



## INSTALLATION, SERVICE AND MAINTENANCE INSTRUCTIONS

# BMI / BRI VERTICAL AGITATOR



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(C) 2016/04



## EC Declaration of Conformity

The manufacturer: **INOXPA, S.A.**  
c/ Telers, 57  
17820 Banyoles (Girona), Spain

herewith declares that the machine:

### **BMI / BRI Vertical agitator**

with the serial number: \_\_\_\_\_

conforms to the relevant provisions of the following directives:

Machinery Directive 2006/42/EC (RD 1644/2008)  
Low voltage Directive 2006/95/EC  
Electromagnetic Compatibility Directive 2004/108/EC

Applicable harmonised Standards:

UNE-EN ISO 12100:2012

Identification of the person empowered to draw up the Declaration on behalf of the manufacturer, and qualified to compile the technical file established by the Community:

Banyoles, 8 January 2014

David Reyero Brunet  
Technical Office Manager

# 1. Safety instructions.

## SAFETY INSTRUCTIONS.

This instruction manual contains the basic indications that should be complied with during installation, start-up and maintenance. Consequently, it is essential that, before installation, both the installer and the plant technical manager read this instruction manual and that it be permanently available alongside the agitator or corresponding installation.

Not only must the detailed safety instructions in this chapter be complied with, but so also should the special measures and recommendations added in the other chapters of this manual.

## SYMBOLS USED.

The safety instructions included in this manual, whose non-compliance may cause risk to persons or to the machine and its correct operation, are expressed by means of the symbols indicated below:



**Danger to people in general.**



**Electrical hazard.**



**Danger of injury caused by the agitator.**



**Danger due to suspended loads.**



**Danger for the agitator and its correct operation.**



**General obligation.**

## GENERAL SAFETY INSTRUCTIONS.



- Read the instructions in this manual before installing the agitator and before starting it up.
- The installation and use of the agitator must always be in accordance with the rules applying to health and safety.
- Before starting up the agitator, check that it be correctly anchored and that the shaft be perfectly aligned. Poor alignment and/or excessive force in fitting, may cause serious mechanical problems for the agitator.



- Specialised personnel should carry out all electrical work.
- To control the engine characteristics and its control panel, especially in areas where there is a risk of fire or explosion, the user company's technical manager shall establish danger areas (area 1 – 2 – 3).
- Do not spray the motor directly during cleaning.
- Do not disassemble the agitator without previously disconnecting the power supply. Remove the fuses and disconnect the motor feed cable.



- Do not operate the agitator if turning components do not have the protection system or if they are badly fitted.
- The agitator has rotating parts. Do not put hands or fingers into an agitator whilst it is operating. This may cause serious injury.
- Do not touch any of the parts of the agitator that are in contact with liquid whilst in operation. If the agitator works with hot products at temperatures exceeding 50 °C, there is a risk of burns. In these cases, collective protective measures should be put in order of priority (distance, protective screen, heat resistance), or –failing this possibility- to provide individual protection (gloves).



- Take all possible precautions in lifting the agitator. Always ensure that it securely attached when being transported by crane or any other lifting mechanism.



- Withdraw all the tools used in mounting before starting up the agitator.
- The agitator is unable to work without liquid. Standard agitators are not designed to operate during the filling or emptying of tanks.



- Do not exceed the agitator's maximum operating conditions. Do not modify the operating parameters that were initially set for the agitator without the prior written consent of INOXPA.
- The agitators and their installation may cause noise levels that exceed 85 dB (A) in some unfavourable operating environments. In such cases, operators should wear hearing protection.

#### **WARRANTY.**

We wish to point out that any warranty issued will be null and void and that we are entitled to an indemnity for any civil liability claim for products which might be filed by third parties if:

- operation and maintenance work has not been done following the corresponding instructions; the repairs have not been made by our personnel or have been made without our written authorization;
- modifications are made to our material without prior written authorization;
- the parts or lubricants used are not original INOXPA parts/lubricants;
- the material has been improperly used due to error or negligence or have not been used according to the indications and the intended purpose.
- all components subject to wear are excluded from the guarantee.

The General Delivery Terms which you have already received are also applicable.

#### **INSTRUCTIONS MANUAL.**

The information provided in the instruction manual refers to updated data.

We reserve the right to modify the design and/or manufacturing specifications of our products as required, devoid of any obligation on our part to adapt any product supplied prior to such alteration.

The technical information made available in this instruction manual, together with the graphs and technical specifications provided, shall continue to belong to us and should not be used (except for starting up this installation), copied, photocopied, made available or otherwise given to third parties without our prior written consent.

INOXPA is reservation the right to modifying this instructions manual without previous notice.

#### **INOXPA SERVICE.**

In the event of doubt or should you require a fuller explanation on particular data (adjustment, assembly, disassembly...), please do not hesitate to contact us.

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## 2. Reception, storage and transport.

### RECEPTION.

On reception of the agitator, check the packing and its contents to ensure that it agrees with delivery note. **INOXPA** packs the agitators fully assembled. Ensure that the agitator has not suffered any damage. In the case of it being found not to be in correct condition and/or some part(s) are missing, the transporter shall have to prepare a report as quickly as possible.

### STORAGE.

If the agitator is not immediately installed, it must be stored in an appropriate place. The shaft must be stored in a horizontal position and on some wooden or similar supports. The shaft in such a position will not become deformed and must not support loads of any description.

### TRANSPORT.

Take all possible precautions in lifting the agitator. Always use the sling hooks when moving the agitator with a crane or any other type of lifting equipment.



Depending on the model, the agitators are too heavy to store or install manually. Use an adequate means of transport. Do not manipulate the agitator by the shaft because it can easily become deformed.

Type	Weight [kg.] with IEC motor, IP-55	Weight [kg.] with IEC motor, flameproof
<b>BMI 1.10-4011-1-160</b>	30	49
<b>BMI 1.10-4015-1-175</b>	33	52
<b>BMI 1.10-4022-1-200</b>	38	60
<b>BMI 1.10-4030-1-200</b>	41	63
<b>BMI 1.10-4040-1-225</b>	44	77
<b>BMI 1.10-4055-1-225</b>	57	101
<b>BMI 1.10-6007-1-175</b>	30	49
<b>BMI 1.10-6011-1-200</b>	33	52
<b>BMI 1.10-6015-1-225</b>	42	65
<b>BMI 1.10-6022-1-250</b>	44	77
<b>BMI 1.10-6030-1-250</b>	56	101
<b>BMI 1.4-4022-1-150</b>	38	60
<b>BMI 1.4-4040-1-200</b>	44	77

### 3. Identification, description and use.

#### IDENTIFICATION.

The agitator is identified by means of a plate stating its characteristics attached to the bearings support. The type of agitator and serial number are on the plate. See figure 3.1.

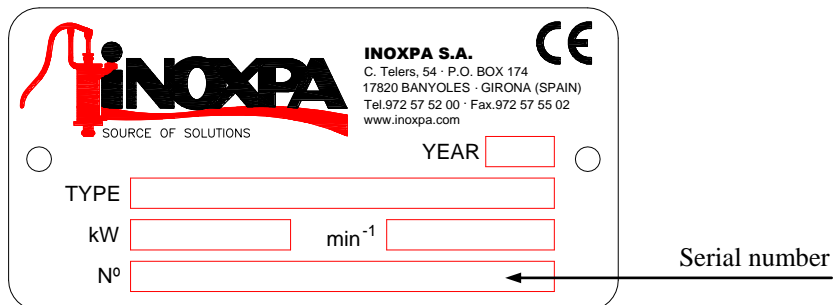


Figure 3.1: Characteristics plate.

#### Example:

BMI 1. 10 - 4 011 - 1 - 150  
 1 2 3 4 5 6 7

#### 1. Name of the agitator.

BMI = vertical agitator with motor.  
 BRI = vertical agitator with gear motor.

#### 2. Number of agitation elements.

1 = one agitation element.  
 2 = two agitation elements.

#### 3. Type of agitation elements.

10 = marine type.  
 4 = sawtooth type

#### 4. Motor speed.

4 poles = 1500 rpm.  
 6 poles = 1000 rpm.

#### 5. Motor power.

011 = 1.1 kW.  
 022 = 2.2 kW.  
 030 = 3 kW.

#### 6. Motor.

1 = IP-55.  
 2 = IP-65.  
 3 = Flameproof.  
 4 = Explosion-proof.  
 5 = Single phase.

#### 7. Diameter of the agitation element.

150 = 150 mm.  
 200 = 200 mm.



## **DESCRIPTION.**

The BMI / BRI series range is vertical agitators with direct motor (BMI) or gearbox (BRI), a stainless steel base and a lip seal as sealing system. The agitator shaft is fixed onto the half shaft with a flange mount.

The agitator shaft is available in one solid piece or two half shafts fixed together with allen studs.

Although these agitators are very compact, they have a bearing bracket which is totally independent of the motor / gear motor with one or two bearings which withstand the thrust and radial load transmitted by the agitation element.

All the parts that come into contact with the product are made of stainless steel, AISI-316 (1.4401) for agitator with marine propeller and AISI-304 (1.4301) for those with sawtooth elements. It has a sand blasted surface finish.

The standard propellers from this agitators range are marine propeller (type 10) and sawtooth propeller (type 4).

## **USE OF THE AGITATOR.**

They are used for mixing and blending processes in open or closed tanks with a 4000 litres of maximum volume and 1000 cPs. of maximum viscosity.

# 4. Installation and assembly.

## INSTALLATION AND ASSEMBLY.



**If the agitator is supplied without a drive or other element, the purchaser shall be responsible for its assembly, installation, start-up and operation.**

### SITE.

Place the agitator in such a way as to facilitate inspection and servicing. Leave sufficient room around the agitator for adequate servicing, separate, even when it is in operation. It is very important to be able to obtain access to the electrical connection mechanism of the agitator, even when it is in working mode.

To achieve an effective mixing process it may be necessary to fit baffles to the bottom of the tank. Consult our technical department for each particular application. If required, the approximate dimensions of the baffles in relation to the diameter of the tank are shown in figure 4.1 and table 4.1.

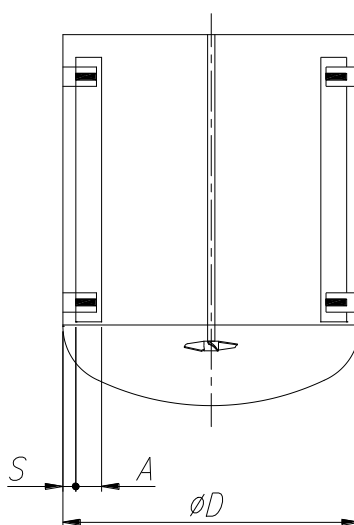


Figure 4.1

Ø D	300	400	500	600	800	1000	1200	1600	2000	2500	3000	3500	4000
A	20	30	35	40	50	70	80	115	130	180	200	240	280
S	5	5	10	10	10	15	20	20	30	30	50	50	50

Table 4.1

### ASSEMBLY.

To locate and fix the agitator in the support flange of the tank, the propeller must be removed from the shaft. Once the base of the agitator is placed on the supporting flange, the fixing nuts and screws will be assembled in their corresponding holes, without being tightened. When this operation has been carried out, the agitator must be levelled using the following method. Place a spirit level against the shaft.

Check 4 points at 90° to each other around the circumference of the shaft and at the same height.

Once the shaft is level, firmly tighten the fixing nuts and screws. Finally the propeller is mounted on the end of the shaft. Be careful when assembling the shaft not to hit or strain it so as to avoid it being bent.



**Force should never be applied to the end of the agitator shaft, as it can easily suffer permanent damage.**

**Check the alignment of the agitator shaft with the half shaft once its assembly is completed.**

## **ELECTRICAL CONNECTION.**

Before connecting the electric motor to the mains, check the local regulations and the corresponding standards regarding electrical safety. Take special account of those parts referring to command and control of the agitator. Check the manufacturer's instruction manual of the motor for connecting it to the mains.

**Let the electrical connection of the motors to qualified personnel. Take the necessary measures in order to prevent any type of breakdown.**



**The motor should be protected with devices against overload and short-circuits.**

**It is not possible to use the agitator in areas of risk of fire or explosion if this has not been included in the order. Risk areas (zones 1 -2 - 3).**

## 5. Start-up, operation and shutdown.

Agitator start-up shall be able to be carried out if the detailed instructions in the section on installation and assembly have previously been realised.

### START-UP.

- Check that the electrical supply is appropriate for what is indicated on the motor plate.
- Check the alignment of the agitator shaft.
- Check the tank's liquid level. Unless specified in the order, the agitators cannot function during tank filling or emptying.



**The agitator can NEVER run without a product. The agitation element must be submerged at least to a height between 1 to 2 times its diameter.**

- All the protectors must be in place.
- Start up the agitator.
- Check that the rotation of the propeller is correct (clockwise when viewed from the side of the motor). See figure 5.1.



**Respect the direction of rotation of the agitation element as indicated by the arrow stuck on the motor. The wrong direction will cause a loss of agitation efficiency.**

- Check the motor's electrical consumption.

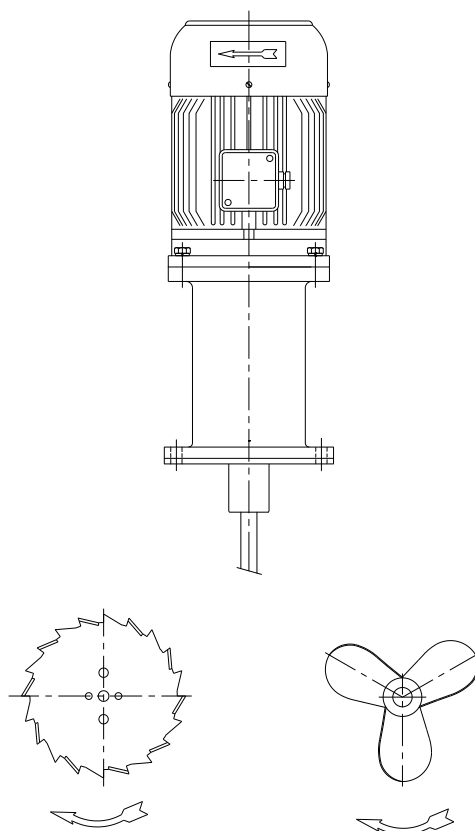


Figure 5.1

## OPERATION.



**Do not modify the operating parameters for which the agitator was initially selected without prior written consent of INOXPA. (Risk of deterioration and danger for the user).**

**Follow the operating instructions and safety indications described in the instructions manual of the tank on which the agitator is mounted.**



**Mechanical hazards (drag, shearing, cutting, strike, squashing, clipping. etc.). If the agitation element is accessible from above or at the man way of the tank then the user is exposed to the aforementioned hazards.**

The tank should be equipped with protection devices and safety equipment. Check the manufacturer's instructions manual.



**The introduction of a solid object or raw material may cause breakage of the agitation element or the breakage of other mechanical parts and endanger safety.**

## 6. Maintenance and conservation.



**Maintenance work can only be carried out by qualified personnel that are trained and equipped with the necessary resources to carrying out this work.**

**Before beginning maintenance work, ensure that the electric motor is disconnected and that the tank is empty.**

### **MAINTENANCE.**

- Inspect the agitator regularly.
- Do not fail to keep the agitator clean.
- Check the state of the gearbox and motor.
- Check the state of the bearings.
- Check the sealing: lip seal.

Gearbox and motor maintenance shall be carried out in accordance with the manufacturer's instructions. See the instructions manual.

### **LUBRICATION.**

The vertical agitators of the BMI / BRI models are supported on permanently lubricated bearings, which means maintenance is not required. The bearings can be re-greased disassembling the support, cleaning thoroughly to remove the old grease or changing them as well as the bearing housings and, finally, applying new grease at 50-70%.

When re-greasing, use only special grease for ball bearings with the following properties:

- Lithium-based or made up of high quality lithium.
- Viscosity 100 - 140 cSt at 40 °C.
- Consistency NLGI grade 2 or 3.
- Continuous work temperature - 30 °C to + 120 °C.

The greasing of the gearbox / motor bearings shall be carried out in accordance with the manufacturer's instructions.

### **SPARE PARTS.**

To order spare parts it is necessary to indicate the type and serial number included on the agitator's characteristics plate, as well as the position and description of the part as found in chapter 9, of technical specifications.

### **CONSERVATION.**

If the agitator is out of service for a considerable period of time, clean and treat the parts with VG 46 mineral oil. The shaft must be stored in the horizontal position and on wooden supports or on supports of a similar material.

## 7. Operating problems: causes and solutions.

Operating problems	Probable causes
Motor overload.	1, 2.
Insufficient agitation.	1, 3, 4, 5.
Vibrations and noise.	6, 7, 8, 9.
Peakage.	10.

Probable causes		Solutions
1	Viscosity of the liquid too high.	Reduce the viscosity, e.g. by heating the liquid.
2	High density.	Increase motor power.
3	Tank too big for the chosen agitator.	Check with the technical department.
4	Wrong direction of rotation.	Change direction of rotation.
5	Agitator speed too low.	Increase the speed.
6	Liquid level insufficient or none.	Check liquid level in the tank.
7	Shaft bended.	Replace the shaft.
8	Critical speed.	Check with the technical department.
9	Worn bearings.	Replace the actuating bearings.
10	Lip seal worn or damaged.	If the lip seal is worn, replace it. If the lip seal is damaged, consult the technical department.



**If the problems persist stop using the agitator immediately. Contact the agitator manufacturer or the representative.**

## 8. Disassembly and assembly.

The assembly and disassembly of the agitators should only be carried out by qualified personnel. Ensure that staff read this instruction manual carefully, especially those parts that make direct reference to their work.

### ELECTRICAL SAFETY.

Ensure that the motor starter is turned off when carrying out disassembly or assembly work on the agitator.



- Place the agitator switch in the “off” position.
- Block the electrical panel and put a warning notice on it.
- Take out the fuses and take them with you to the work area.

### DISASSEMBLY.

Once the motor is disconnected, disassembly work may begin:

- Remove the propeller (02) from the shaft (05), unscrewing the studs (55). On the sawtooth turbine (02), remove the screw (52A). Once extracted it, leave the bucket (02A) with the dragging pivots (55), the turbine (02) and the washer (35).
- Next proceed to disassembly of bearing support unit according to the case:

Bearing support with one ball bearing:

- Remove the shaft (05) from the half shaft (26) through the studs (55A)
- Remove the screws (52) and washers (53), and take out the motor (93).
- Remove the countersunk screws (50). Hit the upper part of the half shaft (26) with a nylon hammer and take out the unit formed by the half shaft (26), ball bearing (70), base plate (42), lip seal (88) and bearing stop ring (31).
- Once in the outside of the bearings support, remove the base plate (42) from the half shaft (26) and with the aid of a nylon hammer remove the lip seal (88).
- Take off the elastic ring (66) with suitable pliers and remove the bearing (70) with a press, as shown in figure 8.1.

Bearing support with two ball bearings:

- Remove the screws (52) and washers (53), and take out the motor (93).
- Remove the countersunk screws (50). Hit the upper part of the shaft (05) with nylon hammer and take out the unit formed by the shaft (05), ball bearing (70, 70A), base plate (42), lip seal (88) and bearing stop ring (31).
- Once in the outside of the bearings support, remove the base plate (42) from the shaft (05) and with the aid of a nylon hammer remove the lip seal (88).
- Take off the elastic ring (66) of the upper ball bearing with suitable pliers and remove the bearing (70A) with a press. Then, remove the other elastic rings (66) and proceed to disassembly the other ball bearing (70) with a press, as shown in figure 8.1.

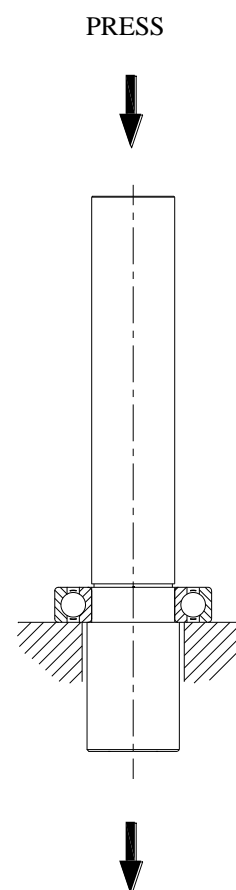


Figure 8.1.



## ASSEMBLY.

- Put the bearing stop ring (31) and the lip seal (88) in the base plate (42).
- Next proceed to disassembly of bearings according to the case:

Bearing support with one ball bearing:

- Fit the bearing (70) and the elastic ring (66) on the half shaft (26).
- After the half shaft / ball bearing unit has been assembled, put it in the bearings support by the base plate side until it is positioned. Fit the unit of base plate (42), bearing stop ring (31) and lip seal (88) on the half shaft. Fit all through the countersunk screws (50).
- Mount the gearbox / motor (93) on the bearings support (06) and fix it with the screws (52) and washers (53).
- Join the agitator shaft (05) with the half shaft using the studs (55A).
- Place the propeller (02) in the agitator shaft and tighten the studs (55).
- Fit the agitator over the tank.

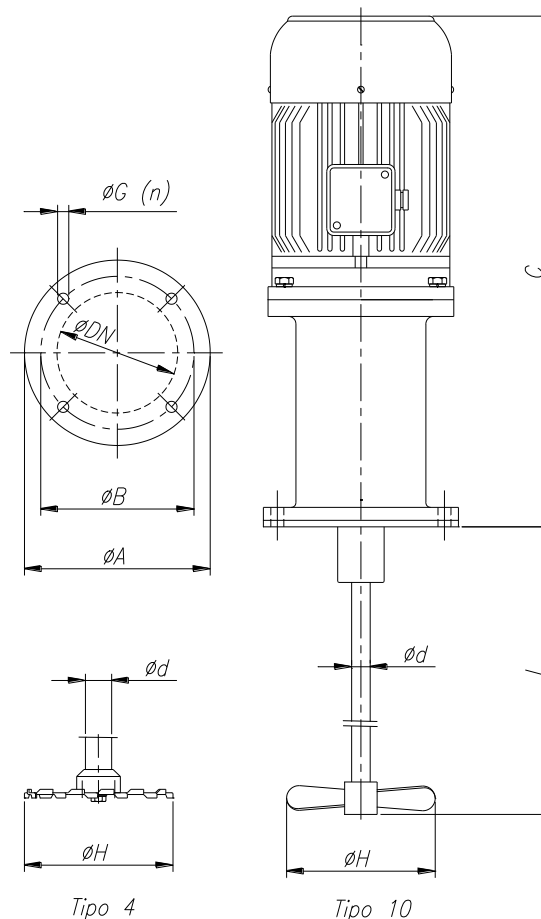
Bearing support with two ball bearings:

- Fit the lower elastic ring of bearing (70) with suitable pliers. Enter the bearing (70) through the top shaft (05), and fix it through the elastic ring. Then repeat the same way for the upper bearing (70A).
- After the shaft and ball bearings unit has been assembled, put it in the bearings support by the base plate side until it is positioned. Fit the unit of base plate (42), bearing stop ring (31) and lip seal (88) on the shaft (05). Fit all through the countersunk screws (50).
- Mount the gearbox / motor (93) on the bearings support (06) and fix it with the screws (52) and washers (53).
- Place the turbine (02). Firstly, put the turbine bucket (02A) with dragging pivots (55B) at the end of the shaft. Locate the holes of the sawtooth turbine (02) with dragging pivots. The direction of rotation must consider. Next, locate the holes of the washer (35) with the dragging pivots and, finally, tightening the screw (52A).
- Fit the agitator over the tank.

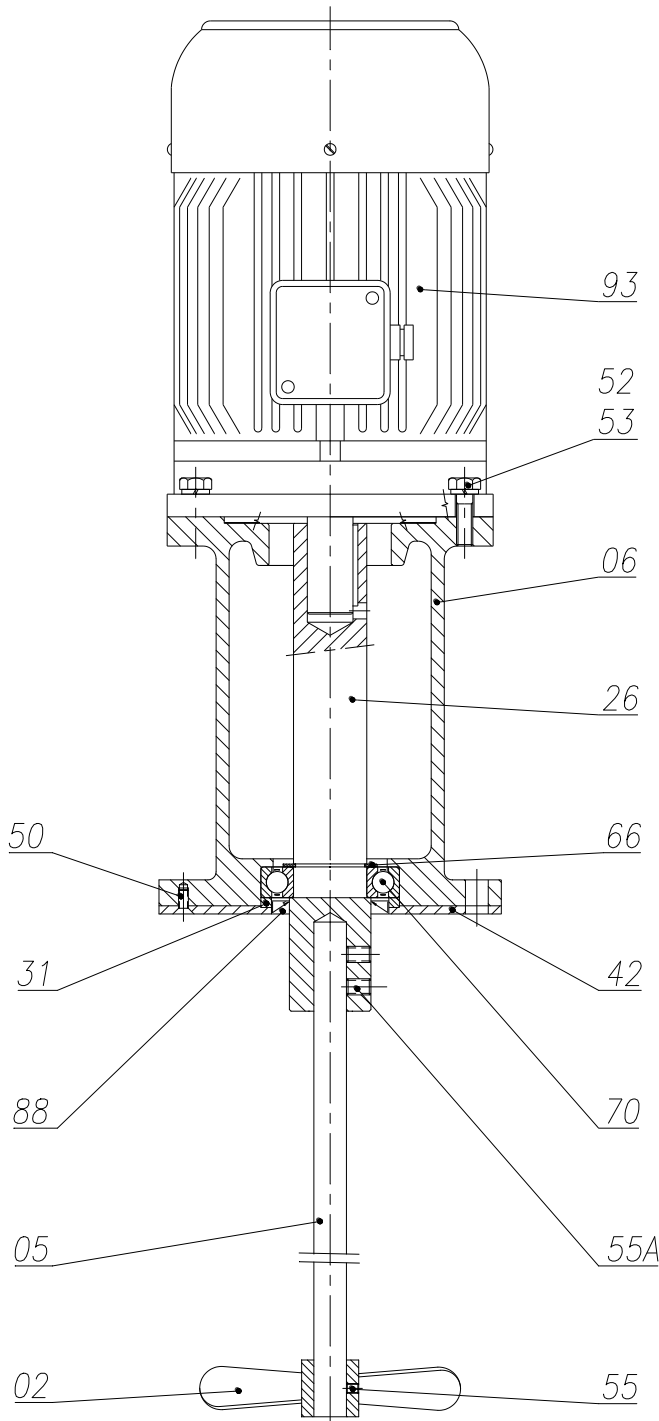
# 9. Technical specifications.

## TECHNICAL SPECIFICATIONS AND DIMENSIONS.

Agitator type	Motor power [ Kw ]	Speed [r/min]	Gear-box size	Dimensions				Agitator shaft		Type							
				C	Flange			$\varnothing d$	$L_{m\acute{a}x.}$	10	4						
					$\varnothing A$	$\varnothing B$	DN			$\varnothing G(n)$	Marine propeller $\varnothing H$	Sawtooth elements $\varnothing H$					
BMI 1.10-4011-1-160	1.1	1450	90	515	210	180	100	14(4)	20	1400	160						
BMI 1.10-4015-1-175	1.5										175						
BMI 1.10-4022-1-200	2.2										200						
BMI 1.10-4030-1-200	3		200														
BMI 1.10-4040-1-225	4		225														
BMI 1.10-4055-1-225	5.5		225														
BMI 1.10-6007-1-175	0.75	950	90	515					210	180	100		14(4)	20	1400	175	
BMI 1.10-6011-1-200	1.1															200	
BMI 1.10-6015-1-225	1.5		225														
BMI 1.10-6022-1-250	2.2		250														
BMI 1.10-6030-1-250	3		250														
BMI 1.4-4022-1-150	2.2	1450	100	543										210	180	100	
BMI 1.4-4040-1-200	4		112	546	200												

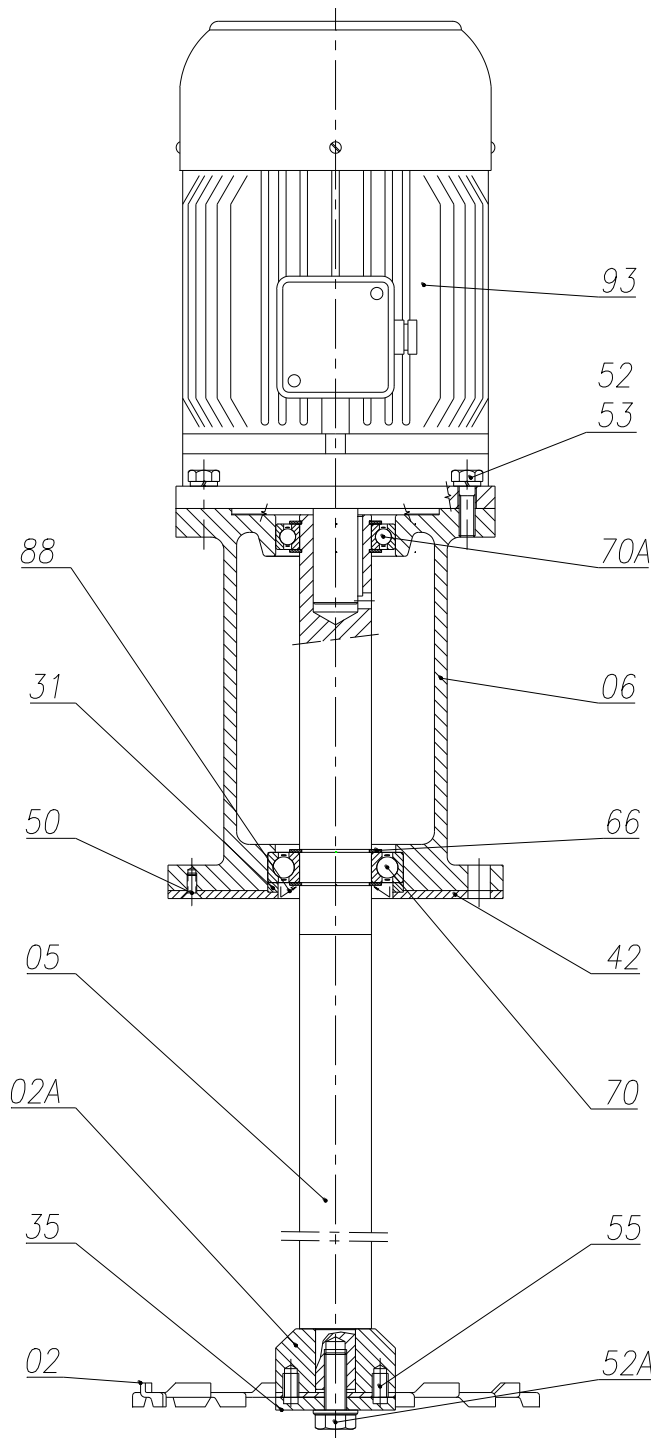


## BMI / BRI AGITATOR AND PARTS LIST.



Position	Quantity	Description	Material
02	1	Marine propeller	AISI-316
05	1	Shaft	AISI-316
06	1	Bearings support	Aluminium
26	1	Half shaft	AISI-316
31	1	Bearing stop ring	F-114
42	1	Base plate	AISI-316
50	4	Countersunk screw	A2
52	4	Hexagonal screw	A2
53	4	Flat washer	A2
55	2	Stud	A2
55A	2	Stud	A2
66	1	Elastic ring	Steel
70	1	Ball bearings	Steel
88	1	Lip seal	NBR
93	1	Motor / Gearbox	-

**BMI / BRI AGITATOR AND PARTS LIST (TWO BALL BEARINGS).**



Position	Quantity	Description	Material
02	1	Sawtooth turbine	AISI-304
02A	1	Turbine bucket	AISI-304
05	1	Shaft	AISI-304
06	1	Bearings support	Aluminium
31	1	Bearing stop ring	F-114
42	1	Base plate	AISI-304
50	4	Countersunk screw	A2
52	4	Hexagonal screw	A2
52A	1	Hexagonal screw	A2
53	4	Flat washer	A2
55	2	Dragging pivot	A2
66	4	Elastic ring	Steel
70	1	Ball bearing	Steel
70A	1	Ball bearing	Steel
88	1	Lip seal	NBR
93	1	Motor / Gearbox	-