Coolant Pump

Model: LVSS-KS

⚠ WARNING

Do not operate, service or inspect this pump until you have read and understood this manual.
Keep this manual in a safe place where it can be cosulted at any time.

To : All mechanical Contractor

Make sure to supply copies of this manual to the customer's operator maintenance and inspection personnel.

TERAL INC.

Limited warranties

1. In the event of a failure or breakage under proper use of the product during the warranty period, equipment supplied by Teral Inc. shall be repaired or replaced free of charge within the scope of the relevant part, provided that such failure or breakage is attributable to inadequacy of the design or workmanship of the equipment.
   The warranty period of this product shall be one year after the date of delivery.

2. The warranty mentioned in the above clause shall be only the mechanical warranty of the defective part, and shall not cover any expenses or other damage arising from the failure or breakage.

3. In the event of the following failures and breakage, the costs of the repairs shall be borne by the user.
   (1) Failures and breakage attributable to equipment that was not delivered by Teral Inc.
   (2) Failures and breakage after the expiration of the warranty period
   (3) Failures and breakage caused by disasters or force majeure, such as fire, acts of God, or earthquakes
   (4) Failures and breakage resulting from repairs or modifications made without the consent of Teral Inc.
   (5) Failures and breakage when parts other than those designated by Teral Inc. are used
   (6) Failures and breakage caused by use or storage outside the specification range

4. Teral Inc. shall not be liable for the damage caused by incorrect or reckless use of the pump. Cost and expenses incurred for sending engineer(s) in such a case shall be borne by the user.

5. If the cause of the failure is unclear, necessary actions shall be determined through mutual consultation.

<Paid repairs>
After the expiration of the warranty period, the costs of investigation and repairs related to the product shall be borne by the user. For any failures that have occurred within the warranty period but that fall outside the above-mentioned warranty coverage, Teral Inc. shall carry out repairs and investigation for a fee. Please give us the instructions to do so in such a case.

Purpose of this manual

The purpose of this manual is to provide the user with detailed information necessary to properly operate, maintain and inspect the pump. Incorrect operation of this product may lead to an unexpected accident. Please use the product correctly according to this instruction manual.
This manual contains the following information and is intended for persons experienced in the operation of pumps, or for those who have been trained by such experienced operators. Only qualified personnel such as licensed electrical engineers are allowed to carry out the electrical wiring work.

Contents

1. Safety precautions

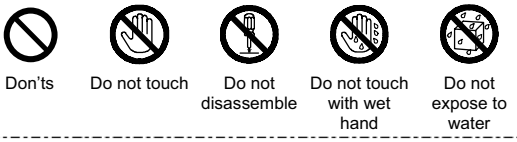
1.1 Types and meanings of warning terms and graphic symbols

This instruction manual divides precautions into the following four categories according to the level of hazards (or the severity of the accident). In addition, prohibited or mandatory actions as well as cautions are indicated with a graphic symbol.
Be sure to understand the meanings of the following terms and comply with the content (instructions) of the instruction manual.

■ Explanation of the warning terms

Warning Term	Meaning
Danger	Indicates an imminently hazardous situation. Failure to observe this will result in death or serious injury.
Warning	Indicates a potentially hazardous situation. Failure to observe this will result in death or serious injury.
Caution	Indicates a potentially hazardous situation. Failure to observe this will result in minor or moderate injury or property damage.
Note	Indicates information that is in particular to be noted or emphasized.

■ Explanation of the graphic symbols



These graphic symbols indicate prohibited actions (that must NOT be done).

This graphic symbol indicates mandatory actions (that must be done).

These graphic symbols indicate existing hazards to beware of.

1.2 Safety precautions

Danger

	Once the main power is turned on, do not touch any live parts. A high voltage applied to live parts may cause a serious electric shock, thus leading to death.
	Do not use the product in any explosive atmosphere. Otherwise, it may lead to an injury or fire.

Warning

 Properly move the unit according to hoisting instructions. Otherwise, the unit may fall, thus leading to an injury or damage.	 Do not carry out any work with/on the pump that is being hoisted. Otherwise, the unit may fall, thus leading to an injury or damage.
 Only those who are authorized by the site manager are allowed to operate the pump. Operation by unskilled personnel may lead to an unforeseen accident.	 Installation, maintenance, and inspection must only be carried out by personnel who have been trained to handle the pump. Operation by unskilled personnel may lead to an unforeseen accident.
 Only qualified personnel, such as licensed electrical engineers, are allowed to carry out electric work. Otherwise, it may lead to an electric shock, fire, failure, or other problems.	 Use high-quality wiring equipment and devices, and carry out wiring work safely and securely according to the technical standards for electrical facilities, as well as the indoor wiring regulations. Otherwise, it may lead to an electric shock, fire, or other problems.
 Do not connect the ground wire to a gas pipe or water pipe. Such a connection is illegal and leads to an electric shock, explosion, or fire.	 Securely install the ground wire and ensure to carry out grounding work. Otherwise, it may lead to an electric leak or electric shock.
 Do not run the unit if abnormal condition is observed in any operation, movement, parts, etc. Otherwise, it may lead to an injury, failure, or various accidents.	 Correctly and securely connect the wires according to the wiring diagram within the terminal box and the instruction manual. Incorrect wiring may cause a fire, electric shock, failure, or other problems.

⚠ Warning

Be sure to keep the terminal box cover attached during the operation of the pump. Otherwise, it may lead to an electric shock.	Be sure to install the coupling cover during the operation of the pump. Otherwise, it may lead to an injury or damage.
After detaching the companion flange from the pump, screw a pipe into it. Otherwise, it may lead to damage or liquid leakage.	Do not forcibly bend, pull, or pinch the power cable or any lead wires of the product. Otherwise, it may lead to an electric shock or fire.
Check the wiring sections and wires for any looseness. A loose connection may cause a fire or electric shock.	Before starting the maintenance or inspection work, be sure to stop the pump and turn off the main power of the panel board. Otherwise, it may lead to an electric shock, injury, damage, or liquid leakage.
Before starting the unit or carrying out maintenance/inspection work, ensure that all the relevant workers are informed of the operation and that there are no workers in the dangerous zone. Otherwise, it may lead to an unforeseen accident.	Before rotating the main shaft by hand to check its smooth rotation, be sure to turn off the main power. Otherwise, it may lead to an injury or damage.
After turning on the power, do not touch any parts of the pump other than those required for operation. Otherwise, it may lead to an electric shock or injury.	Do not perform long hours of zero-discharge operation continuously. Otherwise, the temperature and pressure may increase inside the pump, thus damaging the pump or causing steam to blow off.
Do not put your fingers or foreign objects into any openings or rotating part of the motor during operation. Otherwise, it may lead to an injury or damage.	For overhaul, replacement of parts, or repairs, ask the vendor or the service center specified by Teral. If unskilled personnel carry out work that requires special knowledge, it may lead to an accident or failure.
In the event of a power failure, be sure to turn off the power switch. Otherwise, the pump may suddenly start up on restoration of the power, thus leading to an injury.	

⚠ Caution

Do not use the unit outside the range of the product specifications. Otherwise, it may lead to an electric shock, fire, leakage, failure, or other problems.	Do not use the unit at an incorrect power voltage. An incorrect voltage may damage the motor.
Do not use a single pump unit as the only means of directly operating key facilities or sustaining life. In the event of a failure, the liquid supply may stop. Ensure to make a backup unit available for operation.	Before unpacking the delivered container, check that the container is placed in the correct orientation (not upside down). Carefully unpack the container, while paying special attention to nails. Otherwise, it may lead to an injury or damage.
Ensure that the floor at the unit's installation place is waterproofed and fitted with drainage. Otherwise, it may lead to serious damage in the event of leakage.	Do not install two or more different cables or control wires in one pipe or duct. Otherwise, it may lead to malfunction of the product or other equipment.
Do not step on the pump, motor, cable, or pipe. Otherwise, it may lead to an injury, damage, or other problems.	Do not expose the motor to liquid. Otherwise, it may lead to an electric shock, electric leak, failure, or other problems.
Operate the controls carefully. Otherwise, it may lead to an injury or damage.	During test operation, never run the pump dry (i.e. never run the pump when the liquid level is below the Minimum liquid level). Otherwise, it may lead to damage or a fire.
Before operation, thoroughly clean (flush) the inside of the piping to remove foreign matter. Otherwise, the piping system may be contaminated with foreign matter, thus leading to an accident or a pump failure.	Do not run the pump dry. Otherwise, it may lead to damage or a fire.
Do not put a cloth or other covering on the motor. Otherwise, it may lead to overheating or ignition.	Do not touch the motor body while the pump is running or immediately after the pump has stopped. Otherwise, you may get burns from the hot surface.

⚠ Caution

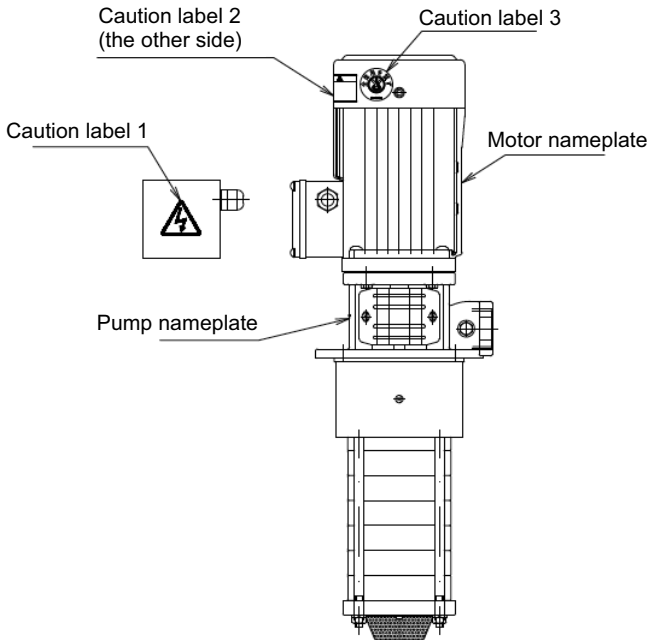
In the event of an alarm or abnormal condition that cannot be resolved, immediately stop the operation, turn off the power, and then contact Teral or its service provider. Otherwise, it may lead to an accident.	Do not run the pump with tools or other objects placed on the unit. Otherwise, it may lead to an injury or damage.
Check that the delivered items are exactly what you ordered. The use of a wrong product may cause an injury or failure.	Do not place any combustibles around the product. Otherwise, it may lead to a fire.
Check the rotation direction of the pump before connecting it to the machine. Otherwise, it may lead to an injury or damage.	Do not hold the strainer located on the tip of the pump. Otherwise, the strainer may come off, thus leading to an injury or damage.
Do not place any obstacles around the product that may hinder ventilation. Otherwise, it may lead to a fire.	Do not touch the impeller, tie bolt, strainer, screw, or other parts of the pump with bare hands. Otherwise, it may lead to an injury or damage.
Do not run the pump at a frequency exceeding 60 Hz. Otherwise, it may lead to motor burnout or a fire.	Do not use the unit for pumping any fluids beyond the specified viscosity limit. Otherwise, it may lead to motor burnout or a fire.
Ensure to install an overcurrent protective device. The user is required by the technical standards for electrical facilities to install one. Otherwise, it may damage the product, thus leading to a fire or failure. It is also recommended to install protective devices such as a ground fault interrupter.	Do not touch any terminals or wires when measuring the insulation resistance. Otherwise, it may lead to an electric shock.
Do not run the pump with its strainer removed. Otherwise, it may lead to an injury or damage.	Once you turn off the power, wait until the pump stops completely. Do not restart the pump until it does. Otherwise, the main shaft may be subjected to an excessive load, which makes the service life of the pump shorter.
Do not touch the screw after removing the strainer. Otherwise, it may lead to an injury.	If you use a solvent for cleaning the product, pay attention to handling of the solvent as well as the environment of use. Otherwise, it may lead to poisoning.
Do not use thinner or benzene for cleaning the product. Otherwise, the product may be discolored or its coating may be peeled off.	Dispose of the product as industrial waste.
When you hoist the product, pay attention to its center of gravity. Otherwise, the product may topple over or fall, thus leading to an injury.	When you lift the product by hand, pay attention to its weight. Do not allow a single person to lift a product heavier than 15 kg. Otherwise, it may put strain on the body, thus leading to an injury.
Be sure to conduct inspection according to the Maintenance checklist. Otherwise, you cannot prevent potential failures, thus leading to a higher risk of accidents.	

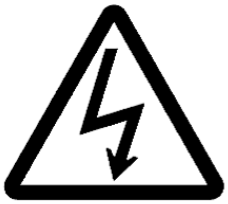
1.3 Location of warning labels and caution labels

The figure shows the locations of warning labels and caution labels. If these labels become dirty and illegible or if they are peeled off, replace them with a new one.

Warning **Caution**

Observe all the instructions in the warnings and cautions affixed to the machine as well as those described in this instruction manual.





Caution label 1

Caution

Do not allow dust or dirt to adhere to or accumulate on the fan cover, frame, or fan of the motor. Otherwise, blocked airflow may lead to insufficient cooling and hot surfaces, ultimately damaging the bearing and body of the motor.

Caution label 2

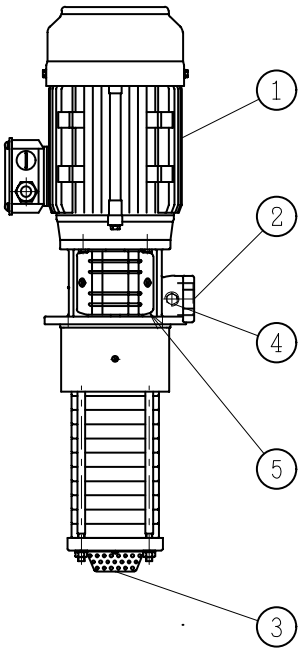
Caution label 3
(3.0 kW or more)

2. Configuration and overview of the pump

This chapter describes the standard specifications of the pump. For details, refer to the delivery specifications such as the dimensional outline drawing and the internal structure drawing. If you have purchased a customized product, some information in this chapter may not be applicable to your unit. See the dimensional outline drawing, the internal structure drawing, and other documents to check the product specifications in such a case.

> **Caution**
>
> Do not use this product under any conditions other than those provided in the specifications. Otherwise, it may lead to an electric shock, fire, leakage, or failure.

2.1 Part names and functions



① Motor
② Discharge port
③ Suction port (with strainer)
④ Plug
⑤ Coupling cover

> **Warning** **Caution**
>
> Be sure to keep the coupling cover and strainer attached during the operation of the pump. Otherwise, it may lead to an injury.

2.2 Naming rule of the model codes

50 LVSS 10-20/12-6 7.5-KS
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Discharge bore [mm] (32, 50)
② Model
③ Nominal flow rate [m^3/h] (1, 3, 5, 10, 15, 20)
④ Number of casing stages (3 to 36)
⑤ Number of impellers (1 to 27)
⑥ Frequency [Hz] (6: 60Hz)
⑦ Output [kW] (0.75 to 7.5)
⑧ Equipped with a motor compliant with Korea energy class indication system (grade IE3)

2.3 Standard specifications*

Applicable liquid	Property of liquid	Fresh water, cleaning liquid and water soluble coolants(e.g. grinding and cutting fluids after secondary treatment Note 1
	Temperature	0 to 90°C (No frozen liquid is allowed.)
	Allowable kinematic viscosity	1mm^2/s
Installation location		Indoors; height above sea level: 1,000 m or less; ambient temperature: 0 to 40°C; humidity:85%RH or less (no condensing); place not exposed to direct sunlight; place without any corrosive gas, explosive gas, or vapor in the atmosphere
Material	Suction casing	Bore diameter 32: SCS14A, Bore diameter 50: SCS13
	Discharge casing	SCS13 + SUS430
	Intermediate casing	SUS304
	Impeller	SUS304
	Main shaft	SUS420J2
Shaft sealing structure		Sealless structure (without mechanical seal)
Motor	Type	Totally-enclosed fan-cooled indoor type
	IP protection	IP55
	Power Note 2	3-phase 60Hz 0.75kW~7.5kW:200-230V
	Insulation class	Class F
	Number of poles	2P
	Standard	IEC60034-1
	Noise [dB(A)]	79
	Coating color	Black

Note 1 If the liquid contains hard sludge, such as abrasive powder, grinding powder, or diamond abrasive grains, the service life might be shorter. In such a case, install a filter (e.g. magnet filter or paper filter). Note that the product cannot be used for special liquids such as printing liquids or acidic liquids.

Note 2 Limit the fluctuations of the power voltage within ±10% of the rated voltage, and also limit the fluctuations of the frequency between –5% and +3% of the rated value. Avoid continuous operation if the voltage is not within ±5% of the rated value or if the frequency is not within ±2% of the rated value.

* This product is labeled with a self-declaration CE mark and complies with the Essential Safety Requirements (ESRs) of the “EU (EC) Directive.” The following are the general descriptions.

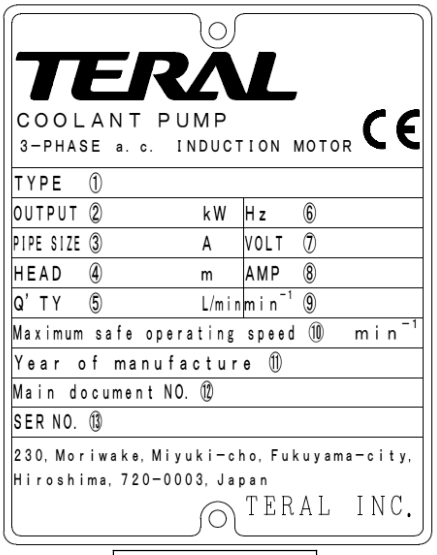
Manufacturer	Teral Inc. 230 Moriwake, Miyuki-cho, Fukuyama-city, Hiroshima 720-0003 Japan
Product	LVSS-e model multistage coolant pump
Standards	Machinery Directive 2006/42/EC
	EN 809/A1:2009, EN ISO 12100:2010, EN 60204-1/A1:2009
Manufacturer (Japan)	Teral Inc., Hiroshima
Administrator (EU nations)	Shiran Tower 5F Luzna 716/2 160 00 Vokovice, Praha 6 CZECH REPUBLIC Person in charge: Tomohisa Yamamoto
Place of declaration	Hiroshima, Japan Manager: Taiji Monden

2.4 Information indicated on the nameplates

The specifications of the pump are indicated on the nameplate. Upon receiving the pump, check the nameplate to verify that the delivered product is exactly what you ordered. Be sure to confirm the model, motor output, frequency, and voltage. If there is anything different from what you ordered, contact the vendor from which you purchased the product.

Do not remove the nameplate or place any obstacles in front of it. Always keep the nameplate clearly visible.

> **Caution**
>
> Do not run the pump at a frequency exceeding 60 Hz. Failure to observe this may cause an overload and burnout of the motor.



Pump nameplate

No.	Item
1	Model
2	Motor output (kW)
3	Discharge bore (A)
4	Total head (m)
5	Discharge rate (L/min)
6	Frequency (Hz)
7	Voltage (V)
8	Current (A)
9	Synchronous Rotation speed (min^{-1})
10	Max. allowable rotation speed (min^{-1})
11	Year of manufacture
12	Instruction manual No.
13	Serial number

2.5 Specification table

- 60Hz (Synchronous rotation speed: 3600 min^{-1})

Discharge bore: 32mm, nominal flow rate: 1m3/h

	Model	32LVSS1-□/8-6.75-KS	32LVSS1-□/10-61.1-KS	32LVSS1-□/13-61.1-KS	32LVSS1-□/15-61.5-KS	32LVSS1-□/17-61.5-KS	32LVSS1-□/21-62.2-KS	32LVSS1-□/23-62.2-KS	32LVSS1-□/25-62.2-KS	32LVSS1-□/27-63.0-KS
Pump	Bore (mm)	32								
	Discharge rate (ℓ/min)	10～50								
	Total head (m)	66.4～31.1	82.9～38.2	107.6～48.6	123.9～55.4	140.3～62	172.8～74.8	189.1～81.1	205.3～87.2	221.4～93.2
Motor	Rated output (kW)	0.75	1.1		1.5		2.2			3.0
	Rated voltage (V)	200/230								
	Rated current (A)	3.2/3.1	4.4/4.1		5.9/5.4		8.4/7.6			11.5/10.8
	Starting current (A)	25.0/28.5	32.5/37.0		41.0/47.6		78.0/82.6			115/135

Note 1) The rated electric current in the above table (current value indicated on the pump nameplate) is the recommended preset current value of the protective device.

Discharge bore: 32mm, nominal flow rate: 3m3/h

	Model	32LVSS3-□/5-6.75-KS	32LVSS3-□/6-61.1-KS	32LVSS3-□/7-61.1-KS	32LVSS3-□/8-61.1-KS	32LVSS3-□/10-61.5-KS	32LVSS3-□/11-61.5-KS	32LVSS3-□/12-62.2-KS	32LVSS3-□/15-62.2-KS	32LVSS3-□/17-62.2-KS	32LVSS3-□/19-63.0-KS	32LVSS3-□/23-63.0-KS	32LVSS3-□/26-64.0-KS
Pump	Bore (mm)	32											
	Discharge rate (ℓ/min)	20～90											
	Total head (m)	42.7～16.7	51.2～20	59.7～23.1	68.1～26.3	85～32.6	93.5～35.7	101.9～38.7	127.1～47.8	143.9～53.8	160.7～59.6	194.1～71.2	219～79.7
Motor	Rated output (kW)	0.75	1.1			1.5		2.2			3.0		4.0
	Rated voltage (V)	200/230											
	Rated current (A)	3.2/3.1	4.4/4.1			5.9/5.4		8.4/7.6			11.5/10.8		14.3/12.8
	Starting current (A)	25.0/28.5	32.5/37.0			41.0/47.6		78.0/82.6			115/135		132/151

Note 1) The rated electric current in the above table (current value indicated on the pump nameplate) is the recommended preset current value of the protective device.

Discharge bore: 32mm, nominal flow rate: 5m3/h

	Model	32LVSS5-□/3-61.1-KS	32LVSS5-□/4-61.1-KS	32LVSS5-□/5-61.5-KS	32LVSS5-□/6-62.2-KS	32LVSS5-□/7-62.2-KS	32LVSS5-□/8-62.2-KS	32LVSS5-□/10-63.0-KS	32LVSS5-□/12-63.0-KS	32LVSS5-□/14-64.0-KS	32LVSS5-□/16-64.0-KS	32LVSS5-□/20-65.5-KS	32LVSS5-□/22-65.5-KS	32LVSS5-□/24-67.5-KS
Pump	Bore (mm)	32												
	Discharge rate (ℓ/min)	40～180												
	Total head (m)	27.7～10.9	36.9～14.5	46.1～18.1	55.3～21.6	64.4～25.2	73.6～28.7	92～35.7	110.3～42.6	128.6～49.5	146.9～56.4	183.4～69.9	201.6～76.6	219.8～83.3
Motor	Rated output (kW)	1.1		1.5	2.2			3.0		4.0		5.5		7.5
	Rated voltage (V)	200/230												
	Rated current (A)	4.4/4.1		5.9/5.4	8.4/7.6			11.5/10.8		14.3/12.8		19.8/17.8		26.5/23.7
	Starting current (A)	32.5/37.0		41.0/47.6	78.0/82.6			115/135		132/151		178/206		254/295

Note 1) The rated electric current in the above table (current value indicated on the pump nameplate) is the recommended preset current value of the protective device.

Discharge bore: 50mm, nominal flow rate: 10m3/h

	Model	50LVSS10-□/1-6.75-KS	50LVSS10-□/2-61.5-KS	50LVSS10-□/3-62.2-KS	50LVSS10-□/4-63.0-KS	50LVSS10-□/5-63.0-KS	50LVSS10-□/6-64.0-KS	50LVSS10-□/8-65.5-KS	50LVSS10-□/9-65.5-KS	50LVSS10-□/10-67.5-KS	50LVSS10-□/12-67.5-KS
Pump	Bore (mm)	50									
	Discharge rate (ℓ/min)	100～280									
	Total head (m)	14.3～5.4	28.9～13.2	43.6～20.9	58.2～28.7	72.8～36.4	87.4～43.6	116.5～57.9	131～65.1	145.5～72.2	174.6～86.5
Motor	Rated output (kW)	0.75	1.5	2.2	3.0		4.0	5.5		7.5	
	Rated voltage (V)	200/230									
	Rated current (A)	3.2/3.1	5.9/5.4	8.4/7.6	11.5/10.8		14.3/12.8	19.8/17.8		26.5/23.7	
	Starting current (A)	25.0/28.5	41.0/47.6	78.0/82.6	115/135		132/151	178/206		254/295	

Note 1) The rated electric current in the above table (current value indicated on the pump nameplate) is the recommended preset current value of the protective device.

Discharge bore: 50mm, nominal flow rate: 15m3/h

	Model	50LVSS15-□/1-61.5-KS	50LVSS15-□/2-63.0-KS	50LVSS15-□/3-64.0-KS	50LVSS15-□/4-65.5-KS	50LVSS15-□/5-67.5-KS
Pump	Bore (mm)	50				
	Discharge rate (ℓ/min)	160～450				
	Total head (m)	18.3～9.9	37～22.3	55.6～34.7	74.2～46.3	92.7～57.8
Motor	Rated output (kW)	1.5	3.0	4.0	5.5	7.5
	Rated voltage (V)	200/230				
	Rated current (A)	5.9/5.4	11.5/10.8	14.3/12.8	19.8/17.8	26.5/24.4
	Starting current (A)	41.0/47.6	115/135	132/151	178/206	254/295

Note 1) The rated electric current in the above table (current value indicated on the pump nameplate) is the recommended preset current value of the protective device.

Discharge bore: 50mm, nominal flow rate: 20m3/h

	Model	50LVSS20-□/1-62.2-KS	50LVSS20-□/2-64.0-KS	50LVSS20-□/3-65.5-KS	50LVSS20-□/4-67.5-KS
Pump	Bore (mm)	50			
	Discharge rate (ℓ/min)	220～600			
	Total head (m)	19.2～7.2	39～18.3	58.8～29.3	78.4～39
Motor	Rated output (kW)	2.2	4.0	5.5	7.5
	Rated voltage (V)	200/230			
	Rated current (A)	8.4/7.6	14.3/12.8	19.8/17.8	26.5/24.4
	Starting current (A)	78.0/82.6	132/151	178/206	253.7/281.9

Note 1) The rated electric current in the above table (current value indicated on the pump nameplate) is the recommended preset current value of the protective device.

2.6 Dimensional outline drawing and dimensions table

Discharge bore: 32 mm

(1) Dimensional outline drawing

Figure 1 (0.75kW)

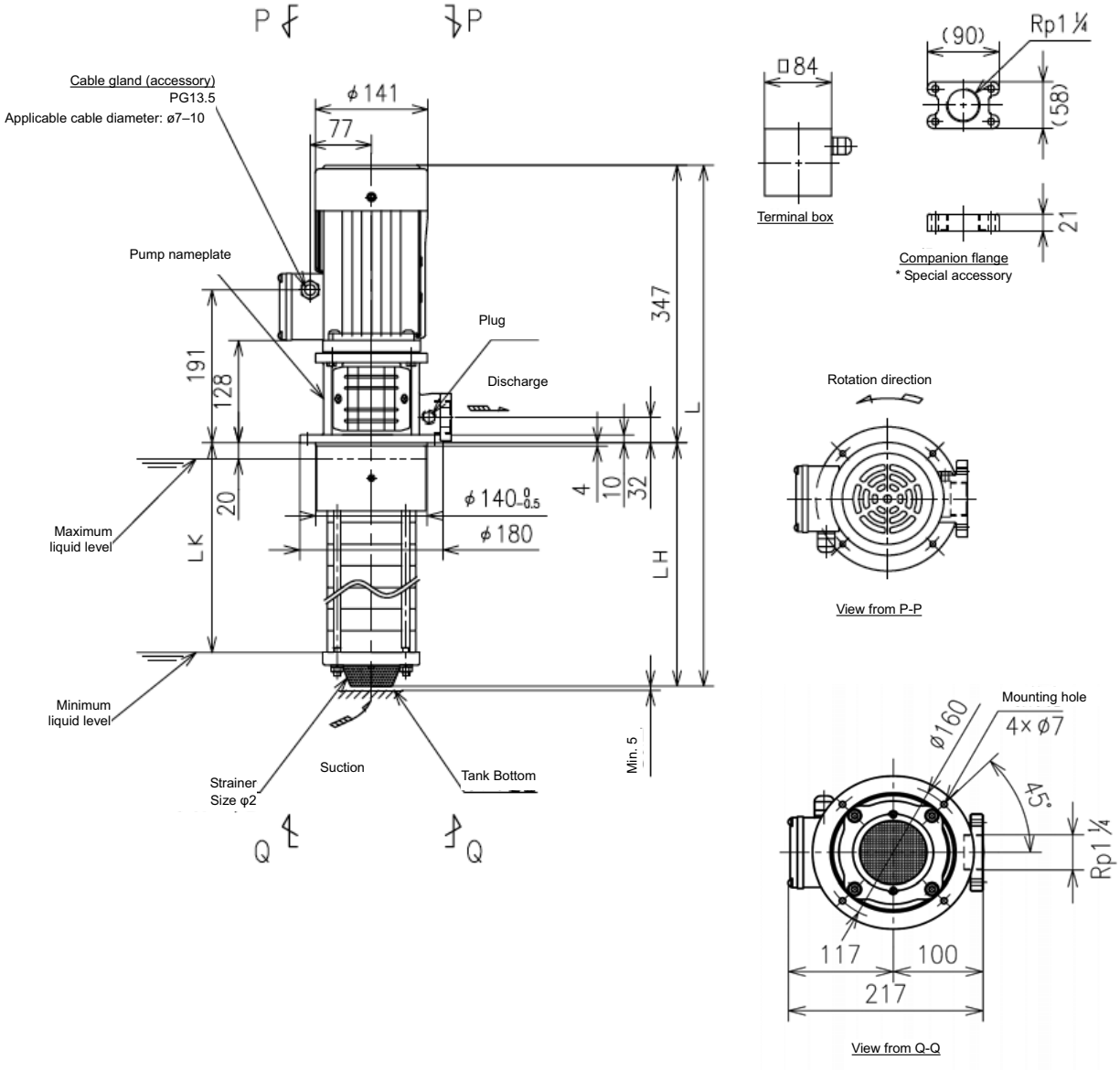
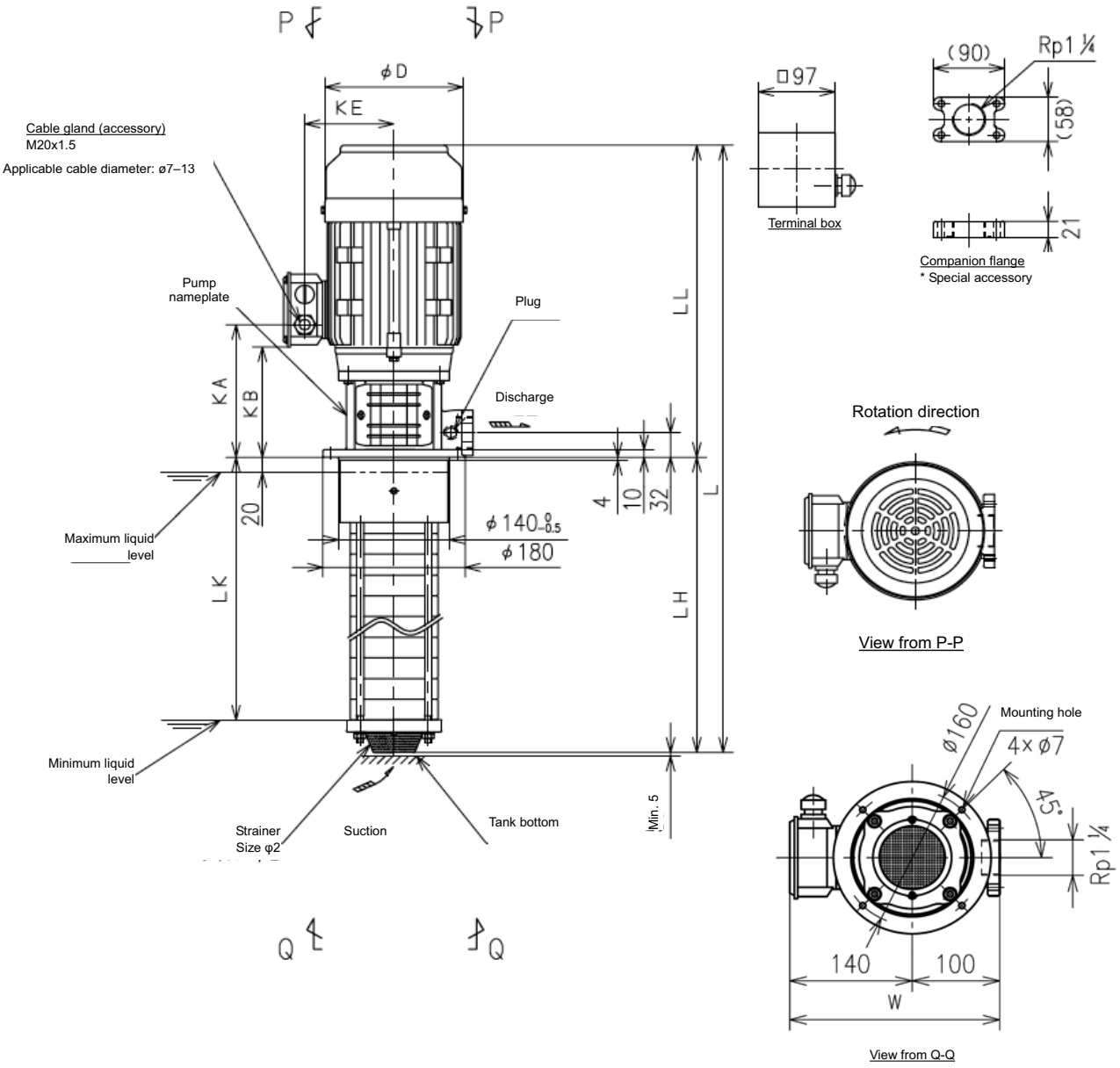
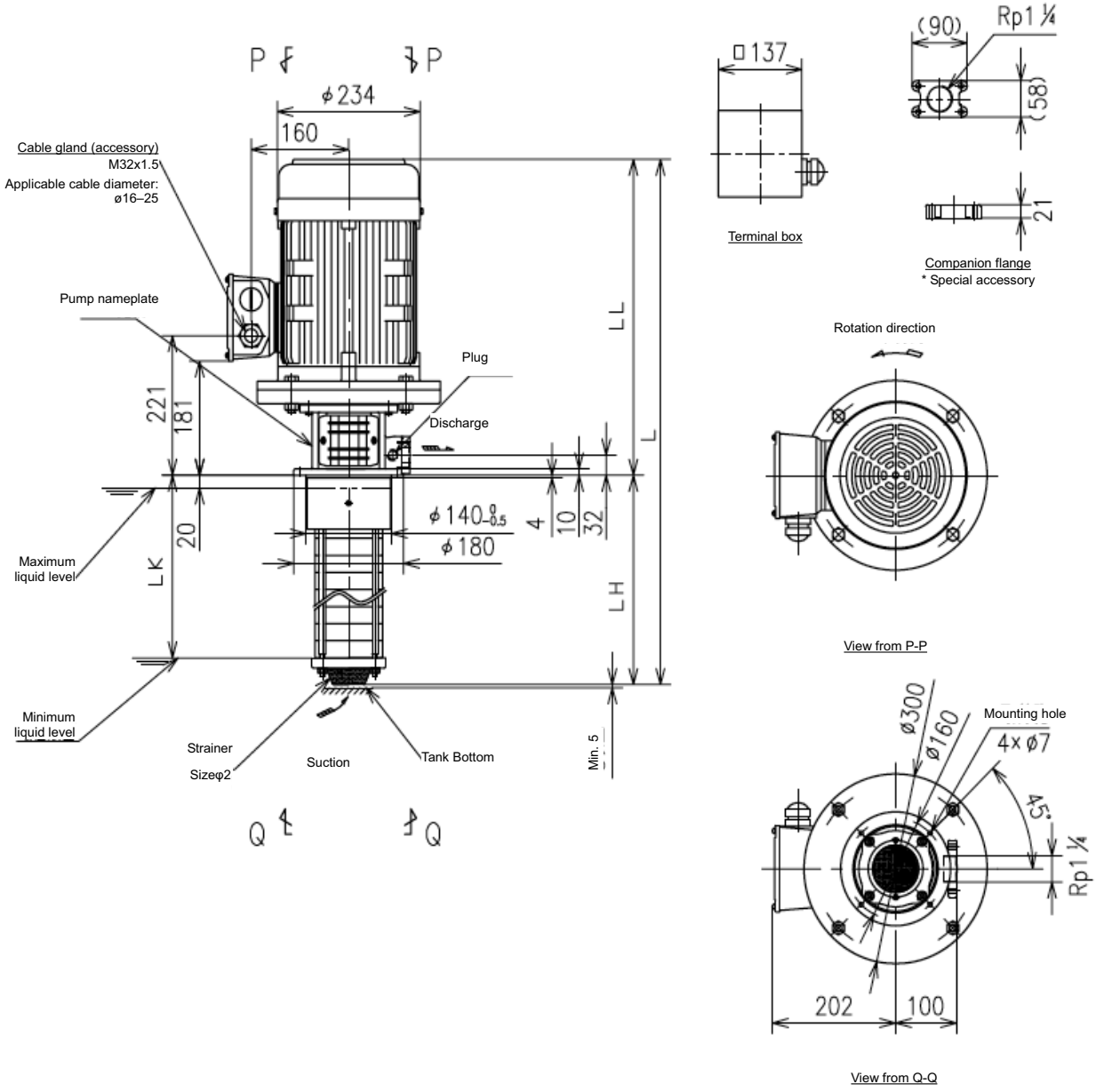


Figure 2 (1.1kW～4.0kW)



OUTPUT kW	Fig.	D	KA	KB	KE	KL	LL	W
1.1	2	175	167	138	113	140	401	240
1.5/2.2		175	173	144	113	140	407	240
3.0		196	174	144	125	152	430	252
4.0		219	178	149	134	161	437	–

Figure 3 (5.5kW～7.5kW)



OUTPUT kW	Fig.	LL
5.5	3	500
7.5		540

Typical models are shown in these figures. The shapes may be slightly different depending on the model and specifications. Because some of the specifications may be changed due to design changes or for other reasons, refer to the delivery specifications when planning your pumping work.

(2) Dimensions table

■ Discharge bore: 32mm, nominal flow rate: 1m^3/h

・60Hz <Unit:mm>

Model	Fig	L	LH	LK	Approx weight (kg)
32LVSS1-8/8-6.75-KS	1	606	259	217	22
32LVSS1-10/8-6.75-KS		642	295	253	22
32LVSS1-13/8-6.75-KS		696	349	307	23
32LVSS1-15/8-6.75-KS		732	385	343	24
32LVSS1-17/8-6.75-KS		768	421	379	24
32LVSS1-21/8-6.75-KS		840	493	451	25
32LVSS1-25/8-6.75-KS		912	565	523	26
32LVSS1-10/10-61.1-KS	2	696	295	253	27
32LVSS1-13/10-61.1-KS		750	349	307	27
32LVSS1-15/10-61.1-KS		786	385	343	28
32LVSS1-17/10-61.1-KS		822	421	379	28
32LVSS1-21/10-61.1-KS		894	493	451	29
32LVSS1-25/10-61.1-KS		966	565	523	30
32LVSS1-13/13-61.1-KS		750	349	307	27
32LVSS1-15/13-61.1-KS		786	385	343	28
32LVSS1-17/13-61.1-KS		822	421	379	28
32LVSS1-21/13-61.1-KS		894	493	451	29
32LVSS1-25/13-61.1-KS		966	565	523	30
32LVSS1-15/15-61.5-KS		792	385	343	32
32LVSS1-17/15-61.5-KS		828	421	379	33
32LVSS1-21/15-61.5-KS		900	493	451	33
32LVSS1-25/15-61.5-KS		972	565	523	34
32LVSS1-30/15-61.5-KS		1062	655	613	36
32LVSS1-17/17-61.5-KS		828	421	379	33
32LVSS1-21/17-61.5-KS		900	493	451	34
32LVSS1-25/17-61.5-KS		972	565	523	35
32LVSS1-30/17-61.5-KS		1062	655	613	36
32LVSS1-33/17-61.5-KS		1116	709	667	36
32LVSS1-21/21-62.2-KS		900	493	451	37
32LVSS1-25/21-62.2-KS		972	565	523	38
32LVSS1-30/21-62.2-KS		1062	655	613	39
32LVSS1-33/21-62.2-KS		1116	709	667	40
32LVSS1-36/21-62.2-KS		1170	763	721	41
32LVSS1-23/23-62.2-KS		936	529	487	38
32LVSS1-27/23-62.2-KS		1008	601	559	39
32LVSS1-30/23-62.2-KS		1062	655	613	39
32LVSS1-33/23-62.2-KS		1116	709	667	40
32LVSS1-36/23-62.2-KS		1170	763	721	41
32LVSS1-25/25-62.2-KS		972	565	523	38
32LVSS1-27/25-62.2-KS		1008	601	559	39
32LVSS1-30/25-62.2-KS		1062	655	613	40
32LVSS1-33/25-62.2-KS		1116	709	667	40
32LVSS1-36/25-62.2-KS		1170	763	721	41
32LVSS1-27/27-63.0-KS		1031	601	559	46
32LVSS1-30/27-63.0-KS		1085	655	613	47
32LVSS1-33/27-63.0-KS		1139	709	667	47
32LVSS1-36/27-63.0-KS		1193	763	721	48

■ Discharge bore: 32mm, nominal flow rate: $3m^3/h$

・60Hz

<Unit : mm>

Model	Fig	L	LH	LK	Approx weight (kg)
32LVSS3-5/5-6.75-KS	1	552	205	163	21
32LVSS3-7/5-6.75-KS		588	241	199	21
32LVSS3-10/5-6.75-KS		642	295	253	22
32LVSS3-12/5-6.75-KS		678	331	289	23
32LVSS3-15/5-6.75-KS		732	385	343	23
32LVSS3-19/5-6.75-KS		804	457	415	24
32LVSS3-23/5-6.75-KS		876	529	487	25
32LVSS3-6/6-61.1-KS	2	624	223	181	25
32LVSS3-10/6-61.1-KS		696	295	253	26
32LVSS3-12/6-61.1-KS		732	331	289	27
32LVSS3-15/6-61.1-KS		786	385	343	28
32LVSS3-19/6-61.1-KS		858	457	415	28
32LVSS3-23/6-61.1-KS		930	529	487	29
32LVSS3-7/7-61.1-KS		642	241	199	26
32LVSS3-10/7-61.1-KS		696	295	253	26
32LVSS3-12/7-61.1-KS		732	331	289	27
32LVSS3-15/7-61.1-KS		786	385	343	28
32LVSS3-19/7-61.1-KS		858	457	415	28
32LVSS3-23/7-61.1-KS		930	529	487	29
32LVSS3-8/8-61.1-KS		660	259	217	26
32LVSS3-10/8-61.1-KS		696	295	253	26
32LVSS3-12/8-61.1-KS		732	331	289	27
32LVSS3-15/8-61.1-KS		786	385	343	28
32LVSS3-19/8-61.1-KS		858	457	415	29
32LVSS3-23/8-61.1-KS		930	529	487	29
32LVSS3-10/10-61.5-KS		702	295	253	31
32LVSS3-12/10-61.5-KS		738	331	289	31
32LVSS3-15/10-61.5-KS		792	385	343	32
32LVSS3-19/10-61.5-KS		864	457	415	33
32LVSS3-23/10-61.5-KS		936	529	487	34
32LVSS3-11/11-61.5-KS		720	313	271	31
32LVSS3-15/11-61.5-KS		792	385	343	32
32LVSS3-19/11-61.5-KS		864	457	415	33
32LVSS3-23/11-61.5-KS		936	529	487	34
32LVSS3-12/12-62.2-KS		738	331	289	35
32LVSS3-15/12-62.2-KS		792	385	343	35
32LVSS3-19/12-62.2-KS		864	457	415	36
32LVSS3-23/12-62.2-KS		936	529	487	37
32LVSS3-15/15-62.2-KS		792	385	343	36
32LVSS3-19/15-62.2-KS		864	457	415	36
32LVSS3-23/15-62.2-KS		936	529	487	37
32LVSS3-26/15-62.2-KS		990	583	541	38
32LVSS3-17/17-62.2-KS		828	421	379	36
32LVSS3-23/17-62.2-KS		936	529	487	37
32LVSS3-26/17-62.2-KS		990	583	541	38
32LVSS3-30/17-62.2-KS		1062	655	613	39
32LVSS3-19/19-63.0-KS		887	457	415	44
32LVSS3-23/19-63.0-KS		959	529	487	44
32LVSS3-26/19-63.0-KS		1013	583	541	45
32LVSS3-30/19-63.0-KS		1085	655	613	46
32LVSS3-36/19-63.0-KS		1193	763	721	47
32LVSS3-23/23-63.0-KS		959	529	487	45
32LVSS3-26/23-63.0-KS		1013	583	541	45
32LVSS3-30/23-63.0-KS		1085	655	613	46
32LVSS3-36/23-63.0-KS		1193	763	721	48
32LVSS3-26/26-64.0-KS		1020	583	541	51
32LVSS3-30/26-64.0-KS		1092	655	613	52
32LVSS3-36/26-64.0-KS		1200	763	721	53

■ Discharge bore: 32mm, nominal flow rate: 5m^3/h

・60Hz

<Unit: mm>

Model	Fig	L	LH	LK	Approx weight (kg)
32LVSS5-3/3-61.1-KS		597	196	154	25
32LVSS5-5/3-61.1-KS		651	250	208	26
32LVSS5-7/3-61.1-KS		705	304	262	26
32LVSS5-10/3-61.1-KS		786	385	343	27
32LVSS5-14/3-61.1-KS		894	493	451	28
32LVSS5-16/3-61.1-KS		948	547	505	29
32LVSS5-20/3-61.1-KS		1056	655	613	30
32LVSS5-4/4-61.1-KS		624	223	181	25
32LVSS5-6/4-61.1-KS		678	277	235	26
32LVSS5-8/4-61.1-KS		732	331	289	26
32LVSS5-10/4-61.1-KS		786	385	343	27
32LVSS5-14/4-61.1-KS		894	493	451	29
32LVSS5-16/4-61.1-KS		948	547	505	30
32LVSS5-20/4-61.1-KS		1056	655	613	31
32LVSS5-5/5-61.5-KS		657	250	208	30
32LVSS5-7/5-61.5-KS		711	304	262	30
32LVSS5-10/5-61.5-KS		792	385	343	31
32LVSS5-14/5-61.5-KS		900	493	451	33
32LVSS5-16/5-61.5-KS		954	547	505	33
32LVSS5-20/5-61.5-KS		1062	655	613	35
32LVSS5-6/6-62.2-KS		684	277	235	34
32LVSS5-8/6-62.2-KS		738	331	289	34
32LVSS5-10/6-62.2-KS		792	385	343	35
32LVSS5-14/6-62.2-KS		900	493	451	36
32LVSS5-16/6-62.2-KS		954	547	505	37
32LVSS5-20/6-62.2-KS		1062	655	613	38
32LVSS5-7/7-62.2-KS		711	304	262	34
32LVSS5-10/7-62.2-KS	2	792	385	343	35
32LVSS5-14/7-62.2-KS		900	493	451	36
32LVSS5-16/7-62.2-KS		954	547	505	37
32LVSS5-20/7-62.2-KS		1062	655	613	38
32LVSS5-8/8-62.2-KS		738	331	289	34
32LVSS5-10/8-62.2-KS		792	385	343	35
32LVSS5-14/8-62.2-KS		900	493	451	36
32LVSS5-16/8-62.2-KS		954	547	505	37
32LVSS5-20/8-62.2-KS		1062	655	613	38
32LVSS5-10/10-63.0-KS		815	385	343	42
32LVSS5-14/10-63.0-KS		923	493	451	43
32LVSS5-16/10-63.0-KS		977	547	505	44
32LVSS5-20/10-63.0-KS		1085	655	613	45
32LVSS5-12/12-63.0-KS		869	439	397	43
32LVSS5-14/12-63.0-KS		923	493	451	43
32LVSS5-16/12-63.0-KS		977	547	505	44
32LVSS5-20/12-63.0-KS		1085	655	613	45
32LVSS5-24/12-63.0-KS		1193	763	721	46
32LVSS5-14/14-64.0-KS		930	493	451	49
32LVSS5-16/14-64.0-KS		984	547	505	50
32LVSS5-20/14-64.0-KS		1092	655	613	51
32LVSS5-24/14-64.0-KS		1200	763	721	52
32LVSS5-29/14-64.0-KS		1335	898	856	54
32LVSS5-16/16-64.0-KS		984	547	505	50
32LVSS5-20/16-64.0-KS		1092	655	613	51
32LVSS5-24/16-64.0-KS		1200	763	721	52
32LVSS5-29/16-64.0-KS		1335	898	856	54
32LVSS5-32/16-64.0-KS		1416	979	937	55
32LVSS5-20/20-65.5-KS		1155	655	613	79
32LVSS5-24/20-65.5-KS		1263	763	721	80
32LVSS5-29/20-65.5-KS		1398	898	856	81
32LVSS5-32/20-65.5-KS		1479	979	937	82
32LVSS5-22/22-65.5-KS		1209	709	667	79
32LVSS5-24/22-65.5-KS	3	1263	763	721	80
32LVSS5-29/22-65.5-KS		1398	898	856	81
32LVSS5-32/22-65.5-KS		1479	979	937	82
32LVSS5-24/24-67.5-KS		1303	763	721	87
32LVSS5-29/24-67.5-KS		1438	898	856	88
32LVSS5-32/24-67.5-KS		1519	979	937	89

Discharge bore: 50 mm

(1) Dimensional outline drawing

Figure 1 (0.75kW)

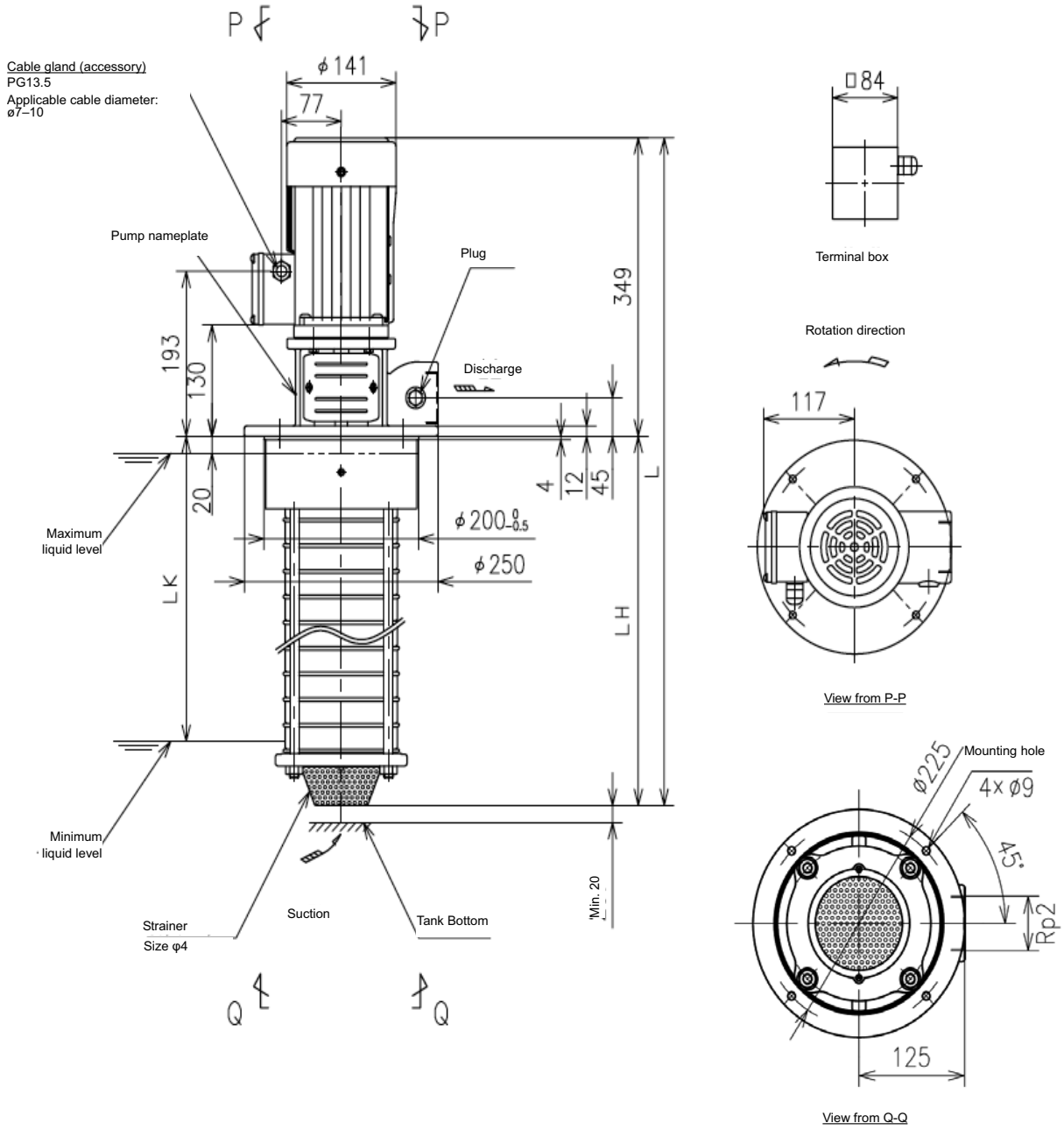
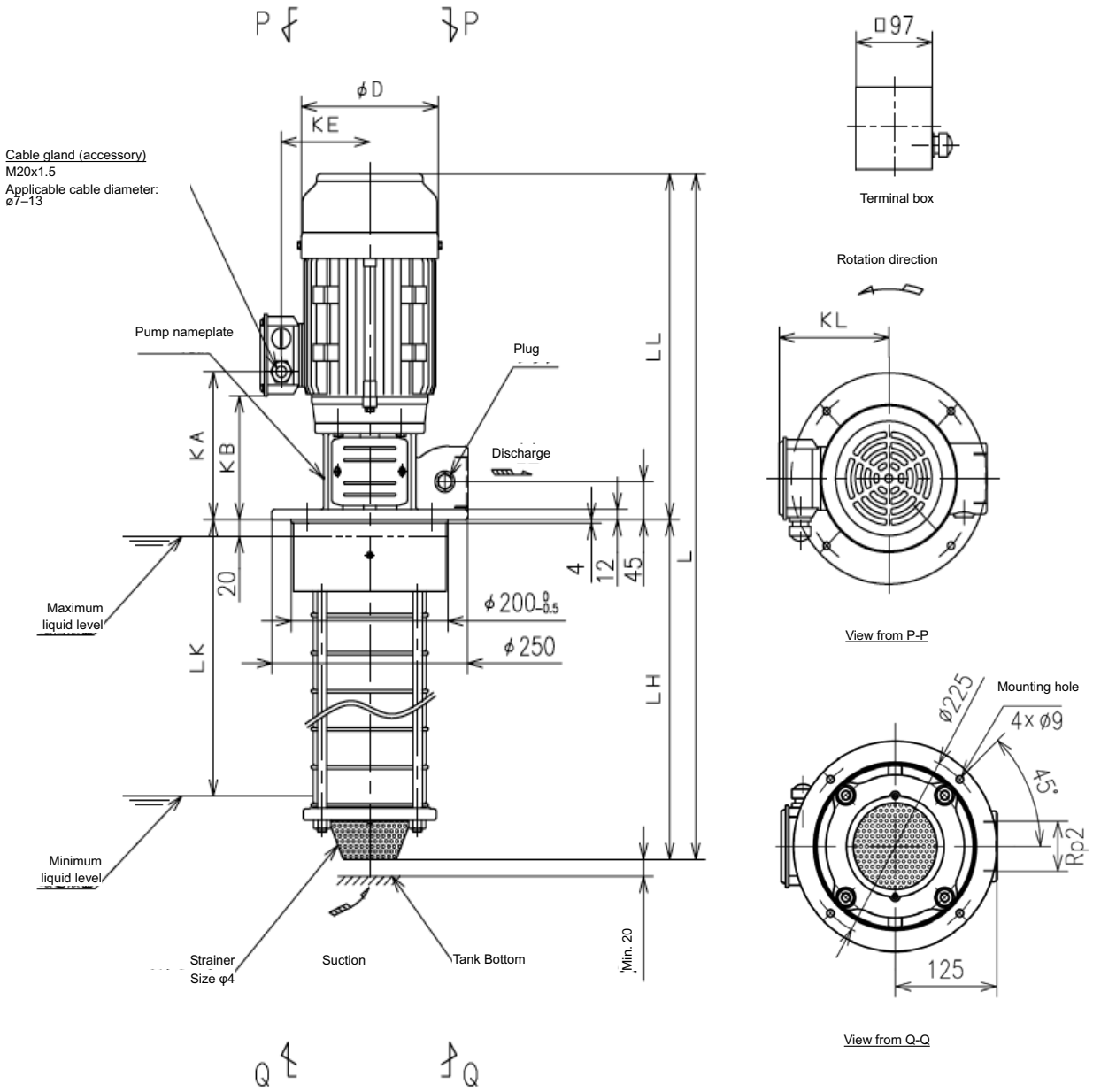
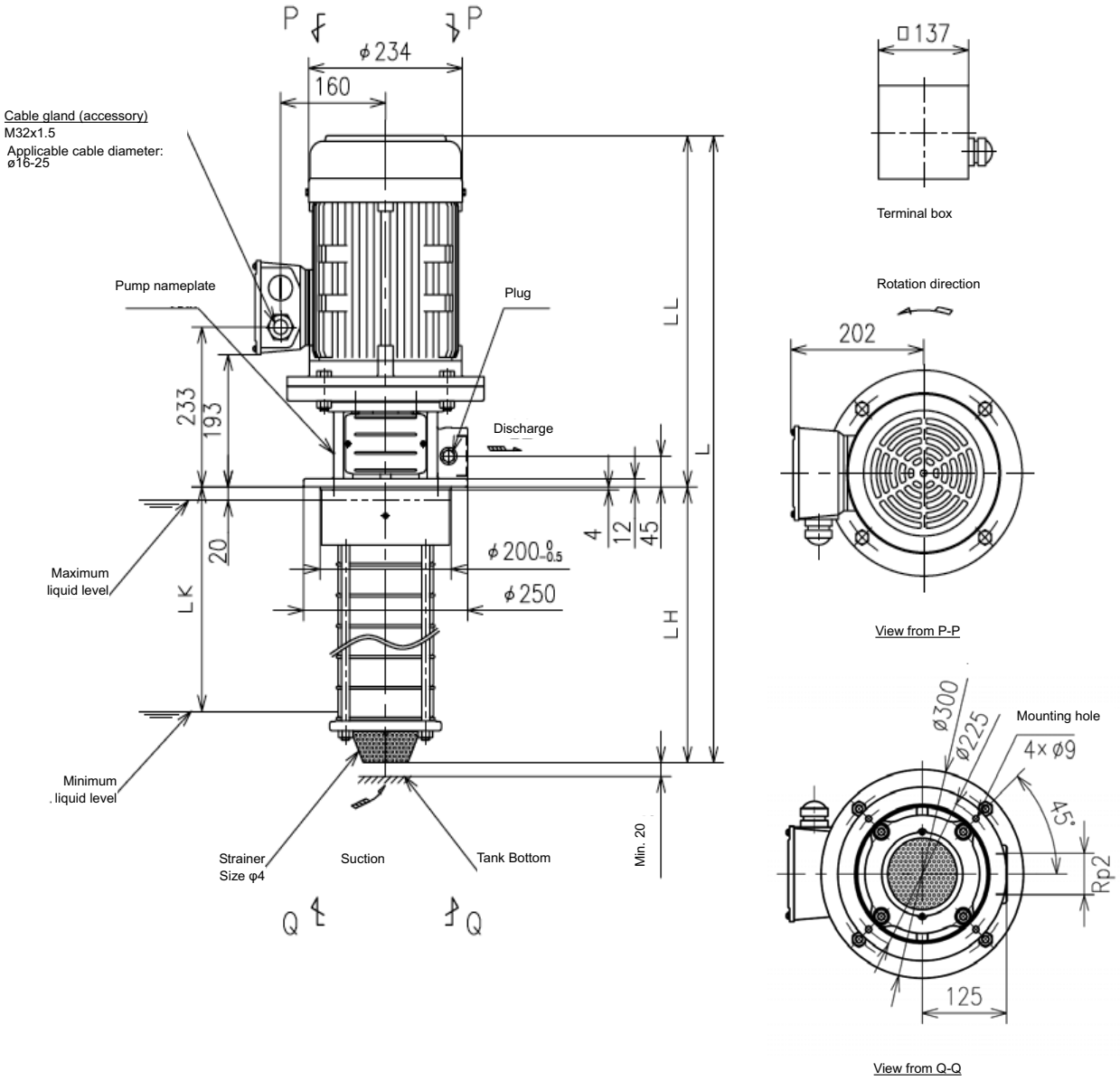


Figure 2 (1.1kW~4.0kW)



OUTPUT kW	Fig.	D	KA	KB	KE	KL	LL
1.1	2	175	169	140	113	140	403
1.5/2.2		175	175	146	113	140	409
3.0		196	186	156	125	152	442
4.0		219	190	161	134	161	449

Figure 3 (5.5kW~7.5kW)



OUTPUT kW	Fig.	LL
5.5	3	512
7.5		552

Typical models are shown in these figures. The shapes may be slightly different depending on the model and specifications. Because some of the specifications may be changed due to design changes or for other reasons, refer to the delivery specifications when planning your pumping work.

(2) Dimensions table

■ Discharge bore: 50mm, nominal flow rate: 10m^3/h

・60Hz <Unit: mm>

Model	Fig	L	LH	LK	Approx weight (kg)
50LVSS10-5/1-6.75-KS	1	631	282	207	30
50LVSS10-6/1-6.75-KS		661	312	237	30
50LVSS10-8/1-6.75-KS		721	372	297	32
50LVSS10-10/1-6.75-KS		781	432	357	33
50LVSS10-12/1-6.75-KS		841	492	417	34
50LVSS10-5/2-61.5-KS	2	691	282	207	38
50LVSS10-6/2-61.5-KS		721	312	237	38
50LVSS10-8/2-61.5-KS		781	372	297	40
50LVSS10-10/2-61.5-KS		841	432	357	41
50LVSS10-12/2-61.5-KS		901	492	417	42
50LVSS10-14/2-61.5-KS		961	552	477	44
50LVSS10-16/2-61.5-KS		1021	612	537	45
50LVSS10-18/2-61.5-KS		1081	672	597	46
50LVSS10-20/2-61.5-KS		1141	732	657	48
50LVSS10-22/2-61.5-KS		1201	792	717	49
50LVSS10-5/3-62.2-KS		691	282	207	41
50LVSS10-6/3-62.2-KS		721	312	237	42
50LVSS10-8/3-62.2-KS		781	372	297	43
50LVSS10-10/3-62.2-KS		841	432	357	44
50LVSS10-12/3-62.2-KS		901	492	417	46
50LVSS10-14/3-62.2-KS		961	552	477	47
50LVSS10-16/3-62.2-KS		1021	612	537	48
50LVSS10-18/3-62.2-KS		1081	672	597	50
50LVSS10-20/3-62.2-KS		1141	732	657	51
50LVSS10-22/3-62.2-KS		1201	792	717	52
50LVSS10-5/4-63.0-KS		724	282	207	49
50LVSS10-6/4-63.0-KS		754	312	237	50
50LVSS10-8/4-63.0-KS		814	372	297	51
50LVSS10-10/4-63.0-KS		874	432	357	53
50LVSS10-12/4-63.0-KS		934	492	417	54
50LVSS10-14/4-63.0-KS		994	552	477	55
50LVSS10-16/4-63.0-KS		1054	612	537	57
50LVSS10-18/4-63.0-KS		1114	672	597	58
50LVSS10-20/4-63.0-KS		1174	732	657	59
50LVSS10-22/4-63.0-KS		1234	792	717	61
50LVSS10-5/5-63.0-KS		724	282	207	49
50LVSS10-6/5-63.0-KS		754	312	237	50
50LVSS10-8/5-63.0-KS		814	372	297	51
50LVSS10-10/5-63.0-KS		874	432	357	53
50LVSS10-12/5-63.0-KS		934	492	417	54
50LVSS10-14/5-63.0-KS		994	552	477	55
50LVSS10-16/5-63.0-KS		1054	612	537	57
50LVSS10-18/5-63.0-KS		1114	672	597	58
50LVSS10-20/5-63.0-KS		1174	732	657	59
50LVSS10-22/5-63.0-KS		1234	792	717	61
50LVSS10-6/6-64.0-KS		761	312	237	56
50LVSS10-8/6-64.0-KS		821	372	297	57
50LVSS10-10/6-64.0-KS		881	432	357	58
50LVSS10-12/6-64.0-KS		941	492	417	60
50LVSS10-14/6-64.0-KS		1001	552	477	61
50LVSS10-16/6-64.0-KS		1061	612	537	62
50LVSS10-18/6-64.0-KS		1121	672	597	64
50LVSS10-20/6-64.0-KS		1181	732	657	65
50LVSS10-22/6-64.0-KS		1241	792	717	66

<Unit: mm>

Model	Fig	L	LH	LK	Approx weight (kg)
50LVSS10-8/8-65.5-KS	3	884	372	297	84
50LVSS10-10/8-65.5-KS		944	432	357	86
50LVSS10-12/8-65.5-KS		1004	492	417	87
50LVSS10-14/8-65.5-KS		1064	552	477	88
50LVSS10-16/8-65.5-KS		1124	612	537	90
50LVSS10-18/8-65.5-KS		1184	672	597	91
50LVSS10-20/8-65.5-KS		1244	732	657	92
50LVSS10-22/8-65.5-KS		1304	792	717	94
50LVSS10-9/9-65.5-KS		914	402	327	85
50LVSS10-12/9-65.5-KS		1004	492	417	87
50LVSS10-14/9-65.5-KS		1064	552	477	89
50LVSS10-16/9-65.5-KS		1124	612	537	90
50LVSS10-18/9-65.5-KS		1184	672	597	91
50LVSS10-20/9-65.5-KS		1244	732	657	92
50LVSS10-22/9-65.5-KS		1304	792	717	94
50LVSS10-10/10-67.5-KS		979	432	357	93
50LVSS10-12/10-67.5-KS		1039	492	417	94
50LVSS10-14/10-67.5-KS		1099	552	477	95
50LVSS10-16/10-67.5-KS		1159	612	537	97
50LVSS10-18/10-67.5-KS		1219	672	597	98
50LVSS10-20/10-67.5-KS		1279	732	657	99
50LVSS10-22/10-67.5-KS		1339	792	717	101
50LVSS10-12/12-67.5-KS		1039	492	417	94
50LVSS10-14/12-67.5-KS		1099	552	477	95
50LVSS10-16/12-67.5-KS		1159	612	537	97
50LVSS10-18/12-67.5-KS		1219	672	597	98
50LVSS10-20/12-67.5-KS		1279	732	657	99
50LVSS10-22/12-67.5-KS		1339	792	717	101

■ Discharge bore: 50mm, nominal flow rate: 15m^3/h

・60Hz <Unit: mm>

Model	Fig	L	LH	LK	Approx weight (kg)
50LVSS15-3/1-61.5-KS		676	267	192	37
50LVSS15-4/1-61.5-KS		721	312	237	38
50LVSS15-5/1-61.5-KS		766	357	282	39
50LVSS15-6/1-61.5-KS		811	402	327	40
50LVSS15-7/1-61.5-KS		856	447	372	40
50LVSS15-8/1-61.5-KS		901	492	417	41
50LVSS15-10/1-61.5-KS		991	582	507	43
50LVSS15-3/2-63.0-KS		709	267	192	49
50LVSS15-4/2-63.0-KS		754	312	237	49
50LVSS15-5/2-63.0-KS		799	357	282	50
50LVSS15-6/2-63.0-KS		844	402	327	51
50LVSS15-7/2-63.0-KS		889	447	372	52
50LVSS15-8/2-63.0-KS		934	492	417	53
50LVSS15-10/2-63.0-KS	2	1024	582	507	55
50LVSS15-12/2-63.0-KS		1114	672	597	56
50LVSS15-14/2-63.0-KS		1204	762	687	58
50LVSS15-17/2-63.0-KS		1339	897	822	60
50LVSS15-3/3-64.0-KS		716	267	192	54
50LVSS15-4/3-64.0-KS		761	312	237	55
50LVSS15-5/3-64.0-KS		806	357	282	56
50LVSS15-6/3-64.0-KS		851	402	327	57
50LVSS15-7/3-64.0-KS		896	447	372	57
50LVSS15-8/3-64.0-KS		941	492	417	58
50LVSS15-10/3-64.0-KS		1031	582	507	60
50LVSS15-12/3-64.0-KS		1121	672	597	62
50LVSS15-14/3-64.0-KS		1211	762	687	63
50LVSS15-17/3-64.0-KS		1346	897	822	66
50LVSS15-4/4-65.5-KS		824	312	237	82
50LVSS15-5/4-65.5-KS		869	357	282	83
50LVSS15-6/4-65.5-KS		914	402	327	84
50LVSS15-7/4-65.5-KS		959	447	372	85
50LVSS15-8/4-65.5-KS		1004	492	417	86
50LVSS15-10/4-65.5-KS		1094	582	507	88
50LVSS15-12/4-65.5-KS		1184	672	597	89
50LVSS15-14/4-65.5-KS		1274	762	687	91
50LVSS15-17/4-65.5-KS	3	1409	897	822	93
50LVSS15-5/5-67.5-KS		909	357	282	90
50LVSS15-6/5-67.5-KS		954	402	327	91
50LVSS15-7/5-67.5-KS		999	447	372	92
50LVSS15-8/5-67.5-KS		1044	492	417	93
50LVSS15-10/5-67.5-KS		1134	582	507	94
50LVSS15-12/5-67.5-KS		1224	672	597	96
50LVSS15-14/5-67.5-KS		1314	762	687	98
50LVSS15-17/5-67.5-KS		1449	897	822	100

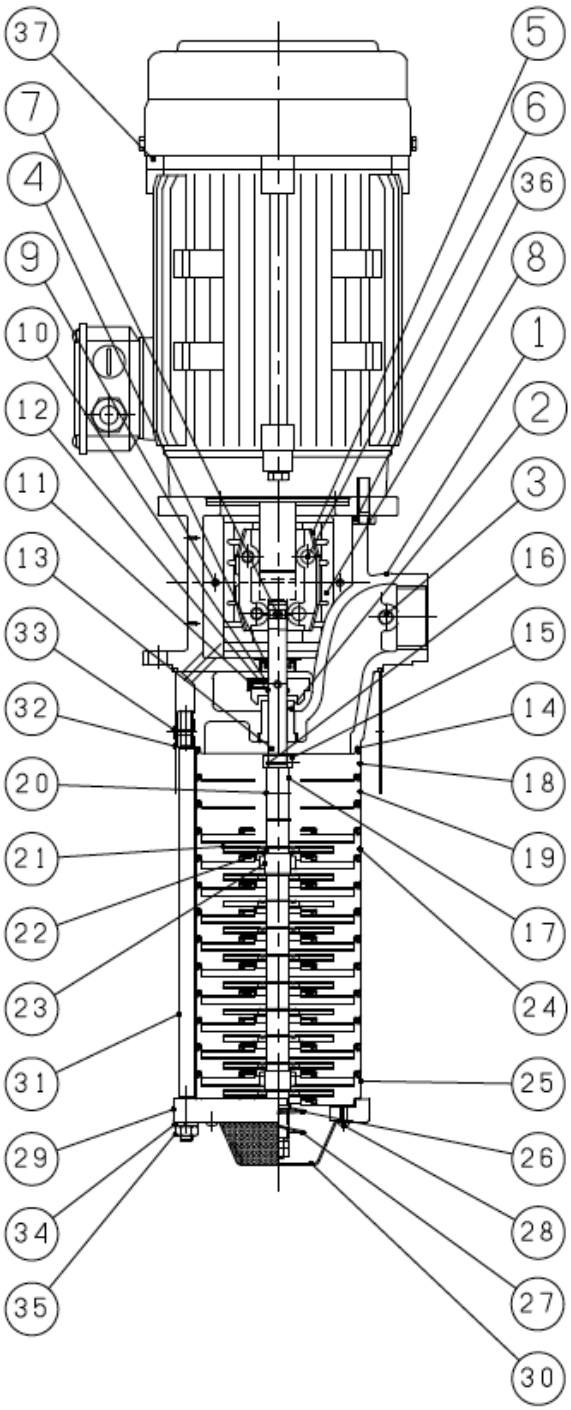
■ Discharge bore: 50mm, nominal flow rate: 20m^3/h

・60Hz <Unit：mm>

Model	Fig	L	LH	LK	Approx weight (kg)
50LVSS20-3/1-62.2-KS	2	676	267	192	41
50LVSS20-4/1-62.2-KS		721	312	237	41
50LVSS20-5/1-62.2-KS		766	357	282	42
50LVSS20-6/1-62.2-KS		811	402	327	43
50LVSS20-7/1-62.2-KS		856	447	372	44
50LVSS20-3/2-64.0-KS		716	267	192	54
50LVSS20-4/2-64.0-KS		761	312	237	55
50LVSS20-5/2-64.0-KS		806	357	282	56
50LVSS20-6/2-64.0-KS		851	402	327	57
50LVSS20-7/2-64.0-KS		896	447	372	57
50LVSS20-8/2-64.0-KS		941	492	417	58
50LVSS20-10/2-64.0-KS		1031	582	507	60
50LVSS20-12/2-64.0-KS		1121	672	597	62
50LVSS20-3/3-65.5-KS	3	779	267	192	81
50LVSS20-4/3-65.5-KS		824	312	237	82
50LVSS20-5/3-65.5-KS		869	357	282	83
50LVSS20-6/3-65.5-KS		914	402	327	84
50LVSS20-7/3-65.5-KS		959	447	372	85
50LVSS20-8/3-65.5-KS		1004	492	417	86
50LVSS20-10/3-65.5-KS		1094	582	507	87
50LVSS20-12/3-65.5-KS		1184	672	597	89
50LVSS20-14/3-65.5-KS		1274	762	687	91
50LVSS20-17/3-65.5-KS		1409	897	822	93
50LVSS20-4/4-67.5-KS		864	312	237	89
50LVSS20-5/4-67.5-KS		909	357	282	90
50LVSS20-6/4-67.5-KS		954	402	327	91
50LVSS20-7/4-67.5-KS		999	447	372	92
50LVSS20-8/4-67.5-KS		1044	492	417	92
50LVSS20-10/4-67.5-KS		1134	582	507	94
50LVSS20-12/4-67.5-KS		1224	672	597	96
50LVSS20-14/4-67.5-KS		1314	762	687	97
50LVSS20-17/4-67.5-KS		1449	897	822	100

2.7 Internal structure drawing (Example)

• 32LVSS1, 32LVSS3, 32LVSS5 (4.0kW or less)

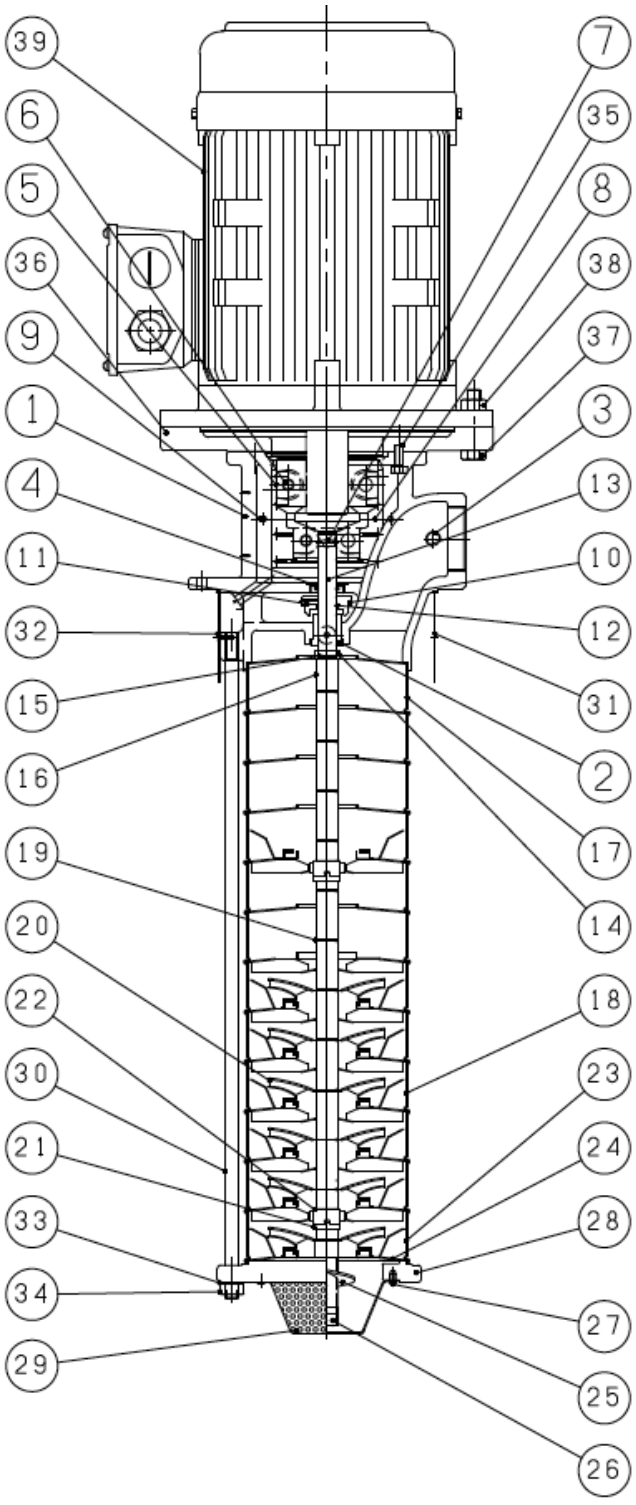


No.	Part name	Material
1	Discharge casing	SCS13
2	Bushing	SUS430
3	Plug	SUS304
4	Oil seal	NBR
5	Coupling	FC0205
6	Hexagon socket head cap screw	SCM435
7	Shaft pin	SUS316
8	Coupling cover	SUS304
9	Cross recessed pan head screw	SUS304
10	Oil thrower	SUS304
11	Set screw	SUS304
12	O-ring	FKM
13	Main shaft	SUS420J2
14	Gasket	-
15	Shaft bushing	SUS304
16	Shaft ring	SUS316
17	Sleeve	SUS304
18	Intermediate casing (last stage)	SUS304
19	Intermediate casing	SUS304
20	Shim	SUS304
21	Impeller	SUS304
22	Baffle	SUS304
23	Bearing	SiC
24	Bearing casing	SUS304+SiC
25	Intermediate casing (first stage)	SUS304
26	Screw	SUS304
27	Hard locknut	SUS304
28	Cross recessed pan head screw	SUS304
29	Suction casing	SUS14A
30	Strainer	SUS304
31	Through bolt	SUS304
32	Outer sleeve	SUS304
33	Cross recessed countersunk head screw	SUS304
34	Spring washer	SUS304
35	Hexagon nut	SUS304
36	Hexagon bolt	SUS304
37	Motor	-

Note 1) The materials in the table above are equivalents.
Note 2) Structure and other details are subject to change without notice.

Typical models are shown in these figures. The shapes may be slightly different depending on the model and specifications. Because some of the specifications may be changed due to design changes or for other reasons, refer to the delivery specifications when planning your pumping work.

• 50LVSS10 (5.5kW or more), 50LVSS15 (5.5kW or more), 50LVSS20 (5.5kW or more)



No.	Part name	Material
1	Discharge casing	SCS13
2	Bushing	SUS430
3	Plug	SUS304
4	Oil seal	NBR
5	Coupling	FC0205
6	Hexagon socket head cap screw	SCM435
7	Shaft pin	SUS316
8	Coupling cover	SUS304
9	Cross recessed pan head screw	SUS304
10	Oil thrower	SUS304
11	Set screw	SUS304
12	O-ring	FKM
13	Main shaft	SUS420J2
14	Shaft bushing	SUS304
15	Shaft ring	SUS316
16	Sleeve	SUS304
17	Intermediate casing (last stage)	SUS304
18	Intermediate casing	SUS304
19	Shim	SUS304
20	Impeller	SUS304
21	Baffle	SUS304
22	Bearing	SiC
23	Bearing casing	SUS304
24	Intermediate casing (first stage)	SUS304
25	Screw	SUS304
26	Hard locknut	SUS304
27	Cross recessed pan head screw	SUS304
28	Suction casing	SCS13
29	Strainer	SUS304
30	Through bolt	SUS304
31	Outer sleeve	SUS304
32	Cross recessed countersunk head screw	SUS304
33	Plain washer	SUS304
34	Hexagon nut	SUS304
35	Hexagon bolt	SUS304
36	Frame spacer	FC200
37	Hexagon bolt	SUS304
38	Hexagon nut	SUS304
39	Motor	-

Note 1) The materials in the table above are equivalents.
Note 2) Structure and other details are subject to change without notice.

Typical models are shown in these figures. The shapes may be slightly different depending on the model and specifications. Because some of the specifications may be changed due to design changes or for other reasons, refer to the delivery specifications when planning your pumping work.

3. Transportation, conveyance, storage and installation

3.1 Precautions for transportation, moving and storing the pump

(1) Do not unpack the container unnecessarily.
If you unpack the container unnecessarily, securely pack again in such a manner that the product body does not jump out of it and fall down during transportation, conveyance or storage.

(2) When you transport, move, or store the pump, ensure that the pump is located in a well-ventilated place with minimum exposure to dust and moisture in an environment at an ambient temperature of -25 to 55 degrees Celsius and humidity of less than 85%RH. The packing materials, made mainly of corrugated cardboards, break more easily when they absorb moisture.

(3) Check the orientation of the container and then place it in the correct orientation (not upside down).

(4) Do not stack the containers of the product more than the allowable number of units indicated on the packing material.

Use extreme care so as not to give an impact or offset load to the pump during conveyance or transportation. The container may greatly incline depending on its center of gravity.

Before transporting or moving the product, confirm the weight of each unit by referring to the catalog, dimensional outline drawing, and other documents, and then determine the appropriate method.

When you lift the product by hand, pay attention to its center of gravity and weight. Do not allow a single person to lift a product heavier than 15 kg. Otherwise, it may put strain on the body, thus leading to an injury.

3.2 Before using the pump

Upon receiving the pump, check the following points first.
If you find any problems, contact the vendor from which you purchased the product.

Before unpacking the delivered container, check that the container is placed in the correct orientation (not upside down). Pay special attention to nails especially when opening a wooden crate. Otherwise, you may get injured.

(1) Check the nameplate to verify that the delivered product is exactly what you ordered. (Refer to 2.4. Information indicated on the nameplates. [page 2-3].)

(2) No part of the product is damaged during transportation.

(3) All fastening parts including bolts and nuts are securely tightened.

(4) All the accessories that you ordered have been delivered.

When you handle the pump, do not hold the strainer located on the tip of the pump. Otherwise, the strainer may come off, thus leading to an injury or damage.

Caution

Do not run the pump at a frequency exceeding 60 Hz. Failure to observe this may cause an overload and burnout of the motor.

3.3 Precautions for installation

Warning

Before turning the pump shaft by hand to check its rotation, be sure to turn off the main power. Otherwise, an unexpected start of the pump may cause an accident.

(1) Install the product in a well-ventilated place with minimum exposure to dust and moisture. (Refer to the Installation location in "2.3. Standard specifications [page 2-2]"). In particular, avoid installing the product in a place where the pumping liquid may be splashed on the motor section.

Warning

Do not install the product in a hot or humid place.
Otherwise, it may lead to heating, ignition or electric leak.

(2) Install the product so that the motor can take air in.

(3) Securely install the product on a flat place without any wobbles.

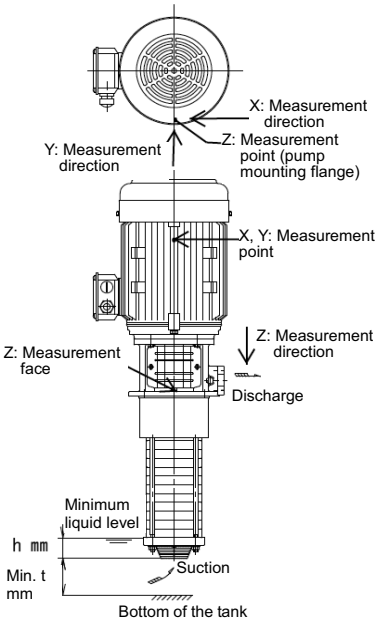
(4) The mounting surface must be strong enough to prevent the amplification of vibrations while the pump is running.
(Restrict the total amplitudes in X, Y, and Z directions [see the right figure] to 33 μm at 50 Hz and to 29 μm at 60Hz during the operation of the pump.)

(5) Select a convenient place to conduct maintenance and inspection. Secure space for maintenance.

(6) It is necessary to make a mounting hole larger than the outside diameter of the pump section so that the pump section can fit into the tank (water or oil tank). See the dimensional outline drawing.

(7) Install the pump so that its main shaft is located in a vertical position.

(8) For the operation, the pump section needs to be submerged below the liquid level. To prevent the strainer from getting clogged with cutting powder, dirt, or other materials, keep the suction port at least *t* mm (shown in the following table) away from the bottom surface of the tank (water or oil tank). If cutting powder, dirt, or other materials are predicted to accumulate on the bottom of the tank, provide as large a distance as possible (at least *t* mm) from the bottom at the design stage.



Model	h	t
32LVSS	42	5
50LVSS	75	20

Note

Always keep the liquid level in the tank (water or oil tank) above the Minimum liquid level.
Keep the suction port of the pump at least *t* mm away from the bottom of the tank (water or oil tank).

(9) Do not install the product in a place where a secondary hazard could occur in the event of any liquid leak.

(10) If the system could be exposed to the freezing temperature in winter, be sure to apply antifreeze measures such as heat insulation or the installation of a heater to the pump, valves, or piping.

(11) Securely install the pump. Recommended size of pump mounting bolt: M6 for 32LVSS, M8 for 50LVSS

Note

Securely fix the pump in place with the bolts. Otherwise, it may lead to abnormal vibration or other problems.

(12) When hoisting the pump, remove the coupling cover, pass a nylon sling or the like through the lifting points of the pump, and then hoist the pump. Do not hoist the equipment with the pump attached. Otherwise, it may damage the hoisting equipment/devices and the pump may fall.

(13) When you hoist or move the pump, be sure to handle the pump carefully so that the pump section would not be subjected to an impact or imbalanced load. The unit may greatly tilt depending on its center of gravity.

Before hoisting the pump, refer to the catalog, dimensional outline drawing, and other documents to check the weight of the units. Do not hoist any units if its weight exceeds the rated load of the hoisting equipment/devices.

Never use a pump or install parts on it when the pump is hoisted. Otherwise, the pump may fall.

When hoisting the pump, pay attention to its center of gravity. Otherwise, the pump may topple over or fall, thus leading to an injury.

When you lift the product by hand, pay attention to its center of gravity and weight. Do not allow a single person to lift a product heavier than 15 kg. Otherwise, it may put strain on the body, thus leading to an injury.

(14) If the pumping liquid is cold, condensation may occur inside the motor while the pump is stopped. Take measures to prevent condensation, for example, by installing the pump in a sufficiently dry room or by heating and insulating the motor even when the pump is stopped.

(15) Carry out touchup painting at a time interval suitable for the environment of use. Depending on the

humidity, condensation, and other conditions, rust may form on areas such as threaded parts, worked areas, anticorrosive-coated sections.

(16) Do not put a cover or filter over the motor. Otherwise, the temperature may increase inside the motor, thus leading to product damage, fire, or other problems.

3.4 Precautions for piping work

(1) The pipes must be as short and straight as possible with minimal joints and valves. Use pipes whose bore size is equal to or larger than the discharge port of the pump. If the piping size is small or there are many bends, the discharge rate may become low.

(2) Ensure to provide adequate pipe supports so that the weight of the piping system will not be applied directly to the pump body.

> **Caution**
>
> Do not allow the weight of the pipes to rest on the pump.
> Otherwise, the main shaft may be displaced from the center, thus leading to equipment damage, vibration, or noise.

(3) Do not forcibly screw a pipe into the pump. Otherwise, it may break the joint.

(4) Securely connect the pipes so that the connections are kept completely airtight without leakage. Prevent leaks of liquid and air with seal tape, liquid packing, or other means. Firmly wind the seal tape while paying attention not to block the piping.

(5) Use a tank (water or oil tank) with as large a capacity as possible.

* It is recommended to use a capacity of at least three times the discharge volume per minute.
  Too small a capacity may cause problems such as the rise of liquid temperature, premature strainer clogging with cutting powder, and lower discharge rate caused by bubbles.
  When you supply a pumping liquid into a tank (water or oil tank), gently pour it to prevent the introduction of air.

(6) Do not allow a large amount of cutting powder, dirt, or other contaminants from entering the pump section. Otherwise, it may clog the pump strainer, damage the pump, or significantly deteriorate the performance. Use liquids that are subjected to secondary treatment through a net cage, a chip conveyor, a magnetic separator, etc.

(7) If water hammer may occur, attach a pressure damper (e.g. accumulator).

(8) If there is an upward curve on the discharge pipe, ensure that air can be vented from the section.

(9) If you provide a relief pipe on the discharge side of the pump, also provide a sluice valve in the middle of the relief pipe to adjust the relief volume.

> **Note**
>
> If the amount of liquid released from the relief pipe is too much, the liquid temperature easily rises in the tank (water or oil tank).

(10) On completion of the piping work, be sure to clean the tank (water or oil tank). Pay attention not to contaminate the system with foreign matter.

3.5 Precautions for wiring work

Use high-quality wiring equipment and devices, and carry out wiring work safely and securely according to the technical standards for electrical facilities, as well as the indoor wiring regulations.
Only qualified personnel such as licensed electrical engineers are allowed to carry out electrical wiring work. Unqualified persons are prohibited by law to carry out wiring work, and it is very dangerous.

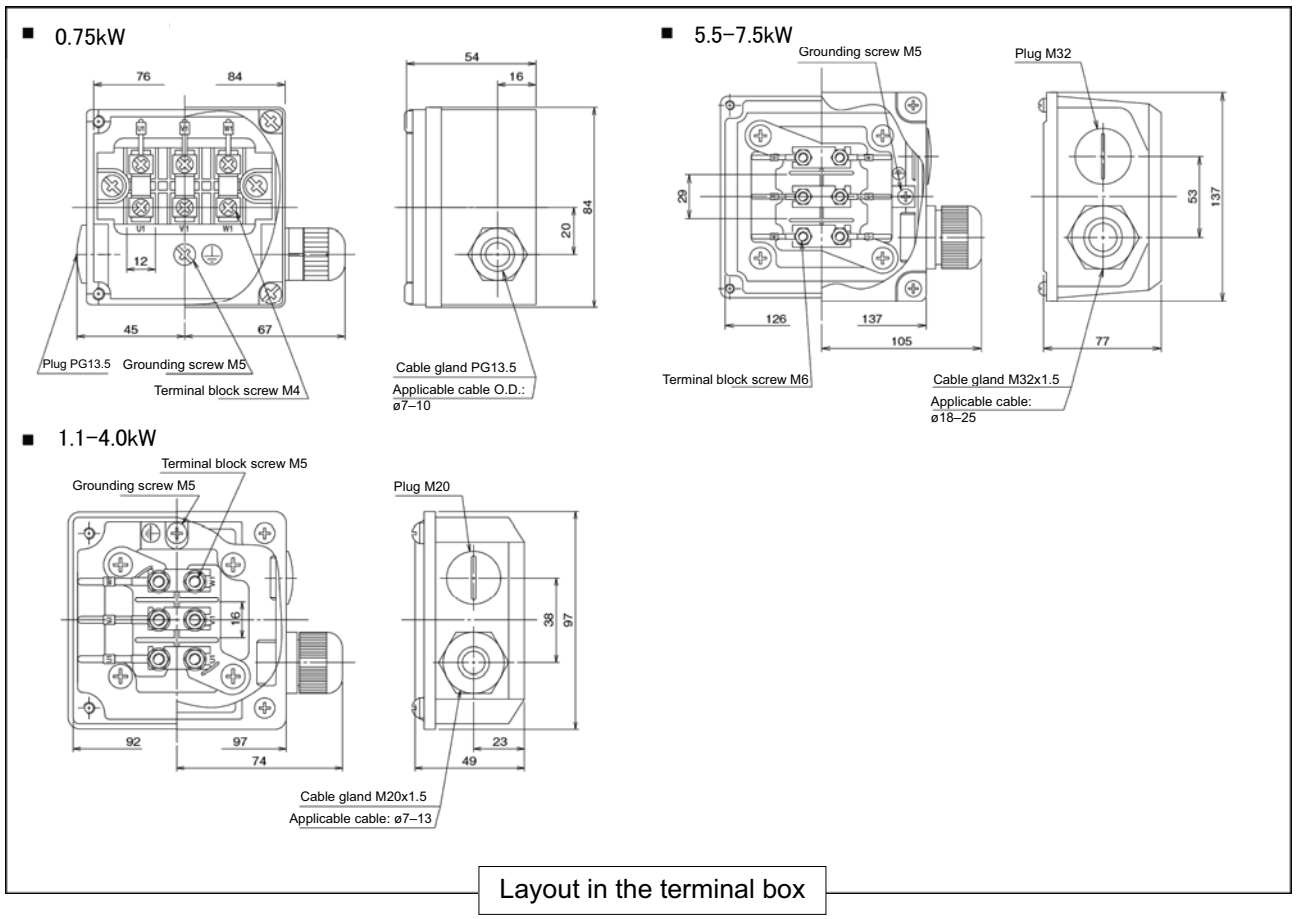
Securely connect the terminals of the power cable. Loose terminals may cause the motor to run in open-phase condition, thus leading to motor burnout.

(1) For the size of the power cable, refer to the following:

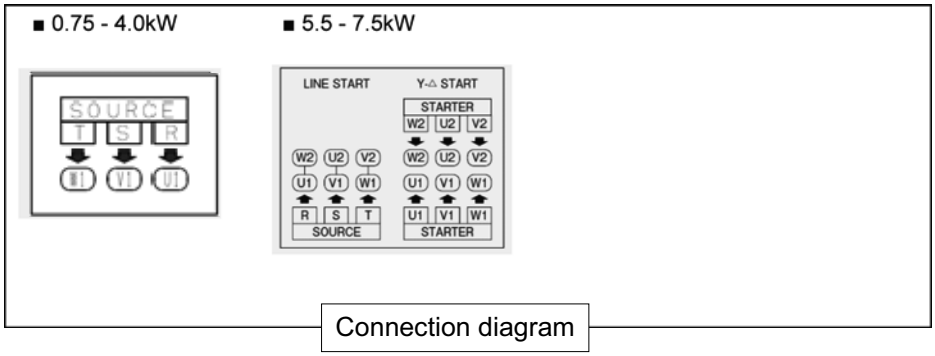
Output [kW]	Minimum size of the cable (200V class)
0.75 to 4.0	1.6 mm^2
5.5	2.0 mm^2
7.5	5.5 mm^2

(2) Be sure to install a ground fault interrupter and an overload protection device on the primary power side of the pump.

(3) Securely connect to the power by wiring the terminals according to the following figure (standard voltage product). Be sure to attach a ground wire to prevent an electric shock. Connect the ground wire to the ground terminal inside the terminal box of the motor.



Layout in the terminal box



Connection diagram

Warning

Connecting a ground wire to a gas pipe or water pipe is illegal and extremely dangerous.

(4) To prevent the terminal block of the motor from being pulled, fasten the power cable to the terminal box with the cable lock.

Warning

Do not change the orientation of the terminal box. Otherwise, liquid may enter the terminal box, thus leading to an electric shock.

(5) To prevent overload and burnout of the motor, it is recommended to use a thermal relay for motor protection.

(6) Take adequate dust-proofing and drip-proofing measures using a connector, gland, or other means to prevent any cutting powder and coolant liquid from entering the terminal box through the external wiring hole.

(7) Pass the power cable through a metal tube or a metal conduit for shielding, and connect a ground wire to the outer surface of the tube.

(8) Limit the fluctuations of the supply voltage within ±10% of the rated voltage, and also limit the fluctuations of the frequency between –5% and +3% of the rated value. Although you can run the pump in these ranges, avoid continuous operation if the voltage is not within ±5% of the rated value or if the frequency is not within ±2% of the rated value. Otherwise, it may overload the pump, thus leading to motor damage or a fire.

Even if the power fluctuations fall within the allowable ranges, the pump characteristics, motor characteristics, and the temperature rise of the motor may differ from those at the rated voltage and frequency.

(9) Precautions for using the inverter drive

- Ensure that the electric current during operation does not exceed 90% of the rated value.
- Ensure that the minimum frequency is set to 20Hz.
  (Contact us if you need to run the drive at 20Hz or lower.)
- Contact us when using a 400V class model. Protective measures may be required against inverter surge.
- An inverter-driven motor generates a magnetic sound which may be annoying compared with the drives using commercial power supply. Although this magnetic sound does not cause an adverse effect on the quality of the motor, some inverters allow the user to adjust the tone by changing the carrier frequency. However, changing the frequency may reduce the allowable output of the inverter. Pay particular attention when selecting an inverter.
- If the pump and motor produce resonance during normal operation, do not run them in the range of the rotation speed.

Do not run the pump at a frequency exceeding 60 Hz. Failure to observe this may cause an overload and burnout of the motor.

4. Operation

4.1 Check items before test operation

4.1.1 Check items related to the electrical system

(1) Check that the equipment is correctly wired.
(2) Check that the terminals are securely connected.
(3) Check that the equipment is securely grounded.
(4) Check that the setup value of the overload protection device is consistent with the rated current value of the motor.

Warning

Do not use the product at any voltage other than the rated value.
Otherwise, it may lead to a fire or electric shock.

4.1.2 Check items related to the pump

Warning **Caution**

Do not run the pump with its coupling cover or strainer removed.
Otherwise, it may lead to an injury or damage.

Caution

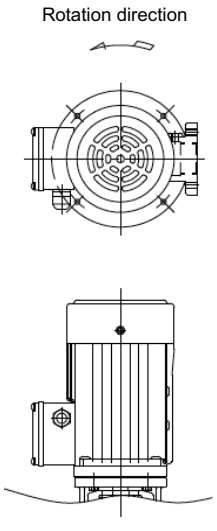
Do not allow a large amount of foreign matter to enter the pump.
Otherwise, it may damage the sliding parts (e.g. bearings, mechanical seal) inside the pump, or lead to leakage or unusual noise.

(1) Check that the liquid level in the tank (water or oil tank) is above the “Minimum liquid level.”

Caution

During test operation, never run the pump dry (i.e. running the pump when the liquid level is below the Minimum liquid level). During normal operation, do not run the pump dry. Otherwise, it may seize up the sliding parts inside the pump.

(2) Check the rotation direction. Normal rotation is counterclockwise when viewed from the motor side. (See the right figure.)



(3) Turn the main shaft by hand to check smooth rotation. To do that, remove the coupling cover and then turn its shaft by holding the coupling. The rotation must be smooth without binding (no sticking points). If the rotation is stiff or not uniform, there may be some rust or foreign matter inside the pump. Inspect the pump in such a case.

Warning

Before turning the pump shaft by hand to check its rotation, be sure to turn off the main power. Otherwise, an unexpected start of the pump may cause an accident.

(4) If you run the pump, open the valve on the discharge piping to release air.

(5) If you run the motor at variable speed with the inverter, be sure to check the following points through test operations.

- The pump may produce resonance depending on installation conditions. If the pump produces resonance, avoid that frequency.
- If the operation frequency is low or the dynamic viscosity of the pumping liquid is high, the pump may not discharge any liquid.
- Do not run the pump at a power frequency exceeding 60Hz. Otherwise, the motor may burn out.

Do not run the pump at a frequency exceeding 60 Hz. Failure to observe this may cause an overload and burnout of the motor.

4.2 Running the pump (test operation)

Be sure to attach the cover of the terminal box of the motor.
Otherwise, it may lead to an electric shock.

Be sure to keep the coupling cover attached during the operation of the pump. Otherwise, it may lead to an injury.

Do not operate the pump if any abnormal condition is observed or if there is anything wrong with the parts, components, and others during the check before test operation. Otherwise, it may lead to an injury, failure, accident, or other problems.

If you pump a liquid over 40°C, do not touch the pump.
Otherwise, its hot surface may cause burns.

Do not touch the motor during operation or immediately after the stop of operation.
Otherwise, its hot surface may cause burns.

(1) Check the rotation direction of the pump by turning on and off the power switch once or twice.
Normal rotation is counterclockwise when viewed from the motor side.
If the pump rotates in reverse, swap two of the three wires of the power cable.

Never check the rotation direction by running the pump dry even for a short time. Otherwise, it may damage the sliding parts (e.g. casing, bearings) in the pump, or lead to leakage or unusual noise.

Do not run the motor in reverse because it may cause a failure.

Do not run the pump dry, and do not allow a large amount of air or foreign matter from entering the pump. Otherwise, it may damage the sliding parts (e.g. bearings) in the pump, make it impossible to pump up liquid, or lead to leakage or unusual noise. It may also heat the pump, thus leading to burns.

(2) Turn on the power to start the pump.

(3) During the initial period of pump operation and circulation, gradually open the sluice valve on the discharge side to circulate liquid at a flow rate (flow velocity) higher than the normal operation.

(4) Adjust the sluice valve on the discharge side so that the specified pressure is achieved. Although running the pump with the sluice valve shut does not cause the overload of the motor, do not perform zero-discharge operation for more than 1 minute. In case of running at a small amount of liquid to flow, allow at least 10L/min for 32LVSS, and at least 20L/min for 50LVSS; or if you no longer use the liquid, stop the pump. Long hours of zero-discharge operation increase the liquid temperature in the pump, thus leading to an unexpected failure.

Do not perform zero-discharge operation for more than 1 minute continuously. Otherwise, the liquid temperature may increase in the pump, thus leading to an unexpected failure.

(5) Because this pump is structured without any mechanical seal (no sealing device at the shaft seal), some liquid is discharged from the outer cylinder of the pump, but it is not a product defect.

(6) When the liquid level is too low, the pump may take air in and decrease the discharge rate, thus making it impossible to pump the liquid. Keep the liquid level above the “Minimum liquid level” indicated in the Dimensional outline drawing. Note that, however, this liquid level changes depending on the viscosity and liquid surface condition. For safety, set the liquid level high enough, but at a level below the “Maximum liquid level” indicated in the outline drawing.

(7) Limit the frequency of the startups and shutdowns according to the following table:

Model	Allowable frequency of startups (times/hour)
4.0 kW or less	60
5.5 to 7.5 kW	20

Caution

Minimize the frequency of startups and shutdowns of the pump because their high frequency may quickly damage the pump.

(8) In the event of a power failure during operation, be sure to turn off the power.

Warning

In the event of a power failure, be sure to turn off the power switch. Otherwise, the pump may suddenly start up on restoration of the power, thus leading to an injury.

(9) Before restarting the pump, confirm that the pump has stopped completely.

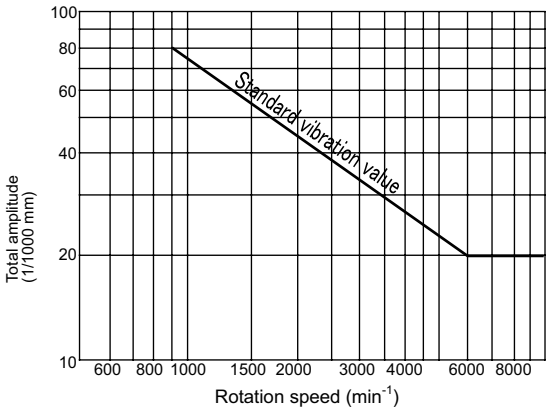
Caution

Before restarting the pump, be sure to check that the pump has stopped completely. Turning on the power while the pump is still rotating causes an excessive torque on the pump and may cause a failure.

(10) In case of using a solenoid valve for flow control, use a relief valve or the like to avoid sudden pressure fluctuations during the operation of the pump.

(11) Check for any abnormal pressure, electric current, vibration, noise, and other abnormal conditions. If you find any abnormal conditions, take appropriate actions after checking the Section “6. Troubleshooting [page 6-1].”

Refer to the following chart for vibration vs. rotation speed.



Standard vibration value at the bearing section

[For reference only]

Relation between the total amplitude (a) and the vibration velocity (V)

$$a = \frac{V \times 6 \times 10^3}{\pi \times n}$$

a: Total amplitude (μm)
V: Vibration velocity (mm/s)
n: Equipment rotation speed (min^{-1})

(12) Do not allow a large amount of cutting powder to enter the pump. Otherwise, it may lead to the clogging of the pump strainer or impeller, thus decreasing the discharge rate. For the LVSS coolant pumps, use liquids that are subjected to secondary treatment through a net cage, a chip conveyor, a magnetic separator, etc. Cutting powders that are small enough to pass through the pump strainer can damage the pump or significantly deteriorate the performance. If you use the pump in processes such as grinding, milling, or end milling in which a large amount of cutting powder is discharged, select the pump carefully.

(13) Stop the pump.

Keep the cocks of the pressure gauges, compound pressure gauges, and other parts closed all the time except when they are used for measurement. Otherwise, they are more prone to fail.

Do not run the pump using the power beyond the allowable current value. Otherwise, the motor may burn out.

Do not put your fingers or other objects into the opening of the motor. Otherwise, it may lead to an electrical shock or injury.

5. Maintenance and inspection

Before checking the pump, be sure to turn off the main power. Otherwise, the pump may suddenly start up in automatic mode or on other occasions, thus leading to great danger.

Before starting the unit or carrying out maintenance/inspection work, ensure that all the relevant workers are informed of the operation and that there are no workers in the dangerous zone.

For overhaul, replacement of parts, or repairs, ask the vendor or the service center specified by Teral. Incorrect work may cause a failure or accident.

5.1 Precautions for maintenance and inspection

(1) Observe the following points, in particular, during daily inspection.

① A large deviation in the pump's discharge pressure, electric current, vibration, noise, or other conditions from the normal status is a sign of an imminent failure. Therefore, immediately take measures, referring to the Maintenance checklist in Section “5.5 Periodic inspection [page 5-4].” For this purpose, it is recommended to keep an operation log.

② If the bearing temperature gets abnormally high, immediately stop the pump and check the bearing. The temperature is normal if the temperature difference between the motor surface and the atmosphere does not exceed 40°C.

③ Because prelubricated shielded bearings are used for the 7.5kW or lower output models, there is hardly any need for maintenance of the bearings such as refilling of grease. Replace the bearings if they generate unusual noise or vibration.
* Urea grease is adopted for lubrication inside the bearings to extend their service life. Use bearings into which urea grease is filled.
* The fan is connected to the motor by interfere fit. Once removing the external fan, exchange it with a new one.

④ An oil seal is attached to the bearing section to prevent the entry of liquid. When you replace a bearing, also replace its oil seal with a new one.

Model	Oil seal type
	Pump section
32LVSS-KS	IS12257
50LVSS-KS	SC16328

* For the oil seal type of the motor section, refer to “5.3 Motor bearing [page 5-3].”

⑤ Keep the cocks of the pressure gauges and compound gauge closed all the time except when inspection is required.

⑥ In the event of a power failure, be sure to turn off the power. The pump suddenly starts up on restoration of the power, thus leading to danger.

In the event of a power failure, be sure to turn off the power switch. Otherwise, the pump may suddenly start up on restoration of the power, thus leading to an injury.

(2) If you do not use the pump for a long time, observe the following points:

> **Caution**
>
> If you do not use the pump for a long time, turn off the power for safety. Otherwise, accumulated dust may cause heating or ignition.

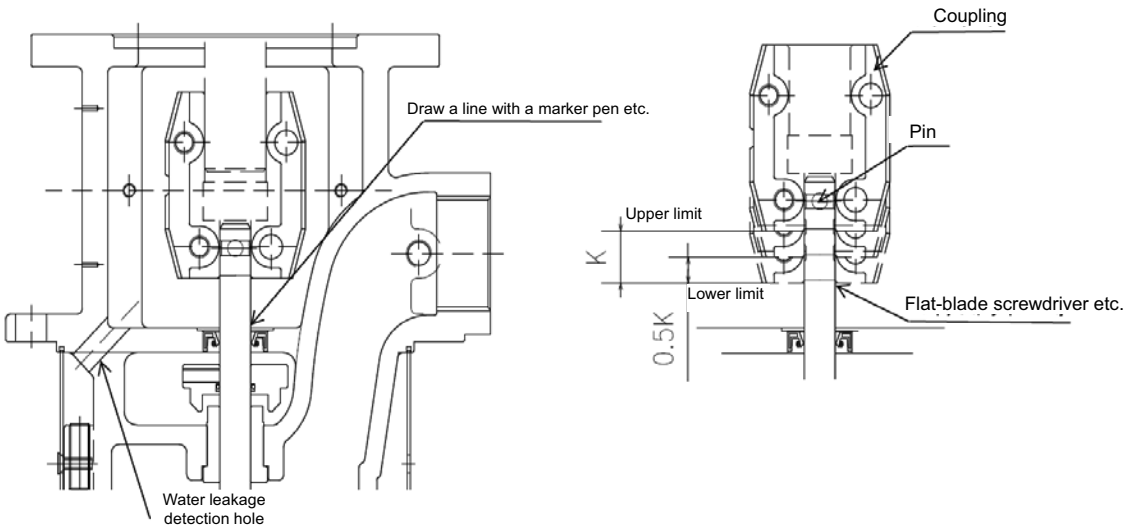
① To prevent possible freezing inside the pump in winter, be sure to take antifreeze measures—such as heat insulation or the installation of a heater to the pump—or completely drain the pump.

② If you have a backup pump, run it from time to time to make it available for operation at any time.

5.2 Tightening the coupling

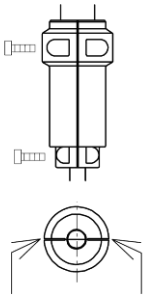
(1) After loosely fixing the coupling in place by passing the pin through the main shaft, lift the coupling with a flat-blade screwdriver or the like, and tighten the coupling at midpoint between the upper and lower limits (at position “0.5K” in the figure below). When you tighten the coupling, ensure to make the gaps of the coupling even (“K” shows movement distance in the axial direction). Before you remove the coupling, you could draw a line at the coupling position on the pump shaft with a marker pen or others to use it as a guide for positioning. If you run the pump with the coupling fixed at the upper or lower limit, you may damage the pump.

(2) Insufficient torque of the screws for coupling may damage the pump. Therefore, tighten them according to the torque shown in the following table.



Tightening torque of screws for coupling

Motor output (kW)	Screw size	Tightening torque (N·m) {kgf·cm}
0.75 to 1.1	M6	13 {130}
1.5 to 4.0	M8	30 {300}
5.5 to 7.5	M10	62 {620}



Make the gaps even.

5.3 Motor bearing

For the bearing type, refer to the following table.

* You can’t use non-standard motor.

Bearing/Oil seal type

Motor output [kW]	Bearing type		Oil seal type	
	Load side	Non-load side	Load side	Non-load side
0.75	6204 ZZ C3	6201 ZZ C3	-	-
1.1	6204 ZZ C3	6304 ZZ C3	-	VC 20 40 7
1.5	6205 ZZ C3	6304 ZZ C3	VC 25 40 7	VC 20 40 7
2.2	6205 ZZ C3	6304 ZZ C3	VC 25 40 7	VC 20 40 7
3.0	6307 ZZ C3	6305 ZZ C3	VC 35 55 7	VC 25 47 7
4.0	6307 ZZ C3	6305 ZZ C3	VC 35 52 7	VC 25 40 7
5.5	6309 ZZ C3	6306 ZZ C3	VC 45 62 8	VC 30 52 8
7.5	6309 ZZ C3	6306 ZZ C3	VC 45 62 8	VC 30 52 8

5.4 Daily inspection

Upon startup and during operation, check the pump for any abnormal conditions in terms of its discharge pressure, electric current, vibration, noise, and others.

5.5 Periodic inspection

(1) Clean any dirt, oil, and other deposits off the outer surface of the coolant pump.

(2) Cutting powder deposited in the tank (water or oil tank) may cause a pump failure. Periodically clean the tank (water or oil tank).

(3) Check the strainer of the pump for any clogging. Clean it if it is clogged.

> **Caution**
>
> Periodically clean the strainer located on the pump suction side. A clogged strainer may cause pressure fluctuations, a lower discharge rate, unusual noise, and other problems, thus leading to a pump failure.

(4) For other inspection items, refer to the Maintenance checklist.

Maintenance checklist

Item	Inspection point		Inspection item	Inspection method	Criterion (Reference page)	Inspection interval				Timing of replacing consumables (as a guide)*1
						Daily	Monthly	Half-yearly	Yearly	
Ambient conditions	Temperature		Check against the specified range.	Measure	Between 0 and 40°C (2-2)	✓				-
	Humidity			Measure	85%RH or less (2-2)	✓				-
	Dust and other contaminants			Visual check	No dust or other contaminants	✓				-
Power	Power terminal block		Voltage	Measure	Specified voltage (2-2)			✓		-
			Voltage fluctuation	Measure	Within the allowable fluctuation range (3-5)			✓		-
			Loose screws	Tighten	Securely tightened				✓	-
Pump and motor	Impeller		Clogging	Disassemble and inspect	No clogging				✓	-
			Wear	Disassemble and inspect	No abnormal condition				✓	When worn out
	Main shaft and its surrounding area		Smooth rotation	Rotate by hand	Rotation is smooth and uniform (4-1)				✓	-
	Bearing (motor) *2		Heat	Touch	Not unusually hot (5-1)				✓	1 to 2 years
			Grease refilling	Visual check Listen	No abnormal vibration/ noise, No outflow of grease					Refer to 5-3 for grease refilling amount and intervals.
	Submerged bearing (bearing ring and sleeve)		-	-	No abnormal condition				✓	2 to 3 years
	Rubber parts	O-rings	-	-	-				✓	Whenever disassembled
		Oil seals, etc.	-	-	No abnormal condition				✓	1 to 2 years
	Others (screws etc.)		-	-	No abnormal condition					As needed
	Appearance		Unusual noise, vibration	Listen Visual check	No abnormal condition	✓				-
	Insulation resistance		Between the ground and each lead wire	Megger tester	1 MΩ or more				✓	-

*1 The timing of replacing consumables (as a guide) does not mean their guaranteed service life. The service life of parts varies depending on the ambient conditions and the conditions for use.

*2 Urea grease is adopted for lubrication inside the bearings to extend their service life. Use a bearing into which urea grease is filled.

6. Troubleshooting

The following table lists causes of failures and their actions. In the event of a failure, however, you should carefully investigate the problem and ask the vendor to carry out any actions that are not easy to take.

Problem	Cause (Reference page)	Action (Reference page)	Done by *
The pump does not start.	Wiring is disconnected or broken.	Check the wires and connections. Repair or replace.	Vendor
	The power fuse is blown.	Replace it with an appropriate fuse.	User
	Tripping of the thermal relay	Check the thermal relay.	User
	Poor connection or contact of power wires (3-4)	Check the wires and connections.	Vendor
	The power voltage is too low. (3-5)	Check the power voltage. Contact the power company.	User
	The motor has failed. (e.g. broken wire of the stator winding)	Repair at vendor's shop. Contact the vendor because disassembly and inspection are required.	Vendor
	Foreign matter is caught in the impeller.	Disassemble, clean, and repair. Contact the vendor because disassembly and inspection are required.	Vendor
	The sliding parts (bearing metal) have seized up.	Disassemble and check. Contact the vendor because disassembly and inspection are required.	Vendor
	The bearing is rusty. (5-1)	Replace the bearing. (5-1) Contact the vendor because disassembly and inspection are required.	Vendor
Overload and overcurrent of the motor	The rotation speed is too high.	Check with the tachometer.	User
	The voltage is too high or too low. (2-2)	Check the power voltage. Contact the power company.	User
	Fluctuation of the voltage		
	A 50Hz pump is run in the 60Hz power zone.	Check the nameplate.	User
	The stator winding is broken, shorted, or grounded.	Contact the vendor because disassembly and inspection are required.	Vendor
	The stator and rotor are in contact due to wear of the bearing. (5-1)	Replace the bearing. (5-1) Contact the vendor because disassembly and inspection are required.	Vendor
	The specific gravity or dynamic viscosity of the pumping liquid is too high.	Reconsider the plan.	User
	The discharge rate is high.	Throttle the sluice valve to adjust the rate as per the specifications.	User
	A rotating part is in contact with another part.	Contact the vendor because disassembly and inspection are required.	Vendor
The pump starts, but cannot achieve the specified discharge rate and the specified head.	The pumping liquid contains many bubbles.	Prevent the formation and suction of bubbles.	User
	The rotation direction is reverse. (4-1)	Correct the wiring so that the motor rotates in normal direction. (4-2)	User
	The piping loss is high.	Check the diameter, route and length of the pipes.	User
	The piping is clogged with foreign matter.	Remove foreign matter and check the joints.	User
	The impeller is worn.	Replace the impeller. Contact the vendor because disassembly and inspection are required.	Vendor
	Foreign matter is accumulated in the impeller and in the casing.	Remove the foreign matter, and check the connections. Contact the vendor because disassembly and inspection are required.	Vendor
	The rotation speed is low.	Check with the tachometer.	User
	The sluice valve is closed.	Open the sluice valve.	User

Problem	Cause (Reference page)	Action (Reference page)	Done by *
The pump starts, but cannot achieve the specified discharge rate and the specified head.	The piping is clogged with foreign matter.	Check and clean the piping.	User
	The strainer on the suction port is clogged.	Check and clean the strainer.	User
	The suction port is exposed above the liquid level. (3-2)	Adjust the liquid level, for example, by refilling the tank with the liquid or by lowering the installation position of the pump.	User
	There is a leak in the discharge pipe.	Check and repair the pipe.	Vendor
Overheat of bearing	The bearing is worn or damaged. (5-1)	Replace the bearing. (5-1) Contact the vendor because disassembly and inspection are required.	Vendor
	The grease is deteriorated.		
	Incorrect installation of the pump and the piping (3-2)	Check and correctly install them.	User
Unusual noise and unusual vibration of the pump	The bearing or the bearing metal is worn or damaged. (5-1)	Replace the bearing or the bearing metal. (5-1) Contact the vendor because disassembly and inspection are required.	Vendor
	The motor is running in open-phase condition.	Check the wiring.	User
	The impeller is clogged with foreign matter, thus leading to imbalanced load.	Disassemble and check. Contact the vendor because disassembly and inspection are required.	Vendor
	Cavitation has occurred.	Contact the manufacturer and vendor.	User
	Incorrect installation of the pump and the piping (3-2)	Check and correctly install them.	User
Leakage from the immersion detection hole	Abnormal condition of the shaft seal part	Check and repair the shaft seal part. Contact the vendor because disassembly and inspection are required.	Vendor
Water hammer occurs.	Hammering has occurred when the valve is rapidly opened and closed.	Provide a pressure damper (e.g. accumulator).	User

* The persons who take the Action are specified here (Done by) only as a guide because the extent of actions that can be taken is different depending on the user.

If you have anything unclear—even about the problems whose actions to be done by User, ask the vendor or contact Teral.

7. After-sales service

> **Caution**
>
> For overhaul, replacement of parts, or repairs, ask the vendor, the service provider specified by the manufacturer, or Teral.
> Improper work may lead to malfunctions or accidents.

- For maintenance and repairs of the pump, ask the vendor from which you purchased the product or ask Teral.
- If you find anything unusual about the active pump, immediately stop the pump and then check the problem. (Refer to Section “6. Troubleshooting” [page 6-1].) For disassembly, inspection, or repair, ask the vendor from which you purchased the product or ask Teral. (Refer to the end of this document.)
- Never repair the pump by yourself because it may lead to danger.
- When you contact the vendor, inform them of the information indicated on the pump nameplate (e.g. pump model and serial number) in addition to the status of the problem.
- For the warranty, refer to “Limited warranties [page I]” on the opening page of this document.

> If you have anything unclear about the product, contact the vendor from which you purchased the product or contact Teral.

8. Disposal

8.1 Precautions for disposal

Before detaching the pump from the system for disposal or replacement, be sure to turn off the main power.

Before detaching the pump, be sure to turn off the main power. Otherwise, the pump may suddenly start up in automatic mode or on other occasions, thus leading to great danger.

When hoisting the pump, pay attention to its center of gravity. Otherwise, the pump may topple over or fall, thus leading to an injury.

(1) Drain liquid from the tank (water or oil tank) so that the bottom of the pump is exposed above the liquid level.

(2) Close the sluice valve on the discharge side and open the air vent valve of the pump to discharge liquid from the pump.

(3) Disconnect the wiring and piping. (For the layout in the terminal box, refer to “Section 3.5. Precautions for wiring work [page 3-55].”)

(4) Remove the pump mounting bolts and coupling cover, pass a nylon sling or the like through the lifting points of the pump, and then hoist the pump. (Refer to “Section 3.3 Precautions for installation [page 3-2].”)

Because the liquid remaining in the pump may flow out while the pump and piping are detached or moved, take measures against it, if necessary, before carrying out this work.

When you handle the pump, do not hold the strainer located on the tip of the pump. Otherwise, the strainer may come off, thus leading to an injury or damage.

(5) Dispose of the pump as industrial waste. Dispose of other parts according to your national and local laws and regulations, for example, by asking the specialized waste disposal contractor.

Note

Dispose of the pump as industrial waste.

Note

For the packing materials that are no longer necessary after installation as well as for used lubricating oils and parts that are no longer necessary after maintenance, inspection, repairs, and replacement, dispose of them according to your national and local laws and regulations, for example, by asking the specialized waste disposal contractor.

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TP-553-02