INSTRUCTION MANUAL

FOR INSTALLATION
OPERATING, AND
MAINTENANCE.

OUR REF: **VRH-FRH-VRG-VRP_IOMM**

ITEM:

HELISEM ®

VRH FRH VRG VRP HELISEM

This manual should be made available to the person responsible for installation, operating and maintenance.

Translated version

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CONTENTS

About this Instruction, Operation and Maintenance Manual

This user manual contains important information on the installation, assembly, start-up, operation, maintenance and servicing of your equipment.

Safety standards:

Persons responsible for the installation, operation and maintenance of this machine must take account of the recommendations in this manual so as to avoid any hazard or harm to the environment while ensuring best use of the equipment.
Special attention must be given to the advice and instructions in this manual. Lastly, the safety data sheets for any chemical product must be followed as well as site recommendations.

0 - HEALTH AND SAFETY INSTRUCTIONS

Please read the table below on the meaning of the pictograms used in this manual.

Risk of crushing / Incorrect postures / Excessive force

Suitable equipment must be used for handling the machine or a machine component if it weighs in excess of 25 kg.
All handling of machines or machine components must be carried out by qualified personnel.

Electrical hazard

All work on the equipment must be performed with the power off.
Electrical appliances must be properly earthed.

Risk of fluid projections and splashing

Special care to be taken

Residual energy risk

Burn hazard

Risk of chemical incompatibility

Wearing of personal protective equipment

EPI

Risk of damage to machine

ATEX

ATEX standard for explosive atmospheres

Environmental risk

Fire risk

Recycling

Risk of auditory damage

Risk of slipping

Information

0-1 General

The personnel responsible for installation, operation and maintenance must read and understand this manual in order to:

- avoid any possible risk to themselves or to third parties:
- ensure reliability of the equipment,
- avoid any error or pollution due to incorrect handling.

In all cases, refer to the applicable legislation, safety rules and best practice for load handling and for electrical and mechanical work in the relevant country and on the site where the machine is installed.

You should comply with your company's safety procedures during maintenance or repair of any item of equipment. Make sure that you have understood all the procedures and instructions before starting work on the assembly.

Check that the location where the machine is to be installed is not subject to any specific regulation. If yes, take account of these specific regulations when following the instructions in this manual to ensure full compliance with local regulatory requirements on health and safety.

For further information, please refer to other documents such as the parts list and arrangement drawing.

0-2 Health, safety and environmental risks

0-2.1 Protection of personnel

Wear all the necessary personal protective equipment for any work on our equipment. All customary precautions must be taken with regard to the chemicals used (acids, bases, redox agents, etc.).

In some conditions, the machine temperature can reach 100°C / 212°F. From 50°C / 122°F protective gloves are mandatory. In this case, it is vital to indicate this and protect access to the machine to eliminate any burn hazard.

All customary precautions must be taken with regard to the chemicals used (acids, bases, redox agents, etc.).

0-2.2 Safety Regulations

Danger may arise from failure to install, operate, or maintain the machine in accordance with the requirements recommended by Milton Roy.

During installation or maintenance, all machine parts must be operated with strict attention to safety.
Safe lifting must be carried out by qualified personnel to prevent damage to the machine parts.
The lifting instructions recommended by Milton Roy Europe must also be observed.

Before dismantling, make sure that all relevant appropriate precautions have been taken.
If you have any questions, please contact your Company's safety department or manufacturer for advice.

If machines are used to deliver hazardous media, it is necessary to ensure that appropriate health and safety regulations are met.

Power supply must be cut off before disassembling.
Make sure that the electrical switch cannot be operated illegally when the machine is disassembled.

Since the machine is used to convey high-pressure or toxic, flammable, explosive, granular or high-viscosity media, when the machine is completely shut down, all pipeline valves in and out of the machine shall be closed, and the liquid inside the machine must be drained.
Before disassembling the machine, check with the Process Engineer whether special cleaning measures and gas masks are necessary.

0-2.3 Firefighting

Firefighting measures

- Suitable extinguishing means: use foam, dry powder or carbon dioxide (CO^2) to extinguish flames.
- Personnel must be trained in firefighting measures. They must include a first responder or qualified staff member in accordance with the country's standards.
- The machine and the metering head must be cleaned with an anti-static cloth.

Suitable fire extinguishing means

- Firefighting instructions: evacuate the area. Prevent firefighting products running into drinking water systems and drains.
- Firefighters should use suitable protective equipment and, in confined spaces, wear self-contained breathing apparatus (SCBA).
- A suitable extinguishing system should be used by trained personnel in compliance with the applicable standards and laws in the country where the equipment is installed.

0-2.4 Environmental protection

Dirty cleaning rags must be stored in suitable containers and disposed of in compliance with the applicable regulations in your region. Oil, degreasing agents and cleaning cloths must be stored in accordance with pollution regulations.

Packaging used to protect the machine (cardboard, padding, wood, etc.) must be disposed of in compliance with the selective sorting system applicable in your region.

During oil changes, used oil must be collected in a suitable container and disposed of in compliance with the applicable regulations in your region.

Any oil spillage that may arise must be removed using a degreasing agent appropriate to the operating conditions.

Outside of normal operating conditions (storage, maintenance, etc.), any part of the machine that has been in contact with chemicals must be decontaminated, and the decontamination residues must be disposed of in compliance with the applicable regulations in your region.

Any replaced part of the machine must be subject to a reprocessing system in compliance with the applicable regulations in your region.
When handling chemicals we recommend having an oil spill kit or emergency response kit nearby (with rolls, socks, protective gloves, protective goggles, recovery bag).

The Directive on waste electrical and electronic equipment (WEEE - 2002/96/EC) came into effect in all of Europe on 13 August 2005. Its purpose is to prevent waste electrical and electronic equipment and to promote its reuse, recycling and other forms of recovery. When you dispose of this product, comply with local waste disposal instructions. Do not dispose of it in the natural environment but take it to a specialized collection center for electrical and electronic waste and/or consult your supplier.

0-3 Residual risks

Despite the fact that safety has been integrated into the design and that protective and preventive measures have been taken, the following residual risks still exist:

Residual mechanical risks:

- For all handling, it is imperative that this handling is carried out by trained and qualified personnel. (E.g.: CACES [license for operating forklift trucks], overhead crane operator/slinger, etc.).
- When carrying out any work in the vicinity of the rotating part, it is imperative that the machine has been properly isolated and rendered inoperative so as to prevent any unintended starting.
- When carrying out any work on a pressurized system, it is imperative to isolate the pressure, ensure that the inlet valve is inoperative and dissipate the residual energy so as to prevent any unintended repressurization.

Residual electrical risks:

- For any work relating to the electrical power supply, it is imperative that this work is carried out by trained, qualified personnel equipped with adequate protective equipment. (E.g.: electrical qualification, etc.).
- Electrical installations must be rendered inoperative (lockout-tagout) and safety marking complied with.
- Suitable personal protective equipment must be worn.
- Carefully read the electrical equipment manual.
- Check the motor specifications (see the motor nameplate) and compare them with the voltage available on your installation before making connections.

Residual risks caused by materials and products:

- When carrying out any work on a pressurized system, it is imperative to isolate the pressure, drain off any product, ensure that the inlet valve is inoperative and dissipate the residual energy so as to prevent any unintended repressurization.
- Decontamination should be carried out prior to any work on a part of the machine that has been in contact with hazardous products.
- In the case of preventive maintenance by Milton Roy, contact the After-Sales Department and send a decontamination log sheet before sending the machine for maintenance.

Residual thermal risks:

If the machine is **operating** abnormally, certain components may rise in temperature and lead to a burn hazard.
In the case of additional ventilation and if the correct direction of rotation cannot be detected: refer to the accessory manufacturer's IOM for the wiring. The blast must be projected towards the motor.

Residual risks caused by noise:

In normal operation, the maximum noise level of your machine is less than 85 dB(A). If the noise level in your environment exceeds this value, employees must be required to wear ear protectors.

0-4 Precautions to be taken

Milton Roy machines are designed and manufactured to give complete user satisfaction in terms of both metering accuracy and mechanical reliability.
In order to preserve this quality over time, it is important to ensure that installation and maintenance are carried out according to the procedures described in the user manual.

The screwed lifting eyes must only be fitted when installing and handling the machine.

1. Do not use the machine under conditions not originally specified.
2. Never carry out work on the machine when in operation.
3. Do not carry or lift the machine by the lifting rings on the machine's accessories.
4. Do not use any nuts and bolts other than those provided.
5. After dismantling, it is recommended to replace nuts and bolts already used, since they may have been damaged.

6. Stop the machine in the case of electrical current intensity greater than that of the motor, any suspicious noise or excessive temperature.
7. Make regular checks on the condition of the machine (signs of corrosion, parts worked loose, etc.) and stop the machine if any anomaly is noted.
8. Do not replace original parts with other parts not supplied by Milton Roy thereby ensuring proper compatibility between parts and equipment reliability.

Precautions specific to agitation :

1. Do not carry or lift the agitator by the shaft or propeller.
2. For cylindrical tanks, it is strongly recommended that the agitator is centred in the tank and fitted with counter-blades to prevent the liquid from rotating, which could cause deformation of the rotating parts.
3. Follow the installation instructions and tightening torques.
4. Do not approach the agitator head until you are sure there is no abnormal movement.
5. The agitator must be mounted in a perfectly vertical position (see tolerances allowed in the installation manual), on a perfectly horizontal support, to avoid any additional stress on the agitator reducing its service life (except in the special case of inclined agitators).
6. Do not remove guards from rotating parts if they exist and, depending on the configuration of the tank, provide a device to prevent any possible contact with the rotating parts.
7. Do not attempt to divert the flow of liquid when the agitator is running or to hinder the rotation of the propellers by any means.
8. Do not modify the characteristics of the substances being agitated without informing Milton Roy Europe in order to check that the new mixture is compatible with the agitator's capabilities (possible increase in power or effort which could reduce the service life or even damage the equipment).
9. Do not change the operating conditions, such as temperature or pressure, without checking that the stirrer is designed for this purpose.
10. Do not install the agitator in a tank not originally designed for it without consulting Milton Roy Europe to check that the two assemblies are compatible.
11. Do not run direct motor drive mixers at no load, during filling or emptying, or with a variable speed drive.
12. Stop the agitator in the event of abnormal vibration, electrical current greater than that of the motor, suspicious noise or excessive temperature.
13. Do not move the position of the propeller on the shaft without checking the calculation of the forces on the shaft.
14. Do not modify the propeller or add a propeller to the shaft.
15. Do not use the shaft or propeller on another agitator.
16. Do not attempt to turn faster than the rated speed, as this will have a considerable effect on power and effort.
17. The temperature at the motor must be below 60°C.

I – GENERAL INFORMATION

I - 1: NORMAL MACHINE USE

A) CONDITIONS AND LIMITS OF USE

- Assemble all mixer bolt torques in accordance with the layout drawing.
- Fit the mixer to the tank or on a support designed to withstand static and dynamic loads.
- Electrical connection must comply with motor nameplate and safety regulations.
- Shaft inside the tank.
- Impeller inside the tank.
- For mixers:
    - Maximum product density and viscosity of the product in compliance with estimate.
    - Maximum product temperature and pressure inside tank in compliance with estimate.
    - Max. outdoor temperature in compliance with estimate.
    - Mixer compatible with shaft and impeller material.
- Rotational speed in compliance with estimate.
- Mixer operation in compliance with estimate.
- Volume of product to be mixed in compliance with estimate.
- Safety or protective equipment in place and operational (closing plate, thermal relay (not supplied by MR), etc.)

B) GENERAL OPERATING PROCEDURE

1- Mixer shutdown
2- Adding the product(s) to be stirred
3- Mixer start-up
4- Mixer operation
5- Mixer shutdown
6- Product draining

I - 2: MISUSE AND CONTRAINDICATIONS

Attached are some of the reasonably foreseeable misuses considered in the case of a mixer in operation.

Reasonably foreseeable misuse	CONSEQUENCE ON:		
	Equipment	**Personal health and safety**	**Environment**
Bolt torques not respected	- Generation of vibrations - Detachment of a component leading to serious damage	Detachment of a component leading to serious damage or to a serious accident and even death	Detachment of a component leading to serious damage
Mixer outside the tank		Risk of entrapment by rotating shaft or impeller, leading to serious accident or death	
Mixer support undersized	Oscillation of the mixer up to breaking of the support or the mixer	Risk related to breakage	Risk related to breakage
Unsuitable wiring equipment	- Partial damage to electrical installation - Fire	Fire risks	Fire risks
Product density and viscosity in excess of expected values	- Mechanical breakdown - Motor overheating - Risk to facility depending on product and/or process	Risks related to breakage	- Overconsumption of electricity - Risks related to breakage
Product temperature and/or tank pressure different from those forecast	- Mechanical breakdown - Risk to facility depending on product and/or process	Risks related to breakage	Risks related to breakage
Outside temperature different from that forecast	- Motor/Gearbox overheating - Partial damage to electrical installation - Fire	Fire risks	Fire risks

Reasonably foreseeable misuse	CONSEQUENCE ON:		
	Equipment	**Personal health and safety**	**Environment**
Mixing operation different from that forecast	- Degraded process performance - Mechanical breakdown - Risk to equipment/facility	Risks related to breakage	Risks related to breakage
Product different from expected	- Corrosion that could cause major damage to equipment/installation and/or product - Mixer service life - Breakage leading to major damage to equipment/facility	Risks related to breakage	Risks related to breakage
Use of container other than that intended	Breakage leading to major damage to equipment/facility	Risk related to breakage	Risk related to breakage
Volume of product to be mixed different from that forecast	Breakage leading to major damage to equipment/facility	Risk related to breakage	Risk related to breakage
Addition of a system modifying the rotation speed initially planned or non-compliance with the recommended speed range	Breakage leading to major damage to equipment/facility	Risk related to breakage	Risk related to breakage
Addition or alteration of mixer components	Breakage leading to major damage to equipment/facility	Risk related to breakage	Risk related to breakage
Attempt to access/operate inside the tank (add product, remove a deposit, clean, etc.)		- Risk of entrapment by rotating shaft or impeller, leading to serious accident or death - Risk of electric shock or electrocution	
Protections removed		- Risk of entrapment by rotating shaft or impeller, leading to serious accident or death - Risk of electric shock or electrocution	

II – RECEPTION

II - 1: UNPACKING AND STORAGE

Packages must be examined carefully on receipt to ensure that there is no obvious damage to the contents. Open packages with care. Check the contents against the delivery note. Check that the manufacturer's nameplates match the order.

If the package is in poor condition, a damage report must be drawn up in the presence of the carrier, and MILTON ROY EUROPE must be informed. If any parts are missing, please notify MILTON ROY EUROPE within **7 days**.

There are 2 types of VRH/FRH/VRG/VRP mixer:

- With solid shaft + one-piece impeller + MAC coupling (small size, 1 package).
- With tubular shaft on frame + 2 or 3-blade impeller + MAB coupling (2 packs)

Note: Before unpacking, check that the package has not been damaged. Also, before starting assembly, check that you have all the parts you need.

In the package you will find:

A) Mixer with cylindrical coupling (MAC):

For a mixer with cylindrical coupling, the unit is delivered in a single package (see photo). In some cases, if the shaft is too long, there may be 2 packages. Packages are always numbered. All packages are shrink-wrapped for extra protection.

<u>This package contains:</u>

- Mixer head (x1)

- Impeller (x1 ou x2)

VRH:

VRG:

VRP:

FRH:

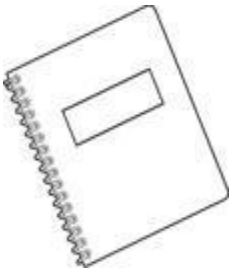
- Shaft (x1)

With indentations (Marker 1, Marker 2) at each end of the shaft:

- 1st side, to fit the shaft with the mixer head, **Marker 1**
- 2nd side, to fit the impeller on the shaft, **Marker 2**

(See PRINCIPLE FOR FITTING THE COUPLING TO THE SHAFT)

- Instruction manual (x1)



The bolts are pre-assembled. However, the nuts and bolts for attaching the mixer to its support are not supplied. A set of Allen keys is required to fit the mixer.

B) <u>Mixer with flange coupling (MAB):</u>

1/2

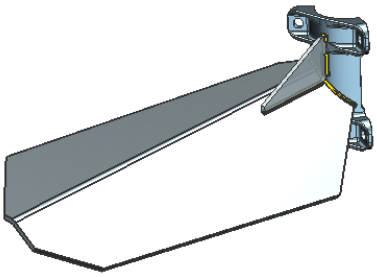
2/2

A larger mixer means a larger package. There are generally 2 packages (the first for the mixer head and impeller, and the second for the shaft). These are always identified by numbering (1/2; 2/2), as well as by their case number.

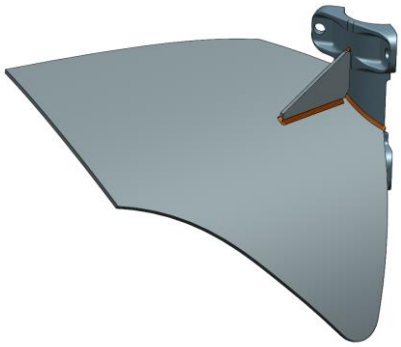
<u>The 1st package contains (numbered ½):</u>

- Impeller blades (x3 for VRH/VRG and x2 for FRH/VRP)

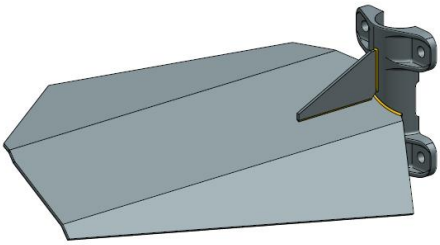
VRH blade



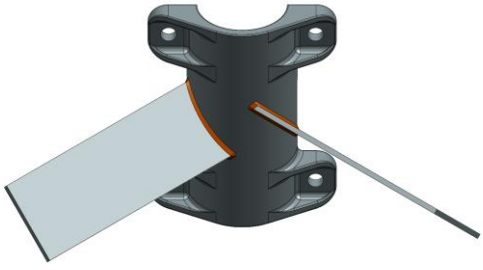
VRG Blade



FRH blade



VRP blade



- Mixer head (x1) -

Instruction manual (x1)

- Bolts and nuts

For blade attachment (x1)

For MAB attachment (x1) and vent plug* attachment
*ref.. Glossary

<u>The 2nd package contains (numbered 2/2):</u>

- Tubular shaft (x1):

A set of standard open-end wrenches and a set of standard pipe wrenches are required for mounting this mixer.

II - 2: STORAGE CONDITIONS

On site, the cases should be stored protected from adverse weather conditions in clean premises.

Cases will not be open, except in cases of necessity for inspection or intervention during storage or if damaged during transportation or handling.

At this time, it is up to the recipient to ensure that the equipment is kept in perfect condition.

➢ **Storage less than six months**

The equipment shall preferably be stored in its original packaging and protected from bad weather and impacts, and away from vibrating equipment, which can cause premature wear to bearings and mechanical bearings.

If it is necessary to remove the machine from its packing case, place it in a clean, dry, shock-proof location to prevent external damage.

All flanges and threaded connections should be left with a protective plate.

➢ **Storage longer than six months**

Storage for more than six months should be indicated or recommended when the order is placed.

Any prolonged storage before or after use in certain specific environmental conditions (humidity, direct exposure to sunlight, salinity, vibrations, corrosion) restricts application of the guarantee.

- Grease all visible unpainted elements. Rubber parts must be protected from sunlight and sudden temperature changes.
- Store the machine in its original packing. In addition, provide for packaging in heat-sealable plastic covering and desiccant bags. (The quantity of desiccant bags should be adapted to the storage period and to the packaging volume.)
- Protective covers are required for all flanges and threaded connections.
- Store protected from adverse weather conditions.

Machines should be stored in transport casings and placed in a dry, shock-free place, as vibrations can damage the motor and the machine.

After long storage, when the machine is to be installed, the grease and oil lubricated components should be cleaned of grease and replaced with new lubricating oil.

These preventive measures are necessary because the lubricant deteriorates over time under certain conditions.

Prior to installation, it is recommended that the machines be checked by a Milton Roy engineer.

Note:

- The shaft must be stored in horizontal position.

II - 3: DESCRIPTION OF THE MIXER

See overall agitator drawing and technical and dimensional specifications.

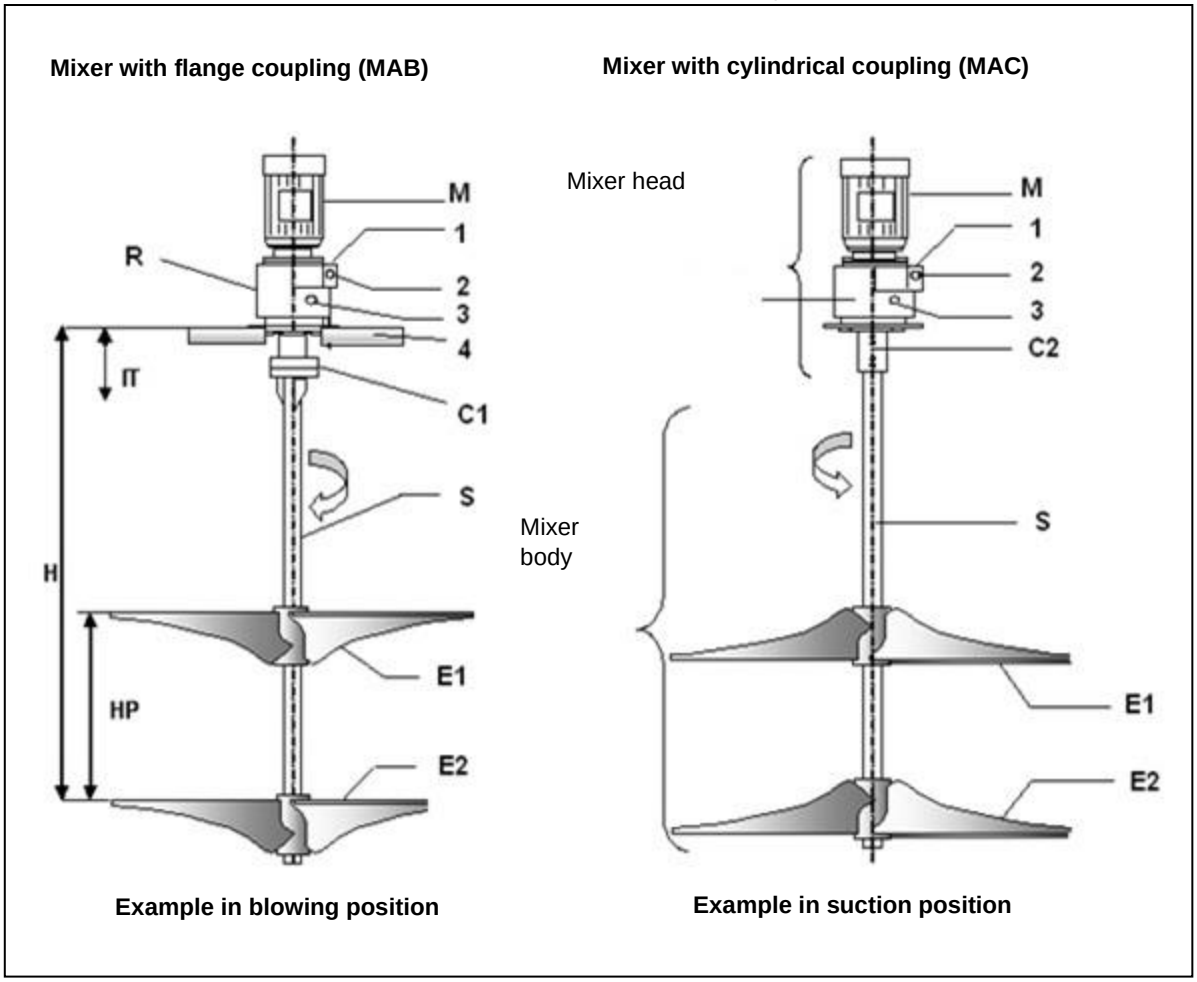
The mixer comprises the following:

- A drive device consisting of a motor [M].
- A gearbox [R]. It provides speed reduction between the motor and the mixer shaft. Lubrication is achieved by splashing in an oil bath.
- A mixing component. It consists of a shaft [S] and an impeller [E] (one or two impellers). It is connected to the gearbox output shaft via a coupling [C].

For a VRH, the impeller used is a 3-blade **H1P**.
For an FRH, the impeller used is a 2-blade **H2P**.
For a VRG, the impeller used is a 3-blade **10SG**.
For a VRP, the impeller used is a 4-blade **PBT**.

For double impellers, the blades must be aligned.

Figure 1: Simplified mixer assembly drawing



M	**Motor/Variable speed motor**	****C2**	**Cylindrical coupling**
1	**Filling plug (vent)**	***IT**	**Max. fluid level**
R	**Gearbox**	**S**	**Shaft**
2	**Level plug**	***H**	**Lower mobile height**
3	**Drain plug**	***HP**	**Spacing between impellers**
4	**Support**	****E1**	**Upper impeller (optional)**
****C1**	**Flange coupling**	****E2**	**Lower impeller (optional)**

* See mixer assembly drawing.

** Depending on model (not always two impellers; coupling depends on installation).

Summary of Part II

► Unpacking and storage

1. Check that the package is in good condition
2. Check the contents of the package on receipt using the delivery note
3. Check conformity of the manufacturer's and nameplates
4. Check the contents of the MAC package (1 package):
    - The impeller
    - The shaft
    - The mixer head
    - The instruction manual
5. Check the contents of the MAB package (2 packages):
    - The impeller
    - The mixer head
    - The instruction manual
    - Bolts and nuts
    - The shaft
6. Storage precautions:
    - Store in original packaging
    - Store away from weather and safe from impacts
    - Store away from vibrating equipment
    - For storage longer than 6 months, consult MR

► Description

1. Mixer composition:
    - A drive device consisting of a motor
    - A gearbox
    - A mixing component consisting of a shaft and an impeller
2. Positioning the double impellers:
    - According to option: blades must be aligned.

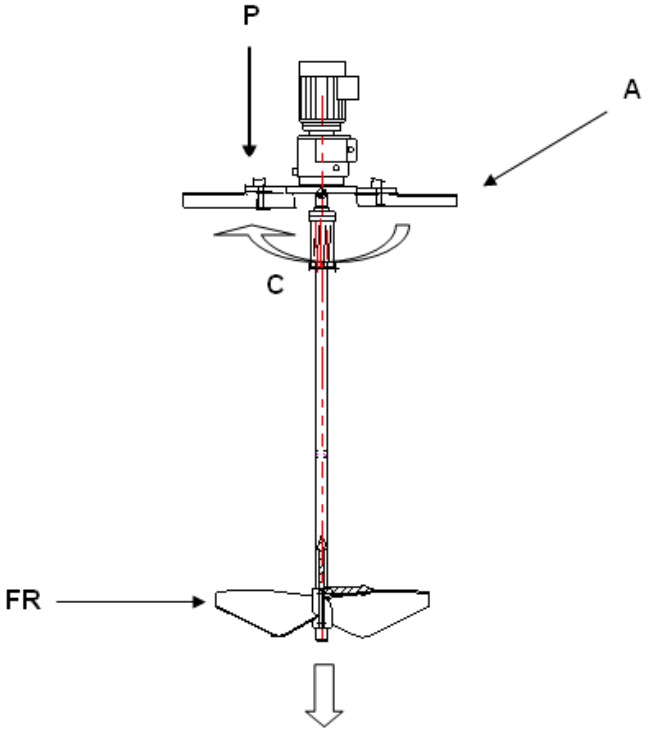
III - INSTALLATION

Installation of the equipment must be carried out by personnel with a sufficient level of mechanical and electrical expertise to ensure strict compliance with the instruction manual.

III - 1: HANDLING

Choose lifting equipment compatible with the weight of the parts to be handled (see Technical and dimensional characteristics of the mixer).

Note: Ensure that the support can withstand the static load and forces generated by the mixer.



P	**Load (weight + axial force)**
A	**Mixer support (not supplied)**
C	**Maximum torque that tends to shear the mixer mounting bolts**
FR	**Radial force**

The weight of the parts to be handled requires no special precautions. However, when handling, the greatest care must be taken not to damage the shaft, and in particular not to deform it.

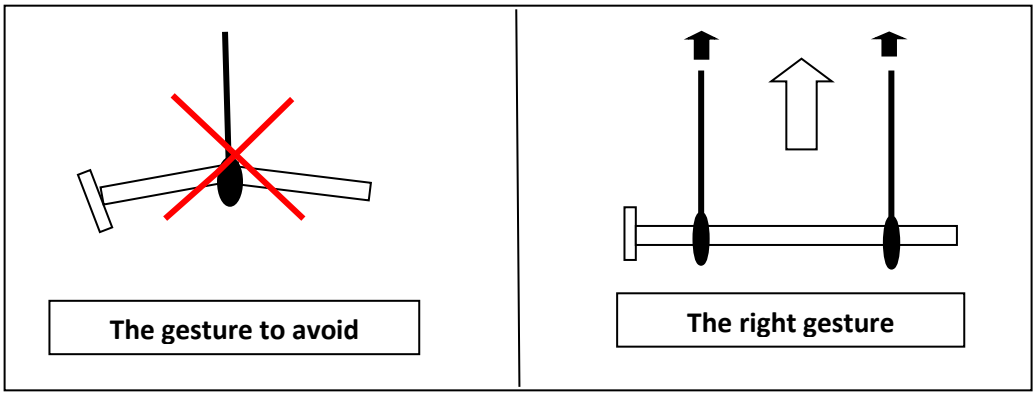
Caution: Take care not to damage the paint! Mechanical (scratches), chemical (acids, lyes) or thermal (sparks, welding beads, heat) damage leads to corrosion, preventing the protection from fulfilling its role. Any damage may invalidate the warranty.

Handling requires the following precautions:

- **Mixer shaft**

Refer to figure 2 "Installation of the sling" on the next page.

- Pass the sling around the motor, taking care not to damage the machined and/or painted surfaces.



- **Geared motor**

Refer to figure 2 “Slinging”, next page.

- Pass the sling around the geared motor, taking care not to damage the terminal box or any machined surfaces.
- Make sure the assembly is balanced before moving.
- Proceed with the installation (see part : INSTALLATION).

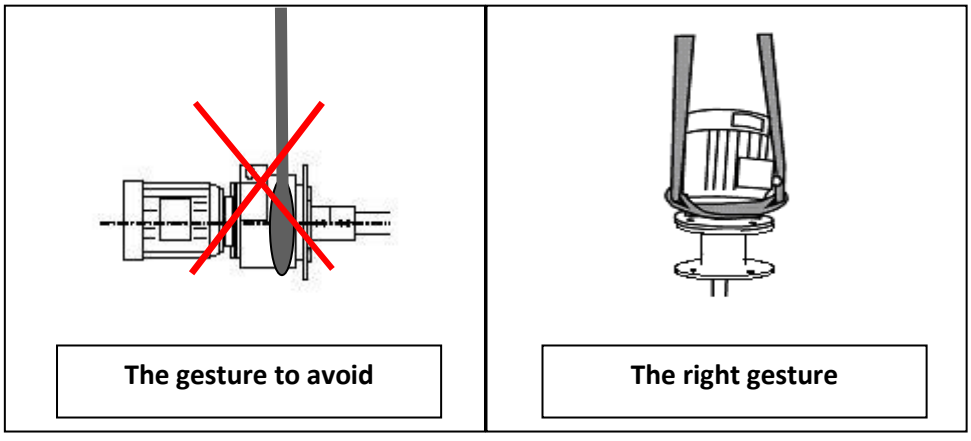
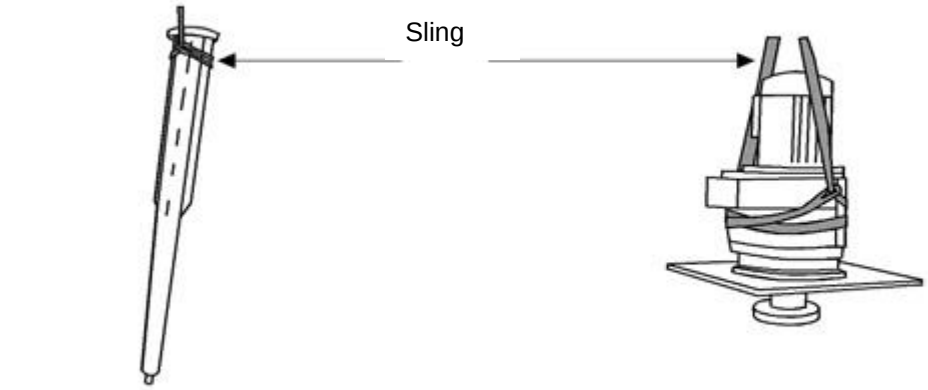


Figure 2: Installing the sling

Sling installation diagram



Handling the shaft

Handling the mixer head

III - 2: SET-UP

Carefully clean the surfaces which will be in contact after assembly (faces and centering of coupling flanges), make sure there are no traces of knocks and grease these faces. Gather the parts to be assembled, and check against the bill of materials to ensure that no parts are missing during assembly. Check that these parts are in good condition.

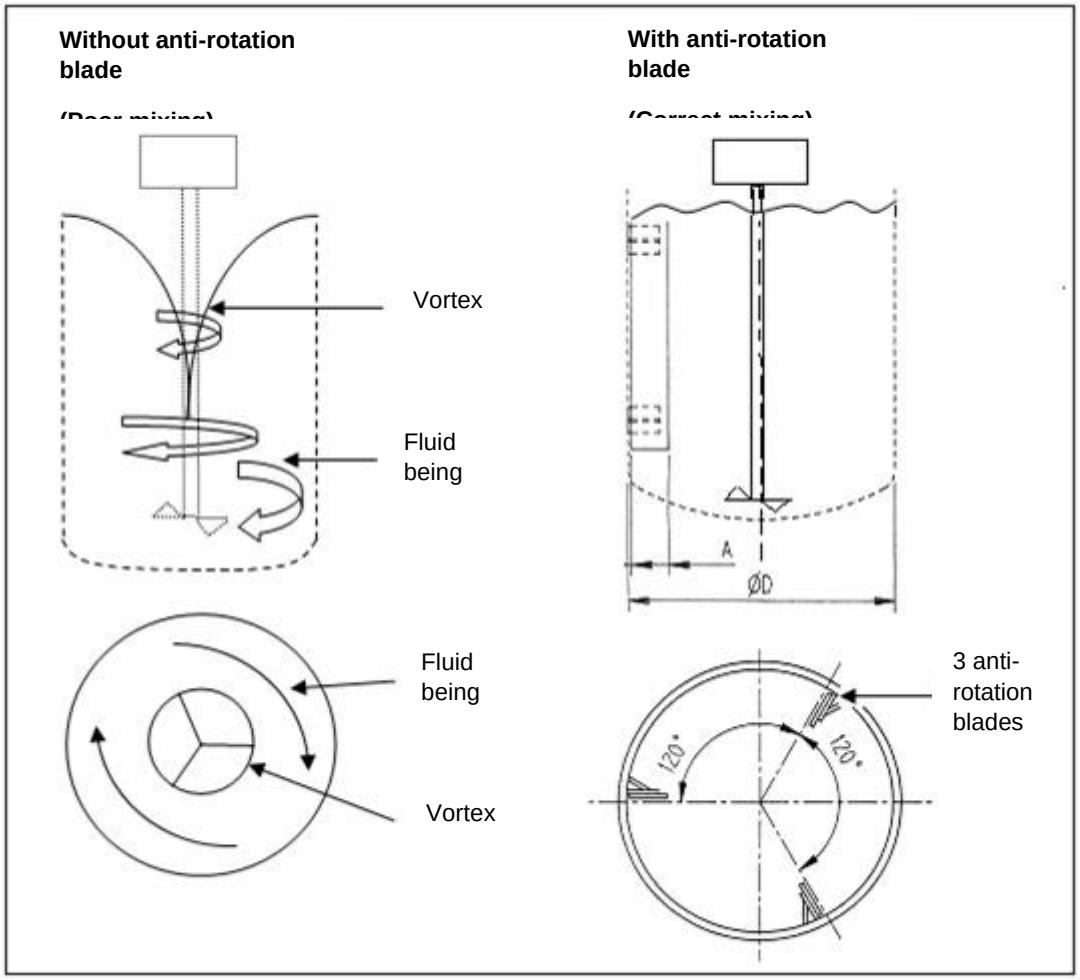
A) BENEFITS OF ANTI-ROTATION BLADES

As all mixers must be installed in the center of the cylindrical tank, it is strongly recommended to install anti-rotation blades as shown in the diagram below. Anti-rotation blades allow provide the following benefits:

- Avoid block rotation of the fluid
- Prevent the formation of vortexes* dangerous to the shaft and the introduction of air
- Achieve satisfactory mixing quality

*ref.. Glossary

Figure 3: Anti-rotation blades



∅D	A	∅D	A	∅D	A
100	8	1000	80	4500	360
200	16	1200	96	5000	400
300	24	1600	128	6000	480
400	32	2000	160	7500	600
500	40	2500	200	10000	800
600	48	3000	240	12000	960
800	64	4000	320		

Dimensions in mm

In special cases, the mixer can be mounted off-center in relation to the tank axis. This requires additional mechanical forces, which must be defined before the order is placed.

B) TOOLS REQUIRED FOR ASSEMBLY

Before assembly, it is useful to have the following equipment:

- Lifting equipment capable of lifting the total mass of the mixer
- Slings, hooks, shackles, ropes
- A standard toolbox up to a 24" open-end wrench
- An adjusting gage
- A calibrated torque wrench* with the tips appropriate for the torques indicated on the layout drawings
- PTFE spray or molybdenum disulfide grease if compatible with the products in the tank for stainless steel bolting
- Joists*.

*ref.. Glossary

C) PRINCIPLE OF SHAFT IMMOBILIZATION IN THE TANK

Note: In the case of a coated mixer, the mixer shaft flange may be drilled with non-through holes: assembly is carried out using studs* which are pre-fixed to the mixer shaft plate.
*ref.. Glossary.

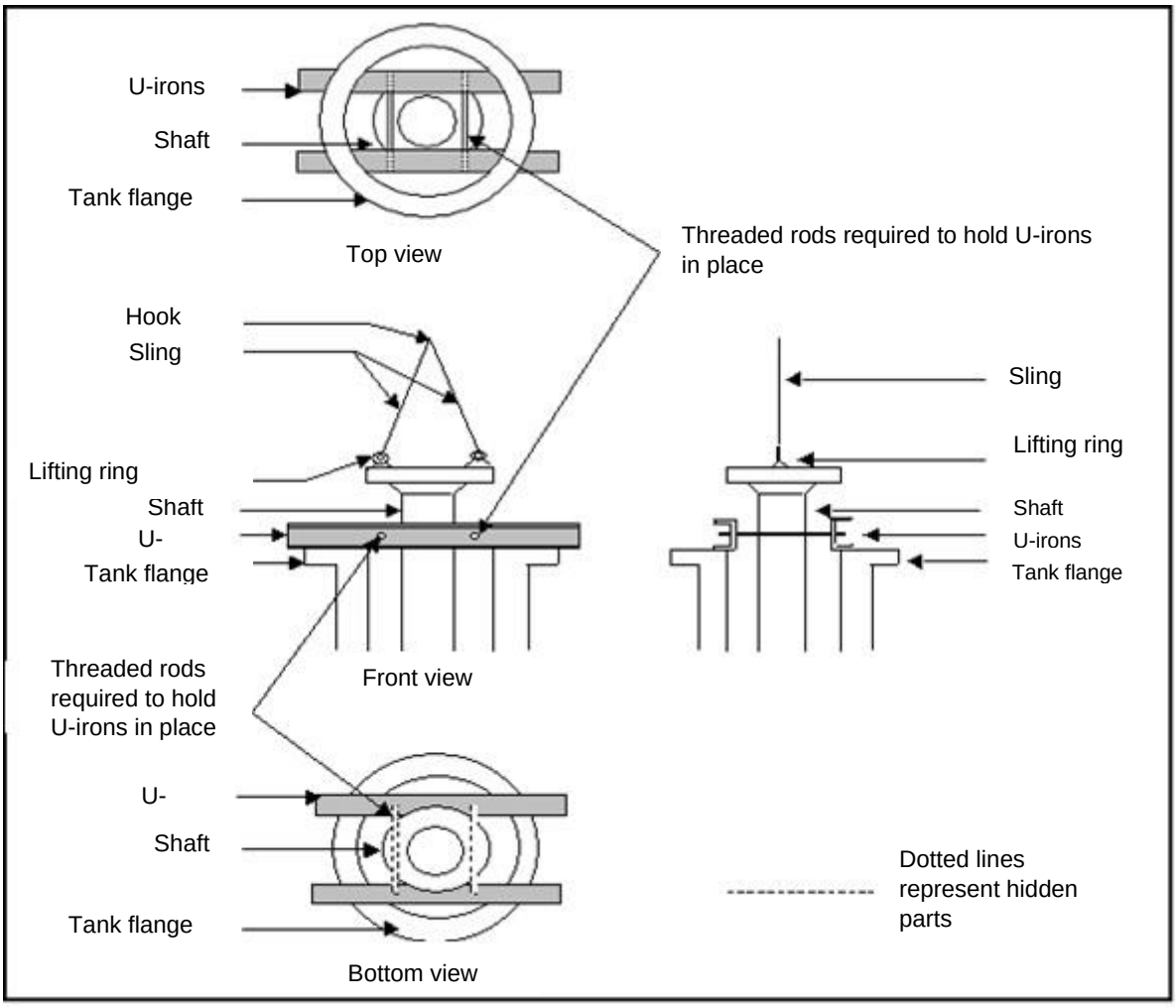
Then secure the shaft with a sling and install the U-irons or joists required to hold the shaft to the tank (as shown in the diagram below).

If necessary, fit the tank gasket to the U-irons (not supplied by MILTON ROY EUROPE unless indicated on the bill of materials).

Caution: Place a guard between the U-irons and the tank flange to prevent damage.

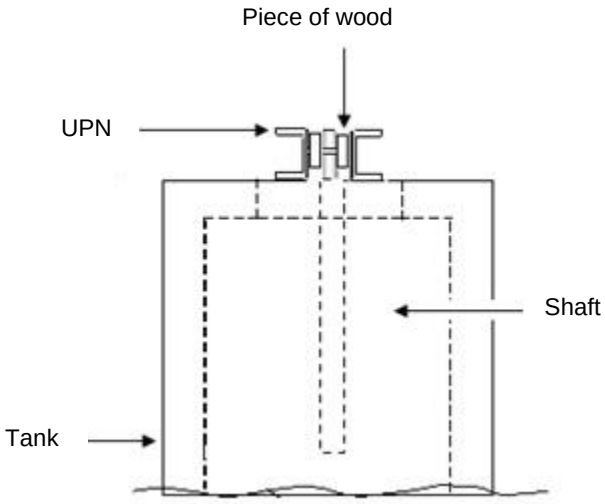
Attach the lifting rings to the lower shaft plate.

Figure 4: Holding the shaft in the tank



Mixers fitted with a solid shaft (MAC assembly) are lightweight and do not necessarily require the shaft to be immobilized in the tank. However, when fitting a heavier and/or longer shaft, please proceed as follows:

- Suspend the mixer head using slings.
- Fit the impeller on the shaft.
- Introduce the shaft into the tank and hold it in place with UPN (U-beam) and pieces of wood.



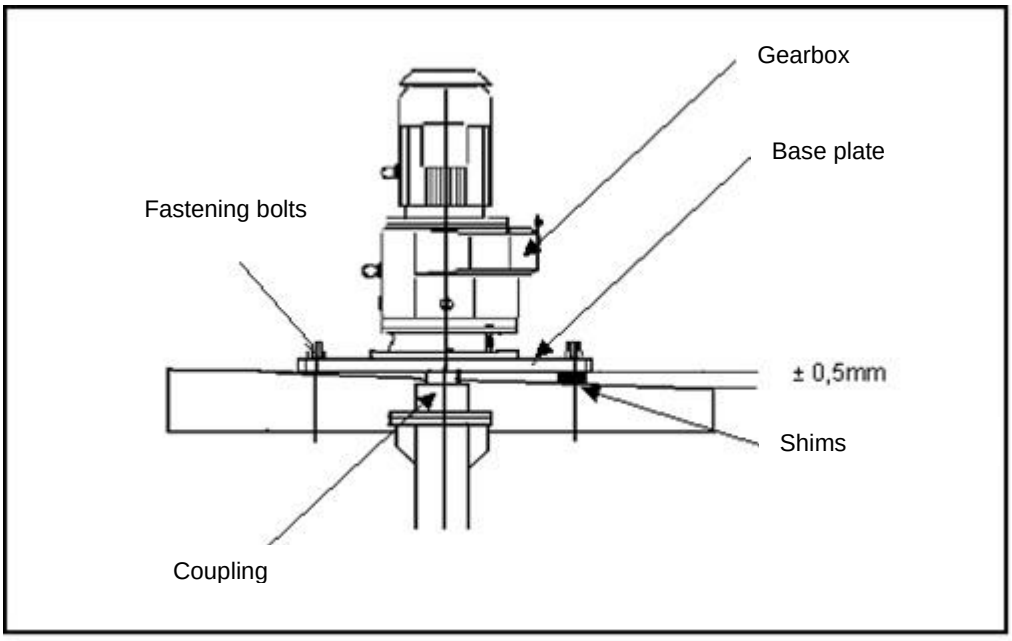
D) PRINCIPLE FOR FITTING THE MIXER TO ITS SUPPORT.

Check that the mixer support is horizontal (installation plan). To do this, you must:

- Position the mixer on its support.
- Correct flatness using shims (see figure 5, below), to avoid distorting the base plate.
- The flatness of the support (concrete) must be perfectly matched to the base plate. Maximum acceptable deviations may not exceed 0.5 mm. Any deviations greater than this must be eliminated by installing steel shims in the gap. This shimming must be carried out under the fastening points. This operation must be carried out before adjusting the horizontal position of the base plate.
  Horizontal adjustment is also very important for mixer operation, as it determines the vertical plane of the propeller shaft (maximum permissible fault tolerance, 2 mm/m)

Assemble and tighten to the torque indicated in the table (figure 7).

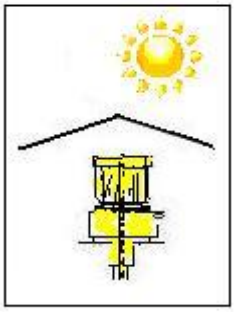
Figure 5: Securing the base plate to the support

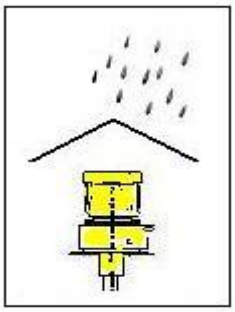


Torque depends on the quality of the bolts used by the customer. Recommended bolting is 8.8 steel. Possibility of fitting with a chemical dowel capable of withstanding the tensile stress caused by the torque of the cl 8.8 bolts.

Wherever possible, we recommend using through-bolts to fix the mixer to a concrete slab.

***Caution*:** We recommend placing a rain cap on outdoor equipment.





E) PRINCIPLE FOR COUPLING TO THE SHAFT

After checking the support, remove the mixer head and proceed with the following assembly:
Caution: the mixer must be mounted in a vertical position.

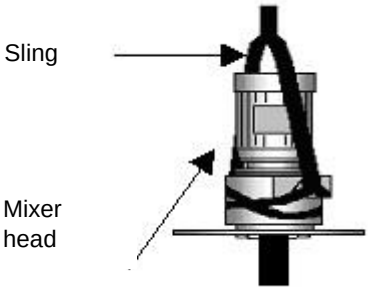
Refer to technical and dimensional characteristics of the mixer.
The mixer shaft [S] is connected to the motor output shaft by means of the following coupling [C]:

a) Mixer assembly steps

- **Cylindrical coupling (MAC):**

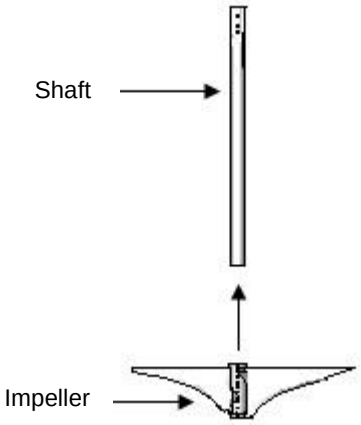
STEP 1

Suspend the mixer head using slings.
Hold the head vertically.



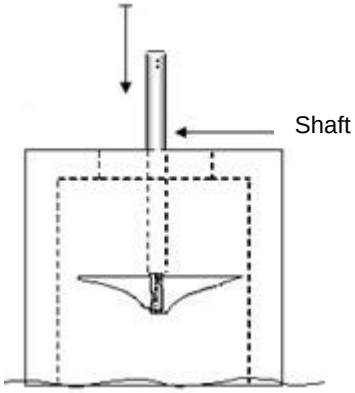
STEP 2

Install the impeller on the shaft.
Refer to part fitting the impeller to the mixer shaft.



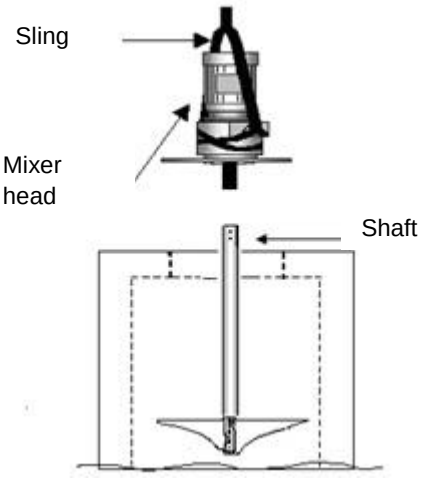
STEP 3

Manually suspend the shaft to install it in the tank.



STEP 4

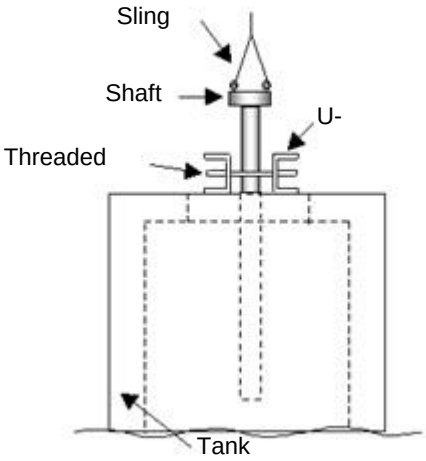
Finally, bring the mixer head towards the shaft and tighten as described in figure 6.



- **The flange coupling (MAB):**

Once you have correctly followed the assembly instructions in figure 5, follow the steps below:

STEP 1

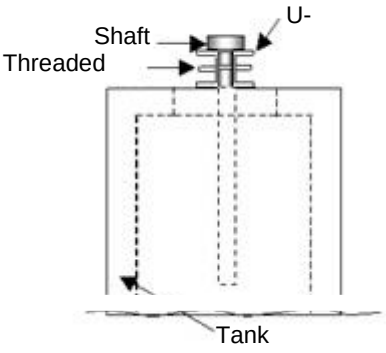


Insert the lower shaft into the tank and place it on the 2 U-irons or joists, depending on the load to be supported, positioned on the installation plan.

Hold the 2 U-irons or joists against the shaft using threaded rods and nuts.

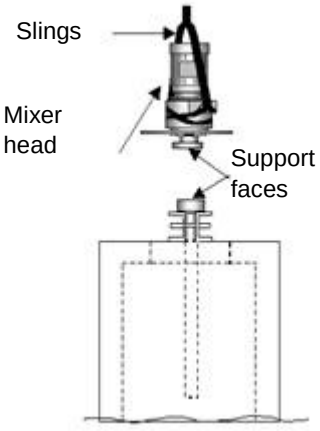
Make sure there's no risk of the equipment falling.

STEP 2



Remove slings and lifting rings.

STEP 3

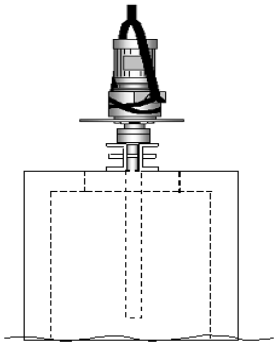


Bring the mixer head over the tank, adjusting the slings to hold the head vertically.

Clean flange bearing faces.

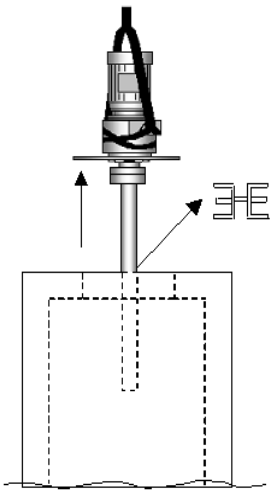
STEP 4

Assemble the 2 coupling flanges so as to fit at least 2 diametrically opposed bolts with locknuts or lock plates and tighten.



STEP 5

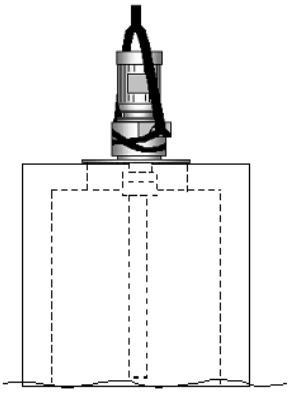
Raise the assembly slightly and remove the 2 U-irons or joists.



Finish fitting the bolts or screws (with their locknuts) on both flanges, taking into account the torque (figure 7). Clean the installation surface for the tank and mixer.

STEP 6

Lower the unit gently, positioning the mounting flange or (depending on option) the base plate correctly on the tank.



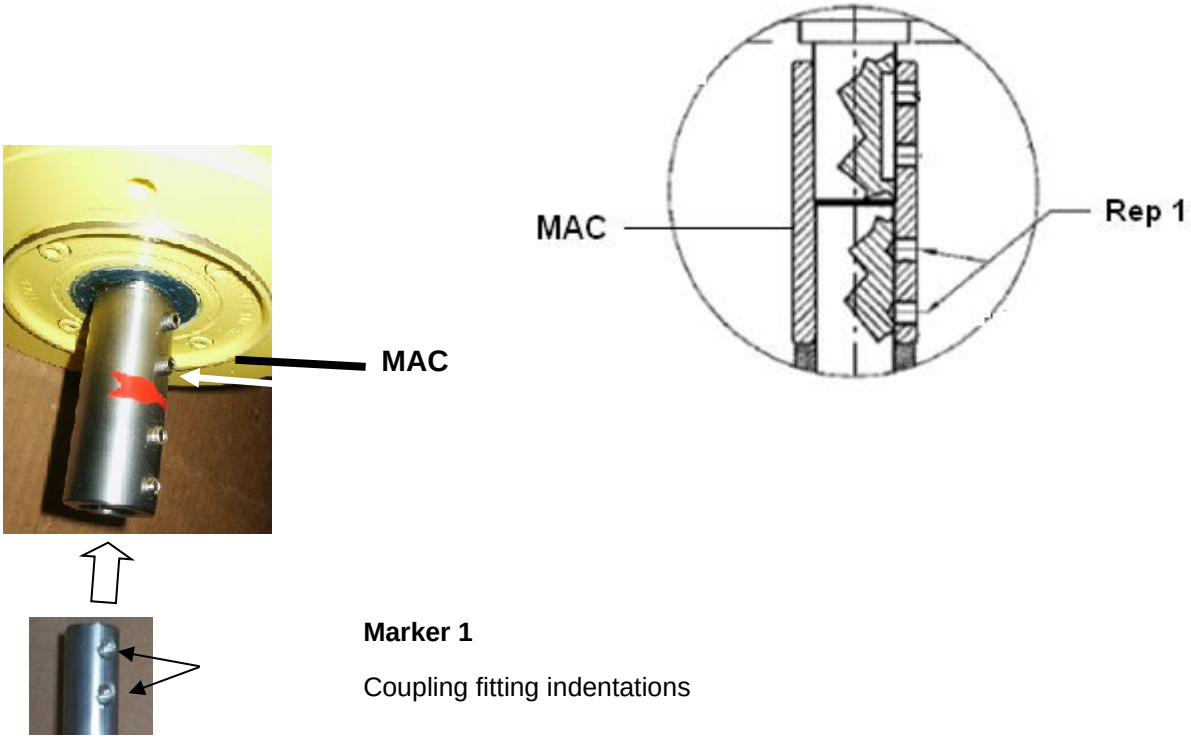
b) Cylindrical coupling assembly

➢ Cylindrical coupling (MAC):

The cylindrical coupling is pre-assembled on the motor output shaft in the workshop.
To complete the assembly of the shaft with the cylindrical coupling:

- **First,** hold the shaft firmly and insert it into the coupling (MAC).
- **Second,** position it so that the screws fit into the existing indentations **(Marker 1)** on the shaft.
- **Third**, assemble and tighten the grub screws to the torque indicated in in the torque table

Figure 6: Cylindrical coupling



Marker 1

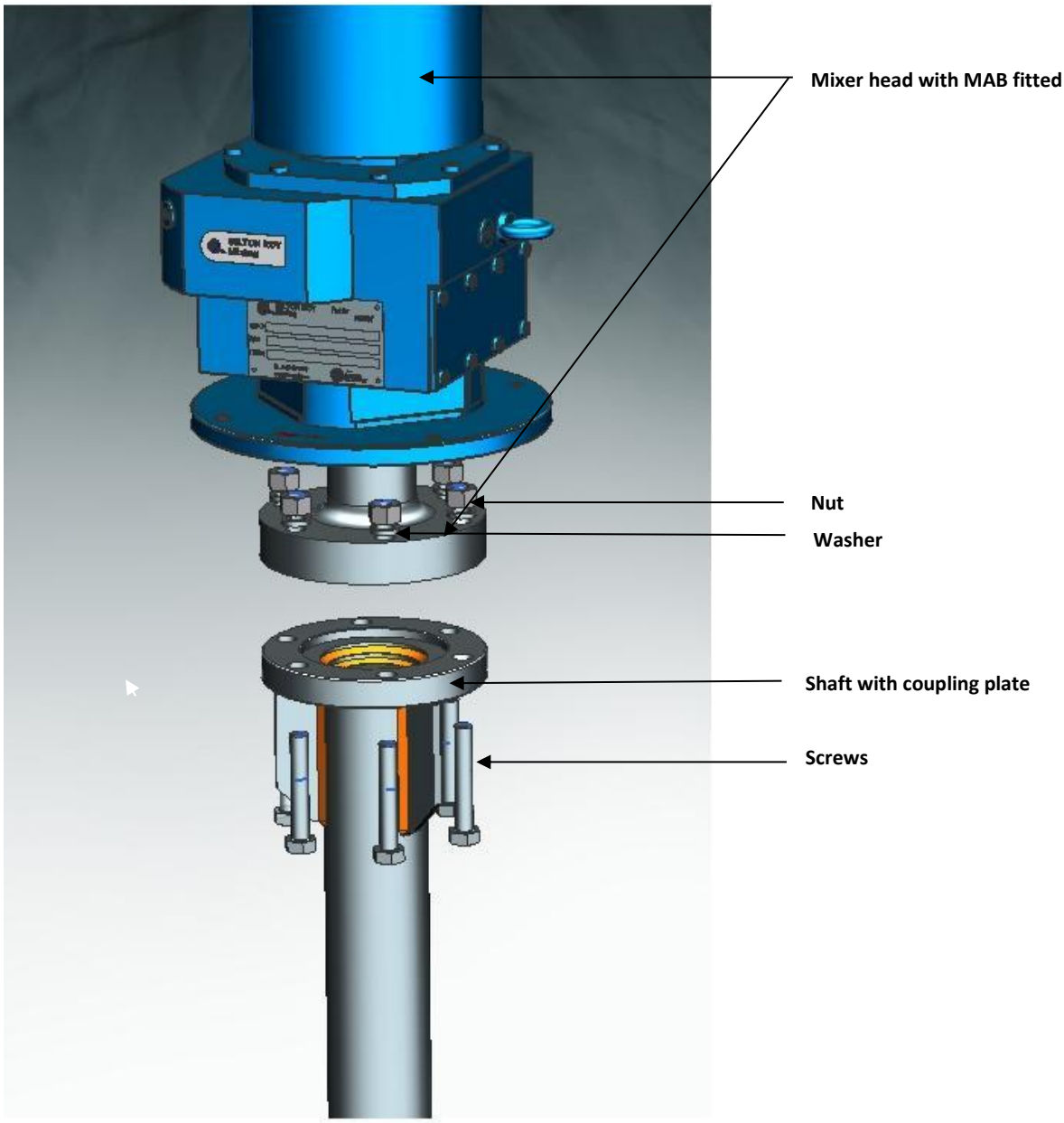
Coupling fitting indentations

- **The flange coupling (MAB):**

<u>Caution:</u> the mixer must be mounted in a vertical position.

In this configuration, the mixer shaft is fitted with a coupling flange at one end. The gearbox is fitted with a flange coupling mounted on the output shaft. This flange coupling (MAB) is pre-mounted on the mixer head using an H screw.
To complete the assembly of the shaft with the flange coupling:

- **First**, bring the shaft close to the mixer head. Please ensure that the holes in the shaft coupling plate are aligned with those in the flange coupling mounted on the mixer head.
- **Second**, insert the screws into the shaft coupling plate and then into the flange coupling. Then place a washer on each screw.
- **Third,** screw the assembly together using the nuts supplied by Milton Roy Europe.



F) FITTING THE IMPELLER TO THE MIXER SHAFT

Installation of the "mixer shaft - impeller" assembly can be facilitated by assembling it at the bottom of the tank (depending on the size of the components and/or layout).

If the impeller is too far from the bottom, use scaffolding.

Refer to the mixer assembly drawing supplied with the mixer to position the mobile(s) [E] on the shaft [S]. Make sure the installation direction is correct (blower or suction position).
As a general rule, place the impeller a few centimeters from the end of the shaft.

Label attached to impeller indicating its direction of rotation using the letter mentioned at top left of each drawing.

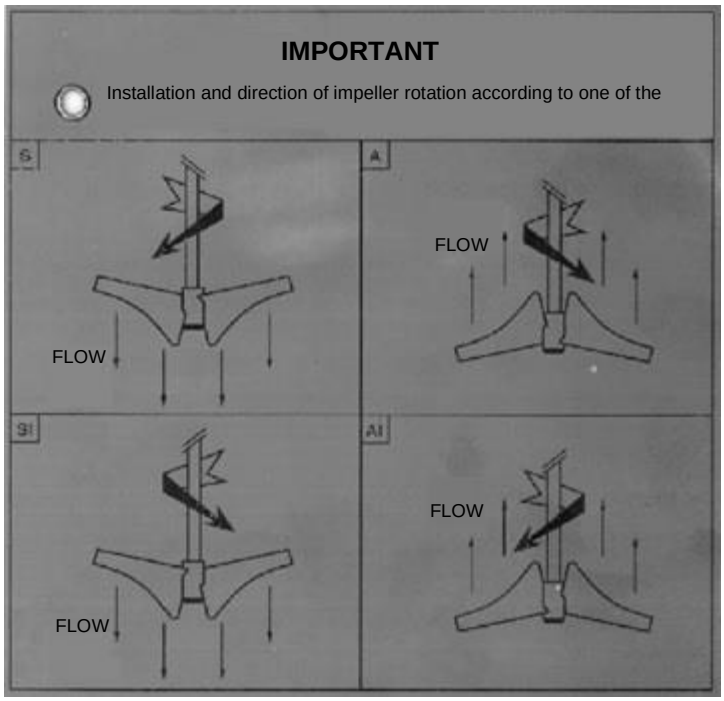
Each letter indicates:

S → blower

A → suction

SI → reverse blower

AI → reverse suction



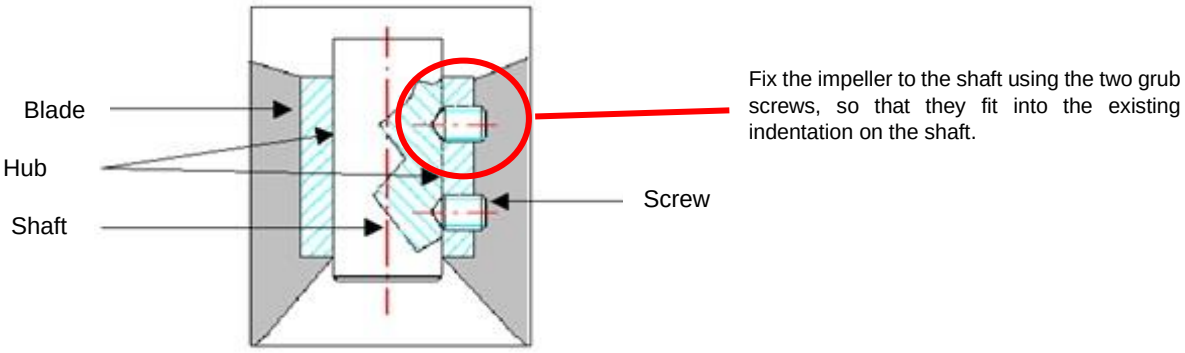
Check the position of the impellers in relation to the tank bottom and walls.

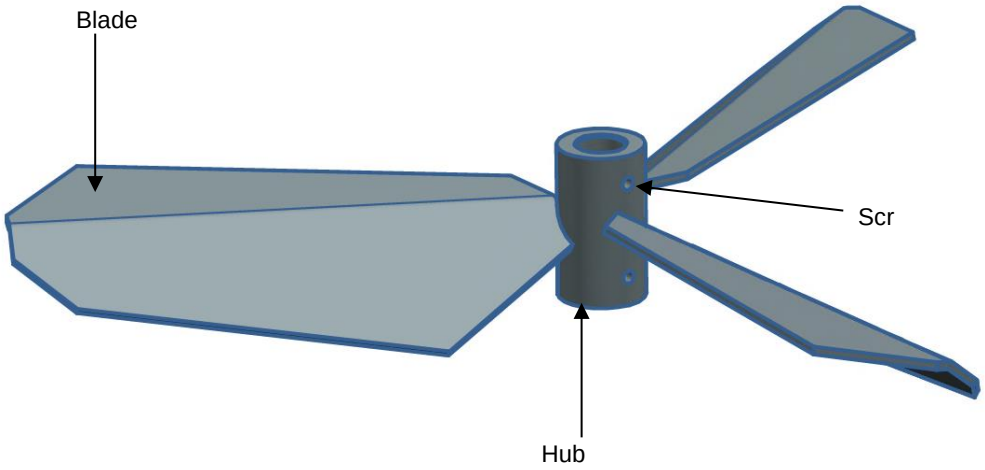
Mark the altitude position of each impeller on the builder's drawing, as well as the suction or blowing direction of the flow, so that you can present the blades for assembly in the right place and position. The flow generated by a suction impeller is directed towards the liquid interface, while that of a blower impeller is directed towards the tank bottom.

Note: The final tightening of the impeller fastening bolts is **a very important operation which determines the subsequent smooth operation of the mixer**. This operation is explained in detail (Figure 7) and must be strictly adhered to.

- **Impellers fitted on one-piece hubs (MAC):**

They are fastened to the shaft by one or two grub screws. Position the impeller so that the screw fits into the existing indentation on the shaft.





Apply the torque indicated in the table below to the nut and locknut.

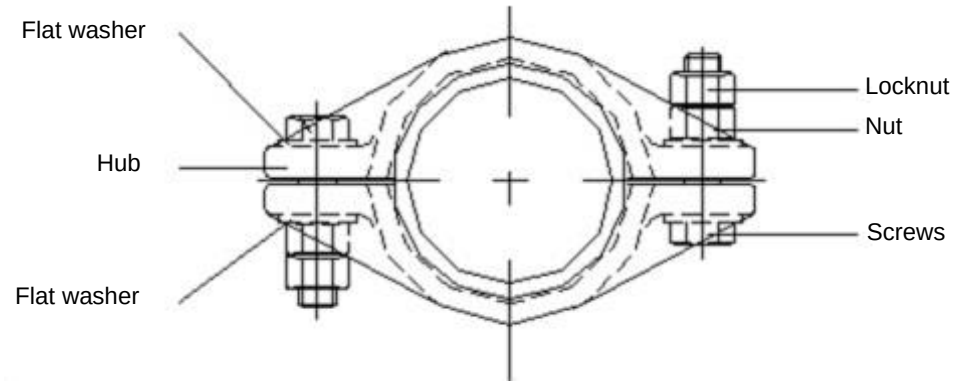
Note: In the case of coated mixers, the impellers are permanently welded to the shaft.

- **Two or three-piece hub-mounted impellers:**

Blade attachment for tubular-shaft models fitted with Sabre® impellers.

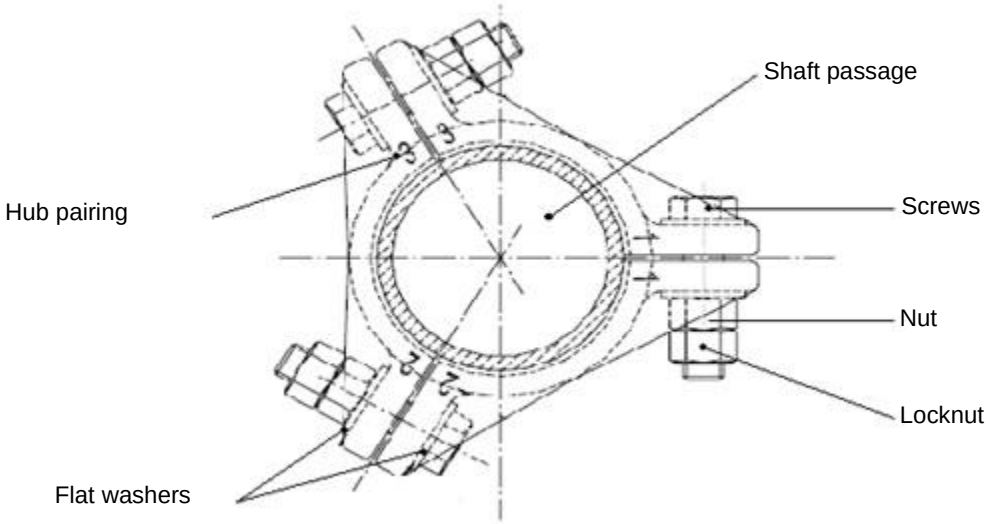
They are fastened to the shaft by assembling the hub components together using bolts (screws, nuts and locknuts). In this case, don't forget the locknuts.

Example with a 2-piece hub



Note: It's imperative to have balanced gaps between each hub, which is the sign of a good assembly.

Example with a 3-piece hub



Fit the 4 or 6 screws with their 2 washers and nuts. Bolts must be clean and greased (there can be a 30% difference in torque between a lubricated bolt and a dry one). It is necessary to have a similar distance between each hub (~ 5 to 10 mm). If there are very large visual discrepancies either radially or laterally, then the bolts have certainly been incorrectly balanced. This sign should be taken as a warning of incorrect assembly.
Gradually tighten each part of the hub to ensure even distribution of the clamping force.
Apply the torque indicated in the table below to the nut and locknut.

Figure 7: Torque table

Dimensions	Bolt torque		
	Fastening bolts in A4-70 stainless steel	**Fastening bolts in steel Class 8.8**	**Fastening screws in Class 8.8 steel or A4-70 stainless steel, made of yield strength material ≥ 210 MPa**
M6	**6.5 N.m**	**9.5 N.m**	**3 N.m**
M8	**16 N.m**	**23 N.m**	**7.5 N.m**
M10	**32 N.m**	**46 N.m**	**15 N.m**
M12	**57 N.m**	**81 N.m**	**26.5 N.m**
M14	**90 N.m**	**128 N.m**	**42 N.m**
M16	**133.5 N.m**	**190 N.m**	**62 N.m**
M18	**183 N.m**	**260 N.m**	**85 N.m**
M20	**260 N.m**	**370 N.m**	**121.5 N.m**
M24	**470 N.m**	**650 N.m**	**213 N.m**

1daN=10N

Bolts for coupling flanges and hubs are supplied with the equipment.

To avoid reversing the bolts, please refer to the tables below. Also, please measure the flange and shaft dimensions on your mixer.

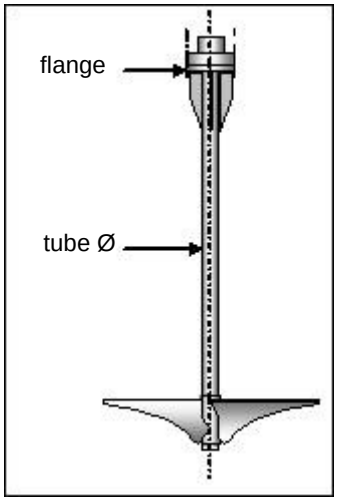
Figure 7.a

Flanged coupling sleeve		
flange ø	Number of screws	Bolts
125	4	H-M12x065/30
175	6	H-M16x090/38
190	6	H-M16x090/38
220	6	H-M16x090/38

Figure 7.b

Hub			
tube Ø	Number of screws		Bolts
	2-piece hub	3-piece hub	
Ø 60.3	4	6	H -M12x55/55
Ø 88.9	4	6	H -M14x60/60
Ø 114.3	4	6	H-M16x70/70
Ø 141.3	4	6	H-M18x80/80
Ø 168.3	4	6	H-M20x90/46
Ø 219	4	6	H-M27x130/66

Figure 7.c



III - 3: ELECTRICAL INSTALLATION

MOTOR CONNECTION

Warning: The connection must be carried out by an authorized person in accordance with current safety regulations.

The data on the nameplates must be observed**.**

Be sure to compare mains current, voltage and frequency before making connections.

The motor's electrical protection (fuse and thermal protection, or circuit breaker) must match the motor's current rating.

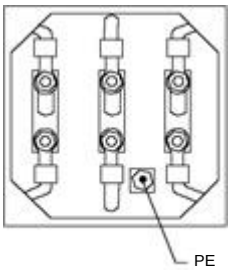
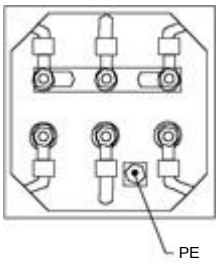
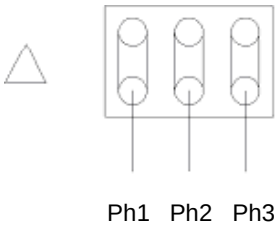
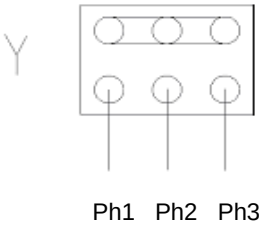
Connect the motor as indicated in the terminal box (Figure 8). Do not forget to connect the motor ground terminal [PE] to the protective conductor.

For a 230/400 V motor, the 230 V TRI connection is made in delta circuit △ (figure 9). For 400 V TRI connection, make a Y star connection (figure 10).

For a 400/690 V motor, the 400 V TRI connection is made in delta circuit △ (figure 9). For 690 V TRI connection, make a Y star connection (figure 10).

Hermetically seal unused cable entries to prevent the ingress of dust and moisture.

Caution: After prolonged storage or shutdown, have the coil insulation resistance measured phase-to-phase and phase-to-ground by an authorized person before start-up. Wet coils can cause leakage currents, disruptive discharges and breakdowns.

Figure 8: Motor terminal box	
	
DELTA ASSEMBLY  ***Figure 9***	**STAR ASSEMBLY**  ***Figure 10***

III - 4: NOISE AND VIBRATION INSTRUCTIONS

Noise:

The A-weighted emission sound pressure level at 1m of HM series agitators is less than 85 dB(A) unless other values are known from MILTON ROY specifications.

In certain resonance configurations between the mixer and the facility, this sound pressure level can be amplified.

In this case, we recommend:

- Modification of the installation's natural resonant frequency (e.g. stiffening of the structure, displacement of structural elements, etc.).
- Insertion of damping devices between the mixer and its support.
- Placement of a hood to improve soundproofing.

Vibration:

HM series mixers generate vibrations < 4.5 mm/s at the gearbox flange, unless other values are known from MR specifications.

In certain resonance configurations between the mixer and the installation, this vibration level can be amplified.

In this case, we recommend:

- modification of the installation's natural resonant frequency (e.g. stiffening of the structure, displacement of structural elements, etc.).
- or insertion of damping devices between the mixer and its support. (Contact MILTON ROY)

Summary of Part III

► Handling

1. Any damage to the paint may invalidate the warranty.
2. The shaft must be handled horizontally.
3. Check balance before moving.
4. The shaft and motor are handled using a sling.

► Installation

1. Check that the unit is clean.
2. Check that parts supplied are in good condition.
3. The mixer must be in the center of the tank.
4. Anti-rotation blades recommended in the tank.
5. Equip yourself with tools such as lifting gear, slings, standard toolbox, torque wrench, PTFE spray, joists.
6. Cylindrical coupling installation procedure:
    - Insert the shaft into the MAC.
    - Check screw positioning with shaft indentations.
    - Check bolt torques.
7. Flange coupling installation procedure:
    - Place the shaft opposite the mixer head.
    - Insert screws and then washers.
    - Screw it all together with the nuts.
8. Use U-irons to immobilize the shaft in the tank.
9. Check that the mixer support is horizontal.
10. Check that the base plate is securely fastened to the support.
11. Make sure the impeller is mounted on the shaft in the correct direction (blowing or suction position).
12. Preferably place the impeller a few centimeters from the end of the shaft.
13. Check fastenings on impellers mounted on one-piece hubs.
14. Check fastenings on impellers mounted on fasteners.
15. Check the various mixer dimensions.

► Electrical installation

1. Make sure you know the data on the nameplates.
2. Check electrical current.
3. Check electrical connections.
4. Check unused electric cable inlets for leaks.

IV – START-UP

IV - 1: PROCEDURES PRIOR TO INITIAL START-UP

Caution: To prevent accidental start-up of the equipment, switch off the power supply (unplug the unit) and signal the intervention (e.g.: "operator making adjustments, do not connect the system").

Before initial start-up, please try to:

- Check the various fasteners and check that the screws are secure (see part "Installation").
- Check that there are no obstacles in the way of the shaft/mobile unit.
- Follow nameplate indications.
- Check that motor voltage and frequency match mains values.
- Check that the direction of rotation is correct and that the speed threshold is not exceeded when the drive is running.
- Check that electrical connections are tight and that monitoring devices have been connected as specified.
- Check that any additional devices are in good working order.
- Check that air inlets and cooling surfaces are clean.
- Check that protective measures have been taken: earthing.
- Check that the motor is correctly secured.
- Check that the terminal box is closed and that the wire entries have been properly sealed.

Note: All HELISEM® mixers are supplied filled with oil.

- Install the vent plug in place of the plug for mixers with gearbox.

Note: If the mixer is to be used in dusty or sandy areas, a special filter is required, please consult us.

- Check oil level in the gearbox [R]. To do this:
  - **First**, unscrew the oil level plug and check that the oil reaches the bore of the plug.
  - **Second,** top up if necessary, by unscrewing the filler cap, to obtain the recommended volume (to find out the recommended oil level, refer to the manufacturer's nameplate).

Caution: Immediately remove any oil spillage using a degreasing agent appropriate to the operating conditions.

  - **Third**, screw the cap back on.

Note: For ZF29 and DF29 gearboxes, there is no drain plug, and lubrication is for life. Simply check the oil level and top up if necessary. However, oil can be drained by suction.

Checking the motor connection

Start the mixer to check the motor's direction of rotation. Impeller rotation must follow the direction indicated by the arrow on the housing To reverse the direction of motor rotation, stop the mixer and reverse Ph1 and Ph2 or Ph1 and Ph3 (Figure 8 : Motor terminal box).

IV - 2: INITIAL START-UP

- Once all the checks and procedures described in the previous chapter have been carried out, start up the mixer.
- Carry out a visual and auditory check (in particular, check for suspicious noises).
- Stop the mixer.
- Fill the tank to operating level and check that there are no foreign bodies in the tank.
- Start the mixer.

IMPORTANT: Do not run the mixer continuously if the impeller is partially submerged.

Checking electrical current

Check the current on all 3 phases using a metric ampere clamp when the liquid is moving, and compare it with the value shown on the motor nameplate.

IV - 3: INCIDENTS ON INITIAL START-UP

GEARED MOTOR PROBLEMS

➢ **Engine runs with difficulty and heats up abnormally**.

- A phase is incorrectly connected.
- Power supply specifications do not match motor specifications.
- The chosen electrical coupling (star or delta) is not suitable.

➢ **The gearbox overheats.**

- The gearbox housing does not contain the required amount of oil.

IV - 4: OPERATION

During operation, check the following:

- Normal operating temperature
- A change in noise
- Oil leakage
- **For mixers used to treat wastewater in the presence of chaff, the mixer should be run in reverse for a few moments at a time.**

These checks are listed in part "Inspection and maintenance schedule".

Note: Do not use the mixer when the liquid is below the mobile's minimum immersion level. Minimum and maximum levels are shown and indicated on the mixer assembly drawing

If an anomaly is detected during operation, stop the motor.

To determine the cause of the malfunction, refer to part "Troubleshooting".

If you have any problems determining the cause of the malfunction or troubleshooting, please contact our Technical Support Department.

Note: In the case of coated mixers, the impellers are permanently welded to the shaft.

IV - 5: INSPECTION AND MAINTENANCE SCHEDULE

The inspection and maintenance schedule depends on the equipment's operating conditions. For this reason, the frequencies given below are for guidance only. It's up to you to adapt the frequencies to your operating conditions.

Figure 11: Maintenance schedule table

When	Inspection	Intervention	See
Every month	Auditory check (bearing wear) if unsatisfactory ->	Remove defective motor for reconditioning	V - 2 A
	Check dirtiness of the motor fan if necessary ->	Clean the motor fan	V – 1 B
Every 3 months	Oil temperature check (max: Chapter VI - 1 D) if incorrect ->	Check - date of last oil change - degree of oil contamination - whether the motor is dirty	V – 1 C
Every 2,500 hours	Check oil level in gearbox housing if incorrect	Search for oil leaks	V – 1 C
Every 5,000 hours		Gearbox oil change (for ZF/DF39 and larger)	V – 1 D
At least once a year	Check fastener locking		V – 1 A

To help you keep track of your work (inspection or maintenance operation), a sample maintenance sheet is shown in figure 12 (next page).

Figure 12: Example of a maintenance sheet

Mixer code :
Case no :
Date of initial start-up :

Intervention	Date	Operating hours	Remarks

Summary of Part IV

► Procedures before start-up

With the mixer off:

1. Visual inspection of unit:
    - Fasteners and screw locking
    - Direction of rotation
    - Electrical connections
    - Additional devices
    - Air inlets and cooling surfaces
    - Motor mounting
    - Closure of the terminal box
2. Placement of the vent plug
3. Check gearbox oil level
4. Filling of the tank
5. Check electrical connections

► Initial start-up

1. Mixer start-up
2. Visual and auditory check
3. Mixer shutdown
4. Filling of the tank
5. Restarting the mixer
6. Checking electrical intensity

► Incidents on initial start-up

Geared motor problems:

- Check phase connection
- Check motor specifications
- Check electrical connections
- Check oil level in gearbox housing.

► Operation

1. Check operating temperature
2. Check noise change
3. Check for oil leaks

► Inspection and maintenance schedule

1. Every month:
    - Auditory check of the device
    - Check motor fan for dirt
2. Every 3 months:
    - Check oil temperature.
3. Every 2,500 hours:
    - Check oil level in gearbox housing.
4. Every 5,000 hours:
    - Gearbox oil change (except ZF/DF29 models).
5. Once a year:
    - Check fasteners for tightness.

V - MAINTENANCE

Caution: if your mixer contains special options that may affect maintenance operations, e.g. special motor, lantern-mounted, variable speed drive, food-safe oil, etc., please refer to the supplementary manual or contact Milton Roy Europe.

V - 1: BASIC MAINTENANCE

A) CHECKING THE LOCKING OF FASTENING ASSEMBLIES

IMPORTANT: Switch off the mixer. Make sure that the equipment cannot be accidentally switched on, and report the intervention (LOTO).

Check the various mixer fastenings and make sure they are secure. The torque is indicated in table figure 7 in part "Installation".

Defective fastening assemblies must be replaced by assemblies of the same class.

B) CLEANING THE MOTOR FAN

This ensures that the heat is dissipated properly.

- **Switch off the mixer. Make sure that the equipment cannot be accidentally switched on, and report the intervention (LOTO).**
- Remove all traces of dirt and dust Do not use high-pressure cleaners or sharp tools.

C) CHECKING OIL LEVEL IN GEARBOX HOUSING

Caution: Before carrying out any maintenance, it is essential to check the oil temperature, which must be below 30°C. Even after a short period of operation, the oil should be allowed to settle for a while, to allow any air bubbles to be eliminated.

Caution: To prevent burns from hot oil, wear appropriate personal protective equipment.

Before undertaking this work, switch off the mixer. Make sure that the equipment cannot be accidentally switched on, and report the intervention (LOTO).

To check the oil level in the gearbox housing:

- **First,** unscrew the plug and check that the oil reaches the plug bore.
- **Second,** if necessary, fill the housing (with an oil suitable for the operating conditions) until the oil reaches the plug bore.

Caution: remove any oil spillage immediately using a degreasing agent appropriate to the conditions of use.

- **Third**, check the condition of the sealing ring, replacing it if necessary.
- **Fourthly**, screw the cap back on.

D) DRAINING THE GEARBOX

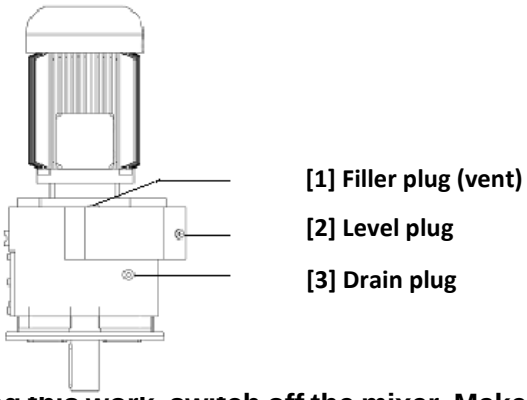
* except models equipped with ZF29 or DF29 gearbox.

Caution: Before carrying out any maintenance, it is essential to check the oil temperature, which must be below 30°C. Even after a short period of operation, the oil should be allowed to settle for a while, to allow any air bubbles to be eliminated. However, it is preferable for the oil to be lukewarm (around 30°) to facilitate its fluidity and proper evacuation. To do this, let the gearbox run for 15 to 30 minutes to warm up.

Drain every 5,000 hours of operation. To prevent burns from hot oil, wear appropriate personal protective equipment.

* gearbox oil is harmful to the environment, collect it carefully and send it to a waste disposal center. The same applies to oil-stained cleaning cloths.

Figure 13: Draining the gearbox



Before undertaking this work, switch off the mixer. Make sure that the equipment cannot be accidentally switched on, and report the intervention (LOTO).

Step 1: draining the gearbox

To drain the gearbox:

- **First,** place a suitable container of sufficient capacity under the drain plug [3].
- **Second**, unscrew the cap [3] and allow the oil to flow completely into the container. The housing must be perfectly clean of any oil residue or particles.
- **Third**, screw the drain plug back on.

Step 2: filling the gearbox

To fill the gearbox:

- **First,** unscrew the oil level plug [2] and the filler cap [1].
- **Second,** to fill the housing, it is advisable to pour the new oil onto a filling filter (with an oil suitable for the conditions of use) until the oil reaches the level of the level plug bore [2].
- **Third**, screw on the level plug [2] and filler plug [1].

  Caution: remove any oil spillage immediately using a degreasing agent appropriate to the operating conditions.

Characteristics:

- Quantity: see technical data sheet at end of manual.
- Original oil: ISO VG 220 EP mineral oil (as per DIN 51502)
- Ambient temperature: - 5°C to + 40°C
- Maximum operating oil temperature: 90°C
- Used oil and soiled rags must be collected in suitable containers.

Table of equivalents:

BP	ENERGOL GR-XP220
ESSO	SPARTAN EP220
MOBIL	MOBILGEAR 630
SHELL	OMALA OIL 220

E) TROUBLESHOOTING

MOTOR PROBLEMS

- Motor does not run

Thermal protection tripped.

- Too much intensity, possible causes:
  - Chaff
  - Viscosity and density of mixed medium higher than expected
- The motor is faulty.
- The wiring is faulty.

- **The motor struggles to start or runs with difficulty.**
  - The quality of the oil in the gearbox housing is incorrect (viscosity).

- **Abnormal motor heating.**
  - Motor fan is dirty.
  - Insufficient oil: check for leaks.
  - The quality of the oil is incorrect. Check the date of the last oil change, the characteristics of the oil used and its degree of contamination.
  - The mixer is used in conditions other than those specified.

NOISY MECHANICAL PROBLEMS

- The bearing clearance is too wide or the bearings are worn (motor or gearbox).
- The gears are worn.

Symptoms when the vent plug is not in place are:

- Risk of overheating.
- Oil leak.

F) ORDERING SPARE PARTS

To facilitate registration and ensure faster delivery of your spare parts order, please provide us with the following information:

- Mixer information: type [1] and case number [2]. These two elements are shown on the data plate attached to the motor cover (figure 14 below).
- Spare part information: part number, description and quantity. These items are included in the spare parts lists.

Contact MILTON ROY EUROPE for spare parts list.

Figure 14: Specification plate

1	**TYPE: Mixer code**
2	**S/N: Serial number**
3	**Year: Year of installation**
4	**Order no.: your order number**
5	**Weight: Mixer weight**
6	**ATEX: ATEX code (if applicable)**
7	**TAG: Mixer tag (if applicable)**

After-sales service Phone: +331 60 74 61 32 /+331 60 74 95 33

V – 2: CORRECTIVE MAINTENANCE

A) MOTOR

GENERAL

- **Precautions**

Dry wet motors before starting them up, and have their insulation value checked by a specialist.

- **Bearings**

Motor bearings are greased for life. They are therefore maintenance-free.
Unusual bearing noises and high bearing housing temperatures indicate poor bearing condition.

MOTOR REMOVAL

- **REMOVAL**

- **Switch off the mixer. Make sure that the equipment cannot be accidentally switched on, and report the intervention (LOTO).**
- Locate the motor connection before disconnecting the wires from the terminal box.
- Install a sling to handle the motor (see Part "Handling").
- Remove motor.

- **REFIT**

Torques are shown in Figure 7 in part "Installation".

- Reassemble the motor on the gearbox. Assemble and lock by tightening to the torque indicated in the table above.
- Connect the motor, taking into account the markings made during removal.
- Check that the motor is connected as indicated by the arrow on the housing (see paragraph "Checking the electrical connection").

B) GEARBOX

GENERAL

The gearbox requires very little maintenance. Lubrication is achieved by splashing in an oil bath.

REMOVING THE GEARBOX OR GEARED MOTOR

- **REMOVAL**
  - **Switch off the mixer. Make sure that the equipment cannot be accidentally switched on, and report the intervention (LOTO).**
  - Locate the motor connection before disconnecting the wires from the terminal box.
  - Install a sling to handle the mixer (see part "Handling").
  - Remove the fastening assemblies (mixer-support) and install a shaft retainer.
  - Lift the mixer to gain access to the fixing screws and remove the mixer shaft (the coupling remains attached to the gearbox shaft axis).
  - If necessary, drain the gearbox and separate the motor from the gearbox (fitted with a coupling sleeve).

- **REFIT**

Torques are shown in Figure 7 in part "Installation".

- If necessary, assemble the motor to the gearbox. Assemble and tighten using the torque indicated in the table above.
- Handle the gearbox as described in part "Handling" and position it above its support.
- Secure the shaft in the coupling sleeve.
- Attach the mixer to its support
- If necessary, top up the oil in the gearbox housing (see part "Basic Maintenance").
- Connect the motor, taking into account the markings made during removal.
- Check that the motor is connected as indicated by the arrow on the housing (see paragraph "Checking the electrical connection").

Summary of Part V

► Checking fastener assembly locking

1. Switch off mixer and signal the intervention (LOTO)
2. Check the various mixer fastenings
3. Check mixer locking

► Cleaning the fan

1. Switch off mixer and signal the intervention (LOTO)
2. Remove all traces of dirt and dust

► Check oil level in gearbox housing

1. Check oil temperature before any intervention (30°).
2. Switch off mixer and signal the intervention. (LOTO)
3. Protective gloves recommended.
4. Check oil level in gearbox housing.
5. Check condition of sealing ring.

► Draining the gearbox

1. Check oil temperature before any intervention (30°).
2. Switch off mixer and signal the intervention. (LOTO)
3. Protective gloves recommended.
4. Change oil every 5,000 hours.
5. Drain the gearbox.
6. Fill the gearbox.
7. Remove any oil spillage.
8. Check recommended specifications.

► Troubleshooting

1. Engine problems:
    - Check intensity
    - Check density
    - Check wiring
    - Check oil quality in gearbox housing.
    - Check oil level in gearbox housing.
    - Check that fan is clean
    - Check mixer usage conditions

2. Mechanical problems:
    - Check bearings
    - Check gears.
    - Check that the vent plug is properly used.

► Ordering spare parts

1 Checking complete parts ordering information :
    - Case type and number.
    - Reference, description and quantity.

► Corrective maintenance: motor

1. Check mixer insulation values

2. Check that bearings are in good condition
3. Motor removal:
    - Switch off mixer and signal the intervention (LOTO).
    - Mark motor connection before disconnecting.
    - Use a sling to handle the motor
4. Reassembling the motor:
    - Connect the motor, taking into account the markings made during removal.
    - Check that the motor connection corresponds to that indicated by the arrow on the housing

► Corrective maintenance: gearbox or geared motor

1. Removal:
    - Switch off mixer and signal the intervention (LOTO).
    - Mark motor connection before disconnecting.
    - Use a sling to handle the mixer.
    - Remove the mounting brackets and install a shaft retainer.
    - Lift the mixer and disconnect mixer shaft.
    - if necessary, drain the gearbox and separate the motor from the gearbox.

2. Refit:
    - If necessary, fit the motor to the gearbox.
    - Use slings to handle the geared motor.
    - Secure the shaft in the coupling sleeve.
    - Attach the mixer to its support
    - If necessary, top up the oil in the gearbox housing.
    - Connect the motor, taking into account the markings made during removal.
    - Check that the motor connection corresponds to that indicated by the arrow on the housing

VI - TECHNICAL SPECIFICATIONS

Note: The values below correspond to standard versions

VI - 1: CODIFICATION

Type of equipment (1) : VRH ...S… VRH…P… VR2H …S…. VR2H….P…
FRH…S… FRH…P… FR2H …S…. FR2H….P…
VRG…S… VRG…P… VR2G…S…. VR2G…P…
VRP…S… VRP…P… VR2P…S…. VR2P…P…

Impeller type : VRH: H1P impeller
FRH: H2P impeller
VRG: 10SG impeller
VRP: PBT impeller

(1) See mixer code on nameplate.

VI - 2: SPECIFICATIONS OF ENGINES IN THE RANGE

Figure 15a: Table of motor specifications 50Hz

Power, in kW	**0.18**	**0.25**	**0.37**	**0.55**	**0.75**	**1.1**	**1.5**	**2.2**	**3**	**4**	**5.5**	**7.5**	**15**
Speed, rpm	1380	1405	1415	1435	1440	1455	1461	1450	1456	1460	1461	1468	1475
Voltage, in V	220-240/380-420 V												
Degree of protection	IP55												
Tropicalization	Yes (up to 30 g water / m3 air)												
Insulation class	F												
Heating	B												
Frequency, in Hz	50												

Figure 15b: 60Hz motor specifications table

Power, in kW	**0.18**	**0.25**	**0.37**	**0.55**	**0.75**	**1.1**	**1.5**	**2.2**	**3**	**4**	**5.5**	**7.5**	**15**
Speed, rpm	1695	1720	1730	1745	1751	1762	1755	1762	1763	1770	1768	1774	1780
Voltage, in V	440-480 V												
Degree of protection	IP55												
Tropicalization	Yes (up to 30 g water / m3 air)												
Insulation class	F												
Heating	B												
Frequency, in Hz	60												

VI - 3: LUBRICATION OF GEARBOXES IN THE RANGE

Figure 16a: Oil volume for 50Hz range gearboxes

Gearbox	RF07	RF17	RF27	RF37	RF47	RF57	RF67	RF77	RF87	RF97	RF107	RF127	RF137	RF147	RF167
VRP type	0205	0355 0505			0605			0805							
FRH type		0655 0755	0905 1105		1305	1555	1855		2305	2805	3355				
VRH type				0705		1005			1455		2055		2855		
VRG type	0205	0305 0405		0555		0805			1155		1605	2255			3255
VR2P type	0205		0355 0505			0605			0805						
FR2H type		0655 0755	0905		1155	1305		1555	1855	2305 2805	3355				
VR2H type						0705		1005		1455		2055		2855	
VR2G type	0205	0305 0405		0555			0805		1155		1605	2255			3255
Mounting type	M4														
Oil volume, in l	0.2*	0.6*	0.7*	1.1	1.7	2.1	2.9	3.8	7.4	13.4	19.2	22.0	31.5	52.0	88.0
Oil quality	See part VI-1														

* For RF07, RF17 and RF27 gearboxes, no draining is required.

Figure 16b: Oil volume for 60Hz range gearboxes

Gearbox	RF07	RF17	RF27	RF37	RF47	RF57	RF67	RF77	RF87	RF97	RF107	RF127	RF137	RF147	RF167
VRP type	0206	0356 0506			0606			0806							
FRH type		0756	0656 0906 1106		1306		1556 1856		2306	2806	3356				
VRH type				0706		1006			1456		2056	2856			
VRG type	0206	0306 0406		0556		0806			1156		1606	2256			3256
VR2P type	0206		0356	0506		0606			0806						
FR2H type		0656 0756	0906		1106		1306	1556	1856	2306 2806	3356				
VR2H type					0706			1006		1456		2056		2856	
VR2G type	0206	0306 0406		0556			0806		1156		1606	2256			3256
Mounting type	M4														
Oil volume, in l	0.2*	0.6*	0.7*	1.1	1.7	2.1	2.9	3.8	7.4	13.4	19.2	22.0	31.5	52.0	88.0
Oil quality	See part VI-1														

* For RF07, RF17 and RF27 gearboxes, no draining is required.

VII - CHECKLIST

Pre-startup checklist to control risks and ensure proper mixer operation.

BEFORE START-UP:

- ☐ **Familiarize yourself with the manufacturer's manual**
- ☐ **Check equipment on receipt**
- ☐ **Check that the support is in good condition and horizontal**
- ☐ **Make sure the impeller is mounted on the shaft in the correct direction (fan or suction position)**
- ☐ **Make sure the propeller is correctly positioned on the shaft**
- ☐ **Make sure locknuts or brake plates are in place**
- ☐ **Check that the fasteners have been correctly applied:**
  - ☐ **For the mixer on its support**
  - ☐ **For the lower shaft to the coupling or to the upper shaft**
  - ☐ **For the impeller(s) on the shaft**
- ☐ **Check bolt torques**
- ☐ **Check that brake plates are properly folded down**
- ☐ **Check voltage compliance (Y motor coupling or Δ)**
- ☐ **Check unused electric cable inlets for leaks**
- ☐ **Check electrical connections**
- ☐ **Check gearbox oil level**

Carried out by:	**Checked by:**	**Date:**

Device start-up authorization:

☐ **YES** ☐ **NO**

START-UP:

☐ **Check direction of mixer rotation**

☐ **Check electrical current**

☐ **Check that the mixer does not make any abnormal noise or overheat**

Carried out by:	**Checked by:**	**Date:**
Device start-up authorization:		
☐ **YES**	☐ **NO**	

GLOSSARY

Vent plug: a vent plug is a mechanical device that regulates the flow of fluids, allowing air to escape during heating and re-enter during cooling.

Torque wrench: a torque wrench is a tool used to limit the bolt torque of screws and nuts, so that they are optimally tightened.

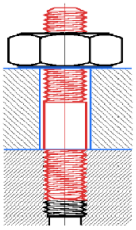
Vortex: vortex flow in which fluid particles rotate around an axis.

Mixer head: drive unit located outside the tank (motor).

Chaff: Chaff is the common name given to the fibers that tangle together around the impeller hub to form a "ball" generating an increase in power or an imbalance.

Joists: pieces of wood used to support the shaft when installing the mixer. They have the same function as U-irons, but are less effective.

Dowel: partially threaded metal rod used to create a "complete, rigid, removable" connection between two parts. For example, on one side it can be embedded in concrete, while on the other it can be used to screw or lock parts. See diagram below.



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DECLARATION D'INCORPORATION

DECLARATION OF INCORPORATION

Personne autorisée à constituer le dossier technique : Emmanuel Fontaine
Person authorized to compile the technical file QSE Manager Milton Roy Europe,
10 Grande Rue 27360 Pont-Saint-Pierre

Nous MILTON ROY Europe déclarons sous notre propre responsabilité que les agitateurs des séries :
We MILTON ROY Europe declare under our own responsibility, that mixers of the following series:

- HELISEM
- HELIMIX
- HM
- ELAT type H et F
- ROBIN type A, B, C, D, E, F, G, H

Satisfont aux exigences essentielles listées dans l'annexe I de la Directive 2006/42/CE suivantes:
Comply with the following essential requirements listed in the annex I of the 2006/42/EC Directive :

- 1.1
- 1.3 éléments au-dessus du plan de pose excepté 1.3.6
- 1.4 éléments au-dessus du plan de pose
- 1.5 excepté 1.5.16
- 1.6 excepté 1.6.3
- 1.7

- *1.1*
- *1.3 for parts above the setting plan except 1.3.6*
- *1.4 for parts above the setting plan*
- *1.5 except 1.5.16*
- *1.6 except 1.6.3*
- *1.7*

MILTON ROY Europe s'engage, sur demande des autorités nationales, à leur transmettre la documentation technique concernant la quasi-machine qui a été constituée conformément à l'annexe VII-partie B.
MILTON ROY Europe undertakes, at the request of national authorities, to send the technical documentation regarding the partly completed machinery which has been established in accordance with the Annex VII part B.

La mise en service est interdite avant que la machine, dans laquelle notre matériel doit être incorporé, soit déclarée conforme aux dispositions de la Directive 2006/42/CE.
The startup is prohibited before the machinery, in which our material is incorporated, complies with the requirements of the 2006/42/EC Directive.

Pont Saint Pierre
11/10/2022

Responsable Qualité / *Quality Manager*
Emmanuel FONTAINE

MILTON ROY EUROPE
Responsable QEHS EMEA
EMEA QEHS Manager
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DECLARATION OF INCORPORATION

The Supply of Machinery (Safety) Regulations 2008
Schedule 2 Part 2 Annex IIB

Authorized person to compile the technical file: Emmanuel Fontaine
QSE Manager Milton Roy Europe,
10 Grande Rue 27360 Pont-Saint-Pierre

We MILTON ROY Europe declare under our own responsibility, that mixers of the following series:

- HELISEM
- HELIMIX
- HM
- ELAT type H et F
- ROBIN type A, B, C, D, E, F, G, H

Comply with the following essential requirements listed in The Supply of Machinery (Safety) Regulations 2008 Schedule 2 Part 1:

- 1.1
- 1.3 for parts above the setting plan except 1.3.6
- 1.4 for parts above the setting plan
- 1.5 except 1.5.16
- 1.6 except 1.6.3
- 1.7

MILTON ROY Europe undertakes, at the request of national authorities, to send the technical documentation regarding the partly completed machinery which has been compiled in accordance with part B of Schedule 2 part 7 Annex VII.

The startup is prohibited before the machinery, in which our material is incorporated, complies with the requirements of The Supply of Machinery (Safety) Regulations 2008.

Pont Saint Pierre
11/10/2022

Responsable Qualité / *Quality Manager*
Emmanuel FONTAINE

MILTON ROY EUROPE
Responsable QEHS EMEA
EMEA QEHS Manager
Emmanuel FONTAINE

MILTON ROY EUROPE Terms & Conditions of Sale Rev 11 – June 2019

1. SCOPE

These Terms & Conditions of Sale (hereinafter referred as to "T&CSG") apply to all sales of Goods. Applicable Terms and Conditions for services will be provided upon request. The placing of an order by the Purchaser is subject to these T&CSG in their entirety and is deemed acceptance of these T&CSG provided in the Quotation. Accordingly, the Purchaser expressly waives applicability of its own terms and conditions even if those terms are presented subsequent to these. Purchaser expressly accepts that any acknowledgement or delivery of Goods by Seller are only made subject to these T&CSG and by accepting delivery Purchaser acknowledges these T&CSG. Any change to these T&CSG is subject to the Seller's express acceptance in writing. The Purchaser may not claim any form of implied acceptance of either its own terms and conditions or any changes to these T&CSG whatsoever. These terms and conditions supersede any and all previous communications, representations or agreements, either oral or written, between the parties with respect to the subject matter. Each party acknowledges that in entering into this Agreement, it does not rely on, and shall have no remedies for, any statement, representation, assurance or warranty (whether made innocently or negligently) that is not expressly set out in this Agreement.

2. DEFINITION AND INTERPRETATION

In these T&CSG, except where the context otherwise requires, the following words and expressions shall have the following meanings:

Agreement shall mean documentation applicable to the Order limited to Ingersoll Rand Code of Conduct, available upon request, Quotation issued by the Seller, the Order issued by the Purchaser to the extent confirmed by the Order Acknowledgment sent by the Seller and any appendix expressly mentioned therein.

Confidential information shall mean all confidential and proprietary information including without limitation know-how, intellectual property, ideas, designs, concepts, plans, data, customer details, employee details and other technical, financial or commercial information, together with all notes, records, extracts, copies, reproductions or analysis of any such information, which (whether before, on or after the date of the Order and whether in oral, written, visual, electronic or whatever form or on whatever media or by way of demonstrations or in any manner) is obtained directly or indirectly by or on behalf of one Party ("the Receiving Party") from or on behalf of the other ("the Disclosing Party") and which is expressly marked as confidential or which a reasonable person would consider to be confidential.

End-User shall mean ultimate user of the Goods.

Event of Force Majeure shall mean any cause or circumstance whatsoever beyond either Party's reasonable control provided the same arises without fault or negligence of the affected Party. Event of Force Majeure includes an Act of God, fire, explosion, failure of public utilities or civil commotion, floods, hurricanes, earthquakes, windstorms, tornadoes, act of terrorism, war (whether declared or not), restrictive governmental Laws or decisions, strikes, lockouts, labor trouble.

Goods shall mean any materials, machinery, equipment, articles, parts, tools, consumables, hardware, software and the like items to be provided as per the Agreement. ***Industry Practices*** shall mean objective norms as defined in the Quotation.

Intellectual Property Rights shall mean all copyright, database rights, topography rights, design rights, trademarks, trade names, trade secrets, utility models, patents, domain names and any other intellectual property rights of a similar nature (whether or not registered) subsisting anywhere in the world in or associated with the Goods.

Law shall mean any applicable international, national, municipal or state treaty, statute, ordinance, customs regulations (import and export) or other law, regulation or by-law or any rule, code or direction or any license, consent, permit, authorization or other approval (whether governmental or non-governmental) including any conditions attached thereto as applicable per the Agreement.

Order shall mean the purchase order issued by the Purchaser which shall not be binding on the Seller until the Order Acknowledgement as defined below is issued by the Seller.

Order Acknowledgment shall mean the written confirmation sent by the Seller to the Purchaser. Unless otherwise mutually agreed between the Parties, Order Acknowledgment is subject to these T&CSG's and Purchaser expressly waives any other terms and conditions including its own issued after the Order Acknowledgment.

Party shall mean either the Seller or the Purchaser.

Parties shall mean the Seller and the Purchaser.

Person shall mean any individual, firm, partnership, trust, joint venture, company, corporation, body corporate, unincorporated body, association, organization, any government or state or any agency or a government or state, or any local or municipal authority or other governmental body.

Purchaser shall mean the Person who issues the Order.

Quotation shall mean the written proposal issued by the Seller to the Purchaser in its latest revision and including these T&CSG.

Seller shall mean MILTON ROY EUROPE.

Third Party shall mean any person who is not expressly a Party to the Agreement.

For the purpose of the Agreement, except wherever the context otherwise requires:

- Words denoting the singular include the plural and vice versa;
- Reference to each Party herein include references to its successors in title, permitted assigns and novates;
- The words "include", "including" and "in particular" shall not be interpreted as limiting the generality of any of the foregoing words;
- Reference to "writing" or "written" includes fax, e-mail and similar means of communication;
- All references to date and time periods in this Agreement shall be construed in accordance with the Gregorian calendar;
- All references to an Incoterm shall be read as per the latest Incoterms version issued by the International Chamber of Commerce

3. FORMATION OF THE CONTRACT

Quotation shall only be considered as binding if the Order strictly conforms to the Quotation, in its latest revision and subject to receipt of an End-user certificate duly signed and stamped by the Purchaser and/or the End-User as may be required by the Seller. Unless stated otherwise, the Quotation is valid for one (1) month after the issuance date thereof.

Sale is considered to have been concluded once the Seller issues an Order Acknowledgement. The Seller shall endeavour to issue an Order Acknowledgement within 8 working days provided (a) the Order strictly conforms to the Quotation, (b) all technical clarifications have been finalised and (c) all information regarding the End-User as may be reasonably required to be fully compliant with any applicable Laws including export obligations has been provided. Once the Order Acknowledgement is sent to the Purchaser, the Agreement is considered as binding. The Purchaser must notify any error or omission appearing in the Order Acknowledgement within seventy-two (72) hours of its receipt. Thereafter, the Order is considered final, and no claims regarding such error or omission will be accepted.

4. MODIFICATION-ORDER AMENDMENTS

No alteration to or variation of this Agreement or any Order shall take effect unless and until the same is in writing and signed on behalf of each of the Parties by a duly authorized representative, taking into consideration, as the case may be, the impact on the Price, time of delivery and the planning or any other contractual obligation affected by such change.

5. SUBCONTRACTING-ASSIGNMENT OF THE CONTRACT

The Seller reserves the right to subcontract, without the prior agreement of the Purchaser, all or part of the design, procurement, services and other works which are the object the Agreement.

Neither Party may assign, transfer, charge or otherwise encumber, create any trust over or deal in any manner with the Agreement or any right, benefit or interest under it nor transfer, novate any of that Party's obligations under it without the prior written consent of the other Party which might not be unreasonably withheld or delayed.

6. TESTS AND TRIALS-INSPECTIONS

The Goods are manufactured in full compliance with applicable Industry Practices. Any specific control, test or inspection demanded by the Purchaser and not expressly stated in the Quotation and not accepted in the Order Acknowledgment will be at the exclusive expense of the Purchaser. The selection of the materials, as per the specifications of the product to be measured, the ambient conditions, and conditions of use are under the full responsibility of the Purchaser. If an inspection is ordered by the Purchaser, the Seller will send to the Purchaser a notification for inspection within fourteen (14) days before scheduled

witnessed tests, and this will be reconfirmed within five (5) days prior to inspection. Failure of the Purchaser to send the inspector's availability and contact details a minimum of five (5) working days before the scheduled inspection may lead to a re-scheduling of witnessed tests. Seller shall not be liable for any damages suffered by the Purchaser for such re-scheduling.

7. DOCUMENTATION

Unless otherwise agreed upon by both Parties:

- Approval of all documents will be made by the Purchaser within 7 calendar days after submission
- No native files will be provided by the Seller
- SPDP and SPIR documents shall be provided with Seller's references only.
- Approval of Final documentation will be made by the Purchaser within 1 month after submission
- Documents reviews shall be limited to three (3) revisions in terms of both form and content, past this number further costs will be incurred for the Purchaser.
- All comments made shall be final and will not be modified on a further revision.
- Minor changes on documentation which do not have any material or technical impact on the Goods shall not delay the payment of the milestones including but not limited to, when applicable, the milestone linked to the documentation.
- In case of non-approval by Purchaser within the time limit, the Seller shall be entitled to claim the payment of all the overdue payment terms and invoice the payment term at shipment when applicable and the delivery date may be delayed for Purchaser's default.

8. PRICES

Unless otherwise stated, all sums payable by the Purchaser under the Agreement are exclusive of VAT and all other applicable taxes, duties and levies, which shall (if and to the extent applicable) be payable by the Purchaser at the rate and in the manner from time to time prescribed by Law. Prices are also exclusive of any customs duty for non-packed Goods on an ex-works basis.

Any Order with a net value exclusive of VAT, taxes (including withholding tax), customs duty of less than one thousand (1000) Euros or the equivalent amount in any other currency will be subject to a flat administration fee of seventy (70) Euros.

9. PAYMENT TERMS

Means and terms of Payment

The Agreement defines the applicable payment terms. Except as otherwise specified, payment must be made before the Goods are dispatched. Payments shall be made by direct bank transfer to the Seller's nominated bank account or by such other means as may be agreed between the Parties from time to time. Unless otherwise agreed, payments shall be made in Euros, net and without application of any discount at thirty (30) days net form invoice date.

Consequences of late payment

Any late payment will give rise from the first day of late payment to: (a) interest at the most recent European Central Bank refinancing rate, plus 10 points; (b) and a fixed debt-recovery fee of forty (40) Euros. Should the debt recovery expenses incurred exceed the fixed-fee allowance; additional compensation will be demanded on submission of supporting evidence. Such interest and debt-recovery fee shall be paid within ten (10) days from the date of issuance of the invoice. Without prejudice to any other remedy it may have, in case of late payment, the Seller is entitled to suspend the manufacturing and delivery of the Goods. Any suspension under this clause will result in any time lost being added to the delivery date.

Prohibition of set-offs

All sums payable by the Purchaser under this Agreement are payable in full, without set-off, reduction, withholding or counterclaim on any account whatsoever.

10. DELIVERY DATE

The Seller will use reasonable endeavours to make the Goods available to the Purchaser on the date defined in the Order Acknowledgment. In any event, and independently of any Order Acknowledgment, the delivery date will be modified, including following circumstances:

- The Seller does not have all the information necessary to execute the Agreement;
- The Seller has not received the first(s) payment(s) due under the Agreement;
- The Seller has not received the letter of credit, where applicable;
- The execution of the Agreement is suspended due to any Event of Force Majeure.

If liquidated damages are agreed between the Parties, notwithstanding anything to the contrary, such liquidated damages will be the sole remedy to the exclusion of any other rights and remedies arising out or in connection with late delivery.

11. PACKING

The Quotation is based on the Seller's standard packing conditions and at the Purchaser's expense. Any specific packing request set out in the specifications will be charged separately. Packaging shall be neither returned, nor subject to a deposit.

12. DELIVERY-TRANSFER OF RISK-TRANSFER OF TITLE

Delivery and transfer of risk

Unless otherwise agreed, Goods are provided ex-works at the Seller's premises. Delivery and transfer of risk shall take place pursuant to the Incoterms agreed by the Parties. It is the Purchaser's obligation to verify the visual conformity of the Goods both in quantitative and qualitative terms and to inform the Seller of any non-conformity in this respect of which it becomes aware within fifteen (15) calendar days of delivery. Failing this, any such non-conformities cannot be the subject of any claim made by the Purchaser against the Seller.

Partial deliveries

The Seller reserves the right to carry out partial deliveries of the Goods covered by the Order. In the event of partial delivery, each batch shall be regarded as a separate sale subject to the conditions of the Agreement. The Purchaser is deemed to have accepted the transfer of risk of the Goods delivered as stipulated in the Agreement on a pro-rata basis for the actual delivered quantity. Payment of each batch must be made in accordance with the payment terms stipulated in the Agreement.

Transfer of title

The Seller retains title to the Goods until the delivery to Buyer in accordance with the agreed Incoterm 2010.

Storage

If the Purchaser does not take delivery of the Goods on the date stated in the Agreement for reasons not attributable to the Seller:

- Storage period shall be limited to one (1) month
- The Purchaser shall nonetheless be obliged to make payment according to the schedule originally set out, without prejudice to the application of storage expenses.
- If the duration of any storage exceeds one (1) month, the Purchaser shall be required to accept delivery of the Goods and pay the Purchase Order price for the Goods.

13. SUSPENSION

No right of suspension shall be granted

14. INTELLECTUAL PROPERTY RIGHTS

Notwithstanding anything to the contrary and except an express licence is granted, each Party shall remain the exclusive owner of the Intellectual Property Rights it owns, develops or uses, whether such ownership, development or usage arises before, during, or after the Agreement. The Seller warrants to the Purchaser that the Goods do not constitute a breach of any pre-existing rights nor any other form of infringement of Intellectual Property Rights, and indemnifies it against any action or claim in this respect, provided that: (a) Seller has been informed in advance and in writing of the existence of such a claim and within a reasonable timeframe for it to be able to prepare its defence, (b) payment has been received for the Goods, and (c) the Purchaser provides the Seller with the necessary opportunity, authority, information and assistance for it to be able to take on exclusive control of the defence against such claims or legal action, including arbitration, mediation, settlements and appeals. Should the liability of the Seller be recognised by any jurisdiction, the Seller shall at its sole option: (1) obtain from the Purchaser the right to use the Goods under the conditions defined by the Agreement; or (2) replace it with a reasonably equivalent Good; or (3) modify it to make it usable without contravening any Third Party rights and in compliance with the Agreement; or (4) recall the Goods, refund the Order Price to the Purchaser less an obsolescence discount.

This obligation does not apply in respect of any claims/infringement action or any other Intellectual Property Rights resulting from the use of the specifications provided by the Purchaser or derived from the design created by the latter, or from changes or modifications to the

equipment imposed by it. Should the Goods supplied by the Seller for the Purchaser be produced in accordance with the Purchaser's designs, samples or instructions, or were designed exclusively by the Purchaser, or were combined with other Goods not supplied by the Seller, the Purchaser will have to defend, guarantee and indemnify the Seller under equivalent conditions to the aforementioned obligation placed upon the Seller.

15. CONFIDENTIALITY

Each Party shall maintain the confidentiality of the other Party's Confidential Information and shall not, without the prior consent of the other use, disclose, copy or modify the other Party's Confidential Information (or permit others to do so) other than as strictly necessary for the performance of its rights and obligations under the Agreement. Each Party undertakes to disclose the other Party's Confidential Information only to whom and to the extent to which, such disclosure is necessary for the purposes contemplated under this Agreement and to procure that such persons are made aware of and agree to observe an equivalent confidentiality obligation. Each Party shall give notice to the other of any unauthorized misuse, disclosure, theft or other loss of the other Party's Confidential Information immediately upon becoming aware of the same.

The provisions of this confidentiality obligation shall not apply to information which:

- Is or comes into the public domain through no fault of the Receiving Party, its officers, employees, agents or contractors;
- Is lawfully received from a Third Party free of any obligation of confidence at the time of disclosure;
- Is demonstrably independently developed by the Receiving Party, its officers, employees, agents or contractors;
- Is required by Law, by court or by governmental order to be disclosed provided that, to the extent permitted by Law, and prior to any disclosure, the Receiving Party notifies the Disclosing Party and, at the Disclosing Party's request and cost, assist the Disclosing Party in opposing any such disclosure.

This confidentiality obligation shall survive for five (5) years after the Order Acknowledgment date.

16. WARRANTY

The Seller guarantees the Goods for eighteen (18) months following delivery date or twelve (12) months from commissioning whichever occurs first, except for agitators and spare parts thereof for which warranty period is twelve (12) months following delivery date. Any claim shall be raised to the Seller's in writing within ten (10) working days of becoming aware of the same and shall enclose the corresponding purchase invoice. Failing that, the Purchaser implicitly waives all right of recourse regarding warranty. The Seller's warranty covers replacement or repair of proven defective parts or Goods at its sole option:

(a) returned to its workshops; or

(b) returned to its distributor or authorized service centre workshop; or

(c) or in case the Goods could not be returned for financial or practical reasons, default or defect shall be assessed on-site.

In case of absence of Seller's responsibility, the Purchaser will bear the costs incurred by the Seller to cover report fees for an amount determined on a case-by-case basis. If the Seller's responsibility is established under the warranty, the Seller shall replace or repair the defective parts at its own expense, excluding any other costs (such as, without limitation dismantling, reassembling and approach (including emptying of the tanks)), which shall be the Purchaser's sole and exclusive remedy for any such defect. The Seller shall reserve the right to modify all or part of its Goods to comply with its warranty obligations. The replacement or the repair of one or more parts for whatever reason shall extend the warranty period for twelve (12) months or till the end of the warranty period whichever occurs first. The warranty shall not apply in the following circumstances: fair wear and tear, installation not compliant with Industry Practice and/or the Seller's instruction manual, lack of monitoring or maintenance, wilful act on the part of the Purchaser, its employees or Third Parties, accident, any modification to the operating conditions, chemical attack, corrosion or erosion.

All Seller's information and recommendations are subject in all cases to the verification and acceptance of the Purchaser, whose liability in this respect cannot be excluded, whether in whole or in part and shall not provide any warranty against wear and tear or chemical action. The warranty shall automatically end: (a) if the storage of the Goods by the Purchaser fails to comply with the Seller's recommendations and with Industry Practices or maintenance manuals; (b) in the event of the Goods being worked on or dismantled without the express written agreement of the Seller or in the event of such work being carried out by a person not approved in writing by the Seller; (c) if original parts have been replaced by other parts non-supplied by the Seller. Warranty claim shall not affect payment terms.

The only warranties made by Seller are those expressly provided herein. Any other statements expressed in the contract, including but not limited to, proposals, specifications, drawings, or manuals shall not be deemed to constitute a warranty of the products. THE WARRANTIES SET FORTH HEREIN ARE EXCLUSIVE AND NO OTHER WARRANTIES OF ANY KIND, WHETHER EXPRESS OR IMPLIED, INCLUDING ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ALL WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE, SHALL APPLY. THE REMEDIES SET FORTH IN THIS ARTICLE ARE THE SOLE AND EXCLUSIVE REMEDIES OF PURCHASER FOR ANY CLAIMS, EXPENSES, OR DAMAGE ARISING OUT OF OR RELATED TO PRODUCTS DELIVERED UNDER THIS CONTRACT.

17. TERMINATION

Either Party may terminate the Agreement in the case of the other party's default by giving notice to the other:

- If the other Party is in material breach of the Agreement which, if remediable, it fails to remedy within forty-five (45) days of notice from the terminating Party requiring it to do so;
- In case of Events of Force Majeure exceeding ninety (90) days.

Immediately upon termination of the Agreement:

- All outstanding payment shall be due and owing (same for any sums subjects to bona-fide dispute, under the Agreement in accordance with its terms);
- Each Party is entitled to ask the other Party to destroy or to deliver all copies of any Confidential Information supplied by or on behalf of the other Party pursuant to the Agreement;
- Each Party shall cease any further use of the Intellectual Property Rights of the other Party pursuant to the Agreement.

Termination of the Agreement is exclusive of any other rights or remedy the Terminating Party may have had under the Agreement or at Law. The provisions that either are expressed to survive the termination of the Agreement or from their nature or context it is contemplated that they are to survive such termination, shall survive termination of the Agreement.

The Seller reserves the right to refuse any termination for convenience.

18. LIMITATION OF LIABILITY

By placing an Order, the Purchaser recognises that the Seller has made available the information required to be able to assess the suitability of the Goods and to take the necessary precautions to limit any malfunction. The Seller assumes no obligation or responsibility in relation to the precision or lack thereof of the information communicated by the Purchaser; the Seller is under no obligation to verify the pertinence or accuracy of such information.

NOTWITHSTANDING ANYTHING TO THE CONTRARY IN THIS AGREEMENT AND TO THE EXTENT PERMITTED BY LAW, THE AGGREGATE LIABILITY OF THE SELLER TO THE PURCHASER, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, WILL BE LIMITED TO 100% OF THE ORDER GIVING RISE TO THE LIABILITY. NOTWITHSTANDING ANYTHING TO THE CONTRARY IN THIS AGREEMENT, IN NO EVENT SHALL THE SELLER OR ANY OF ITS AFFILIATES, SUBSIDIARIES, OR REPRESENTATIVE BE LIABLE TO THE PURCHASER FOR ANY LOSS OF PRODUCTION, PROFIT, REVENUE OR INCOME, OR FOR ANY CONSEQUENTIAL, INCIDENTAL, INDIRECT, EXEMPLARY, SPECIAL OR PUNITIVE DAMAGES, INCLUDING ANY DAMAGES FOR BUSINESS INTERRUPTION, LOSS OF USE, OR LOSS OF DATA, WHETHER ARISING OUT OF BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, REGARDLESS OF WHETHER SUCH DAMAGES WERE FORESEEABLE AND WHETHER OR NOT THE PURCHASER WAS

ADVISED OF THE POSSIBILITY OF SUCH DAMAGES ARISING UNDER THE AGREEMENT, ANY STATUTE, OR TORT.

19. FORCE MAJEURE

Neither Party shall be liable for any loss or damage suffered or incurred by the other Party arising from the first Party's delay in performing or failure to perform its obligations hereunder to the extent that and for so long as such delay or failure results from an Event of Force Majeure. The affected Party shall notify the other Party within five (5) working days (or a longer period if the context otherwise requires) of becoming aware of the same of such Event of Force Majeure and the manner and the extent to which its obligations are likely to be prevented or delayed. Each Party shall use all reasonable endeavours to mitigate the extent of the excusable delay or failure arising from or in connection with an Event of Force Majeure and its adverse consequences and to recommence performance of the affected obligations as soon as and to the extent reasonably practicable. If any Event of Force Majeure occurs, the date(s) for performance of the obligation(s) affected shall be postponed for so long as is made necessary by the Event of Force Majeure provided that if any event of Force Majeure continues for a period of or exceeding ninety (90) days, either Party shall have the right to terminate this Agreement forthwith on written notice to the other Party. In case of such termination the Purchaser shall pay the Seller:

(a) the cost of all Work performed through the date of termination.

(b) the price for all material ordered and received (or which have not been received but cannot be cancelled) in connection with the performance of this Purchase Order, and;

(c) reasonable settlement costs (including subcontractors' settlement costs) associated with the termination.

(d) however, the termination fee shall be limited to the Order price

20. TRADE COMPLIANCE

Both Parties shall be responsible for obtaining and maintaining any and all required export licenses, approvals, or authorisations that are required under any applicable Laws, including French, E.U. and U.S. regulations regarding control of exports.

Purchaser will not, directly or indirectly, export, re-export, transfer or re-transfer any Goods or technical data received from Seller to any destination if such export or re-export would violate the applicable laws. The Purchaser is responsible for providing any information for the Seller to determine if the Order is subject to any export control Law. Hence, Purchaser shall duly fill-in and sign an end-user statement or a customer statement of end-use (as required by the Seller) on a format acceptable to the Seller and to keep Seller updated of any changes impacting this document during the execution of the Contract. Should any of the Goods be regarded as being dual use as per applicable regulations, Seller undertakes to: (1) inform the Purchaser of the classification of the Good, (2) provide the necessary documents to the Purchaser, and, if the Seller is the exporter, (3) endeavour to obtain the necessary export authorisations. The Seller cannot, however, guarantee the success of any such licence requests, or that they will be kept in force.

The Purchaser shall never be entitled to claim liquidated damages in case of late delivery resulting from suspension, revocation, not renewing a certification or in case of a refusal, suspension, revocation, non-renewal or invalidation of the Goods export licence despite Seller's diligence.

In the case of dual-use goods and payment by letter of credit, the goods concerned by export license may be excluded from shipping and payment by letter of credit, if the license has not been received upon receipt of the notification of the opening of the letter of credit. This will require the issuance of a mandatory amendment to letter of credit.

In this case, the goods concerned by the export license will be shipped against a separate payment by bank transfer before shipment, after obtaining the export license.

21. APPLICABLE LAW-COMPETENT COURT-ARBITRATION

The Agreement and any non-contractual obligations arising out of or in connection with it shall be governed by and construed in accordance with French Law. The Parties agree to exclude application of the International Convention of Vienna regarding Sales of Goods as may be amended from time to time. The Parties shall endeavour to settle by negotiation any dispute arising out of or in connection with the Agreement and all the consequences thereof. Such dispute shall be duly notified by the claiming Party to the other Party, in the forms required under the Agreement, and the Parties shall endeavour to settle such dispute by negotiation within fifteen (15) days from receipt of said notice. In case of failure to settle the dispute by negotiation within the period of time above-mentioned, the claiming Party shall notify to the other Party its intention to submit the dispute to the jurisdiction or arbitration court mentioned below.

If the Parties are both located in a Country member of the European Union

The Parties irrevocably agree that Paris Commercial Court shall have exclusive jurisdiction to settle any dispute arising out or in connection with this Agreement.

If one of the Parties is located outside European Union

The dispute shall then be finally settled under the Rules of Arbitration of the International Chamber of Commerce by one (1) arbitrator appointed in accordance with the said Rules. Unless the Parties agree upon another place, the arbitration shall be held in Paris, France. Unless both Parties are located in countries where French is one of the official languages, arbitrator shall be fluent in English language and the arbitration shall be conducted in the English language. The arbitrator shall decide according to Law and not ex aequo et bono. The tribunal of arbitration's award shall be in writing and shall be final and binding upon the Parties. Each Party waives, to the fullest extent permitted by Law, any right to apply to any court of Law and/or other judicial authority to determine any preliminary point of Law and/or review any question of Law and/or the merits. However, any Party may make an application to any court having jurisdiction for judgment to be entered on the award and/or for the enforcement of any award, including any award granting interlocutory relief and any order for the obtaining of potential evidence which the arbitrator direct be produced as part of the arbitration. The Parties undertake to keep strictly confidential the contents of the arbitration proceedings, the decision and any award of the tribunal of arbitration except to the extent necessary for the enforcement of such award.

22. OTHER PROVISIONS

Waiver

The failure by the Seller to invoke any of the clauses of these T&CSG cannot be validly interpreted as constituting a waiver to its rights under the aforementioned T&CSG, except when expressly agreed in writing.

Severability

If at any time any provision of these T&CSG shall be found by any court or administrative body of competent jurisdiction to be invalid, illegal or unenforceable, such illegality, invalidity or unenforceability shall not affect the other provisions of these T&CSG which shall remain in full force and effect. In the event that the circumstances referred to the first paragraph of this article occur, the Parties agree to attempt to substitute for any invalid, illegal, or unenforceable provision a valid, legal and enforceable provision which achieves, to the greatest extent possible the same effect as would have been achieved by the invalid, illegal or unenforceable provision.

Mitigation of loss

Both Parties shall take all reasonable steps to mitigate any loss resulting from any breach of the Agreement by the other Party.

Language

It is under the responsibility of the Purchaser to specify the language of the documentation to be supplied otherwise it will be supplied in French and/or English.

About Ingersoll Rand Inc.

Ingersoll Rand Inc. (NYSE:IR), driven by an entrepreneurial spirit and ownership mindset, is dedicated to helping make life better for our employees, customers and communities. Customers lean on us for our technology-driven excellence in mission-critical flow creation and industrial solutions across 40+ respected brands where our products and services excel in the most complex and harsh conditions. Our employees develop customers for life through their daily commitment to expertise, productivity and efficiency. For more information, visit **www.IRCO.com.**

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