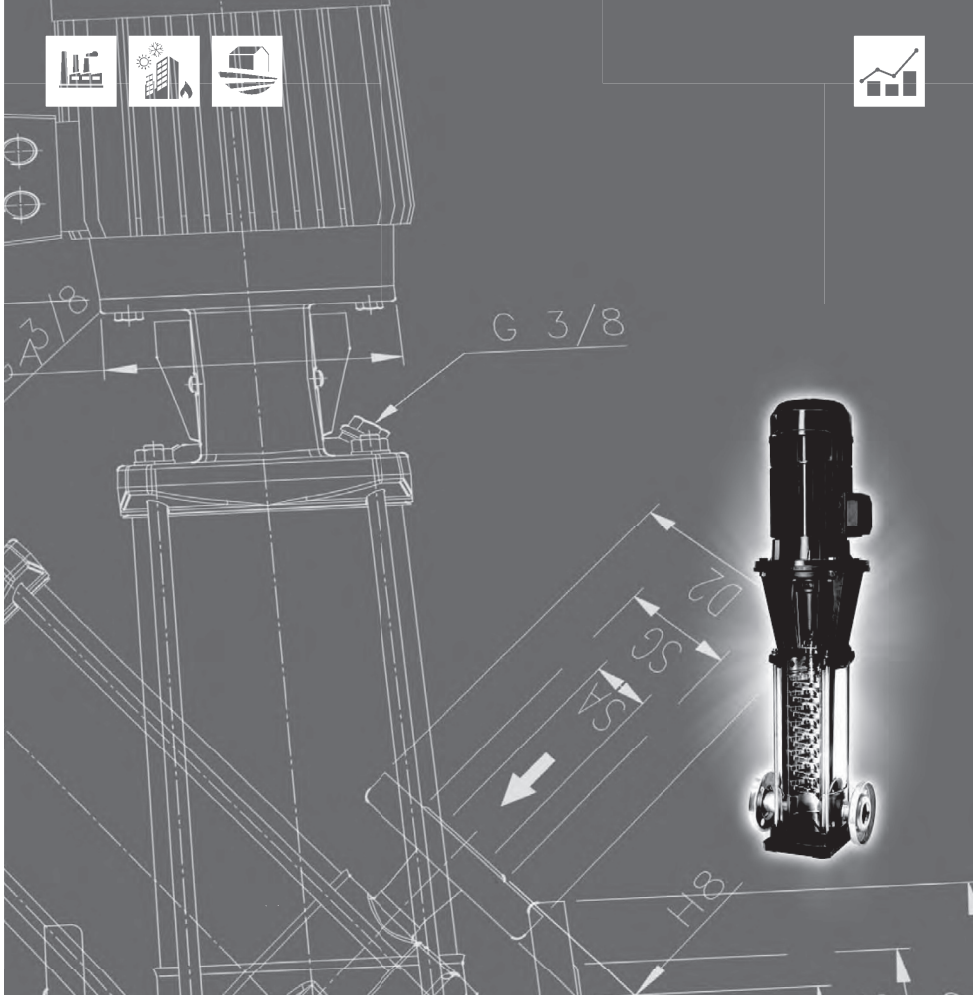


EVMSU Series

Vertical Multistage Pumps

Operation, Installation & Maintenance Manual



***Note:** Model EVMSU with seal code "S" is Certified

Low NPSH models and models with optional seal types are not certified.

All specifications subject to change without notice.

Certified to
NSF/ANSI/ICCAN 01
& 372

PARTS REFERENCE

STANDARD WARRANTY

All sectional drawings and parts reference charts are included in the Parts Reference Document.



Scan the above QR Code to view
Parts Reference Document



Scan the above QR Code to view
EPAC Standard Warranty



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INSTRUCTION MANUAL REGARDING USE AND MAINTENANCE

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Please keep this instruction manual on hand for future reference.

1. INTRODUCTION

To obtain best results from product, observe all operation and maintenance instructions given in this manual. If you need further information, please contact the nearest authorized distributor.

NO PART OF THESE ILLUSTRATIONS AND/OR TEXT MAY BE REPRODUCED FOR ANY REASON.

The following symbols have been used in the compilation of this instruction manual to make the reader aware of what may happen if instructions are not followed:



WARNING! Risk of damaging the pump or system



Risk of causing injury or damaging property



Electrical hazard

2. MANUFACTURER IDENTIFICATION DATA

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*Models EVMSU/EVSUL 1-20 & EVMSG(G)/EVSUL 32-90 certified to NSF/ANSI/CAN 61 & NSF/ANSI/CAN 372

NOTE: Only products bearing the NSF Mark on the product, product packaging, and/or documentation shipped with the product are Certified.

3. GENERAL INFORMATION

FAILURE TO OBSERVE THE INSTRUCTIONS OUTLINED IN THIS MANUAL AND/OR WORK DONE ON THE PRODUCT BY ANYONE OTHER THAN OUR SERVICE CENTERS WILL VOID THE WARRANTY AND RELIEVE THE MANUFACTURER OF ALL LIABILITY FOR PERSONAL INJURY AND DAMAGE TO THE PRODUCT.

Always check to make sure that the pump was not damaged in shipment before accepting delivery. If damage is evident, a claim should be filed with the carrier at that time.

Check that the model on the pump nameplate matches that of your order.

The following parts are subject to wear during normal operation:

- bearings
- mechanical seals
- grommets
- capacitors

If a fault that is not listed in the "TROUBLESHOOTING" table (section 13) occurs, please contact the nearest authorized retailer.

4. GENERAL SAFETY WARNINGS

Before using the product, you must be sure you can follow the instructions given in this manual and apply them whenever using or servicing it.

4.1 PREVENTIVE MEASURES TO BE TAKEN BY THE USER



The user must comply with all local and national regulations that apply to the installation and operation of electric pumps. Operation of the pump must be compatible with the pump construction as shown in the SPECIFICATIONS section of this manual. Always wear protective gloves when handling the pump or performing maintenance.



When repairing or servicing the product, always disconnect the power first. Before starting the pump, make sure that all cables, electrical connections, and controls are in working order and are properly grounded. Improper installation may result in serious or even fatal injury.



Any electrical work should be performed by a qualified electrician.



Attempting to service, install or handle the product while it connected to a power source can result in serious and even fatal injury. When starting up the product, make sure you are wearing shoes, not standing in water, and that your hands are dry.



Users MUST NOT PERFORM ANY WORK on the motor or pump not covered within this manual.



In case of pump failure, stop operation immediately. Operation of a broken pump may result in injury or damage to property.



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4.2 IMPORTANT PROTECTIONS AND CAUTIONS



All products are designed with guards over moving parts. Operating the pump without the guards in place can cause physical injury.



The pump is supplied with a grounding conductor or a grounding type plug. To reduce the risk of electric shock, be certain that it is connected only to a properly grounded electrical supply. Do not connect pump to a power supply until permanently grounded.

4.3 ADDITIONAL RISKS FOR SURFACE PUMPS:

- Possible contact with the motor cooling fan by inserting any objects (e.g. screwdrivers, sticks and similar) through the fan cover holes.
- Possible restart without warning due to automatic re-arming of the motor protection device, if tripped due to motor overheating.

5. HANDLING AND STORAGE

5.1 HANDLING



Crushing hazard: The pump and its components are HEAVY and must be handled carefully. Use proper lifting equipment and work apparel. When lifting the pump/motor, use appropriate crane (or hoist). Check position and tightness of lift system so that weight of the pump is NOT unbalanced. Failure to observe this precaution can result in serious accidents.

The following must be done when moving or dismantling the motor pump:

- disconnect the electric supply;
- remove the suction and discharge pipes (where present) if too long or bulky;
- if present, remove any screws that secure the pump to its supporting surface;
- lift the pump using equipment suitable to the pump weight and dimensions (refer to the technical section specifications).

The product is packed horizontally in a cardboard box, with handles on request. Larger models may be packed on a wooden pallet.



Fig 1. Pump & Motor with Eyebolts



Fig 2. Pump & Motor without Eyebolts



Fig 3. Bare Pump

Handling a complete pump with motor

To move the pump from its horizontal packed position, simply attach a suitable strap securely to the pump and motor and lift slowly using a hoist while keeping the load balanced.

WARNING! EVMSU pumps with motor installed tend to be top heavy. Care should be taken in handling and transporting to prevent damage or injury caused by the pump falling over.

Handling a bare pump:

Follow the same procedure as for a complete pump with motor. In this case, the strap must be attached to the motor bracket. Keep packing materials inside the motor bracket in place while moving the bare pump.

5.2 STORAGE

- The product must be stored in a covered and dry place, far away from heat sources and protected against dust, dirt, and vibration.
- Protect the product against damp conditions, heat sources and mechanical damage.
- Do not place heavy objects on the packaging.
- The product must be stored at an ambient temperature between +5°C and +40°C (41°F – 104°F) with a relative humidity of 60%.

6. PRODUCT OVERVIEW

6.1. DESCRIPTION

EBARA's EVMSU pumps are vertical multi-stage multi-purpose, non-self-priming pumps. EVMSU pumps are designed for coupling to standard electric motors to provide pumping of water at various flow, pressure and temperature conditions in a wide range of applications.

The abbreviations EVMSU identify a wide range of vertical multi-stage pumps with in-line ports, sized for nine nominal flow rates (EVMSU 1, 3, 5, 10, 15 & 20, EVMSU 32, 45, 64, & 90) with varying number of stages available either as a complete pump with motor or bare pump.

If you have purchased a bare pump, please make sure your motor is suited to coupling with the pump.

The model designation can be found in section 7.1.

6.2 APPLICATIONS

The pump is designed for:

- commercial and industrial water distribution systems
- washing systems
- water treatment
- fire systems
- cooling systems
- pressurisation systems
- irrigation systems

6.2.1 USE WITH DRINKING WATER

The product is constructed with materials suited for pumping drinking water. Before being used, the pump must be run with clean water at its nominal flow rate for the time indicated in the following table:

EVMSU1	60 minutes (minimum)	EVMSU20	15 minutes (minimum)
EVMSU3	60 minutes (minimum)	EVMSU32	15 minutes (minimum)
EVMSU5	30 minutes (minimum)	EVMSU45	15 minutes (minimum)
EVMSU10	30 minutes (minimum)	EVMSU64	15 minutes (minimum)
EVMSU15	15 minutes (minimum)	EVMSU90	15 minutes (minimum)

6.3 PUMPS ARE NOT DESIGNED FOR USE IN THE FOLLOWING APPLICATIONS



Improper use of the pump is hazardous and can result in personal injury and damage to property.

WARNING! Improper use of the product may void the warranty

The pumps may not be used for:

- dirty water
- highly acidic water
- corrosive fluids
- water at temperatures higher than indicated in "TECHNICAL DATA"
- sea water
- flammable/explosive fluids
- fluids incompatible with the pump's materials
- installation outdoors without protection against atmospheric agents
- dry running

ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE. THE MANUFACTURER RESERVES THE RIGHT TO AMEND TECHNICAL DATA FOR THE PURPOSE OF PRODUCT IMPROVEMENTS.



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7. PRODUCT SPECIFICATIONS

EVMSU(L)1-3-5-10-15-20

PUMP														
Version		EVMSU					EVMSUL							
Performance range	Nominal size	1	3	5	10	15	20	1	3	5	10	15	20	
	Motor Power	1/2 to 25 HP												
	Capacity	2.9 to 132.1 gpm												
	Total Head	24.3 to 860 ft												
Liquid Handling	Type of liquid	Clean water (for other clean liquids, consult factory)												
	Maximum working pressure	230 / 375 PSI (depending on model)												
	Liquid temperature range	-22°F to 248°F (-30°C to 120°C)												
Size	Suction	1 1/4"			2"		1 1/4"			2"				
	Discharge	1 1/4"			2"		1 1/4"			2"				
Key Component Materials	Impeller	AISI 304 (EN 1.4301)					AISI 316 (EN 1.4401)							
	Intermediate casing	AISI 304 (EN 1.4301)												
	Liner ring	AISI 304 (EN 1.4301) + PPS					AISI 316 (EN 1.4401) + PPS							
	Bottom casing	AISI 304 (EN 1.4301)					AISI 316 (EN 1.4401)							
	Casing cover	AISI 304 (EN 1.4301)					AISI 316 (EN 1.4401)							
	Shaft	AISI 304 (EN 1.4301)	EVMSU 1-3-5, EVMSU 10-15-20 (depending on model)											
		AISI 316L (EN 1.4404)	EVMSUL 1-3-5, EVMSUL 10-15-20 (depending on model)											
		AISI 329A (EN 1.4462)	EVMSU / EVMSUL 5-15-20 (depending on model)											
	Shaft sleeve bearing	Tungsten carbide												
	Shaft Seal	SiC/Carbon/FPM	●	●	●	●	●	●	●	●	●	●	●	●
		SiC+Graphite/SiC/FPM	○	○	○	○	○	○	○	○	○	○	○	○
		SiC/Carbon/EPDM	○	○	○	○	○	○	○	○	○	○	○	○
		SiC+Graphite/SiC/EPDM	○	○	○	○	○	○	○	○	○	○	○	○
	O-ring	FPM	●	●	●	●	●	●	●	●	●	●	●	●
		EPDM	○	○	○	○	○	○	○	○	○	○	○	○
Outer casing	AISI 304 (EN 1.4301)					AISI 316L (EN 1.4404)								
Motor bracket	Cast Iron													
Tie rod	AISI 431 (EN 1.4057)													
Coupling	up to 5 HP	Die cast aluminium												
	from 7 1/2 HP	Cast Iron												
Base	Die cast aluminium													
Pipe connection	Oval flange	up to 230 PSI	○	○	○	○	○	○	○	○	○	○	○	
	Round flange (ANSI compatible raised face)	up to 230 PSI	●	●	●	●	●	●	●	●	●	●	●	
		from 230 PSI to 375 PSI	●	●	●	●	●	●	●	●	●	●	●	
	Loose round flange (ANSI compatible raised face)	up to 230 PSI	○	○	○	○	○	○	○	○	○	○	○	
		from 230 PSI to 375 PSI	○	○	○	○	○	○	○	○	○	○	○	
	victaulic	up to 230/375 PSI	○	○	○	○	○	○	○	○	○	○	○	
Clamp	up to 230/375 PSI	○	○	○	○	○	○	○	○	○	○	○		
Motor	Type	NEMA C/T/C/TSC frame, TEFC or ODP enclosure												
	Speed	2-or 4-pole, 60 Hz, 3500 or 1750 rpm nominal speed												
	Power Requirements	3 Phase, 230/460V or 208-230/460V - Single Phase, 115/230V												
	Direction of Rotation	Clockwise when viewed from motor end												
	Motor Options	Consult factory for optional motor types												

Legend: ● Standard ○ Options



7. PRODUCT SPECIFICATIONS

EVMSU(L)N 3-5-10

PUMP								
Version		EVMSUN			EVMSULN			
Performance range	Nominal size	3	5	10	3	5	10	
	Motor Power	3/4 to 15 HP						
	Capacity	6.6 to 79.26 US gpm						
	Total Head	54 to 815 ft						
Liquid Handling	Type of liquid	Clean water (for other clean liquids, consult factory)						
	Maximum working pressure	360 psi						
	Liquid temperature range	-22°F to 284°F (-30°C to 140°C)						
Pipe Connection	Suction size	1 1/4"	2"	1 1/4"	2"			
	Discharge size	1 1/4"	2"	1 1/4"	2"			
	Flange type	Round flange (ANSI compatible raised face)						
Key Component Materials	Impeller	AISI 304 (EN 1.4301)			AISI 316 (EN 1.4401)			
	Intermediate casing	AISI 304 (EN 1.4301)			AISI 316 (EN 1.4401)			
	Liner ring	AISI 304 (EN 1.4301) + PPS			AISI 316 (EN 1.4401) + PPS			
	Bottom casing	AISI 304 (EN 1.4301)			AISI 316 (EN 1.4401)			
	Casing cover	AISI 304 (EN 1.4301)			AISI 316 (EN 1.4401)			
	Shaft	AISI 304 (EN 1.4301)	EVMSUN 3-5-10 (depending on model)					
		AISI 316L (EN 1.4404)	EVMSULN 3-5-10 (depending on model)					
		AISI 329A (EN 1.4462)	EVMSUN / EVMSULN 5 (depending on model)					
	Shaft sleeve bearing	Tungsten carbide						
	Shaft Seal	SiC+Graphite/SiC/EPDM						
	O-ring	EPDM						
	Outer casing	AISI 304 (EN 1.4301)			AISI 316L (EN 1.4404)			
	Motor bracket	Cast Iron						
	Tie rod	AISI 431 (EN 1.4057)						
	Coupling	up to 3 HP	Die cast aluminium					
from 5 HP		Cast Iron						
Base	Die cast aluminium							
Motor	Type	NEMA C/TC/TSC frame, TEFC or ODP enclosure						
	Speed	2-pole, 60 Hz, 3500 rpm nominal speed						
	Power Requirements	3 Phase, 230/460V or 208-230/460V - Single Phase, 115/230V						
	Direction of Rotation	Clockwise when viewed from motor end						
	Motor Options	Consult factory for optional motor types						



7. PRODUCT SPECIFICATIONS

EVMSU(G)(L) 32-90

		EVMSUG				EVMSU				EVMSUL								
		32	45	64	90	32	45	64	90	32	45	64	90					
Performance Range	Nominal size																	
	Motor Power	5 to 60 HP																
	Capacity	79.3 to 607 US gpm																
Liquid Handling	Total Head	20.7 to 918.7 ft																
	Type of liquid	Clean water (for other clean liquids, consult factory)																
	Maximum working pressure	230 / 360 / 435 psi (depending on model)																
Size	Liquid temperature range	-22°F to 248°F (-30°C to 120°C)																
	Suction	2 1/2"	3"	4"	4"	2 1/2"	3"	4"	4"	2 1/2"	3"	4"	4"					
	Discharge	2 1/2"	3"	4"	4"	2 1/2"	3"	4"	4"	2 1/2"	3"	4"	4"					
Key Component Materials	Impeller	EN 1.4301 (AISI 304)								EN 1.4404 (AISI 316L)								
	Intermediate casing	EN 1.4301 (AISI 304)								EN 1.4404 (AISI 316L)								
	Liner ring	EN 1.4301 (AISI 304) + PPS								EN 1.4404 (AISI 316L) + PPS								
	Bottom casing	EVMSU(G)32	Cast Iron EN GJL-250 EN 1561								EN 1.4308 (ASTM CF8)				EN 1.4408 (ASTM CF8M)			
		EVMSU(G)45-64-90 230 psi																
		EVMSU(G)45-64-90 230+ psi	Cast Iron EN GJS 400-15 EN 1563															
	Casing cover	EN 1.4301 (AISI 304)								EN 1.4404 (AISI 316L)								
	Shaft	AISI 304 (EN 1.4301)								AISI 316L (EN 1.4404) (Depending on model)				AISI 329A (EN 1.4462) (Depending on model)				
	Shaft sleeve bearing	Tungsten carbide																
	Shaft Seal	SIC/Carbon/FPM	●	●	●	●	●	●	●	●	●	●	●	●				
		SIC+Graphite/SIC/FPM	○	○	○	○	○	○	○	○	○	○	○	○				
		SIC+Graphite/SIC/EPDM	○	○	○	○	○	○	○	○	○	○	○	○				
	O-ring	FPM	●	●	●	●	●	●	●	●	●	●	●	●				
		EPDM	○	○	○	○	○	○	○	○	○	○	○	○				
	Outer casing	EN 1.4301 (AISI 304)								EN 1.4404 (AISI 316L)								
	Motor Bracket	Cast Iron EN GJS 400-15 EN 1563																
	Tie rod	EN 1.4057 (AISI 431)																
Coupling	up to 5 HP	Die cast Aluminium EN AB-AISI11 Cu2 (Fe)																
	from 7 1/2 to 40 HP	Cast Iron EN GJL250 EN 1561																
Base	50 HP and larger	Carbon Steel																
		Cast Iron EN GJL200 EN 1561																
Pipe connection	Round flange (ANSI compatible raised face)	●	●	●	●													
	Loose round flange (ANSI compatible raised face)					●	●	●	●	●	●	●	●					
Motor	Type	NEMA C/TC/TSC frame, TEFC or ODP enclosure																
	Speed	2-pole, 60 Hz, 3500/3550 rpm nominal speed																
	Power Requirements	3 Phase, 230/460V or 208-230/460V - Single Phase, 115/230V																
	Direction of Rotation	Clockwise when viewed from motor end																
	Motor Options	Consult factory for optional motor types																

● Standard ○ Optional



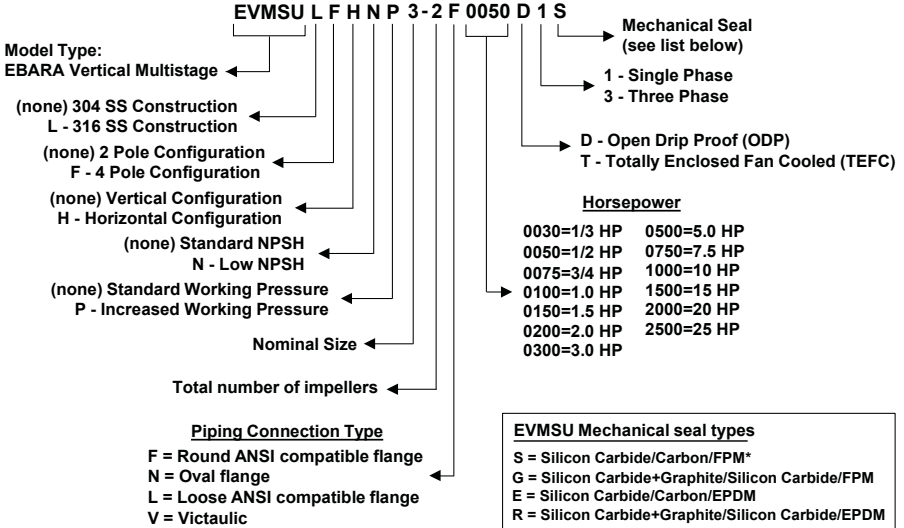
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7.1 MODEL DESIGNATION

MODEL DESIGNATION

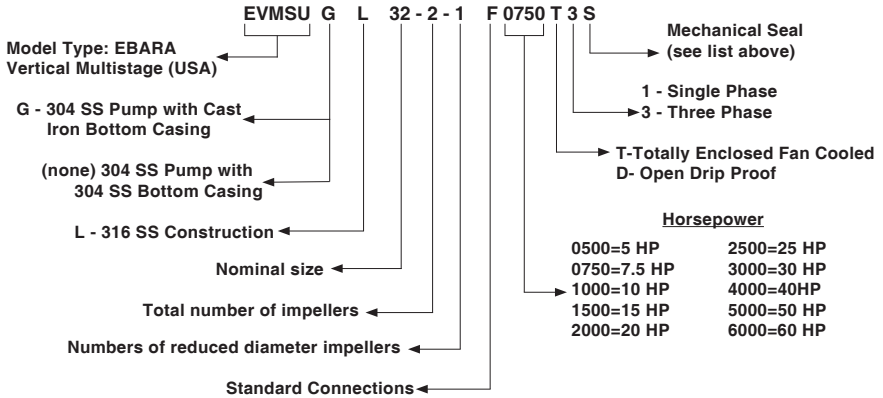
Models EVMSU 1, 3, 5, 10, 15, 20
 EVMSUL 1, 3, 5, 10, 15, 20



EVMSU Mechanical seal types

S = Silicon Carbide/Carbon/FPM*
 G = Silicon Carbide+Graphite/Silicon Carbide/FPM
 E = Silicon Carbide/Carbon/EPDM
 R = Silicon Carbide+Graphite/Silicon Carbide/EPDM
 X = Special order seal materials (consult factory)
 *NSF/ANSI/CAN 61 & 372 certified configuration

Models EVMSUG 32, 45, 64, 90
 EVMSU(L) 32, 45, 64, 90



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8. PREPARING FOR USE

WARNING!



Installation must be performed by qualified or factory trained personnel.



When lifting the pump/motor, use appropriate lift equipment, and check position and tightness of lift system so that the weight of the pump remains balanced. Failure to observe this precaution may result in serious accidents.

Lifting eye(s) attached to the motor (if provided) are intended only for lifting the motor and must not be used to lift the complete pump assembly.

8.1 COUPLING TO THE MOTOR

The motors to be coupled to the EVMSU pumps must meet NEMA standards. Consult motor nameplate and motor manufacturer's specifications for additional guidance on motor installation and operation, including maximum starts per hour.

Check that all power is off and that the motor is disconnected from the power supply prior to ANY work performed on the pump and/or motor.

It is strongly suggested to perform a start-up test run following coupling to check operation. If possible, it is suggested to perform coupling once the pump has been fastened down in its working position and connected to the suction and discharge pipes.

8.1.1 ASSEMBLING THE MOTOR TO THE PUMP

WARNING!



The following procedure must be done with the unit disconnected from its electrical power supply.

EVMSU1-20 and EVMSU32-90 below 50HP models [-A-]

1. Position and secure the pump vertically on a flat, rigid surface.
2. Unscrew the 4 coupling guard screws, then remove the two coupling guards. [A-1]
3. Remove foam packing material from around the coupling. [A-1]
4. EVMSU only: Evenly loosen the three set screws in the seal holder (shaft locking collar) by one full turn. [A-2]
5. Unscrew the coupling screws and remove both coupling halves from the pump. [A-3]
6. EVMSU only: Remove the motor key from the motor and install the half-key. [A-4]

WARNING!

The half-key should not protrude from the slot in the motor shaft.

7. Set the motor vertically with its shaft downwards and place it over the pump. [A-5]
8. Insert and evenly tighten down the 4 motor bolts to the torque specified on page 14. [A-5]
9. Loosely reinstall the coupling halves. For EVMSU, the half-key must face away from the gap between the coupling halves. [A-6]
10. Use a suitable lever to pull the coupling upward until it stops against the end of the motor shaft. [A-7]
11. With the coupling raised, evenly tighten the four coupling bolts evenly to the torque specified on page 14. [A-7]
12. Rotate the coupling by hand and use a feeler gauge to check that the gap between the coupling halves is even. If not, repeat from step 9. [A-8]
13. EVMSU only: Evenly tighten the three set screws on the seal holder to the torque specified on page 15. [A-9]

WARNING!

The seal holder set screws must be tightened prior to operation or damage to the pump may occur.

14. Reinstall the two coupling guards. [A-10]
15. The motor is now installed.

EVMSU32,45,64,& 90 50-60HP Models

1. Position and secure the pump vertically on a flat, rigid surface.
2. Attach a strong sling or chains to the motor lifting lugs or eyebolts to ensure that the motor is balanced when lifted.
3. Set the motor vertically with its shaft downwards and place it over the pump.
4. Insert and evenly tighten down the 4 motor bolts: 1/2" - 58.3 Nm (43 lb-ft), 5/8" - 124.8 Nm (92 lb-ft)
5. The motor is now installed

8.2 GENERAL INSTALLATION PRECAUTIONS

WARNING!

Remove the suction and discharge caps before connecting the pump to the piping.

- a) Use metal or rigid plastic pipes to avoid pipe strain or collapse due to possible force created at suction
- b) Support and align pipes so that they do not put any stress on the pump;
- c) Avoid throttling caused by bending suction and discharge hoses;
- d) Seal any piping connections: air infiltration in the suction pipe negatively affects pump operation;
- e) Isolation valves should be installed on both the suction and discharge side of the pump in the event service of the pump is required; It is recommended that a bleed valve be installed in the discharge line to allow pressure in the pump to be relieved for service;

WARNING!

Installing a bleed valve is especially necessary in hot water applications to prevent injury.

- f) Properly support and secure all piping so that it is not supported by the pump;
- g) Use minimal bends (goosenecks) and valves;
- h) In suction lift installations, the suction pipe should be fitted with a foot valve and filter in order to prevent foreign matter from entering, and its end should be immersed at a depth that is at least twice the diameter of the pipe; its distance from the bottom of the reservoir should also be one and a half times its diameter.
For suction piping exceeding 13 feet use an oversized pipe (1/4" wider at suction) for improved efficiency;
- i) Ensure that the pump suction, marked by a sticker, is connected to the liquid source and that the discharge, similarly marked, is connected to the discharge line;
- j) Ensure that the suction and discharge gaskets are properly installed to prevent leaks and that they do not restrict the flow to or from the pump.

Standard ANSI mating flanges should be used to connect the pump to the piping. Suction and discharge piping should be no smaller than the respective pump port sizes.

8.2.1 INSTALLATION

- a) Position the pump on a flat surface that is as close as possible to the water source. Leave enough space and ventilation around the pump to allow safe use and maintenance. There must be a minimum distance of 4 inches of "free space" in front of the cooling fan;
- b) use standard plumbing practices to avoid unnecessary line losses, cavitation, and air lock.

8.2.2 POSITIONING THE PRODUCT

WARNING!

Install the pump in a ventilated area protected from weather or destructive elements (rain, frost, etc).

Note: The ambient temperature and altitude ranges are provided in Section 10.1.

Place the pump away from walls, the ceiling or other obstacles so that the pump can be fastened, operated and serviced safely.



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8.2.3 FASTENING DOWN

Bolt the pump on to a concrete base or suitable metal structure. Use of anti-vibration supports is highly recommended in commercial buildings (with occupants) if the concrete base is an integral part of the reinforced concrete structure of buildings. When fastening, use a drill bit to center mark the 4 holes in the base of the pump on the surface it is due to be installed on. Use a drill to make 4 holes (dia. 12mm (15/32") for EVMSU 1, 3, 5, 10, 15, 20 pumps and dia. 14mm (9/16") for EVMSU 32, 45, 64, 90 pumps). Move the pump back into position, line it up with the pipes and tighten the screws all the way. The position of the fastening holes is also illustrated in section 15.6.

8.2.4 PIPEWORK

In addition to the instructions given below, also comply with the general instructions found in sect. 15.7 of the manual and with the directions in fig. 1.

WARNING! Suction and discharge piping must be sized to withstand the maximum working pressure of the pump.



It is recommended that a pressure gauge be installed on the discharge line before the check valve and isolating valve. Use adequate supports for the suction and discharge lines to avoid stress on the pump flange. If the pump is installed with a suction lift arrangement (liquid level lower than the pump) and it feeds an open circuit, install a foot valve at the end of the suction line and use a hose connected to the pump.

WARNING! Ensure that available NPSH is greater than NPSH required by the pump. Insufficient NPSH will result in cavitation, which reduces pump performance and may result in damage to the pump. Refer to the pump curves.

8.2.5 ELECTRICAL CONNECTION

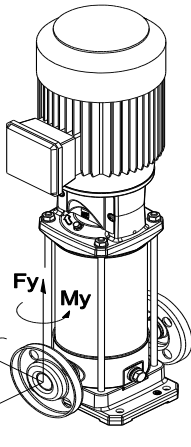
WARNING! Electrical connections must be made by qualified personnel. Motor and circuit protection must be appropriately sized. Observe all applicable codes and standards.



Connect the electrical supply to the pump, following the motor manufacturer's instructions.



8.3 FLANGE LOADING AND TIGHTENING TORQUES



Piping Connection Type

- F = Round ANSI compatible flange
- N = Oval flange
- L = Loose ANSI compatible flange
- V = Victaulic
- C = Clamp

FLANGE TIGHTENING TORQUE

Model	Flange		Pressure Rating	Bolt Size	No. of Bolts	Tightening torque			
						[lb-ft]	[Nm]		
EVMSU(L)	1-3-5	F	ANSI 1-1/4"	230/360	5/8"	4	52	70	
EVMSU(L)	1-3-5	L	ANSI 1-1/4"	230/360	5/8"	4	52	70	
EVMSU(L)	1-3-5	N	-	1-1/4"	230/360	5/8"	2	22	30
EVMSU(L)	10-15-20	F	ANSI 2"	230/360	5/8"	8	26	35	
EVMSU(L)	10-15-20	L	ANSI 2"	230/360	5/8"	8	26	35	
EVMSU(L)	10-15-20	N	-	2"	230/360	5/8"	2	37	50
EVMSU(L)	32	L	ANSI 2-1/2"	230	3/4"	4	59	80	
EVMSU(L)	32	F	ANSI 2-1/2"	360	3/4"	8	59	80	
EVMSUG	32	L	ANSI 2-1/2"	230	3/4"	4	59	80	
EVMSUG	32	F	ANSI 2-1/2"	360	3/4"	8	59	80	
EVMSU(L)	45	L	ANSI 3"	230	3/4"	4	59	80	
EVMSUG	45	F	ANSI 3"	360	3/4"	8	59	80	
EVMSU(L)	64	L	ANSI 4"	230	3/4"	8	59	80	
EVMSUG	64	F	ANSI 4"	360	3/4"	8	74	100	
EVMSU(L)	90	L	ANSI 4"	230	3/4"	8	59	80	
EVMSUG	90	F	ANSI 4"	360	3/4"	8	74	100	

ALLOWABLE STRAIN ON THE FLANGE

Model	Flange		Fx		Fy		Fz			
			[lb]	[N]	[lb]	[N]	[lb]	[N]		
EVMSU(L)	1-3-5	F	ANSI 1-1/4"	61	270	52	230	47	210	
EVMSU(L)	1-3-5	L	ANSI 1-1/4"	61	270	52	230	47	210	
EVMSU(L)	1-3-5	N	-	1-1/4"	61	270	52	230	47	210
EVMSU(L)	10-15-20	F	ANSI 2"	110	490	101	450	90	400	
EVMSU(L)	10-15-20	L	ANSI 2"	110	490	101	450	90	400	
EVMSU(L)	10-15-20	N	-	2"	110	490	101	450	90	400
EVMSUG	32	F	ANSI 2-1/2"	472	2100	416	1850	382	1700	
EVMSUG	32	F	ANSI 2-1/2"	236	1050	208	925	191	850	
EVMSU(L)	45	L	ANSI 3"	562	2500	506	2250	461	2050	
EVMSUG	45	F	ANSI 3"	281	1250	253	1125	230	1025	
EVMSU(L)	64	L	ANSI 4"	2471	3350	2213	3000	1991	2700	
EVMSUG	64	F	ANSI 4"	1235	1675	1106	1500	996	1350	
EVMSU(L)	90	L	ANSI 4"	2471	3350	2213	3000	1991	2700	
EVMSUG	90	F	ANSI 4"	1235	1675	1106	1500	996	1350	

ALLOWABLE TORQUE ON THE FLANGE

Model	Flange		Mx		My		Mz			
			[lb-ft]	[Nm]	[lb-ft]	[Nm]	[lb-ft]	[Nm]		
EVMSU(L)	1-3-5	F	ANSI 1-1/4"	170	230	207	280	140	190	
EVMSU(L)	1-3-5	L	ANSI 1-1/4"	170	230	207	280	140	190	
EVMSU(L)	1-3-5	N	-	1-1/4"	170	230	207	280	140	190
EVMSU(L)	10-15-20	F	ANSI 2"	251	340	310	420	221	300	
EVMSU(L)	10-15-20	L	ANSI 2"	251	340	310	420	221	300	
EVMSU(L)	10-15-20	N	-	2"	251	340	310	420	221	300
EVMSU(L)	32	L	ANSI 2-1/2"	885	1200	1106	1500	811	1100	
EVMSUG	32	F	ANSI 2-1/2"	442	600	553	750	406	550	
EVMSU(L)	45	L	ANSI 3"	959	1300	1180	1600	848	1150	
EVMSUG	45	F	ANSI 3"	479	650	590	800	424	575	
EVMSU(L)	64	L	ANSI 4"	1070	1450	1291	1750	922	1250	
EVMSUG	64	F	ANSI 4"	535	725	645	875	461	625	
EVMSU(L)	90	L	ANSI 4"	1070	1450	1291	1750	922	1250	
EVMSUG	90	F	ANSI 4"	535	725	645	875	461	625	



9. FILLING THE PUMP [- B -]

WARNING! DO NOT START the pump until it has been positioned and installed the final place of operation.

The pump and suction line must be filled with water. Running the pump without water will cause serious damage to the pump.



Extreme caution should be used if priming the pump in a hot water application

9.1. FILLING PUMP IN SUCTION LIFT ARRANGEMENT [B-1]

- Unscrew the fill plug (large plug) located above the outer jacket in front of the coupling guard (remove coupling guards if necessary).
- Using a funnel, fill the suction line and pump casing with water to overflowing.
- Screw the fill plug back on until tight.
- Areas that have become wet as a result of water leaks must be dried thoroughly.
- Reinstall the coupling covers if they have been removed;

9.2 FILLING PUMP IN A FLOODED INSTALLATION [B-1a]

- Loosen the vent plug (small plug) several turns. Complete removal of the plug is not necessary to prime the pump;
- Open the suction valve until the water flows out around the vent plug;
- Tighten the vent plug.

10. USE, STARTING AND RUNNING [- B -]

WARNING! Never allow the pump to operate without water. Doing so can seriously damage internal components.

10.1. GENERAL WARNINGS

- The pumps are designed to operate at ambient temperature no higher than 104°F (40°C) and elevation no higher than 3280 feet (1000 m);
- The pumps cannot be used in swimming pools or similar plants;
- Prolonged operation with the discharge pipe closed can cause damage

WARNING! EVMSU pumps are designed for continuous and normal off/on operation. Rapid cycling may cause high heat and loading that can damage the motor or the pump.

- Avoid starting the pump more than 50,000 times per year. If the pump is started more than 50,000 times per year, the pump life may be shortened and there is a risk of premature failure.
- During power outages, it is advisable to disconnect the power to the pump.
- Select the pump so that it will operate near the best efficiency point. Operate the pump within the allowable operating region of the pump curve.

10.2 STARTING

Once the pump has been properly installed and primed, check the direction of rotation before operating the pump. [B-3]

- Start the pump with the discharge valve closed.
- Check the motor rotation. Rotation should be clockwise when viewed from the top (fan end) of the motor. Rotation is most easily seen immediately after the motor is turned off. [B-3]
- If motor rotation is in the wrong direction, (counterclockwise), disconnect the power supply and swap two of the motor's power phases in the electrical enclosure or terminal block.
- With the motor running, vent air from the pump by loosening the vent plug until water comes out, then tighten to close.
- Start the pump two or three times to check system conditions;
- With the motor running, partially close, then re-open the discharge line isolation valve a few times to cause a rapid pressure increase.
- Run the pump for a few minutes, checking that noise, vibration, pressure, voltage, and current are within acceptable range.
- Shut off power to the motor and wait for the coupling to come to a stop.
- Unscrew the 4 screws and remove the two coupling guards
- Inspect the interior of the motor bracket for water. If water is present, drain the pump and reposition the coupling. Repeat the process from step 4 to step 20 of section 8.1.1.
- Reinstall the two coupling guards.

10.3. RUNNING

Start the pump with the isolating valve on the discharge line closed, then open it gradually. The pump must operate smoothly and quietly. Close the isolating valve again and make sure that the reading on the discharge line pressure gauge is close to the that indicated in the pump specifications. (This approximation is mainly attributable to tolerances and to possible suction lift). If the pressure gauge reading is much lower than specified, repeat the priming procedure in section 9 of this manual. The pump is working properly if the two readings are close in value. If the trouble with the isolating valve open continues, it typically is an electrical or mechanical motor system problem or of pump cavitation due to:

- excessive difference in height or excessive pressure loss along suction line,
- low backpressure in the discharge line;
- temperature of the liquid being pumped.

Note: motor output is reduced if ambient temperature and elevation are higher than those specified. In this case, a larger motor may be required.

Fast-closing valves (exceeding 1.5 times the pump nominal pressure) can cause pressure peaks or water issues and damage to the pump.



Do not operate the pump continuously with the discharge line isolating valve closed.

Operating the pump continuously at a flow rate below the minimum rate indicated on the nameplate will result in potential overheating of the pumped liquid and overloading of the motor bearings.

10.4 STOPPING

- Gradually shut off water to the discharge line to avoid overpressure in the piping and pump;
- Cut off the power supply.



11. MAINTENANCE AND REPAIRS



ALWAYS DISCONNECT ALL POWER BEFORE PERFORMING ANY MAINTENANCE WORK ON THE PUMP AND MOTOR.



Before servicing the pump, be sure to relieve the system pressure. Removing components under pressure may result in injury or damage. Use a pressure bleed valve in hot water applications where water temperature could cause physical injury.

Regularly scheduled maintenance should not be necessary. However, periodic inspections recommended to ensure the pump is running properly. Periodic checks and preventive maintenance will reduce sudden or significant problems and repairs. Common maintenance operations include:

- replacement of mechanical seals
- replacement of grommets
- replacement of bearings
- replacement of single-phase motor capacitors.

Although subject to typical wear, correct operation of the pump will prolong the service life of these parts.

If the pump will not be operated and inactive for a long period, it should be emptied completely, with the discharge and fill caps removed, then washed and rinsed carefully with clean water. Avoid leaving residual water inside the pump.

To prevent damage to pump components, these steps should also be followed if freezing temperatures are expected.



When performing repair work, order original spare parts from our sales and customer support network. Non-original spare parts can damage the product and are a hazard for persons and property.

11.1 REPLACEMENT OF SHAFT SEAL [- C -]

See pictorial instructions on pages 16-19.



The mechanical seal must be set following the procedure outlined in the seal replacement instructions. Ensure that the seal holder (locking collar) set screws are tightened. Failure to set the mechanical seal may result in damage to the pump.

12. DISPOSAL

The user is responsible for disposing of the equipment by taking it to a collection and recycling facility authorized to dispose of electrical waste. Please adhere to local waste disposal regulations should the product become defunct and need to be "scrapped." Completely empty the product of all fluids – do not leave any treated fluid inside it. EBARA pumps should not (typically) contain hazardous polluting material. For further information on equipment collection points, contact your local waste disposal authority.

13. TROUBLESHOOTING

DISPLAYED FAULT	CAUSE	SOLUTION
	Float sticking	Check that the float reaches the level ON
	Thermal protection activated (single phase)	It reactivates automatically (single phase only)
	Incorrect electrical connection	Check the terminal board and the electrical panel
	Automatic switch triggered or fuses blown (*)	Reset the switch or replace the fuses and verify the cause
THE PUMP DOES NOT WORK The motor does not turn	No electricity	Check the electrical supply meter
	Plug not inserted	Check the connection to the power supply
	Built-in thermal overload protection device (if fitted) or thermal cutout in control panel tripped (*)	Wait for built-in thermal overload protection device to reset or reset thermal cutout in control panel
	Device protecting against dry running tripped (*)	Check water level and/or correct connection of system devices
(*) If you encounter the same trouble again, call our Service Department		
	Decrease in the line voltage	Wait for voltage to return to normal
	Suction filter / inlet blocked	Clean filter/inlet
	Foot valve blocked (**)	Release or clean the valve and check that it works properly
	Pump has not been filled (**)	Fill (sect. 9)
THE PUMP DOES NOT WORK The motor turns	Water level low (if no protection system is fitted) (**)	Restore water level
	Pump not primed	Prime the pump Check any isolation and check valves Check the liquid level
	Pressure too low	Restrict the discharge line
(**) Caution: mechanical seal could be damaged		



DISPLAYED FAULT	CAUSE	SOLUTION
THE PUMP WORKS with a reduced flow rate	System undersized	Ensure that pump is sized for the application
	System dirty	Clean the piping, valves, filters
	Water level too low	Switch off the pump or immerse the foot valve
	Incorrect rotational direction (three-phase only)	Swap two of the line phases
	Incorrect supply voltage	Supply the pump with the voltage indicated on the nameplate
	Leaks from piping	Check the joints
	Pressure too high	Recheck the system
PUMP STOPS AFTER RUNNING FOR SHORT TIME as a result of thermal overload protection tripping	Supply voltage outside motor's accepted range	Check whether there are excessive drops in voltage due to undersized line or cables
	Inadequate thermal cutout setting	Adjust setting to motor's rated current (see rating plate)
	Motor overload due to dense and/or viscous liquid	- Reduce flow rate, throttling the discharge line or replace motor with more powerful one - Check actual power absorbed by the pump based on liquid pumped
	Pump delivers liquid at higher rate than max. flow rate on rating plate	Reduce flow rate by throttling discharge line
	Panel exposed to sun or other sources of heat	Protect panel from sun or sources of heat.
	Foreign matter blocking impeller rotation	- Disassemble and clean pump - Call our nearest Servicing Department to do the job
	Motor bearings worn	- Replace bearings - In this case, motor is noisy, too
THE PUMP STOPS AFTER WORKING FOR BRIEF PERIODS Thermal protection intervention	Liquid temperature too high	The temperature exceeds the technical limits of the pump
	Internal fault	Contact the nearest authorized distributor or service center

DISPLAYED FAULT	CAUSE	SOLUTION
THE PUMP STOPS AFTER WORKING FOR BRIEF PERIODS Pressure applications	The difference between maximum and minimum pressure is minimal	Increase the difference between the two pressures
	THE PUMP DOES NOT STOP Pressure applications	Maximum pressure too high
THE PUMP VIBRATES Or is too noisy during operation	Flow rate too high	Reduce the flow rate
	Cavitation	Contact the nearest retailer
	Piping not secured	Secure piping
	Noisy bearing	Contact the nearest authorized distributor or service center
	Debris contacting the motor fan	Remove debris
Circuit breaker trips or fuses blow when starting pump	Incorrect priming	Prime the pump and/or fill it again
	Motor short-circuited	Check and replace
GFCI current circuit breaker trips as soon as switch closes	Short-circuit due to incorrect connection	Check and reconnect correctly
	Leakage current caused by damaged insulation of motor, cables or other electric components	Check and replace electric component with ground fault
Pump performs a few turns in opposite direction when stopping	Foot valve leaking	Check, clean or replace
	Suction pipe leaking	Check and repair
Pump vibrates and is unusually noisy	Motor bearings worn	Replace bearings
	Foreign matter between fixed and rotating parts.	- Disassemble and clean pump - Call nearest authorized service center
	Pump operation affected by cavitation	Reduce flow rate by throttling discharge line. If cavitation persists, check: - Suction height - Pressure loss along suction line (diameter of pipe, elbows etc.) - Liquid temperature - Discharge line backpressure

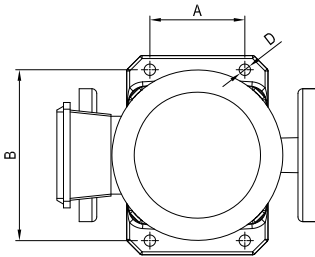


14 ADDITIONAL TECHNICAL INFORMATION
14.1 MAXIMUM WORKING PRESSURE CHART

Maximum working pressure (psi)	Pump Model		
	EVMSU1	EVMSU3	EVMSU5
230	2-18	2-15	2-12
375	20-29	16-23	13-19

Maximum working pressure (psi)	Pump Model		
	EVMSU10	EVMSU15	EVMSU20
230	1-10	1-7	1-6
375	11-16	8-12	8-10

Maximum working pressure (psi)	Pump Model			
	EVMSU32	EVMSU45	EVMSU64	EVMSU90
230	1-5	1-4	1-3	1-3
360	6-8	5-6	4-5	4
435	9-10	7	-	-

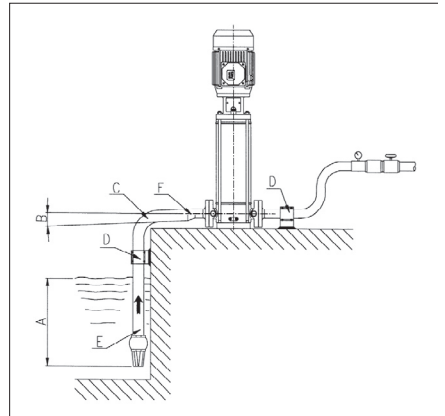


Pump Model	D mm	A mm	B mm
EVMSU32	14	170	240
EVMSU45		190	266
EVMSU64			
EVMSU90			

Pump Model	D in	A in	B in
EVMSU32	9/16	6 11/16	9 7/16
EVMSU45		7 15/32	10 15/32
EVMSU64			
EVMSU90			

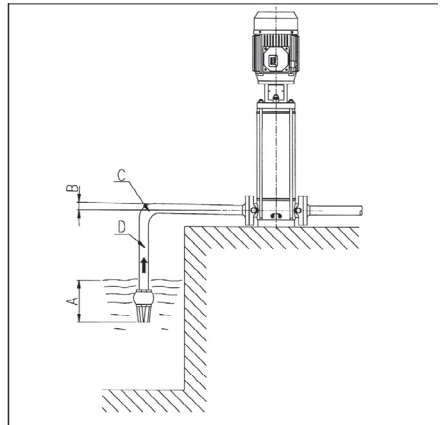
15.1 WARNINGS FOR CORRECT OPERATION OF EVMSU(G)(L) PUMPS (FIG. 1 - FIG. 2)

FIG. 1



- a) Adequate immersion;
- b) Positive slope;
- c) Wide-radius bend
- d) Pipework with independent supports;
- e) Suction pipe diameter \geq pump port diameter;
- f) Reducing coupling for eccentric pipes.

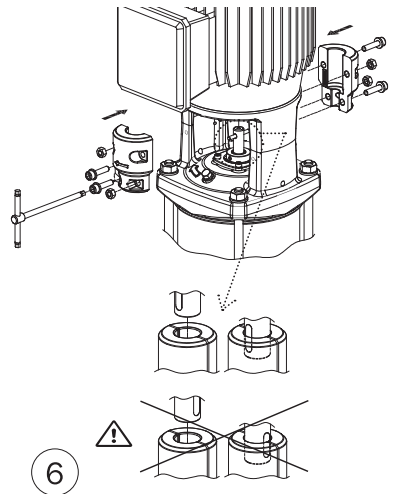
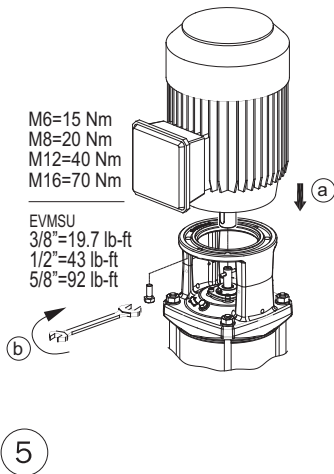
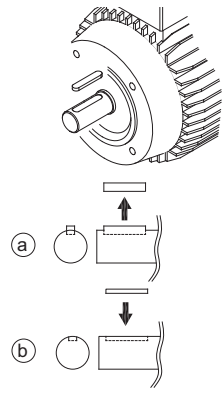
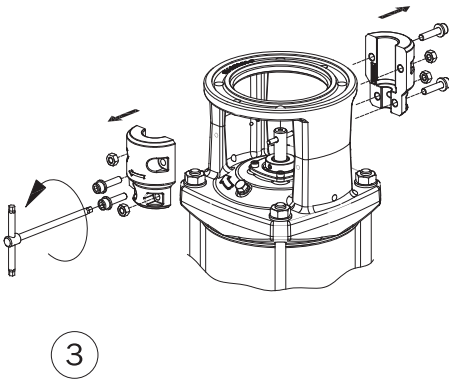
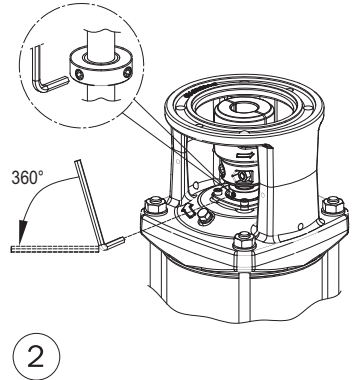
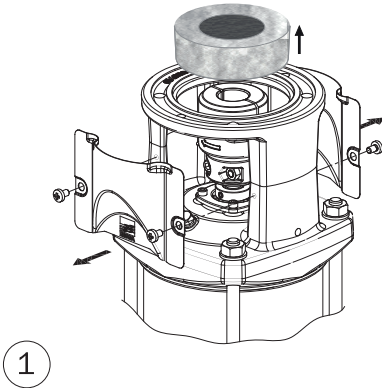
FIG. 2



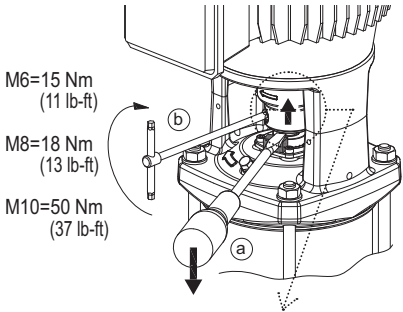
- a) Insufficient immersion;
- b) Negative slope, air pockets created;
- c) Tight bend, pressure loss;
- d) Pipe diameter $<$ pump port diameter, pressure loss



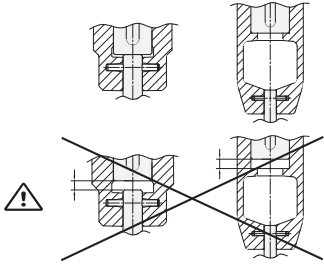
ASSEMBLING THE MOTOR TO THE PUMP - EVMSU1 to EVMSU20 and EVMSU32-90 models below 50HP[-A-]



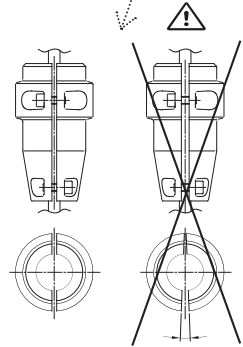
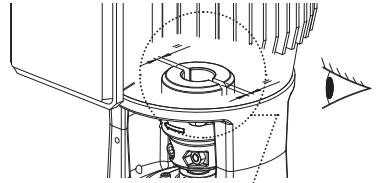
ASSEMBLING THE MOTOR TO THE PUMP - EVMSU1 to EVMSU20 and EVMSU32-90 models below 50HP [-A-]



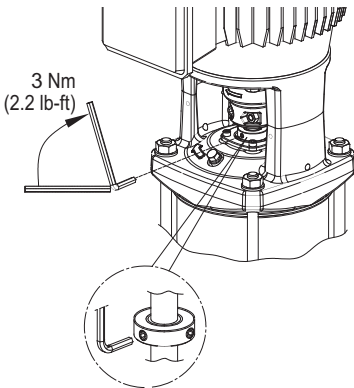
(≤ 3 HP EVMSU) (≥ 5 HP EVMSU)



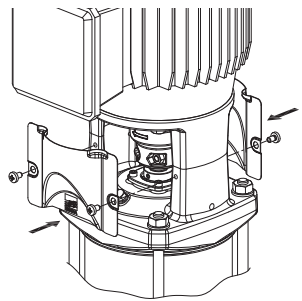
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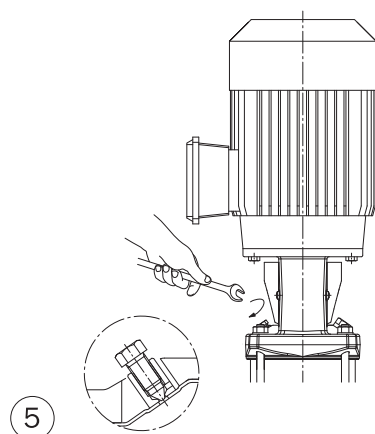
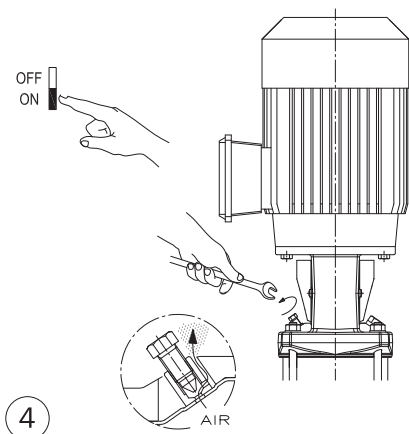
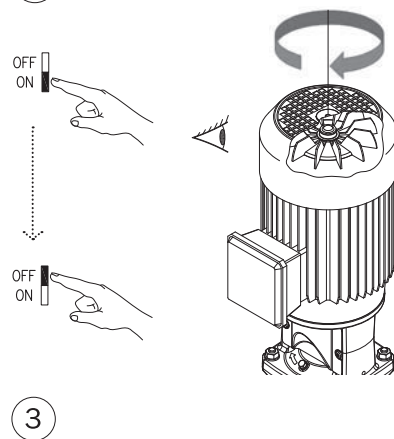
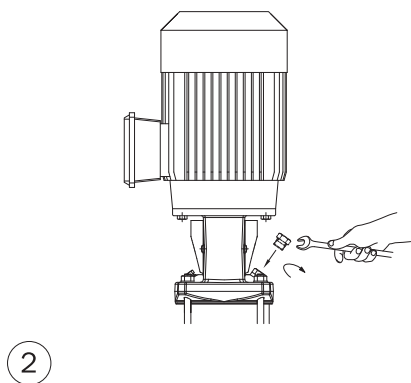
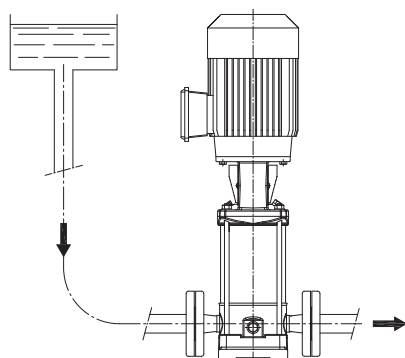
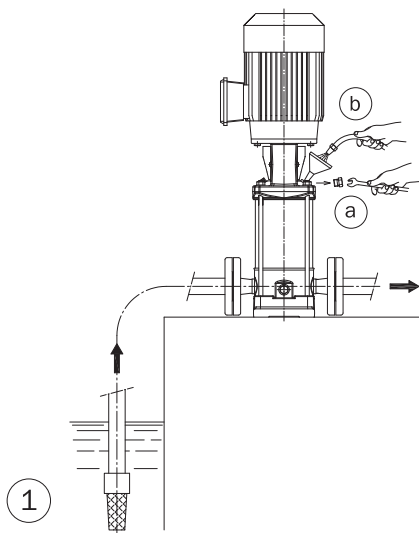
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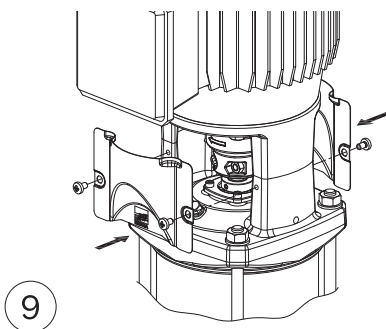
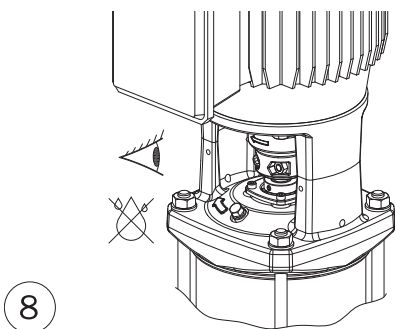
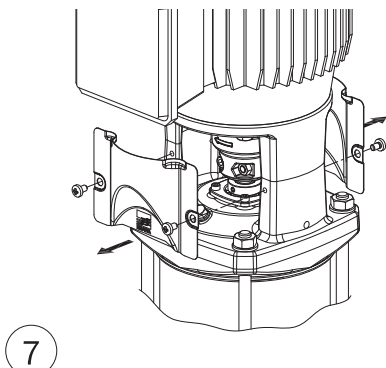
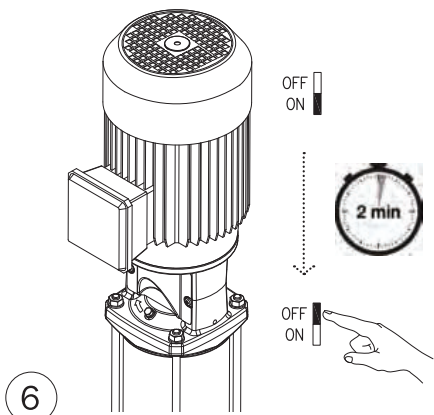
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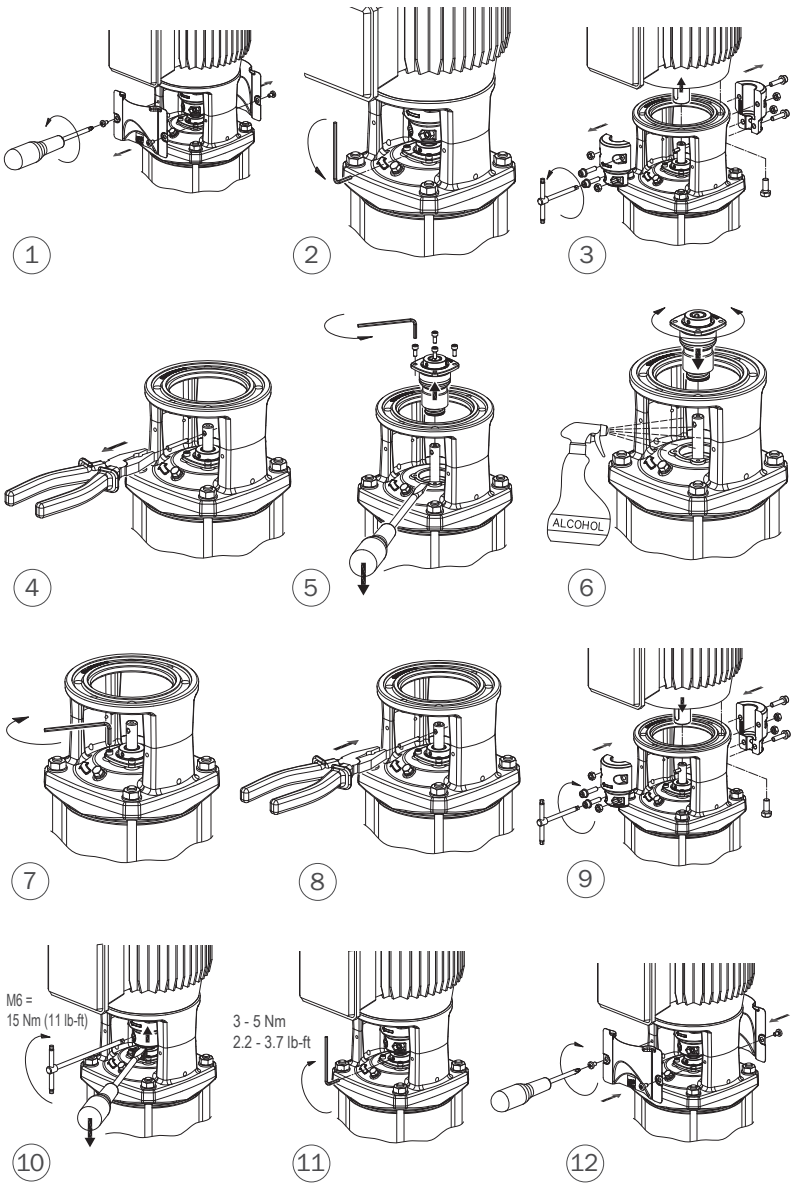
USE, STARTING, AND RUNNING [-B-]



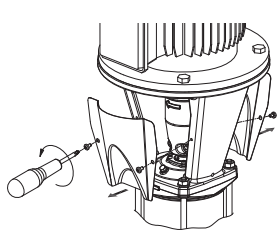
USE, STARTING, AND RUNNING [-B-]



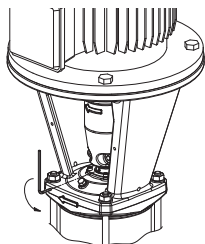
REPLACEMENT OF SHAFT SEAL EVMSU 1 - 3 - 5 - 10 - 15 - 20 and EVMSU32-45-64-90 NON-SPACER COUPLING [-C-]



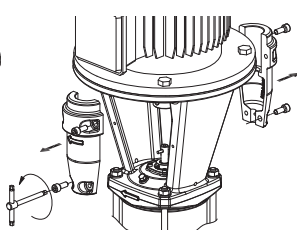
REPLACEMENT OF SHAFT SEAL EVMSU 1 - 3 - 5 - 10 - 15 - 20 and EVMSU32-45-64-90 SPACER COUPLING [-C-]



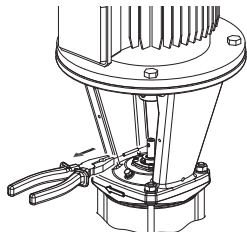
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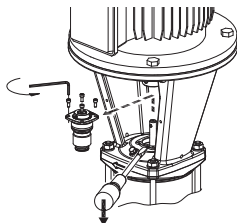
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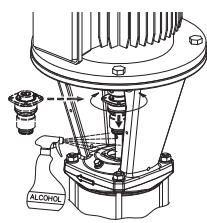
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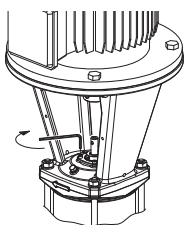
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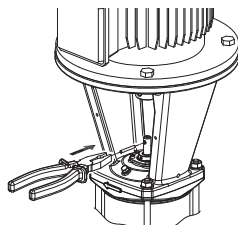
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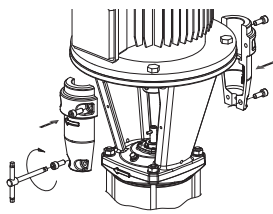
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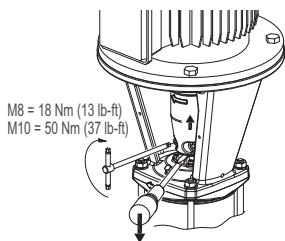
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8

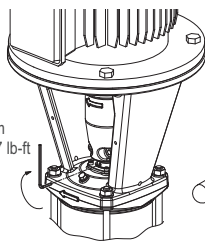


9



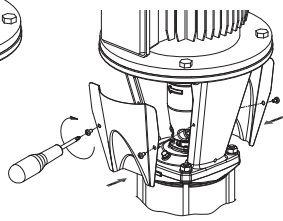
M8 = 18 Nm (13 lb-ft)
M10 = 50 Nm (37 lb-ft)

10



3 - 5 Nm
2.2 - 3.7 lb-ft

11



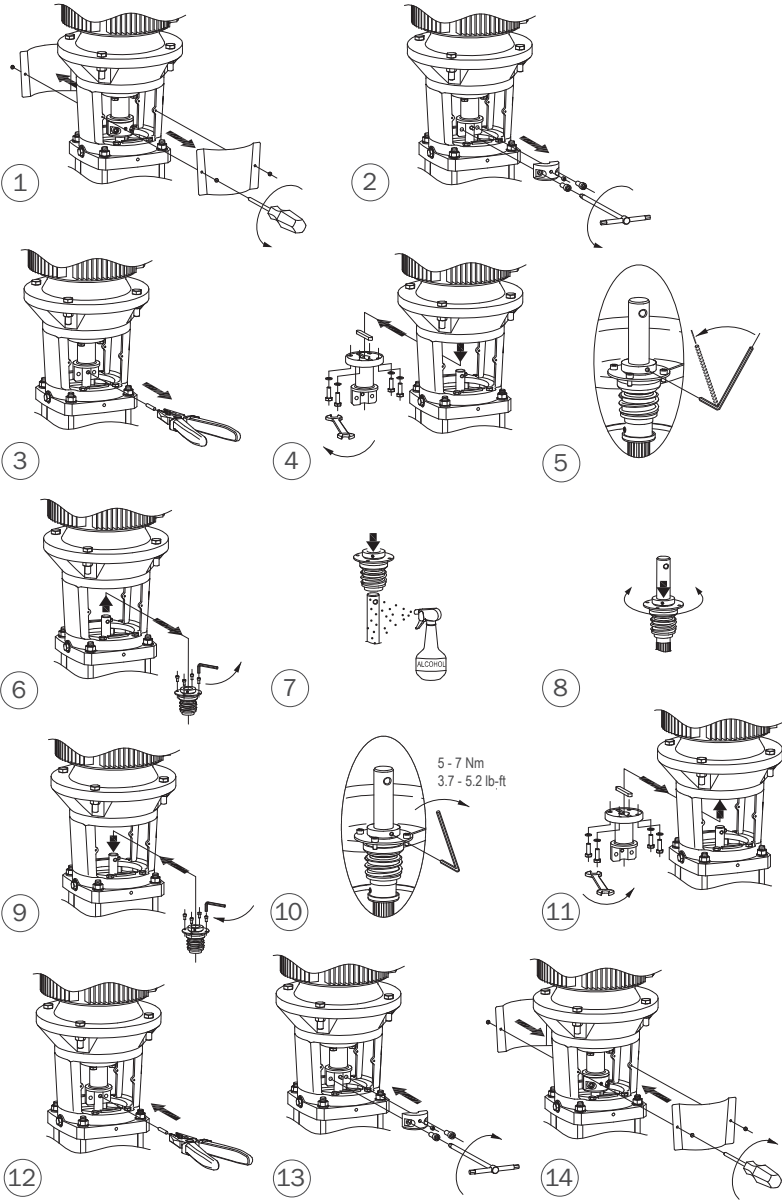
12



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REPLACEMENT OF SHAFT SEAL EVMSU 32-45-64-90 with bearing [-C-]





*Contact your dealer or supplier
for more information about other EBARA products:*



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