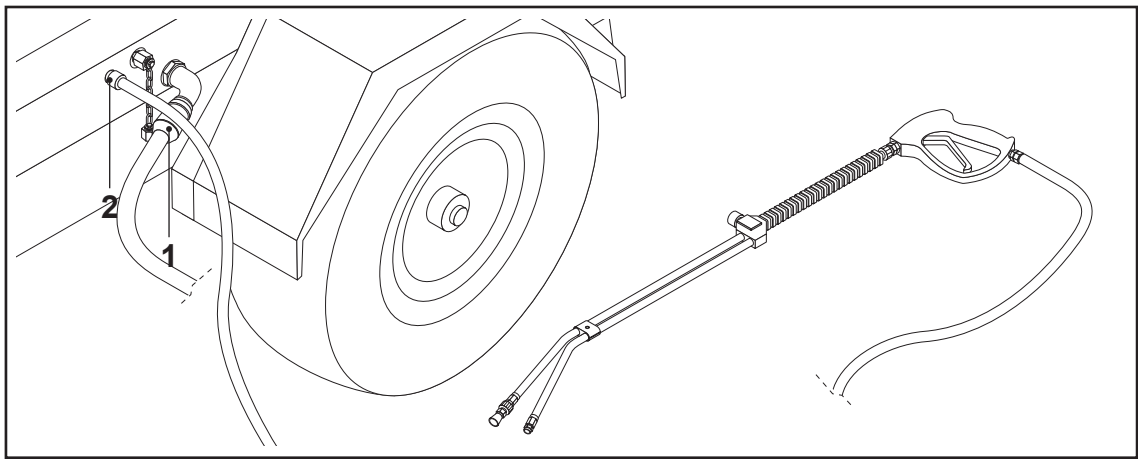

FIG. 51

7.6.1 Washing the piping

The pipes and hoses can be washed in three different ways:
1) by flushing with water under pressure
2) by flushing with compressed air
3) by reverse pumping (vertical piping only)

Note that:
- Flushing with water or compressed air lets you use all the concrete produced since it is expelled onto the place of application.
- With reverse pumping the slurry inside the piping is brought back to the hopper. Bear in mind that the hopper's capacity will let you recover about 200 litres of slurry.

- Flushing with water

- Soak a pipe sponge (FIG. 52-REF. 1) and put it inside the pipe.
- Connect the pipe to the machine and open the gate valve if present.
- Connect the basket (FIG. 52-REF. 2) designed to catch the sponge to the end of the hose using a Victaulic coupling complete with rubber gasket.
- Fill the hopper with water and start pumping.

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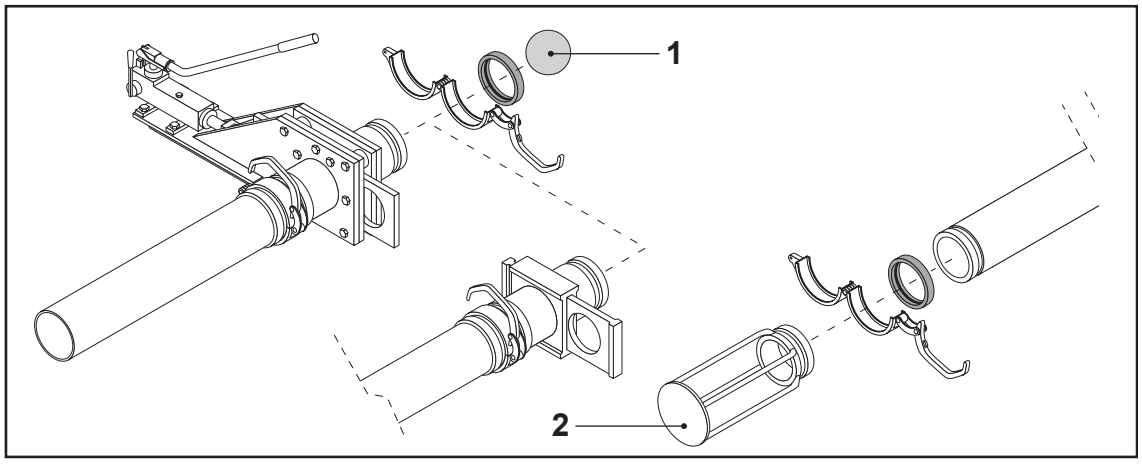

FIG. 52

The sponge will be violently expelled from the hose. Make sure the hose is pointing in a direction where there is no risk of harming anyone or damaging anything. If the piping is encrusted the sponge will not be expelled. In this case, reverse the direction of pumping to reduce the pressure inside the piping and stop the machine.

In case the pipes are found to be clogged when flushing, follow the instructions in paragraph 7.7.

- Flushing with compressed air

- Connect the basket (FIG. 53-REF. 1) designed to catch the sponge to the end of the hose using a Victaulic coupling complete with rubber gasket.
- At the other end, introduce an adequately-sized pipe sponge (FIG. 53-REF. 2) soaked in water, connect the flushing cap supplied (FIG. 53-REF. 3) and make sure it is well fastened.
- Close the valve (FIG. 53-REF. 4).
- Connect the compressed-air hose (FIG. 53-REF. 5) from the compressor to the quick-release coupling (FIG. 53-REF. 6) on the flushing cap.
- Start the air compressor, open the valve (FIG. 53-REF. 4), pressurize the piping for a few seconds and then close the valve. The slurry will begin to flow out and the pressure shown on the pressure gauge will begin to fall.
- Open the valve again and adjust it so that the air pressure stays at a level sufficient to push the slurry out.

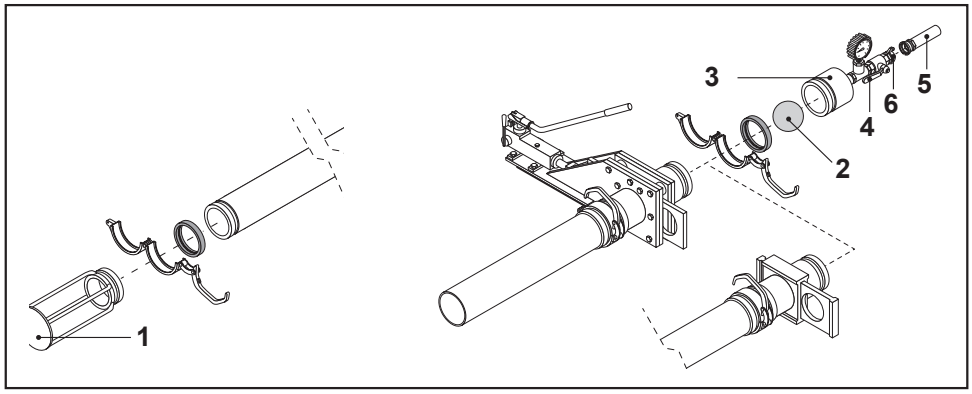

FIG. 53

Before you loosen any joint on the slurry delivery hose, make sure that the valve with the safety lever is open, that the pressure gauge shows a pressure of zero bar and that there is no residual pressure inside the piping.

The sponge will be violently expelled from the hose. Make sure the hose is pointing in a direction where there is no risk of harming anyone or damaging anything.

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In case the pipes are found to be clogged during flushing, follow the instructions in paragraph 7.7. Be sure to discharge the pressure before you open any coupling:

- close the valve (FIG. 53-REF. 4)

- close the compressed-air hose valve

- disconnect the compressed-air hose from the coupling (FIG. 53-REF. 6)

- open the valve (FIG. 53-REF. 4)

- Cleaning by reverse pumping

If the pumping line is vertical, introduce the rubber sponge into the delivery hose, press ON/OFF (d1) to start pumping and press and hold the ON (d2) button to reverse the direction of pumping. The concrete will be drawn back into the hopper.

Note: Each metre of Ø 100 mm piping can contain approximately 8 litres of slurry, and each metre of Ø 75 mm piping can contain approximately 4.5 litres.

If the piping is relatively long the cement may overflow from the hopper.

7.7 IMPORTANT WARNING

The following operations should be carried out only by specifically trained personnel. In particular, before breaking a joint make sure there is no residual pressure inside the piping and that no one is standing nearby. This operation is potentially dangerous and should always be performed with caution and by qualified personnel only.

In case of clogging, the pressure gauge (FIG. 37-REF. k2) will show a pressure above 150 bar and pumping will be stopped.
If this occurs, press the button (FIG. 35-REF. d2) to reverse the pumping and carry out 4-8 pumping cycles. The level of the slurry inside the hopper will rise.
You can now proceed to remove the clogging.

Clogging usually occurs inside and close to the couplings.

Clogging in steel pipes

- To locate a clogging, strike the pipe with an iron hammer and listen to the sound it makes:
a metallic sound means the pipe is clear, while a dull sound indicates a clogged pipe.
- Detach the piping between the clogging and the front delivery flange (FIG. 55-REF. 1).
- Disconnect the steel pipe downstream from the clogging. Once you have separated it from the line, hold the clogged section vertically and clean it out.

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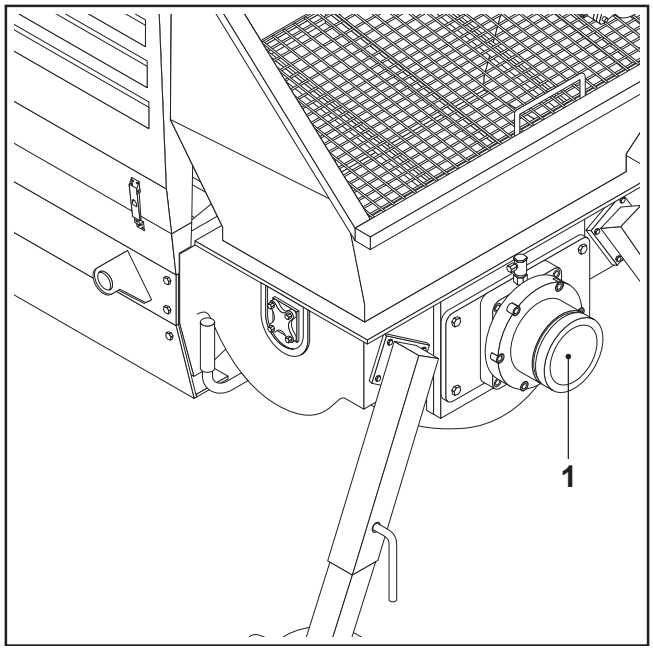

FIG.55

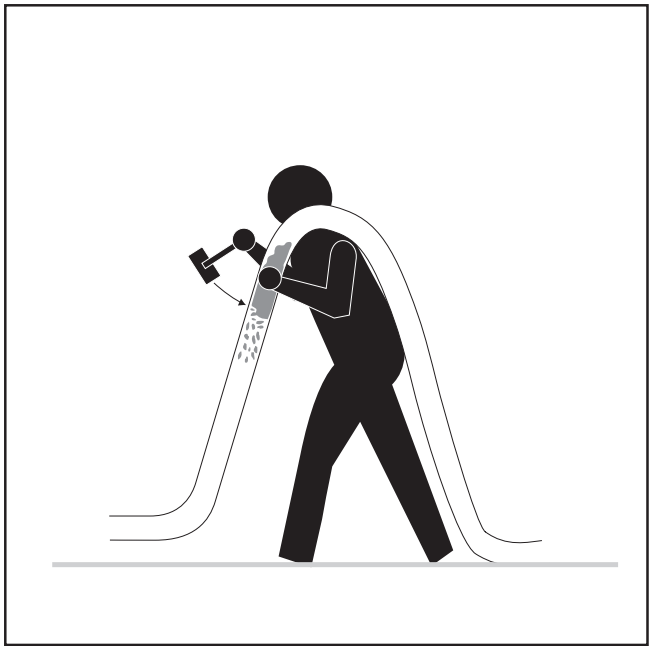

FIG.56

Clogging in rubber hoses

- An empty hose will yield when stepped upon, whereas a clogged tube will be stiff and unyielding.
- Detach the piping upstream from the clogged hose.
- Strike the hose with a hammer (FIG. 56) to break the obstruction and discharge the pressure downstream.
- Disconnect the hose downstream from the clogging. Once you have separated it from the line, hold the clogged section vertically (resting it on your shoulder) to clean it out.

EMERGENCY STOP

Use the emergency button (FIG. 42-REF. 1) only when you must stop the machine for an emergency. Do not use it to stop the machine when no emergency is under way. Repeated, unjustified use of the emergency button may damage the machine.

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8.1 MAINTENANCE TO BE CARRIED OUT BY OPERATOR

The following are the basic instructions for performing proper maintenance on the machine. More detailed information can be found in the diesel engine operation and maintenance manual (supplied), which operators are required to read and understand (along with the present manual) before using the machine.

- Checking the lubrication water level

- Open the discharge lever (FIG. 57-REF. 1) to empty the tank.
- If the water in the tank is not clear but grey and thick, it means that slurry is seeping out from between the piston and the pumping tube. If this occurs, replace the pistons.
- Turn the lever (FIG. 57-REF. 1) to its horizontal position to close the tank.
- Fill the tank by pouring water through the slots until overflowing.

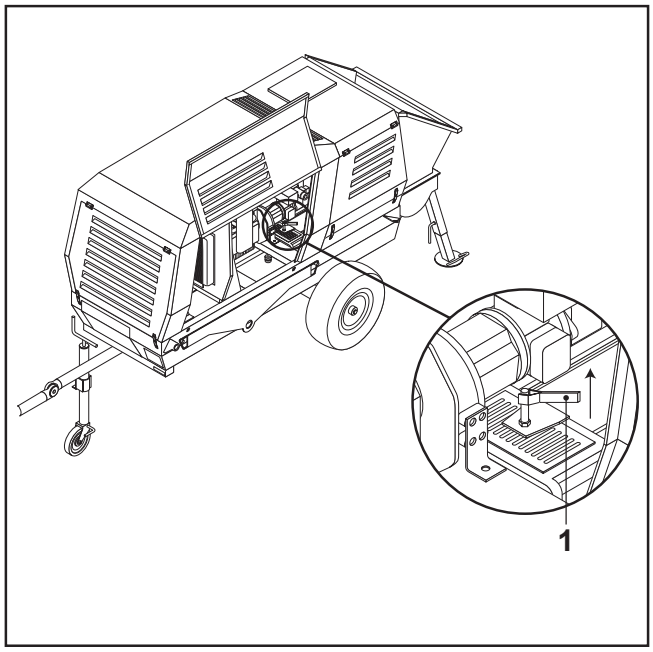

FIG.57

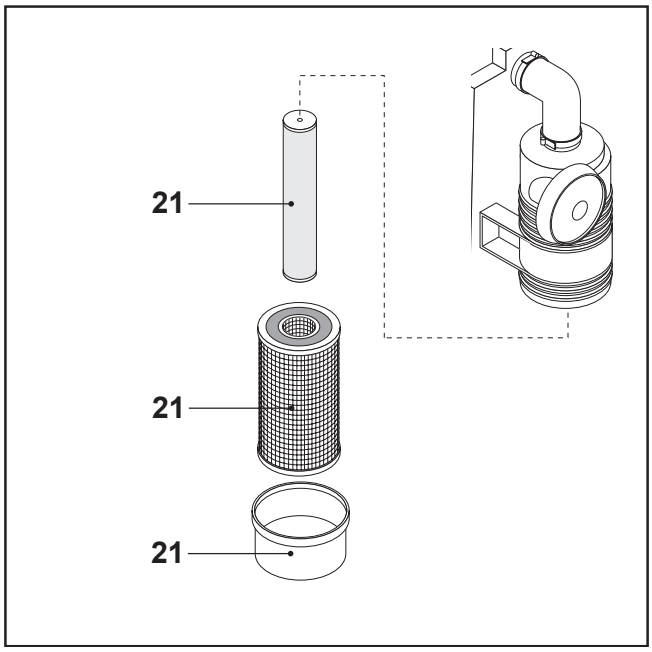

FIG.58

The lubrication water should be changed completely at least once a week, or preferably after every work session.

When working in a cold climate, empty the tank at the end of every work session or add antifreeze.

- Checking the engine coolant level

Check the level of the engine coolant and top up if necessary (see paragraph 7.3).

- Checking the motor oil

Check the motor oil level using the dipstick. The level should be near the top mark but never above.
For topping up, use: TOTAL RUBIA TIR 7400 or an equivalent oil.

- Checking the engine air filter

The engine air filter contains two filter cartridges (1st and 2nd stage). To inspect the filter snap off the cover (FIG. 58-REF. 1) and remove the 1st stage cartridge (FIG. 58-REF. 2) and the 2nd stage cartridge (FIG. 58-REF. 3). Lightly tap the filter element of the 1st stage cartridge on a hard surface a few times to shake off any excess dirt. Do not blow the paper filter element with compressed air. The 2nd stage cartridge can be cleaned a few times with compressed air but not washed with water. Accurately clean the cover and the filter mount.

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- Checking the diesel fuel level

Check the diesel fuel level.
Top up the diesel fuel tank at the end of every work session to avoid the forming of condensate inside the tank when the machine cools down.

- Checking the hydraulic oil level

Check the level of the oil in the hydraulic oil tank through the inspection window (FIG. 59-REF. 1).
If the oil level does not remain constant there may be a leak that must be found and stopped; this should be done by qualified personnel.
Top up the oil through the cap (FIG. 59-REF. 2).
Use ELF OLNA DS46 hydraulic oil.

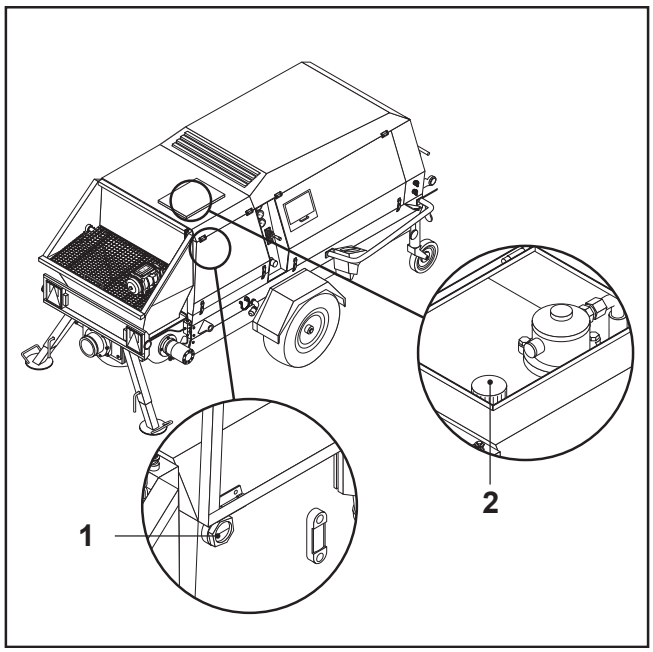

FIG.59

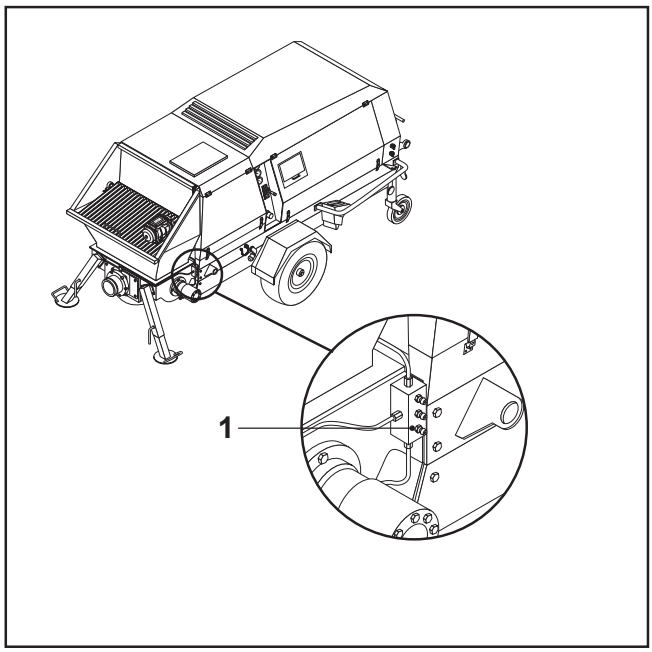

FIG.60

- At the end of a work session

- After a work session and after cleaning the machine, we recommend spraying it with a liquid that can prevent the forming of deposits.
- Using the grease pump supplied, lubricate the three greasing points (FIG. 60-REF. 1) on the mixer support and the S-valve mount.
- Lubricate the switching jacks.

- If the machine is equipped with a set-accelerator metering pump lubricate the point (FIG. 61-REF. 1).

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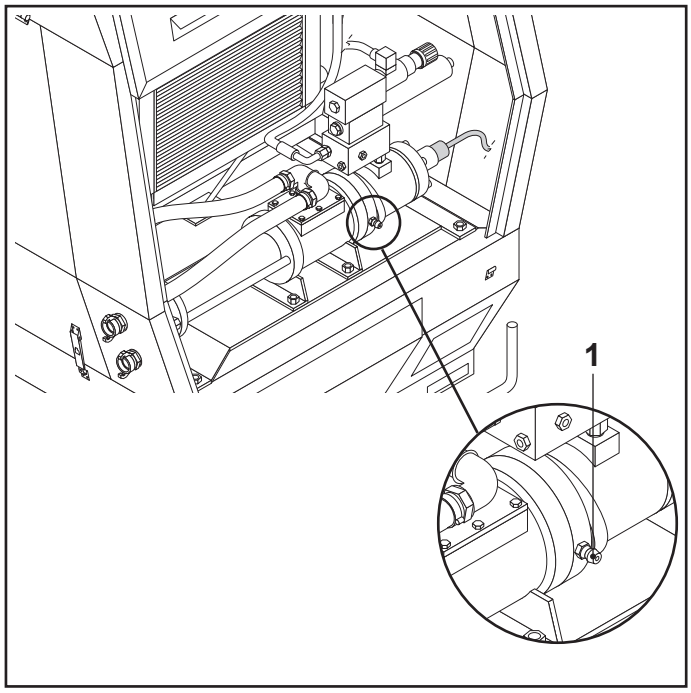

FIG. 61

8.2 REPLACING THE PUMPING PISTONS

Replace the pumping pistons when the lubrication water in the tank appears cloudy and contains coarse grains.

Prepare the tools supplied:
- 32 mm wrench (FIG. 62-REF. 1)
- M20 (FIG. 62-REF. 2) and M16 (FIG. 62-REF. 3) threaded rods
- M20 (FIG. 62-REF. 4) and M16 (FIG. 62-REF. 5) nuts
- piston guide ring (FIG. 62-REF. 6)
- guide spacer (FIG. 62-REF. 7)
- two rod spacers (FIG. 62-REF. 8)
- flange for removing piston (FIG. 62-REF. 9)
- two pistons (FIG. 62-REF. 10)

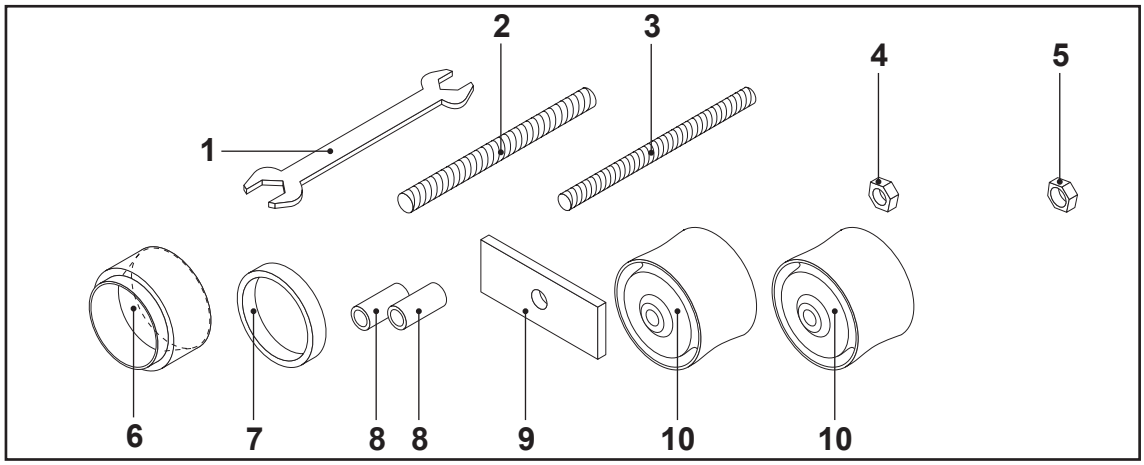

FIG. 62

- Empty the water tank.
- Start the machine, and with the engine idling, turn the handwheel (r1) to set the flow of the hydraulic pump at minimum.
- Press the reverse flow button ON (d2),
- Watch the hopper and when one of the pistons reaches the end of its stroke lift the safety grid to stop the pumping.
- Stop the machine.

The following steps must be carried out with the machine switched off.

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To facilitate operations we recommend removing the upper hopper by unscrewing its four fastening screws. Be sure to remove the hopper safety sensor too.

- Remove the screw (FIG. 63-REF. 1) on the piston head.

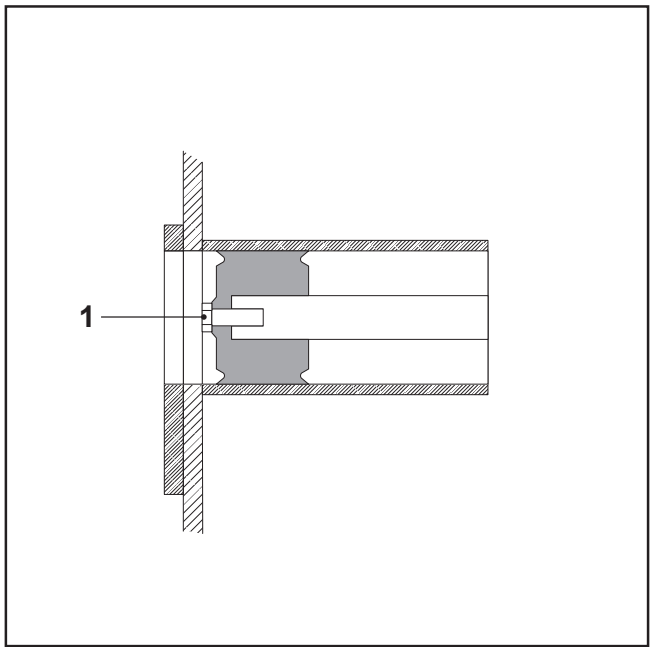

FIG.63

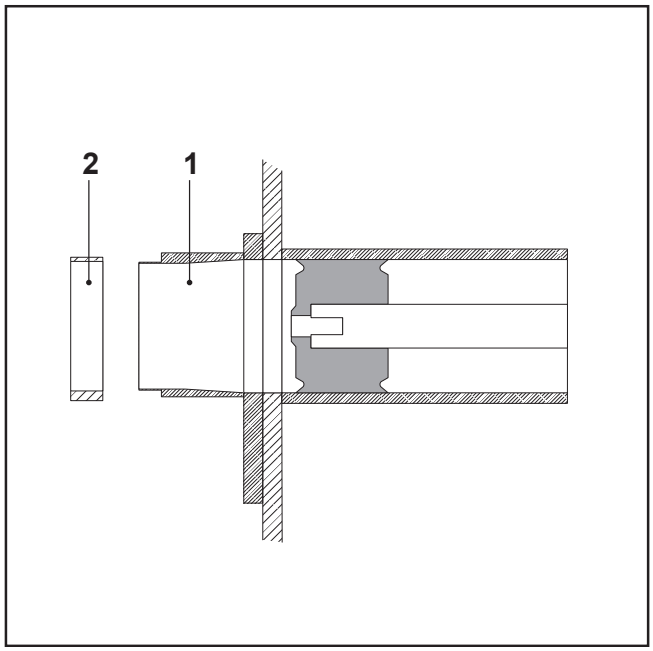

FIG.64

- Slip on the guide ring (FIG. 64-REF. 1) applying the tapered part on the wear plate.
- Holding the guide ring against the liner, slip the spacer (FIG. 64-REF. 2) on to the guide ring.
- Mount the flange for removing the piston (FIG. 65-REF. 1).

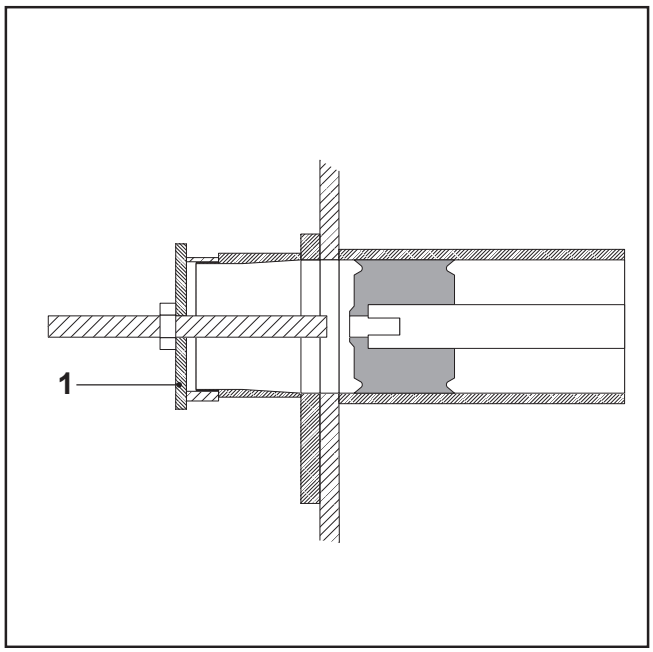

FIG.65

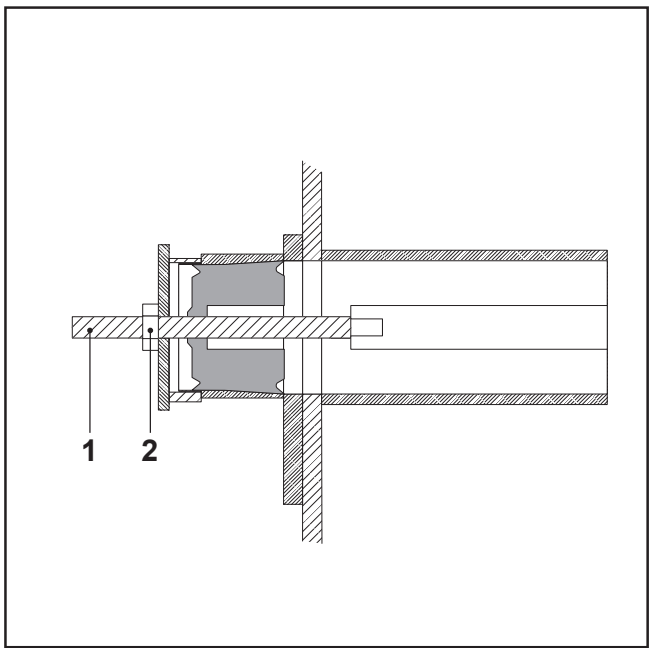

FIG.66

- Screw the M20 threaded rod (FIG. 66-REF. 1) onto the piston head, screw on the nut (FIG. 66-REF. 2) and pull out the piston.
- Remove the piston with the guide ring (FIG. 67).

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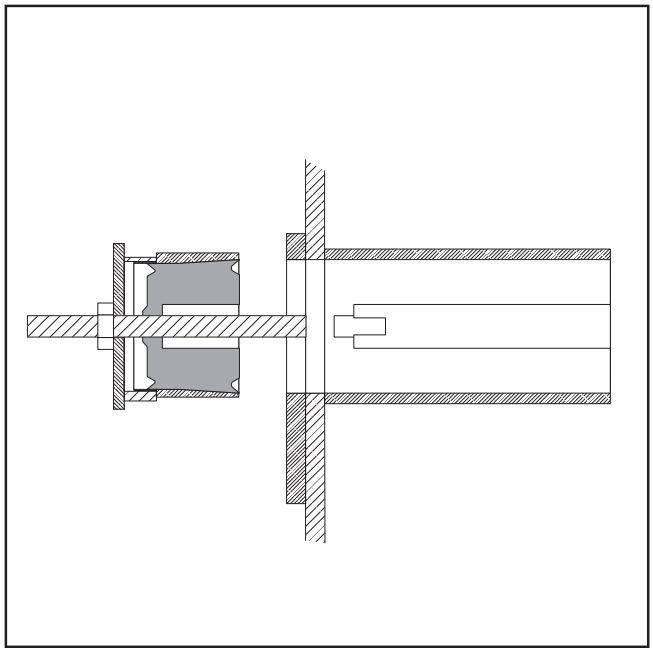

FIG.67

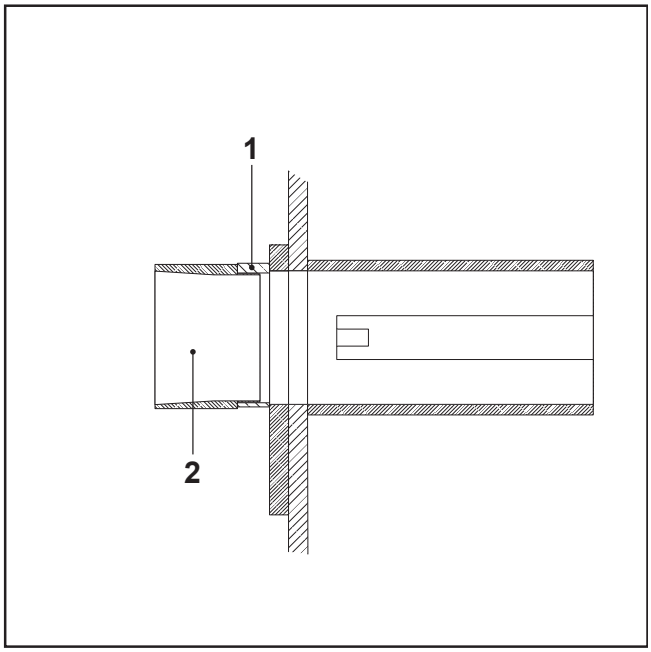

FIG.68

To install a new piston proceed as follows:
- Slide the guide spacer (FIG. 68-REF. 1) onto the cylindrical part of the guide ring (FIG. 68-REF. 2) with the countersunk part facing outward.
- Lubricate the piston (FIG. 69-REF. 1) with Vaseline, and slide the piston into the tapered part of the guide ring.

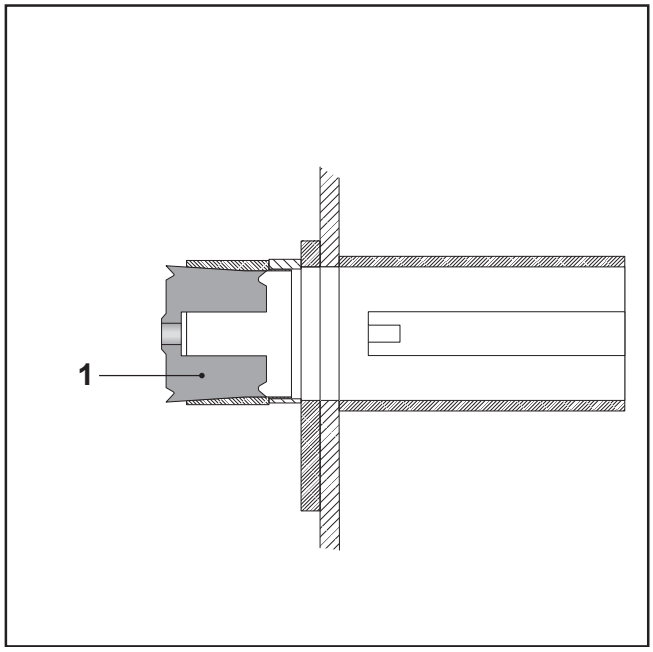

FIG.69

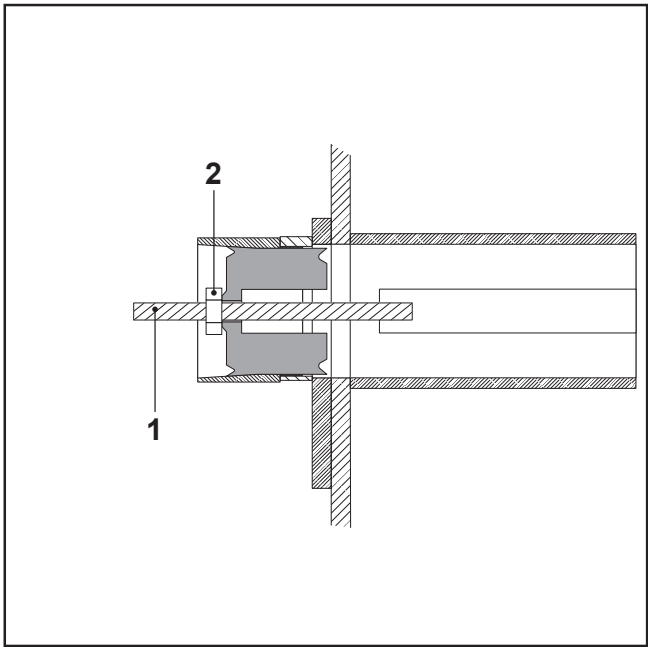

FIG.70

- Apply more Vaseline.
- Push the piston completely into the guide ring, screw on the threaded rod M16 (FIG. 70-REF. 1) and the threaded nut (FIG. 70-REF. 2).
- To make the piston reach the piston rod (FIG. 71/72-REF. 1) apply the spacers and keep tightening the nut.

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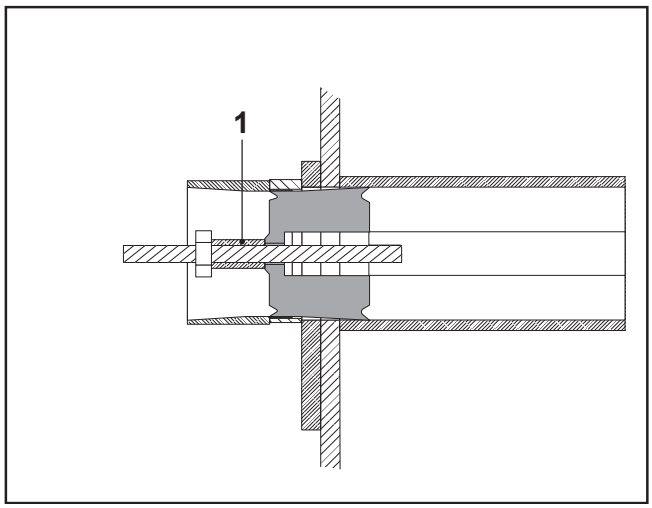

FIG.71

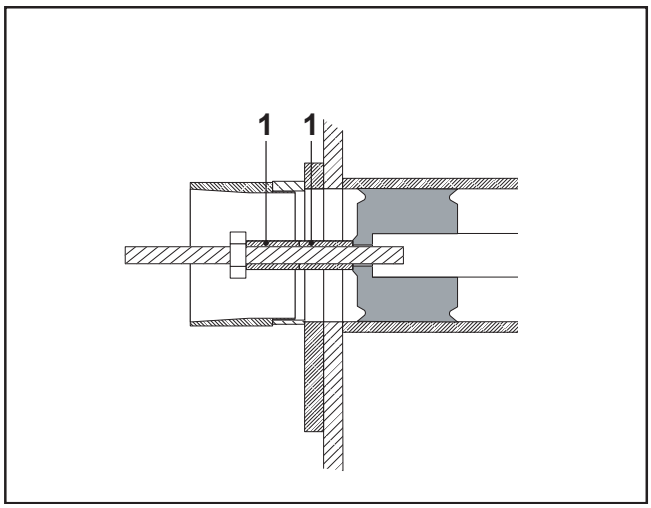

FIG.72

- Unscrew and remove the nut, remove the M16 threaded rod, the spacers, the guide ring and the guide ring spacer.
- Tighten the screw and washer on the piston.
- Repeat the entire procedure for the second piston.
- Reinstall the upper hopper and the safety grid.

8.3 ADJUSTING THE S-VALVE

The S-valve should be adjusted to eliminate all play between the wear plate and the wear disc and make them seal to each other. Play is caused by wear on the two elements produced by scraping.
Imperfect sealing can be detected during washing, when water seeps out from between the disc and the plate, and during pumping, when slurry seeps out from between them.
As a rule, the S-valve should be adjusted when the distance between the disc and the wear plate is greater than about 0.25 mm or in case of frequent clogging of the S-valve.

The following steps must be carried out with the machine switched off.
- Remove the TE screw (FIG. 73-REF. 1), remove the lever locking the adjustment nut (FIG. 73-REF. 2) and loosen or tighten the adjustment nut as required (FIG. 73-REF. 3); usually it is sufficient to turn the nut by 60°-120°.
- Put back the nut-locking lever (FIG. 73-REF. 2) and fasten it with the screw (FIG. 73-REF. 1).
- Start the machine and, with the engine running idle, make sure the S-valve switches regularly.

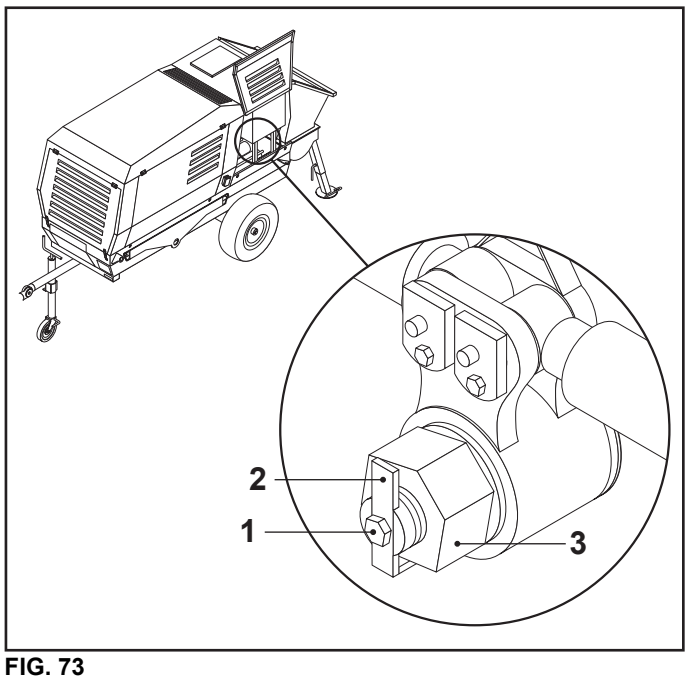

FIG. 73

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8.4 REPLACING THE WEAR DISC, THE WEAR PLATE AND THE S-VALVE

The following steps must be carried out with the machine switched off.

- Remove the upper hopper by unscrewing its four fastening screws.
- Remove the rigid grease fitting (FIG. 74-REF. 1) on the greasing flange.
- Loosen the 4 TE screws (FIG. 74-REF. 2) and remove the delivery flange.
- Remove the TE screw (FIG. 73-REF. 1), remove the lever locking the adjustment nut (FIG. 74-REF. 2) and remove the adjustment nut (FIG. 74-REF. 3).
- If you only need to replace the wear disc and the wear plate, pull the S-valve out as far as necessary to do so.
- If you need to replace the S-valve too, strike it with a hammer to facilitate removing.

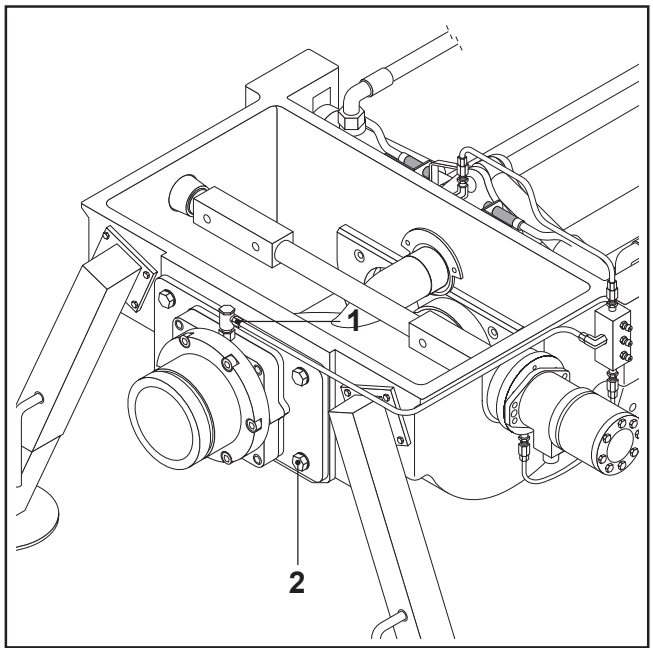

FIG.74

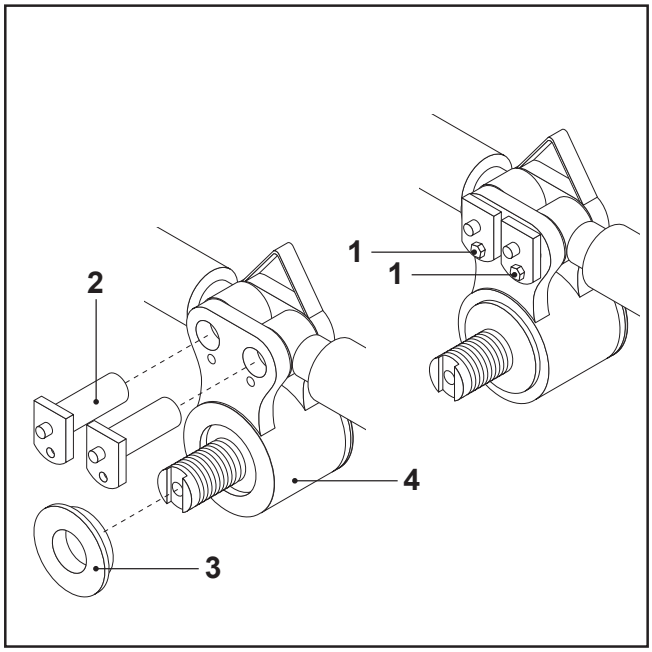

FIG.75

- Unscrew the two TE screws (FIG. 75-REF. 1) on the head of the jack retaining pins and remove the two pins (FIG. 75-REF. 2).
- Set aside the lever locking washer (FIG. 75-REF. 3) and the tapered connecting rod (FIG. 75-REF. 4).

- Remove the 5 fastening screws (FIG. 76-REF. 1) and take out the wear plate.
- Apply two new O-rings (FIG. 76-REF. 2) lubricating them with grease (the grease keeps the rings in place). Do not apply too much grease because it creates thickness.
- Install and fasten the wear plate.

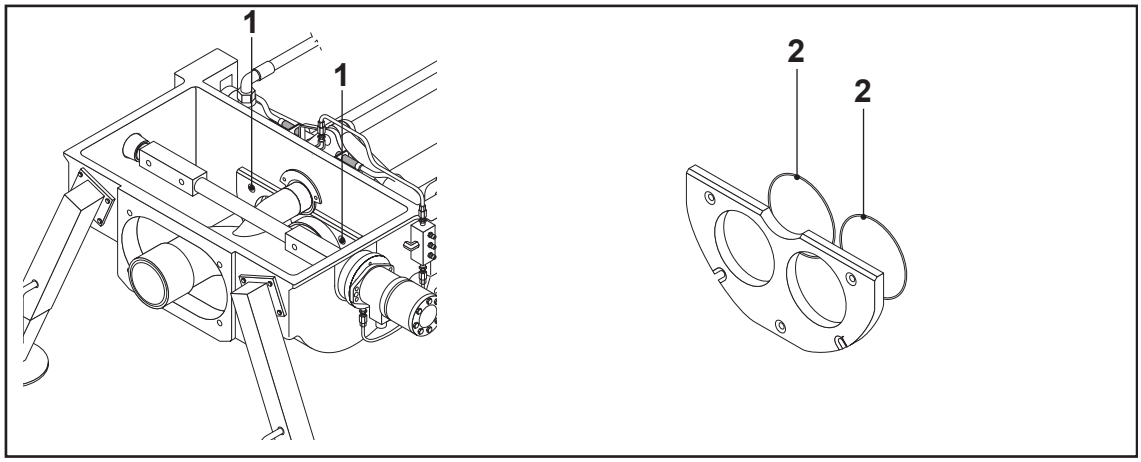

FIG. 76

- Install the wear disc (FIG. 77-REF. 1) with the O-ring (FIG. 77-REF. 2) on the S-valve.

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- Reinstall the S-valve.
- Reinstall the tapered connecting rod, aligning the little hole between the flanges with the hole on the S-valve.

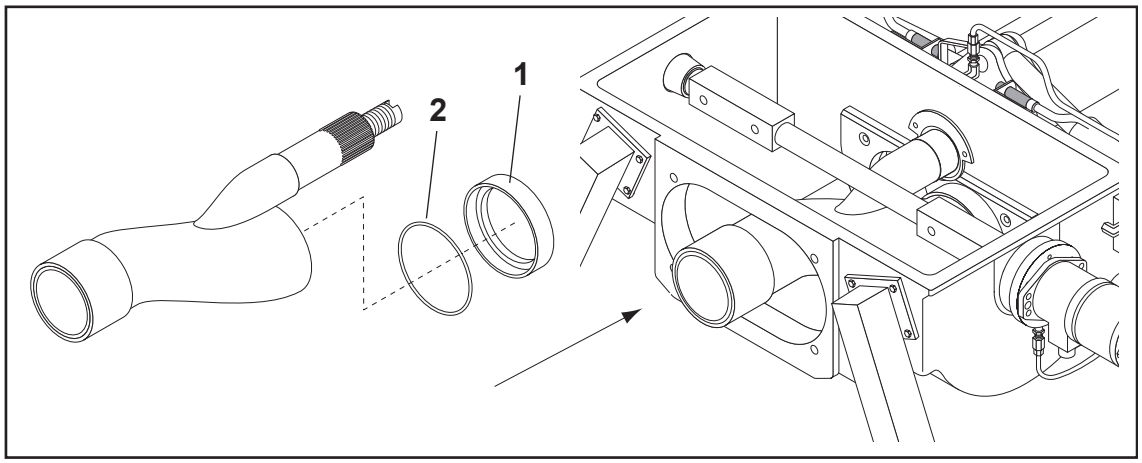

FIG. 77

- Put back the lever locking washer (FIG. 78-REF. 1), the adjustment nut (FIG. 78-REF. 2), the nut locking lever (FIG. 78-REF. 3) and fasten it with the TE screw (FIG. 78-REF. 4).
- Put back the two pins (FIG. 78-REF. 5), align the holes on the tapered connecting rod with the holes on the jack and tighten the screws to fasten them.

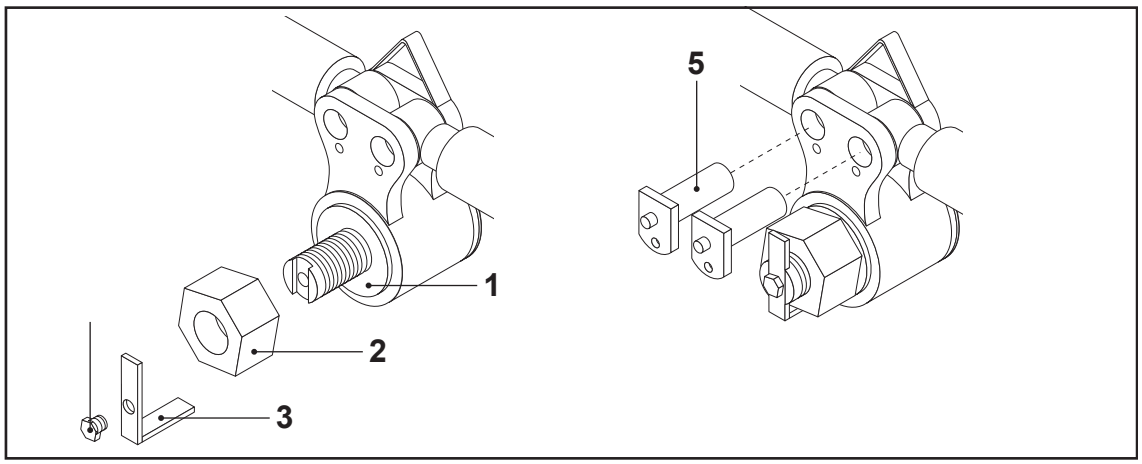

FIG. 78

- Reinstall the delivery flange and the grease fitting.
- Reinstall the upper hopper and the safety grid.
- Start the machine and make sure the S-valve switches regularly.

8.5 CHANGING THE FIRST OIL FILTER

The following steps must be carried out with the machine switched off and the oil cooled down.

The hydraulic oil tank is provided with two filters. Replace the filter on the cover every 500 hours and the filter inside the tank every 1000 hours.
- To change the filter (FIG. 79-REF. 1) unscrew the four screws on the oil filter inspection cover on the fixed casing.
- Unscrew the filter cap (FIG. 79-REF. 2) and remove and replace the filter cartridge.
- Screw the cap back on (FIG. 79-REF. 2) and fasten the inspection cover with the screws.

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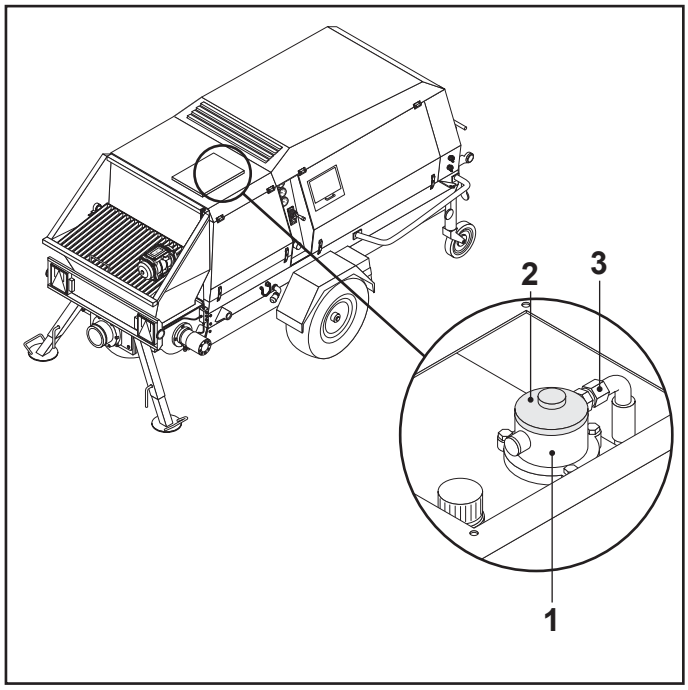

FIG. 79

8.6 CHANGING THE SECOND OIL FILTER

- Take down the fixed casing by removing the screws on the casing mounts and on the brackets that fasten it to the hydraulic oil tank (FIG. 80).

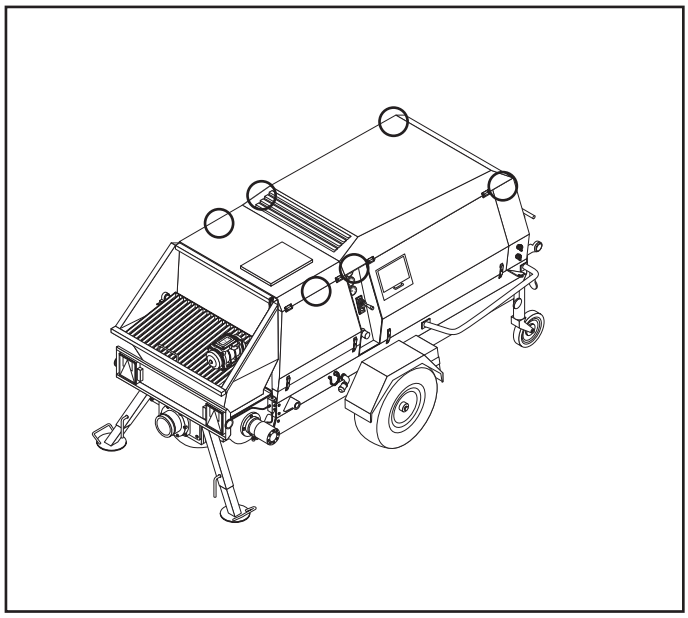

FIG. 80

- Open the valve (FIG. 81-REF. 1) beneath the oil tank to drain the tank, placing an adequately sized container below it to collect the oil.
- Disconnect the hydraulic oil pipe (FIG. 79-REF. 3).
- Unscrew and replace the internal filters (FIG. 81-REF. 2/3) and close the tank after inspecting the conditions of the gasket (replace if necessary).
- Open the cap (FIG. 81-REF. 4) and fill the tank with 75 litres of ELF OLNA DS 46 hydraulic oil.
- Check the oil level through the inspection window (FIG. 81-REF. 5).
- Reinstall the fixed casing and fasten it with the screws.
- Start the engine and let the hydraulic pump run idle for a few minutes while checking the oil level through the inspection window (FIG. 81-REF. 5); if the level is below the inspection window, add more oil.

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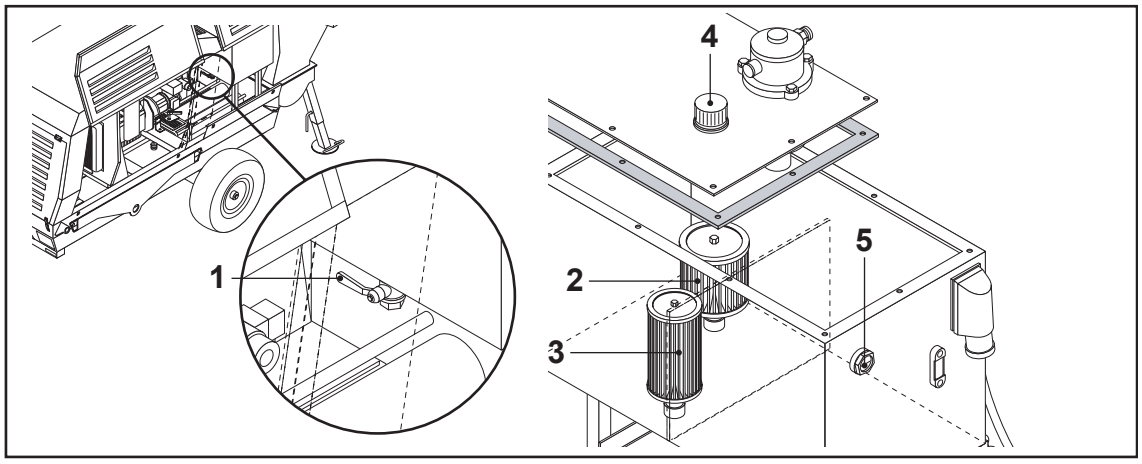

FIG. 81

8.7 REPLACING THE ADDITIVE METERING PUMP

The following steps must be carried out with the machine switched off.

- Disconnect the quick-release coupling (FIG. 82-REF. 1), unscrew the hose clamps (FIG. 82-REF. 2/3) and remove the slurry delivery manifold by loosening the tie rod locking nuts (FIG. 82-REF. 4) using the wrench supplied.
- Replace and reinstall the pumping assembly.

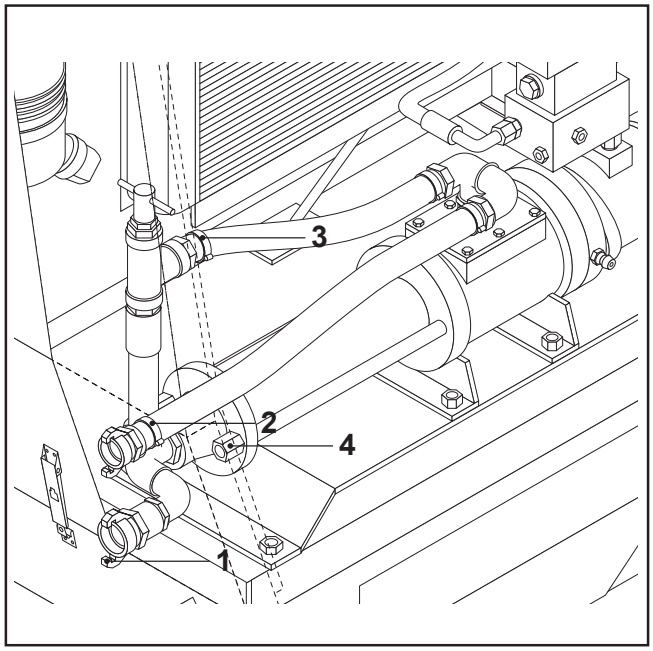

FIG.82

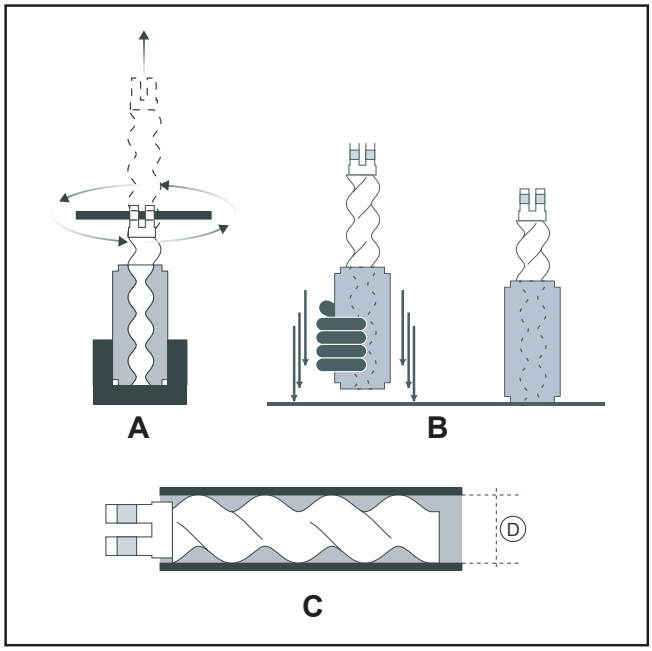

FIG.83

The stator usually works at half the rate of the auger. Accordingly, it may be necessary to replace only the stator while leaving the auger in place.
- Uninstall the pump from the machine (see above).
- Put the pump in a vice and remove the auger (FIG. 83-REF. A).
- Lubricate the auger and the opening in the stator with Vaseline (DO NOT USE OIL OR GREASE, USE ONLY VASELINE).
- Partially introduce the auger inside the countersunk opening.
- Tap the pump (stator + partially inserted auger) repeatedly against an object that will not damage the stator (e.g., a block of wood) (FIG. 83-REF. B).

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8.8 TO BE CARRIED BY QUALIFIED PERSONNEL

The machine is programmed to request periodic servicing.
The first maintenance operations are required after 50 hours of work; the following operations are required at specific intervals.
The machine requests servicing by showing the message "MAINTENANCE" on the display (FIG. 84).
The message is displayed for a period of 8 hours, after which it is automatically cancelled.

FIG. 84

To cancel the message after servicing the machine:
- press the start button ON/OFF;
- enter the access code (see paragraph 7.5);
- press F2 before starting the engine; the following message will appear:

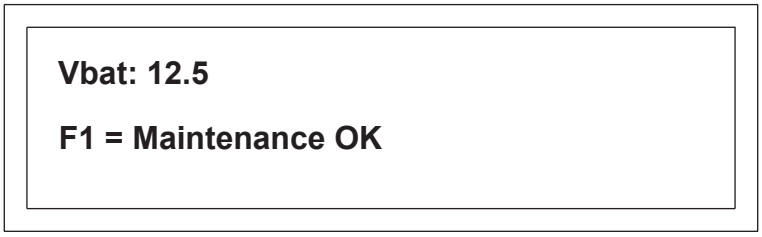

FIG. 85

- Press F1 to reset the service request and cancel the message.
- Press any other key to go back.

8.8.1 Maintenance after 50 hours

- Check the engine coolant level.
- Check and adjust the engine idling speed.
- Change the motor oil; use TOTAL RUBIA TIR 7400.
- Remove the plug (FIG. 86-REF. 1) and drain the oil.
- Put the oil drain plug back in, remove the refilling cap (FIG. 87-REF. 2), refill with oil and put back the cap. Check the level on the dipstick. It should be near the maximum mark (FIG. 87-REF. 1).
- Replace the motor oil filter cartridge.
- Replace the fuel filter cartridge and screen.
- Clean the engine air filter.
- Check the valve clearance and adjust if necessary.
- Check the engine mountings and tighten if necessary.
- Check the tightness of the pumping sensors, the safety sensors and the BETON MASTER operation sensors (diesel fuel level, hydraulic oil temperature, coolant temperature).
- Make sure there are no leaks from the engine.
- Check the tightness of the fittings in the hydraulic system.
- Check the tightness of the nuts and wheels.
- Adjust the brakes on versions equipped with vehicle towing gear.

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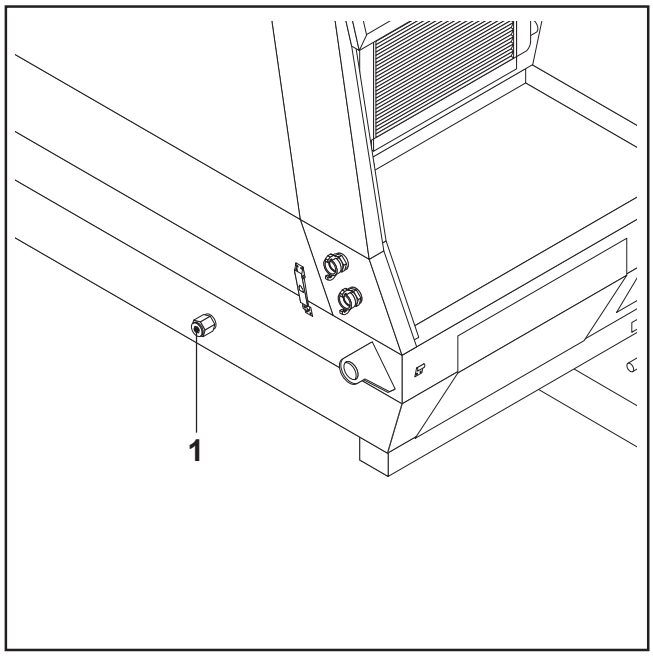

FIG.86

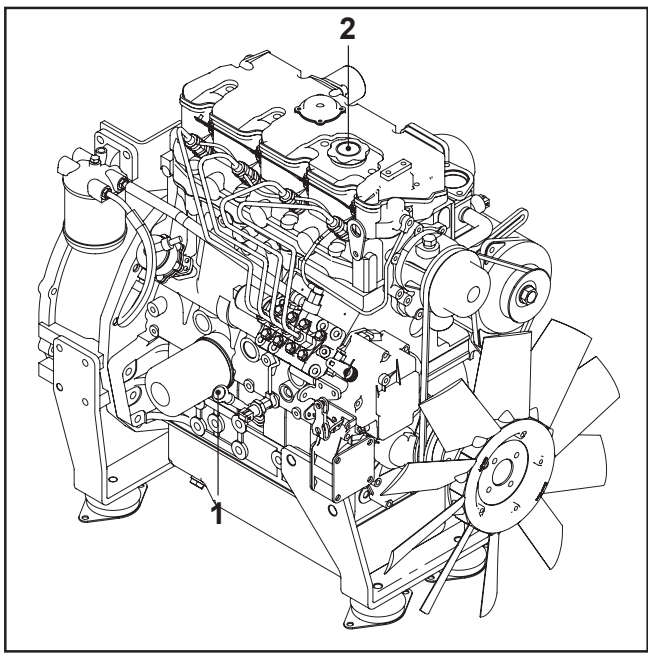

FIG.87

8.8.2 Maintenance to be performed every month or every 125 hours

- Change the motor oil
  - Use TOTAL RUBIA TIR 7400.
  - Remove the plug (FIG. 86-REF. 1) and drain the oil.
  - Put the oil drain plug back on.
  - Remove the refilling cap (FIG. 87-REF. 2), refill with oil and put back the cap.
  - Make sure the level shown on the dipstick (FIG. 87-REF. 1) is near the maximum mark.
- Clean the finned surface of the radiator with compressed air.
- Check the tension of the alternator belt.
- Check the battery: the tightness of the terminals, the level and density of the electrolyte (see engine instructions booklet).

Gas released by the battery is explosive. Avoid making sparks near the battery. Avoid contact of the electrolyte with skin or clothing.

8.8.3 Maintenance to be performed every 250 hours

- Check the wear on the delivery flange and replace if necessary.
- Replace the motor oil filter cartridge.
- Clean the diesel fuel prefilter.
- Replace the fuel filter.
- Replace the oil filter on the additive metering pump.
- Replace the engine air filter cartridges.
- Check the sleeves in the cooling circuit and replace any worn sleeves.
- Check the density of the coolant.

8.8.4 Maintenance to be performed every six months or every 500 hours

- Check the glow plugs.
- Replace the hydraulic oil filters inside the hydraulic oil tank.
- Clean and set the injectors.

8.8.5 Maintenance to be performed every year or every 1000 hours

- Change the oil in the hydraulic circuit.
- Check the clearance on the S-valve and adjust if necessary.
- Check the conditions of the hoses and fittings in the oil-hydraulic circuit.
- Check the conditions of the hoses and fittings in the diesel fuel circuit.
- Check the conditions of the hoses and fittings in the cooling circuit.
- Remove and clean the engine breather pipe.

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- Check the functioning of the alternator, the starter motor, etc.
- Inspect the electric system.

8.8.6 Maintenance to be performed every 2500 hours

- Replace the engine breather pipe.

8.9 TOWING GEAR MAINTENANCE

- Service and clean every 10,000 km or every 12 months.
- Replace the shock absorber on the overrun brake:
  - if very weak
  - if air bubbles are present
  - if the rod slips off easily
  - in case of oil leaks
- Lubricate all the sliding surfaces and joints in the overrun brake (FIG. 88). Use DIN 51825 multipurpose grease.

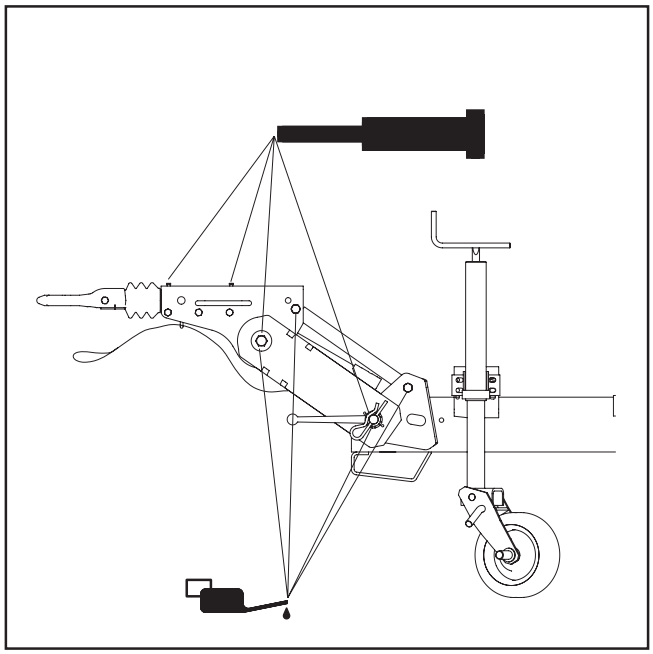

FIG.88

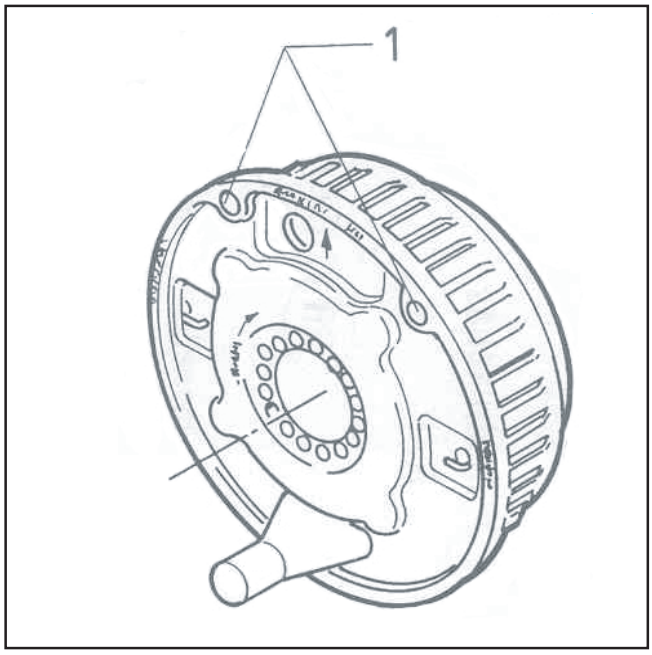

FIG.89

If the drawbar remains set at a certain height for a long period of time, a thin layer of rust may form between the toothed flanges. This make cause the flanges to stick to each other. To prevent this from happening, clean the flanges every six months and apply water-repellent grease (DIN 51502 KPF 2C multipurpose grease).

- Check the wear of the brake lining through the inspection hole (FIG. 89-REF. 1). Have the brakes adjusted if necessary.

All maintenance work should be carried out by trained personnel in authorized workshops or service centres.

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9.1 GENERAL INFORMATION

Follow the local regulations at the time of scrapping the machine.

Separate the machine parts according to the type of material (plastic, rubber, iron, etc.).

The oil, the coolant and the storage cell must be handed over to authorized firms specializing in the disposal of polluting products.

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10.1 PROBLEMS WITH THE ELECTRONIC BOARD

In case of failures in the electronic board inside the control panel, a pumping job may be completed by manual operation.
You can control the pistons' pumping and sucking operations using the small levers (m1-m2) on the side of the control panel.
Open the side doors on the casing from the control panel side so that you can monitor the alternating lighting up of the LEDs on the S-valve and the lubrication water tank.

- The LEDs on the two sensors next to the jacks controlling the S-valve show which of the two pistons is currently pumping.
- Two more sensors (and respective LEDs) on the water tank show when the relative pumping piston ends its suction phase and is ready to start the pumping phase.

When the LED (FIG. 90-REF. 1) is on, meaning that the piston is ready for pumping, move the lever (m1) to position 1.
When the LED (FIG. 90-REF. 3) turns on the pumping phase is completed.
Now move the lever (m1) to position 2 to switch the position of the S-valve. LEDs (FIG. 90-REF. 2) and LED (FIG. 90-REF. 4) will light up.
Move on to the lever (m2) and follow the same procedure: position 1 starts the pumping and position 2 switches the S-valve.
Proceed until the hopper is empty.

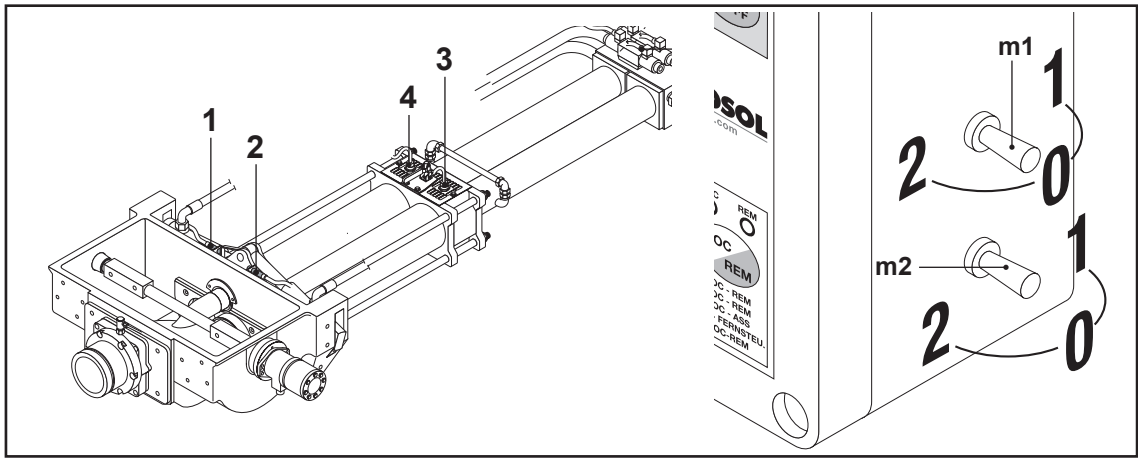

FIG. 90

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10.3 OPERATOR'S INTERVENTION

PROBLEMS	CAUSES	SOLUTIONS
THE CONTROL BOARD DOES NOT SWITCH ON	No electric power supply.	• Check the battery charge state and the main fuse (see wiring diagram).
	Circuit board breakdown	• End pumping by acting manually (see paragraph 10.1). Contact the authorised after-sales assistance centre.
THE STARTER MOTOR DOES NOT TURN.	No electric power supply to starter motor.	• Check the charge status of the battery, the main fuse and check electric wiring of the starter motor (see wiring diagram).
THE MACHINE DOES NOT PRE-HEAT THE SPARK PLUGS ON START-UP REQUEST.	Probable spark plug pre-heat breakdown.	• Check the spark plug relay functioning and replace it if necessary.
THE STARTER MOTOR TURNS BUT THE DIESEL ENGINE DOES NOT START.	Emergency button inserted.	• Check that the machine is ready for start-up and disconnect the emergency button.
	No fuel.	• Fill the tank with fuel and try again.
	Fuel does not reach the motor	• Check functioning of the diesel electrovalve control relay (see wiring diagram).
THE DIESEL ENGINE FUNCTIONS IRREGULARLY AND TENDS TO SWITCH-OFF.	Diesel filters blocked.	• Replace the diesel filters.
	Reserve diesel tank.	• Add diesel.
	Air filters blocked.	• Clean or replace the air filters.
BATTERY CHARGER ON AND THE DIESEL ENGINE DOES NOT START ALARM.	Alternator does not charge the battery.	• Check the status of the alternator transmission belt and replace it if necessary.
WATER TEMPERATURE ON AND THE DIESEL ENGINE DOES NOT START ALARM.	Insufficient level of refrigerant liquid and/or cooling radiator motor dirty.	• Top-up the level of refrigerant liquid and clean the radiator.

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PROBLEMS	CAUSES	SOLUTIONS
THE PUMP STOPS.	Unsuitable mixture.	• Modify the mixture making it more fluid.
	Mixer grill open.	• Close the mixer grill.
	Insufficient hydraulic oil level.	• Top-up the hydraulic oil tank.
	Hydraulic oil temperature too high.	• Check the hydraulic oil level and clean the hydraulic oil radiator, wait for the oil to cool with diesel engine running.
	Breakdown of one of the control electrovalves of the S-valve and/or the pumping pistons control.	• Check the electric wiring of the position sensors (see wiring diagram).
THE MIXER DOES NOT TURN.	Function not active on the control panel.	• Press the button (e1) on the control panel.
	Hopper grid open.	• Close the hopper grid.
	Presence of a foreign body that blocks the mixer. Check the pressure on the manometer (k3).	• Remove the foreign body.
	Breakdown of the mixer control electrovalve. Check switch-on of the relative LED.	• Check mixer electrovalve wiring and relative relay (see wiring diagram).
WORSENING OF MACHINE PERFORMANCE.	Wear plate and/or disc worn.	Adjust the S-valve (see paragraph 8.3).
	Pumping pistons worn.	• Replace the pumping pistons (see paragraph 8.2).
	Mixture to be pumped too dense and cannot be pumped.	• Modify the mixture making it more fluid (see paragraph 3.5 and 7.2).
DIRTY WATER IN THE PISTONS COOLING TANK.	Pumping pistons worn.	• Replace the pumping pistons (see paragraph 8.2).
THE VIBRATING SIEVE DOES NOT WORK.	Function not active on the control panel.	• Press the button (f1) on the control panel.
	No electric power supply.	• Check the wiring, the insertion of the plug into the relevant socket and functioning of the relative relay (see wiring diagram).
PRESSURE DROP ON THE MANOMETER(k2) OR REPEATED BLOCKING OF THE S-VALVE	There is play between the S-valve and the wear plate	• Adjust the S-valve (see paragraph 8.3).

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PROBLEMS	CAUSES	SOLUTIONS
DIRTY WATER IN THE PISTONS COOLING TANK.	Pumping pistons worn.	• Replace the pumping pistons (see paragraph 8.2).
THE VIBRATING SIEVE DOES NOT WORK.	Function not active on the control panel.	• Press the button (f1) on the control panel.
	No electric power supply.	• Check the wiring, the insertion of the plug into the relevant socket and functioning of the relative relay (see wiring diagram).
PRESSURE DROP ON THE MANOMETER(k2) OR REPEATED BLOCKING OF THE S-VALVE	There is play between the S-valve and the wear plate	• Adjust the S-valve (see paragraph 8.3).

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This section regards problems that might arise when towing the machine with a vehicle.

PROBLEMS	CAUSES	SOLUTIONS
BRAKING SYSTEM NOT VERY EFFICIENT.	The cylinder returns completely	Check brake calibration
	Brake linings not run-in.	It eliminates itself after a few braking actions.
	Faulty brake linings.	Replace the brake linings.
	Little efficiency due to too much friction, formation of rust on the piston.	Make all transmission parts and tie-rods run well, lubricate
REVERSE GEAR HARD OR BLOCKED.	This occurs when the adjustment of the system is too taught.	Adjust correctly.
	Reverse gear lever blocked.	Clean and oil the mobile parts.
BRAKE OVERHEATING IN START DIRECTION.	Incorrect calibration.	Have them calibrated.
	The braking system does not open perfectly in the start direction.	Release the hand brake.
	Return lever blocked.	Make all transmission parts and tie-rods run well, lubricate mobile parts of the road frame.
	Bent rod support.	Check the rod support.
	Dirty brake.	Clean.
	Bent brake cord.	Replace.
	Dust in the drum.	Replace the drum and the brake linings if necessary.
PARKING BRAKE NOT VERY EFFICIENT.	Incorrect calibration and/or to much play in the tie-rods.	Have them calibrated.
	Brake linings not run-in.	It eliminates itself.
	Too much friction between the mobile components.	Make all transmission parts and tie-rods run well, lubricate
	Faulty gas spring	Replace gas spring
IRREGULAR AND JERKY BRAKING	Too much play in the braking system	Have them calibrated.
	Faulty shock absorber	Replace the shock absorber
DECELERATING THE TRAILER BRAKES EXCESSIVELY	Faulty shock absorber	Replace the shock absorber
HEIGHT ADJUSTMENT VERY HARD	Watering joints blocked	Release, clean, lubricate and calibrate joints. Coupling torque 70 Nm
NO BALANCING	Gas spring weakened of faulty	Replace gas spring

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11.1 RESPONSIBILITY

The person in charge of the machinery is responsible for assuring that whoever operates such machinery is well aware of the instructions contained in this use and maintenance manual, and in particular that said operator has received special training in the proper execution of those operations marked in the manual
The warranty offered by the manufacturer becomes null and void if this machinery is not used in accordance with the instructions in this manual. In addition, this manual must always accompany the machine.
The machine's operator must be thoroughly taught and trained in regard to the operation and use of the machine itself and must sign this use and maintenance manual on the line reading "read and approved". If this procedure is not complied with, the operator is prohibited from using this machine.

Signature of the person in charge _____

Read and approved _____

Signature of the operator _____

Read and approved _____

11.2 WARRANTY

The machinery manufactured by Turbosol Produzione S.p.A. is guaranteed for a period of twelve (12) months or one thousand (1,000) hours of operation - whichever comes first - from the date said machinery is delivered to the end consumer, and in any event not more than eighteen (18) months from its shipment. The date upon which these products are delivered to the end consumer must be entered on the special warranty certificate which comes with all new machinery leaving the factory.
This warranty shall be valid only if the Manufacturer receives the attached warranty certificate card within thirty (30) days of delivery of the machinery in question. This card must be filled out completely and signed by the Purchaser.
This guarantee is to be understood as covering any defect In manufacturing or in the materials employed in said manufacture.
Component parts supplied by Turbosol Productions S.p.A. by third parties shall be covered by the guarantee said parties have provided Turbosol and which Turbosol in turn shall make available to the end consumer.
In the event that anomalies should appear during the period covered by the warranty, the right to intervene to correct said anomalies shall be limited to the Manufacturer itself or to parties specially authorised by the Manufacturer. The end consumer shall be responsible for having the defective machinery brought to the designated repair facility during regular working hours. Defective parts must be sent free port to the Manufacturer, which shall either repair said parts or replace them free of charge when and if, in the final judgement of the Manufacturer, said parts show defects in quality. The replacement parts shall remain the exclusive property at the Manufacturer.
The Purchaser shall be responsible for those expenses related to shipping the materials in question as well as for the costs of possible intervention on the part of the Manufacturer's personnel.
Repairs or replacements shall in no way extend the life of the overall warranty period. The warranty does not cover normal wear of parts or their deterioration through improper use, said parts to include: valve housings and spherical valves made of rubber, piston liners, rubber stators and pump screws, axle boxes, deflectors, stirring blades, wear protection for vessel, wear plates and cones, filters, etc
The Purchaser shall forfeit his rights under this warranty when and if he fails even on but one single occasion, to comply with the payment terms and/or if the breakdowns reported prove to have originated: from circumstances introduced by the Purchaser himself, by his employees or by third parties, when the damage is due to incorrect use, poor installation, or utilization that is improper or in conflict with the instructions given in the use and maintenance manuals provided with the machinery.
This warranty shall no longer be valid if the injection systems are damaged by unsuitable or polluted fuel, if the electrical systems break down due to an improper feed or because of such components as relays, condensers, remote control devices, etc., the latter of which are covered by warranties issued by the supplier.
The warranty shall likewise no longer be valid following questionable tampering and/or the use of non-original spare parts or rubber hosing different from that furnished by the Manufacturer.
The Manufacturer shall rightfully decline all responsibility arising from an impossibility to utilise the product or from damages due to interruption in work, or loss of direct or indirect profits, or for damages likewise caused by removal of the cowling or protective carters; on moving parts and safety devices.
Imperfections and defects must be reported in writing to the Manufacturer as indicated by law.
In the case of disputes arising from interpretation of the clauses above, the original Italian text shall apply.

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