PFEIFFER
VACUUM+FAB SOLUTIONS

TORRI

Multi-stage Rotary Lobe Vacuum Pumps
BD 0100 A, BD 0300 A, BD 0600 A, BD 1200 A

Instruction Manual

2000246505 | -0001_en-US | Original instructions

2025/02/19

Table of Contents

1 Safety

Prior to handling the machine, this instruction manual should be read and understood. If anything needs to be clarified, please contact your manufacturer representative.

Read this manual carefully before use and keep for future reference.

This instruction manual remains valid as long as the customer does not change anything on the product.

The machine is intended for industrial use. It must be handled only by technically trained personnel.

Always wear appropriate personal protective equipment in accordance with the local regulations.

The machine has been designed and manufactured in accordance with the state-of-the-art methods. Nevertheless, residual risks may remain, as described in the following chapters and in accordance with the chapter Intended Use.

This instruction manual highlights potential hazards where appropriate. Safety notes and warning messages are tagged with one of the keywords DANGER, WARNING, CAUTION, NOTICE and NOTE as follows:

DANGER

... indicates an imminent dangerous situation that will result in death or serious injuries if not prevented.

WARNING

... indicates a potentially dangerous situation that could result in death or serious injuries.

CAUTION

... indicates a potentially dangerous situation that could result in minor injuries.

NOTICE

... indicates a potentially dangerous situation that could result in damage to property.

NOTE

... indicates helpful tips and recommendations, as well as information for efficient and trouble-free operation.

2 Important Precautions

DANGER

Only qualified personnel is allowed to unload and lift the pump. When elevating the pump, no personnel should be under the object.

DANGER

Add noble gases during process which contains 21% oxygen to prevent fire or explosion.

WARNING

Only a qualified electrician should perform electrical work. Before beginning wiring or maintenance work, make sure to cut and lock out the electrical power.

WARNING

Before removing and cleaning the vacuum or exhaust pipes, use N2 gas to dilute the flammable or toxic material in the piping and keep the toxic material away from the personnel.

WARNING

After installing the piping, perform a leak check to prevent leaks of the flammable, dangerous or toxic gases, and to avoid air getting into the pump.

It will cause improper chemical reactions if gases get into the pump.

WARNING

Before the application of different processes, the pump is requested for overhaul to avoid the interaction of the residuals in the pump.

WARNING

When the temperature is below 0°C the cooling water might damage the pipe due to freezing and expansion. Remove the cooling water from pipe during shutdown, stock, and delivery.

WARNING

Vacuum pump motor with electromagnetic waves, no pacemakers allowed in the vicinity of the pump.

CAUTION

Do not modify the pump or any of its parts without approval of the manufacturer. The manufacturer will stop the warranty or compensation, if the damage to the pump or to the vacuum system is caused by any private modification or replacement.

CAUTION

All the wastes, including vacuum oil, vacuum grease and PC boards, should be properly treated according to the local and national environmental regulations.

CAUTION

As far as temperature is concerned, the pump is suitable for evacuation of a 300 liters tank. The pump is not suitable for continuous duty at a pressure superior or equal than 60 mbar.

The pump is able to handle Argon gas capacity up to 10slm.

The following safety warning label appears on the housing of the pump:

Electric shock caution:

3 Inspection and Transportation

3.1 Pump Specification Checking

Check the specification on the nameplate of the pump and confirm that the pump supplied is according to your purchase.

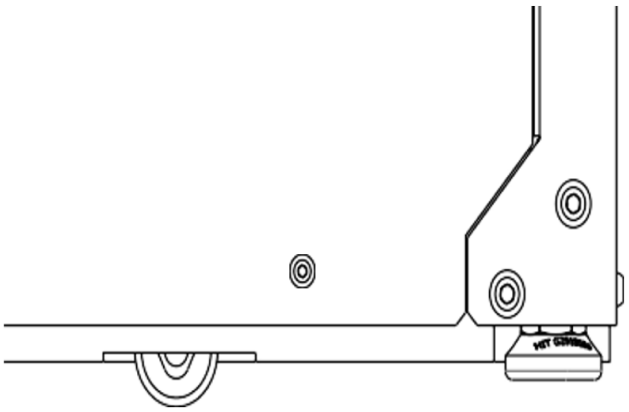
3.2 Accessories Checking

Check if all the parts attached are complete. When there is any damage or when components are missing, please contact us immediately. All the vacuum pumps have attached:

1. Instruction Manual, one copy.
2. One electric power connector (Female).
3. One centering ring for inlet (KF50).
4. One set of quick-connect couplers for cooling water (RC 1/4”).

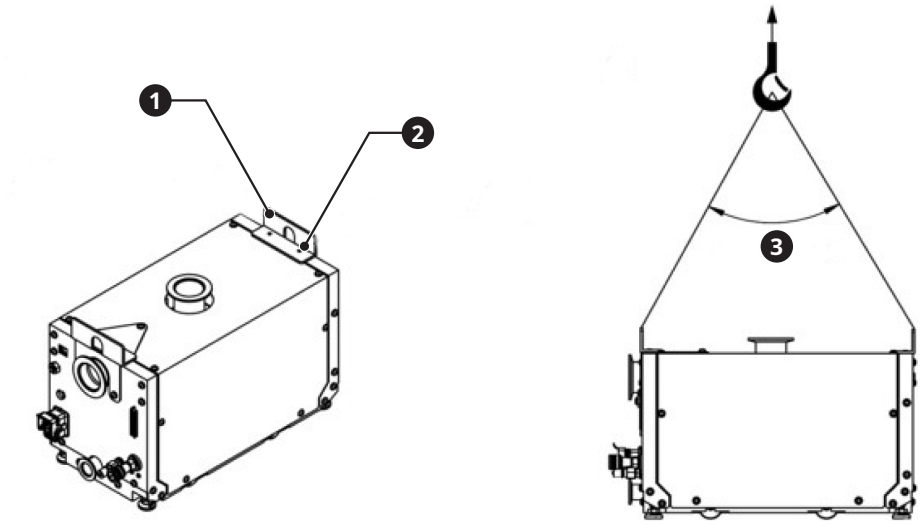
3.3 Attention for Moving the Pump

For a convenient installation, four mobile support units, each consisting of a caster and a height-adjustment foot (shown in the drawing at the right), are attached at the frame of the pump. Before moving the pump, make sure to check the four-adjustment foot are already at their highest positions.



3.4 Instructions for Lifting the Pump

The appropriate way to life the pump is with a hoist. There is a silencer on the bottom of the pump that will be damaged if the pump is lifted from underneath by a forklift truck or other methods that rely on the silencer to support the weight of the pump. (The lifting brackets are included in pump package).



Description			
1	Make sure the direction of installation is correct	2	Hex bolts (M6x12) & Washers
3	60 deg. or less		

4 Quick Installation

4.1 Installation

- Verify that the main supply voltage is correct and that the capacity of the No Fuse Breaker (NFB) and wires in the power supply cabinet meet the requirements in the table below:

	Voltage			
	200~220V		380~415V	
Model	**No Fuse Breaker (NFB)**	**Cable Size (Temperature 105°C)**	**No Fuse Breaker (NFB)**	**Cable Size (Temperature 105°C)**
TORRI BD 0100 A	15A	12AWG	10A	12AWG
TORRI BD 0300 A	20A	12AWG	15A	12AWG
TORRI BD 0600 A	30A	12AWG	20A	12AWG
TORRI BD 1200 A	30A	12AWG	20A	12AWG

1. Lower the adjustable foot on the pump frame until the movable wheels are 3 - 5 mm above the floor, then tighten the M16 nuts to secure the adjustable foot.
2. Check the oil level of the gear box in screw pump and booster pump (if any), the level should be required at 1/2 to 2/3 of the oil sight glass.
3. Connect the vacuum system with the pump.
4. Connect the exhaust system.
5. Connect the cooling water supply.
6. To avoid shock are accidental starting, make sure the NFB in the power supply cabinet is turned off or that the emergency stop button is depressed. Use a power supply cable that conforms with the wire diameter and temperature requirements in the table above, connect the pump to the power supply cabinet.
7. If remote operation via SEMI regulation is planned, set the control mode in the LCD controller to “SEMI” and refer to *Interface Connection* [➔ 31] for input and output signal connections on the Tool Interface Connector, which is item 25 in following drawing: *Pump Module* [➔ 10].

4.2 Start

1. Turn on the cooling water and check piping for water leaks.
2. Turn on the power switch in the pump controller or release the emergency stop button.
3. Ensure the cooling water flow is correct. Higher than minimum 1 L/Min (15°C - 28°C) for TORRI BD 0100 A and minimum 2 l/min (15°C - 28°C) for TORRI BD 0300 A, BD 0600 A & BD 1200 A.
4. When the control mode of the pump is LOCAL, push “START” button to start the pump; and push “STOP” button to stop the pump.
5. Check if operating current is normal or not.
6. After the pump has run for 4 hours, check the temperature of the motor and pump casing is normal or not.

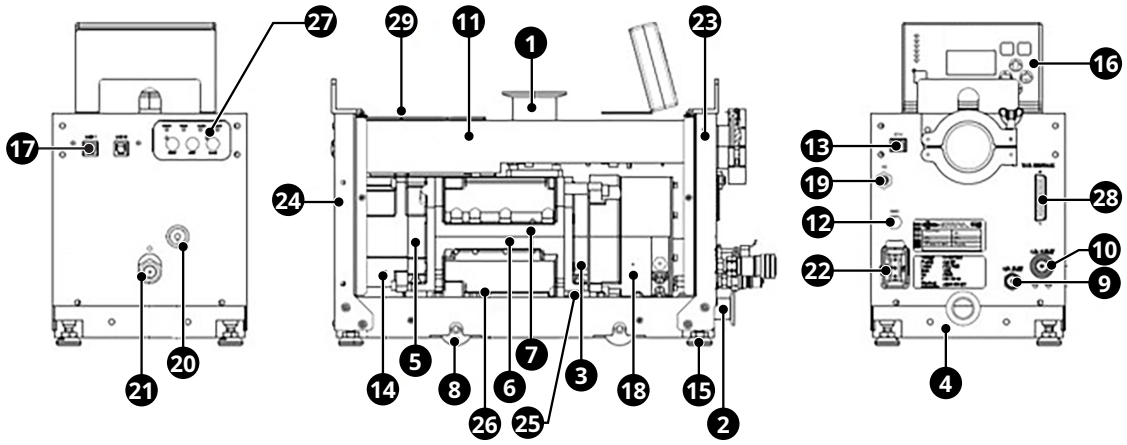
5 Introduction

5.1 Pump Module

TORRI Multi-Roots Vacuum Pumps are Dry Pumps. They all belong to positive- displacement rotary pumps. During operation, the pump rotors do not make contact with each other, eliminating the need for grease lubrication or sealing, and removing any concerns about oil vapor backflow.

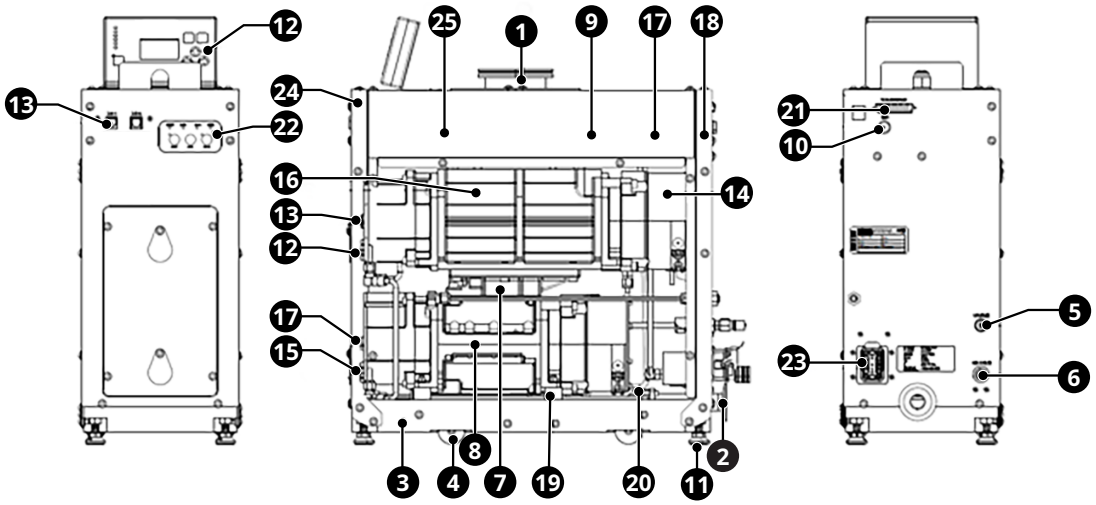
Rotor：5 stages & 2 lobes simple structure bring low power consumption and users can save power consumption costs at the end.

TORRI BD 0100 A configuration diagram and description of each component:



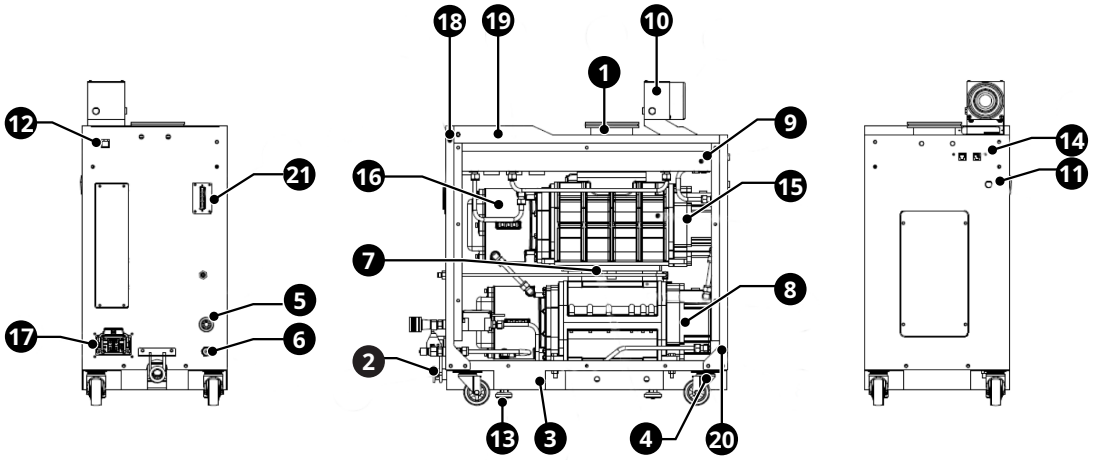
Description			
1	Inlet (NW50)	2	Exhaust (NW25)
3	A-side endplate	4	Base frame
5	B-side endplate	6	Casing (lower)
7	Casing (upper)	8	Caster
9	Cooling water inlet	10	Cooling water outlet
11	Electrical unit	12	Emergency stop switch (planned)
13	Ethernet port	14	Gear box
15	Height-adjustment foot	16	LCD controller
17	LCD controller port	18	Motor (3HP)
19	N2 Port	20	Oil filling plug
21	Oil sight glass	22	Power supply receptacle
23	Pump frame	24	Pump frame
25	Schock-absorbing pad	26	Silencer
27	Simple control panel	28	Tool interface
29	Variable speed drive		

TORRI BD 0300 / 0600 A configuration diagram and description of each component:



Description			
1	Inlet (ISO80)	2	Exhaust (NW25)
3	Base frame	4	Caster
5	Cooling water inlet	6	Cooling water outlet
7	Connector	8	DP (BD 0100)
9	Electrical unit	10	Emergency stop switch port
11	Height-adjustment foot	12	LCD controller
13	LCD controller port	14	Motor (3HP)
15	Oil level indicator	16	Oil sight glass
17	Plug	18	Pump frame
19	Schock-absorbing pad	20	Silencer
21	Semi port	22	Simple control panel
23	Power supply receptacle	24	Pump frame
25	Variable speed drive		

TORRI BD 1200 A configuration diagram and description of each component:

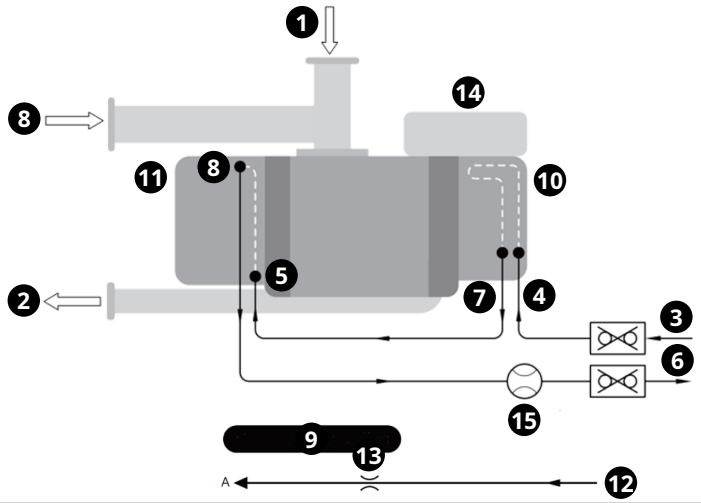


Description			
1	Inlet (ISO100)	2	Exhaust (NW25)
3	Based frame	4	Caster
5	Cooling water inlet	6	Cooling water outlet
7	Connector	8	DP
9	Electrical unit	10	EMO
11	EMO port	12	Ethernet port
13	Height-adjustment foot	14	LCD controller port
15	MB	16	Motor
17	Power supply receptacle	18	Pump frame
19	Pump frame	20	Pump frame
21	Semi port		

5.2 Cooling Water Piping System

TORRI BD 0100 A cooling water system as below:

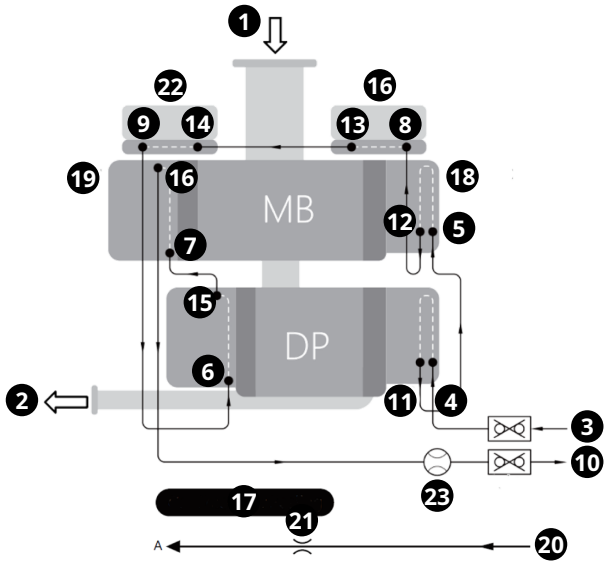
From Cooling water inlet (1) →to Gear box & Variable speed drive (2 - 3) → Cooling water motor (4 - 5) → Water flow meter (6) → Cooling water outlet (7).



Description			
1	Gas inlet	2	Gas outlet
3	Cooling water inlet	4	Cooling water inlet of Gear Box
5	Cooling water inlet of Motor	6	Cooling water outlet
7	Cooling water outlet of Gear Box	8	Cooling water outlet of Motor
9	Gas Line A for Sealing	10	Gear box
11	Motor	12	N2 Inlet
13	Orifice	14	Variable speed drive
15	Water flow meter		

TORRI BD 0300 / 0600 A cooling water system as below:

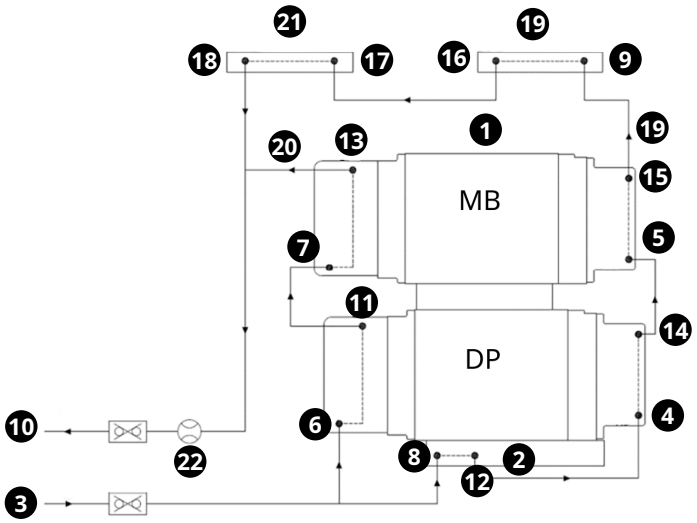
From Cooling water inlet (1) → to Gear Box of DP & MB (2 – 3 – 4 - 5) →to Variable speed drive (6 – 7 – 8 - 9) → to Motor (10 – 11 – 12 - 13) → to Water flow meter (14) → to Cooling water outlet (15).



Description			
1	Gas inlet	2	Gas outlet
3	Cooling water inlet	4	Cooling water inlet of Gear Box (DP)
5	Cooling water inlet of Gear Box (MB)	6	Cooling water inlet of Motor (DP)
7	Cooling water inlet of Motor (MB)	8	Cooling water inlet of Variable speed drive (DP)
9	Cooling water inlet of Variable speed drive (MB)	10	Cooling water outlet
11	Cooling water outlet of Gear Box (DP)	12	Cooling water outlet of Gear Box (MB)
13	Cooling water outlet of Variable speed drive (DP)	14	Cooling water outlet of Variable speed drive (MB)
15	Cooling water outlet of Motor (DP)	16	Cooling water outlet of Motor (MB)
17	Gas Line A for Sealing	18	Gear box
19	Motor	20	N2 Inlet
21	Orifice	22	Variable speed drive
23	Water flow meter		

TORRI BD 1200 A cooling water system as below:

From Cooling water inlet (1) separate → to Motor of DP & MB (2 - 4 - 6 - 8) → to outlet (16), another path to silencer (3 - 5) → to Gear box (7 - 9 - 10 - 11) → to VSD (12 - 13 - 14 - 15) → to outlet (16).



Description			
1	Gas inlet	2	Gas Outline
3	Cooling water inlet	4	Cooling water inlet of Gear Box (DP)
5	Cooling water inlet of Gear Box (MB)	6	Cooling water inlet of Motor (DP)
7	Cooling water inlet of Motor (MB)	8	Cooling water inlet of Silencer
9	Cooling water inlet of Variable speed drive (MB)	10	Cooling water outlet
11	Cooling water outlet of Motor (DP)	12	Cooling water outlet of Silencer
13	Cooling water outlet of Motor (MB)	14	Cooling water outlet of Gear Box (DP)
15	Cooling water outlet of Gear Box (MB)	16	Cooling water outlet of Variable speed drive (MB)
17	Cooling water inlet of Variable speed drive (DP)	18	Cooling water outlet of Variable speed drive (DP)
19	Gear Box	20	Motor
21	Variable speed drive	22	Water flow meter

Piping and quick connector are both stainless steel, so there is no cooling water pollution issue. The system will send a warning action or alarm action for insufficient water flow.

To prevent the flow meter from malfunctioning due to external contamination, when the pump casing or motor temperature is normal, the system will send a warning message for insufficient water flow.

When the pump casing or motor temperature is higher than default setting value, the alarm action of insufficient water flow will be generated.

When the cooling water flow is insufficient, but the pump temperature is normal, choose direct protection action by parameter setting (see *LCD Control Panel* [➔ 38]).

If the cooling water valve is equipped, please refer to the Other Setup - Cooling Water Delay Time (see *Control Panel Operating Flowchart* [➔ 39]). When the pump is turned off for some time, close the water valve.

When the ambient temperature is below 0°C and the pump is not in operation, to prevent the cooling water from freezing and causing pipe cracks. Remove the quick connector and apply high- pressure air into the pipe to remove the residual water.

Default setting protection action parameter:

Issue		Water Flow		
		Normal	Warning	Alarm
(Motor or Casing) Temperature	Normal	Pump Running	Pump Running	STOP
	Warning	Pump Running	Pump Running	STOP
	Alarm	STOP	Pump Running	STOP

5.3 Control System

The control system for TORRI Multi-Roots vacuum pumps consists of variable speed drive and controller. It also can monitor and record the operating status of the pump. It has an LCD controller (option), Modbus TCP network port and Ethernet port. The protection provided by the control system has two levels: Warning and Alarm.

When a warning message appears, the pump will not shut down. When an alarm message appears, the pump will shut down immediately. With the monitoring of the control system, the user can know the pump operating status, can do the maintenance in advance of a real breakdown, and can prevent a sudden shutdown of the pump. The record message of “Warning” and “Alarm” can be available for the user to do checking and find out the problem of the shutdown.

The LCD controller indicates the parameter setting, the indication of operating status, the warning and alarm messages, starting or stopping the pump. The Ethernet port can provide the remote operation with external signals and can start or stop the pump. In addition, the Modbus TCP network port is also available for a monitoring by a PC.

6 Technical Data

6.1 Technical Specification List

			TORRI BD 0100 A
Nominal pumping speed		l/min	1667
		m^3/h	100
		ACFM	58.9
Ultimate pressure		TORR	0.0075
		hPa (mbar)	0.01
		Pa	1
Canned motor	Nominal motor frequency backing pump	Hz	183.3
	Operating voltage	V	220 +/- 10% / 380 +/- 10%
	Nominal motor rating backing pump	kW	2.2
	Supply current	A (V)	11 (220) / 6.3 (380)
Gas inlet			DN 50 KF
Gas outlet			DN 25 KF
Cooling water max. pressure		kg/cm^2 (PSI)	4.0 (57)
Cooling water pressure differential		kg/cm^2 (PSI)	1.0 (14)
Cooling water min. flow		l/min	> 1.0
Cooling water temperature		°C (°F)	15 - 28 (59 - 82.4)
Cooling water connection			RC 1/4"
Dimensions (L x W x H)		mm (inches)	450 x 230 x 275 (18 x 9 x 11)
Weight approx.		kg (Lbs.)	60 (132)
Sound pressure level (ISO 2151), KpA = 3 dB *		dB(A)	<55
Leak rate max.		mbar·L/s	1×10^{-5}
Ambient temperature		°C (°F)	5 ... 40 (41 ...104)
Operation moisture		RH	90%
Oil type			Busch YLC 250 B
Oil capacity **		l	0.1

***** The noise varies depending on the installation. When there are walls or objects that may reflect noise, the noise may be higher than the standard.

****** The amount of oil is based on the oil level of the oil indicator 1/2 to 2/3.

			TORRI BD 0300 A
Nominal pumping speed		l/min	5000
		m^3/h	300
		ACFM	176.6
Ultimate pressure		TORR	0.00075
		hPa (mbar)	0.001
		Pa	0.1
Canned motor	Nominal motor frequency booster pump	Hz	110
	Nominal motor frequency backing pump	Hz	183.3
	Operating voltage	V	220 +/- 10% / 380 +/- 10%
	Nominal motor rating vacuum booster	kW	2.2
	Nominal motor rating backing pump	kW	2.2
	Supply current	A (V)	11 (220) / 6.3 (380)
Gas inlet			DN 80 KF
Gas outlet			DN 25 KF
Cooling water max. pressure		kg/cm^2 (PSI)	4.0 (57)
Cooling water pressure differential		kg/cm^2 (PSI)	1.0 (14)
Cooling water min. flow		l/min	> 2.0
Cooling water temperature		°C (°F)	15 - 28 (59 - 82.4)
Cooling water connection			RC 1/4"
Dimensions (L x W x H)		mm (inches)	520 x 230 x 530 (20.9 x 9.1 20.5)
Weight approx.		kg (Lbs.)	125 (275)
Sound pressure level (ISO 2151), KpA = 3 dB *		dB(A)	<55
Leak rate max.		mbar·L/s	1×10^{-5}
Ambient temperature		°C (°F)	5 ... 40 (41 ...104)
Operation moisture		RH	90%
Oil type			Busch YLC 250 B
Oil capacity **		l	0.1 / 0.1

***** The noise varies depending on the installation. When there are walls or objects that may reflect noise, the noise may be higher than the standard.

****** The amount of oil is based on the oil level of the oil indicator 1/2 to 2/3.

			TORRI BD 0600 A
Nominal pumping speed		l/min	10000
		m^3/h	600
		ACFM	353.1
Ultimate pressure		TORR	0.00075
		hPa (mbar)	0.001
		Pa	0.1
Canned motor	Nominal motor frequency booster pump	Hz	233.3
	Nominal motor frequency backing pump	Hz	183.3
	Operating voltage	V	220 +/- 10% / 380 +/- 10%
	Nominal motor rating vacuum booster	kW	2.2
	Nominal motor rating backing pump	kW	2.2
	Supply current	A (V)	11 (220) / 6.3 (380)
Gas inlet			DN 80 KF
Gas outlet			DN 25 KF
Cooling water max. pressure		kg/cm^2 (PSI)	4.0 (57)
Cooling water pressure differential		kg/cm^2 (PSI)	1.0 (14)
Cooling water min. flow		l/min	> 2.0
Cooling water temperature		°C (°F)	15 - 28 (59 - 82.4)
Cooling water connection			RC 1/4"
Dimensions (L x W x H)		mm (inches)	520 x 230 x 530 (20.9 x 9.1 20.5)
Weight approx.		kg (Lbs.)	125 (275)
Sound pressure level (ISO 2151), KpA = 3 dB *		dB(A)	<55
Leak rate max.		mbar·L/s	1×10^{-5}
Ambient temperature		°C (°F)	5 ... 40 (41 ...104)
Operation moisture		RH	90%
Oil type			Busch YLC 250 B
Oil capacity **		l	0.1 / 0.1

***** The noise varies depending on the installation. When there are walls or objects that may reflect noise, the noise may be higher than the standard.

****** The amount of oil is based on the oil level of the oil indicator 1/2 to 2/3.

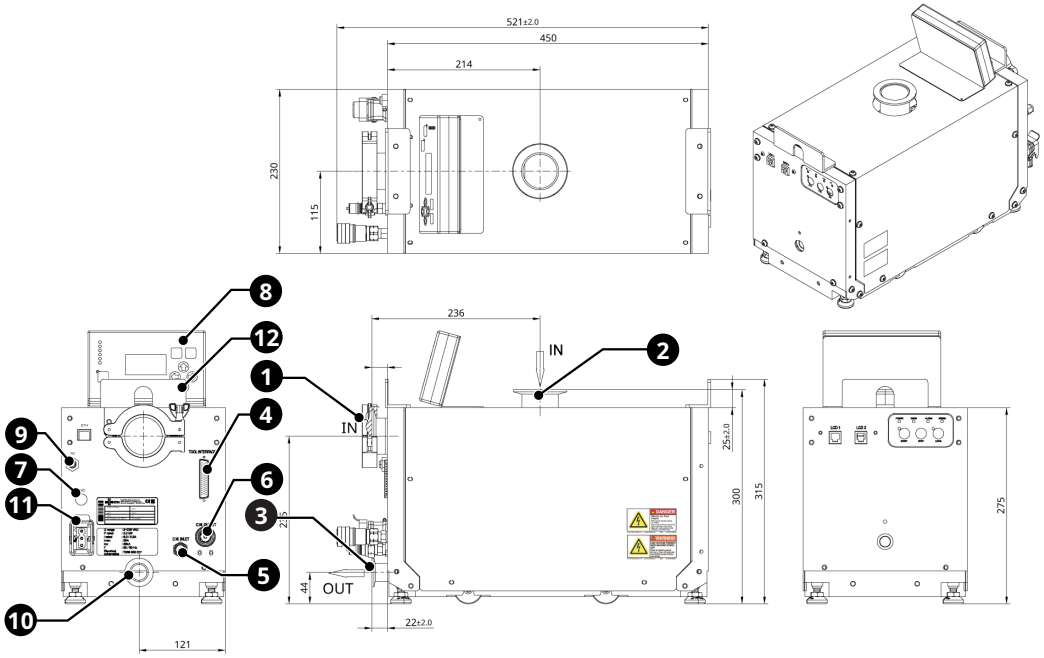
			TORRI BD 1200 A (available soon)
Nominal pumping speed		l/min	20000
		m^3/h	1200
		ACFM	706.2
Ultimate pressure		TORR	0.00075
		hPa (mbar)	0.001
		Pa	0.1
Canned motor	Nominal motor frequency booster pump	Hz	500
	Nominal motor frequency backing pump	Hz	333.0
	Operating voltage	V	220 +/- 10% / 380 +/- 10%
	Nominal motor rating vacuum booster	kW	3.75
	Nominal motor rating backing pump	kW	3.75
	Supply current	A (V)	11 (220) / 6.3 (380)
Gas inlet			DN 100 KF
Gas outlet			DN 25 KF
Cooling water max. pressure		kg/cm^2 (PSI)	4.0 (57)
Cooling water pressure differential		kg/cm^2 (PSI)	1.0 (14)
Cooling water min. flow		l/min	> 2.0
Cooling water temperature		°C (°F)	15 - 28 (59 - 82.4)
Cooling water connection			RC 1/4"
Dimensions (L x W x H)		mm (inches)	684 x 350 x 676 (26.9 x 13.8 x 26.6)
Weight approx.		kg (Lbs.)	250 (550)
Sound pressure level (ISO 2151), KpA = 3 dB *		dB(A)	<55
Leak rate max.		mbar·L/s	1×10^{-5}
Ambient temperature		°C (°F)	5 ... 40 (41 ...104)
Operation moisture		RH	90%
Oil type			Busch YLC 250 B
Oil capacity **		l	0.16 / 0.16

***** The noise varies depending on the installation. When there are walls or objects that may reflect noise, the noise may be higher than the standard.

****** The amount of oil is based on the oil level of the oil indicator 1/2 to 2/3.

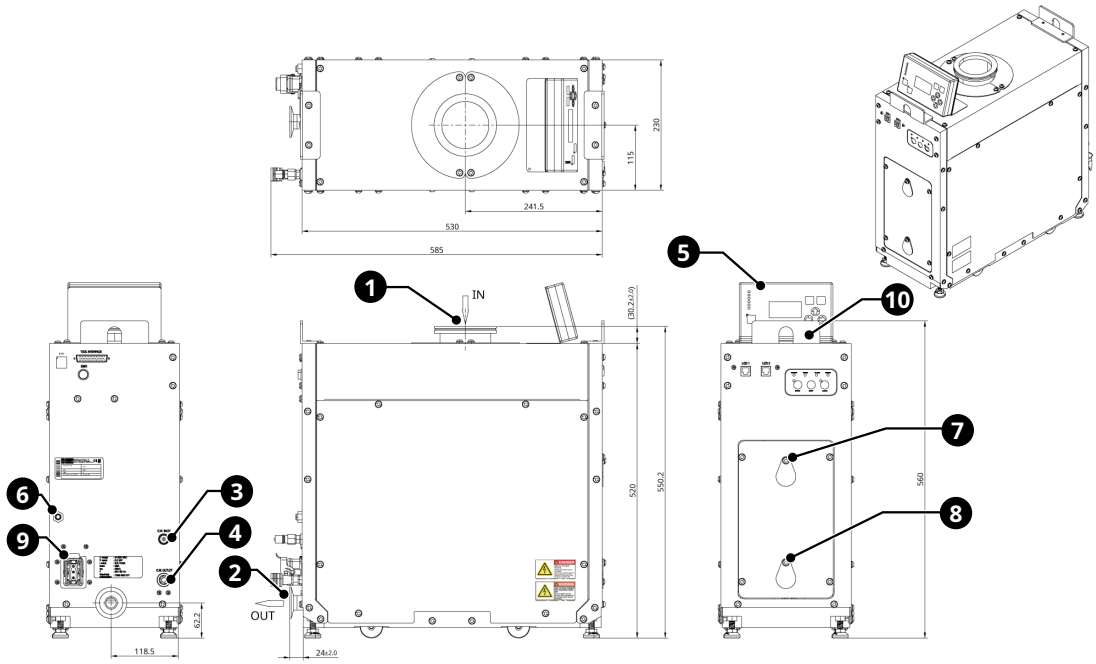
6.2 Dimensions

TORRI BD 0100 A



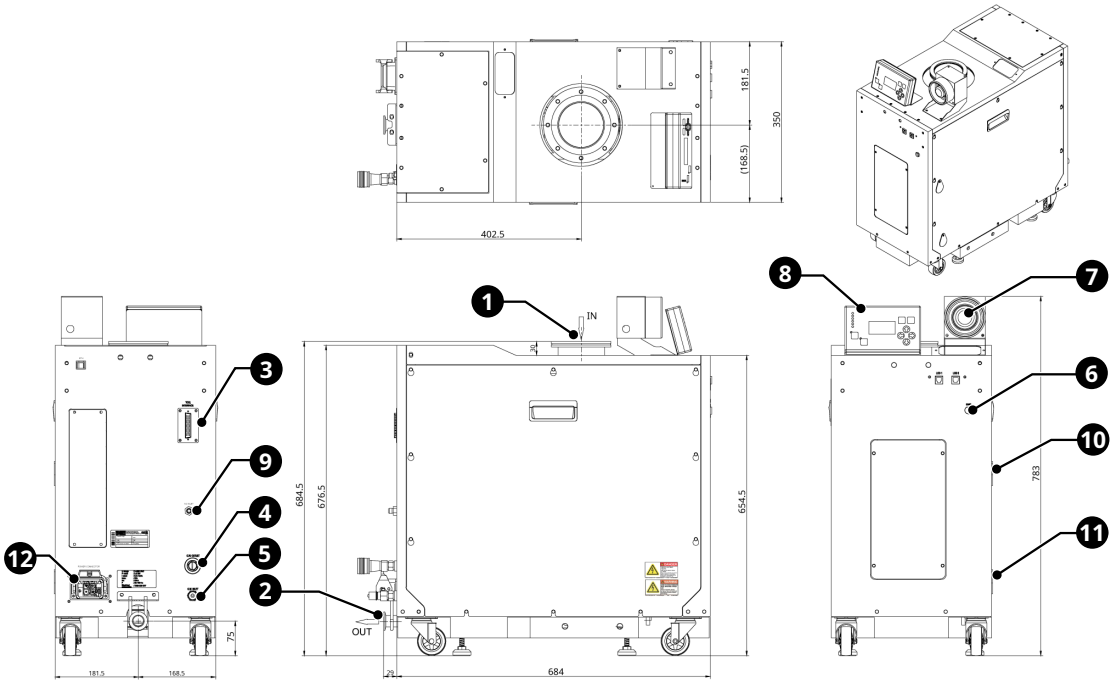
Description			
1	*Inlet (Horizontal) DN50 ISO-KF	2	Inlet (Vertical) DN50 ISO-KF
3	OUT	4	AMP adapter (D-sub 50P)
5	Cooling water inlet (1/4")	6	Cooling water outlet (1.4")
7	EMO post	8	Hand pad
9	Nitrogen inlet (1/4")	10	Outlet DN 25 ISO-KF
11	Power connector	12	System lifting bracket

TORRI BD 0600 A



Description			
1	Inlet (Vertical) DN80 ISO-K	2	Outlet DN40 ISO-K
3	Cooling water inlet (1/4")	4	Cooling water outlet (1/4")
5	Hand pad	6	Nitrogen inlet (1/4")
7	Oil sight glass	8	Oil sight glass
9	Power connector	10	System lifting bracket

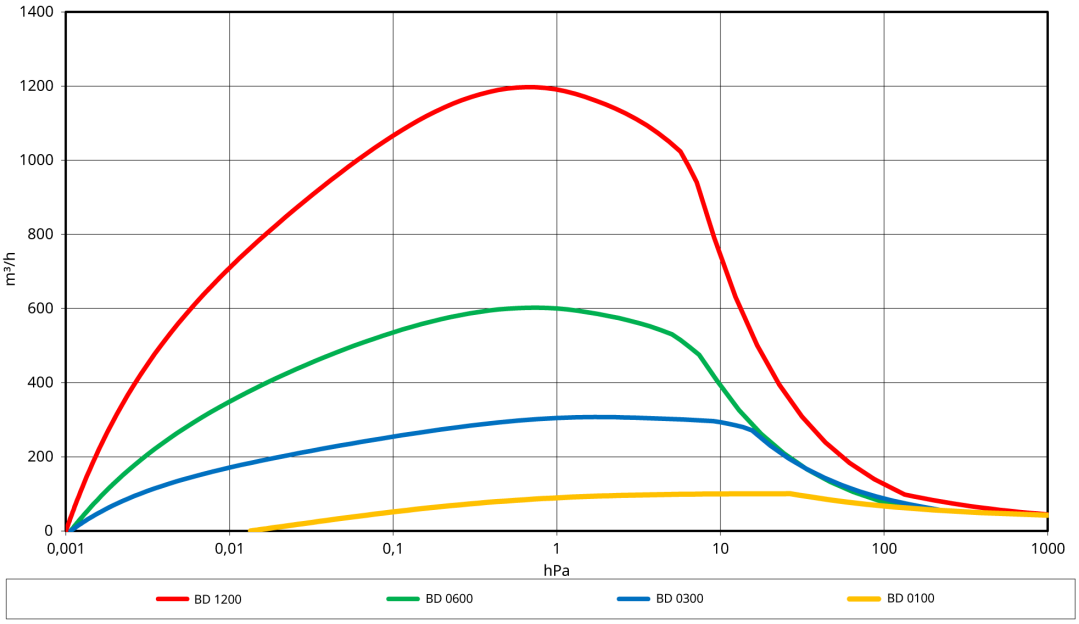
TORRI BD 1200 A



Description			
1	Inlet (Vertical) DN100 ISO-K	2	Outlet DN25 ISO-K
3	AMP adapter (D-sub 50P)	4	Cooling water inlet (1/4")
5	Cooling water outlet (1/4")	6	EMO port
7	EMO button	8	Hand pad
9	Nitrogen inlet (1/4")	10	Oil sight glass
11	Oil sight glass	12	Power connector (Harting Han 40A)

6.3 Pumping Speed Curves

TORRI BD Series Pumping Capacity Curves



7 Installation

7.1 Notes

WARNING

Before installing and using this pump, please read this manual carefully and operate according to the explanation in the content, to prevent a hazard and damage to the pump.

CAUTION

Be careful not to overturn the pump when pushing or pulling the pump sideways.

Attention for Electrical Safety

1. Make sure that the grounding wire is connected, and that the grounding function meets the electric rules.
2. Every pump must be connected to the power supply with a power cable and the connector provided with the pump respectively. The wire size must match the power consumption of the pump.
3. Make sure the power supply voltage is correct; and the rated current of the NFB in user's facility meets the Table values below:

Recommended NFB Rated Current:

	Voltage			
	200~220V		380~415V	
Model	**No Fuse Breaker (NFB)**	**Cable Size (Temperature 105°C)**	**No Fuse Breaker (NFB)**	**Cable Size (Temperature 105°C)**
TORRI BD 0100 A	15A	12AWG	10A	12AWG
TORRI BD 0300 A	20A	12AWG	15A	12AWG
TORRI BD 0600 A	30A	12AWG	20A	12AWG
TORRI BD 1200 A	30A	12AWG	20A	12AWG

7.2 Environment and Location

Environment Requirements

1. The vacuum pump is designed for indoor installation, with a good ventilation and sufficient illumination; is not designed for indoor installation in a place which is highly polluted, very humid, full of corrosive gases, metal dust, with a direct sun shining and getting soaked easily by the rain.
2. The temperature of the environment for installing the pump must not exceed 40 ℃, and the installing site must be away far enough from boilers and any other equipment that would be heat-transpiring.
3. The space on top and around the pump must be kept over 900 mm, min. for maintenance purpose.
4. Ensure good ventilation in the indoor installation area to prevent the interference with the machine's heat dissipation. Carefully consider the placement of the vacuum pump.
5. Luminance must be higher than 300 lux.

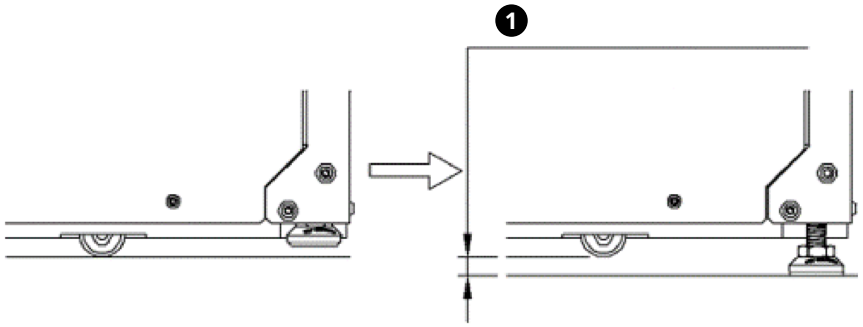
Location Requirements

- The pump must be installed on the floor which can stand the weight of the pump. A shock-absorbing pad must be used between the frame of the pump and the floor for a better ground holding and less impact of the floor vibration.

Adjusting Height of Pump

- Set he adjustment foot on the pump frame until the moveable wheels are 3-5 mm away from the ground; then tighten the M16 nuts to fix the pump.

Foot and Caster Adjustment



Description			
1	approx. 3-5 mm / max. 10 mm		

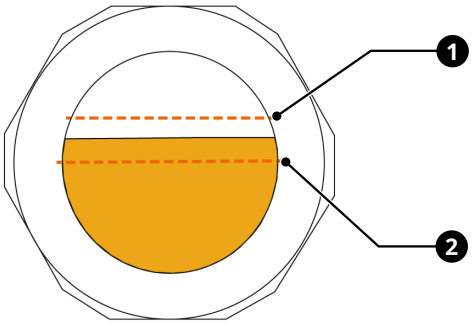
7.3 Oil Level Inspection

CAUTION

The oil level must be checked monthly at least; the vacuum oil must be regularly changed every year or half a year, depending on the process application. When filling the vacuum oil, make sure that the pump is switched off.

The oil level in the gear box of the vacuum pump must be higher than 1/2 ~ 2/3 of the oil indicator, refer to the drawing below. If under 1/2 of the oil indicator, new vacuum oil must be re- supplied. Please refer to *Maintenance* [➔ 45].

Oil Level Sight Glass



Description			
1	High Level	2	Low Level

7.4 Piping

7.4.1 Vacuum and Exhaust Piping

WARNING

Check for leaks after installing the pump. A leak may cause dangerous discharge of hazardous substances or unpredictable reactions with air admitted into the pump.

WARNING

The exhaust pipes of the pump must be connected properly with an exhaust gas treatment equipment to avoid the leakage of toxic or dangerous gases.

CAUTION

Open the valve on the exhaust piping before starting the pump. If an exhaust gas scrubber is installed on the system, open its inlet and outlet valves. Operating pump with these valves closed will pressurize the exhaust and overload the pump.

Connection for Vacuum System

Apply following rules when connecting the vacuum pump and the vacuum system:

1. For the deepest vacuum and best pumping speed, use the shortest possible pipe and as less elbows as possible. Select pipe diameters with sufficient diameter to minimize losses in the pressure range of your process without unnecessarily increasing pumped volume for systems like load lock that cycle. A bellows between the fore line and the pump inlet is recommended to reduce stress and vibration in the pipe work.
2. The supports should be, as much as possible, installed under the vacuum pipelines; to avoid shear strength at the joints of the pipelines, and possible resulting leakages.

Connection for Exhaust System

For connecting pump and the exhaust system, observe the following:

1. When there is high pressure from the exhaust system, check if the silencer of the vacuum pump and the exhaust pipes for the facilities are blocked or not.
2. A bellows or braided bellows should be installed between the exhaust connection of the pump and the exhaust pipeline to reduce vibration and stress in the pipe work. Centering rings with a second metal ring outside the O-ring are strongly recommended for all exhaust line and pump exhaust connections. This metal ring captures the O-ring to prevent it from deforming and letting gas escape if the pressure in the exhaust line increases.
3. When using explosive, corrosive, or toxic gas for the process, the pump exhaust system must not contact the atmosphere.

A leak check must be performed after the installation of the vacuum pump or when leakage occurs. When proceeding with the leak check for the vacuum pump or the vacuum system, make sure to check any emission of gas (moisture, residual of organic solvent) which will cause virtual leaks of the vacuum system. The recommended maximum leak rate value for a Helium leakage test or other test procedures of test is $1x10^{-5}$ mbar·l/s.

7.4.2 Cooling Water Piping

CAUTION

Never stop the cooling water supply during the pump operation, otherwise, the components of the pump will be over-heating and damaged.

After the pump is stopped, keep cooling down the pump with the cooling water for more than ten minutes; after that, stop the cooling water supply.

WARNING

After the power supply switch is turned on, do not pull off the cooling pipelines inside the pump:

Risk of spill out of cooling water!

Risk of short circuit!

Risk of electrical shock!

The water ports are quick-connect couplers (RC1/4”), and the maximum admissible pressure is 4 kg/cm^2 (57 PSI). The water flow meter is installed inside the pump for a monitoring and protection purpose. Please refer to chapter 4 for settings. The operating steps are as follows.

1. According to the directions of water inlet and outlet from the pump, connect the male and female quick joints to the rear panel.
2. Supply the cooling water and check any leakage from the joints and the pipelines.
3. Check, with the LCD controller, if the water flow is over the minimum flow rate required. If not, increase the flow.
4. Do not connect pump cooling water loops in series. Select piping to ensure sufficient flow through each pump.
5. If a cooling water valve is installed, set the delay time to close the valve in the control panel.

7.5 Electrical Connection

1. Refer to the CNS 9829/C1118 national standards to select appropriate specifications for the main power supply cable, grounding wire, and no-fuse breaker (NFB) to ensure electrical safety.
2. The voltage for the power supply must be kept within ±10% of the rating voltage.
3. The voltage unbalance must be kept within 10%.
4. The input power frequency must be kept within ±5% of the rating frequency.
5. The system succeeded the SEMI F47-0812R. It will be kept running when the input voltage in accordance with standard. The system can carry out an automatic recovery run within 1 second of voltage interruption.
6. The variable speed drive and power supply of the system succeeded the harmonic test according to the IEC 61000-3-2 Class A standard.

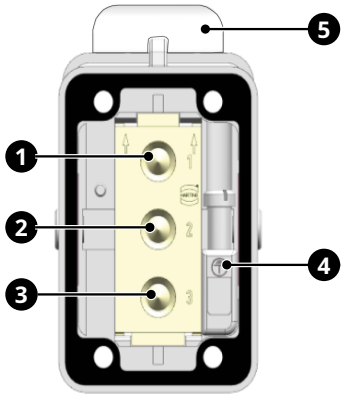
7.5.1 Power Supply Connection

WARNING

The vacuum pump power supply wiring must follow the instructions below, otherwise it will cause major damage to the pump unit and the motor parts of the major damage.

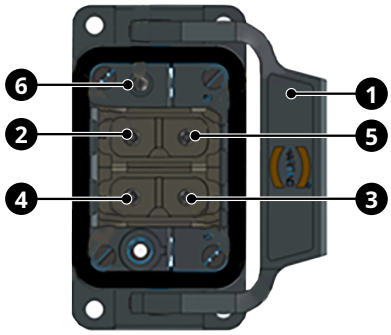
Description	Mating connector description / external supply rating
Mains connection	Han® C module: 40A; 2.5 - 8 mm²

Power connector pin assignments TORRI BD 0100-0300-0600 A (Supply socket)



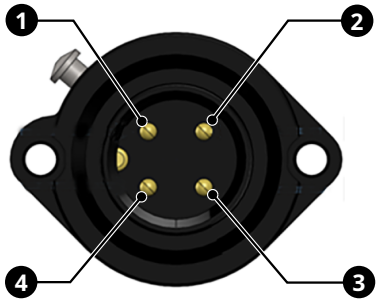
Description			
1	Phase L1	2	Phase L2
3	Phase L3	4	Ground
5	Lock		

Power connector pin assignments TORRI BD 1200 A (Supply socket)



Description			
1	Lock	2	Not connected (Pin B2)
3	Phase 1 (Pin A1)	4	Phase 2 (Pin A2)
5	Phase 3 (Pin B1)	6	Protective Earth

AMP-4P Power supply socket (Option)

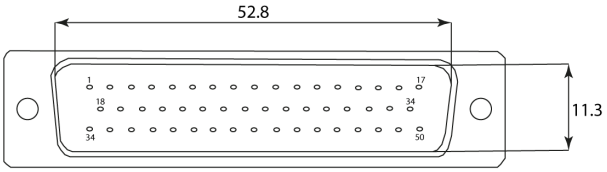


Description			
1	Phase 1	2	Phase 2
3	Phase 3	4	Protective Earth (PE)

7.5.2 Interface Connection

According to the semiconductor industrial standard E73-0299, the vacuum pump has one set of 50-Pin Female D-sub connector for connecting with the process equipment (see Drawings below). The functions and pin assignments are shown in the *“Table Pin Assignment for Interface Connector”* [➔ 31] bel ow. Please refer to *"Pump Start & Stop sequence"* [➔ 33] and *"Process on Signal Sequence"* [➔ 34] for sequence and “Interface circuit diagram and connection method” for wiring.

Interface Connector



AMP 16-Pin Interface Connector (Option)

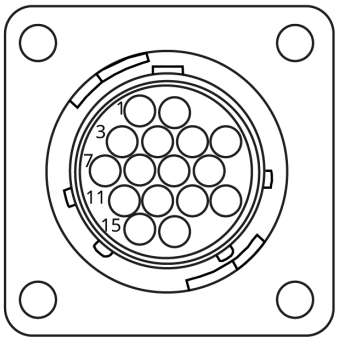


Table Pin Assignment for Interface Connector

Pin no	Purpose	Sign in	Signal Type
1	Alarm status	OUT (type D)	Open (when Alarm)
2	Alarm status		
3	Warning status	OUT (type D)	Open (when Warning)
4	Warning status		
5	DP start/stop status	OUT (type D)	Close (when DP starts)
6	DP start/stop status		
7	MB start/stop status	OUT (type D)	Close (when MB starts)
8	MB start/stop status		
9	Pump ready status	OUT (type D)	Close (when pump ready)
10	Pump ready status		
13	MB full speed reached	OUT (type D)	Close (when reached)
14	MB full speed reached		
15	Remote/Local Status (+)	OUT (type C)	Close (when Remote)
16	Remote/Local Status (-)		
17	Remote Start Pump (+)	IN (type B)	Close (DP will start)
18	Remote Start Pump (-)		
21	Process ON (+)	IN (type B)	Close (Pump will full speed)
22	Process ON (-)		

Pin no	Purpose	Sign in	Signal Type
37	Remote Start Pump	IN (type A)	Close (DP will start)
38	Remote Start Pump		
39	EMO	OUT	Open (When triggered EMO)
40	EMO		
41	Process ON	IN (type A)	Close (Pump will full speed)
42	Process ON		

For output signal: There are 5 sets of dry contact. Refer to *"Process on Signal Sequence"* [➔ 34] below. Observe the contact rating when using it.

For input signal: Pin 37 and Pin 38 are connected by dry contact or open collector to control pump start or stop.

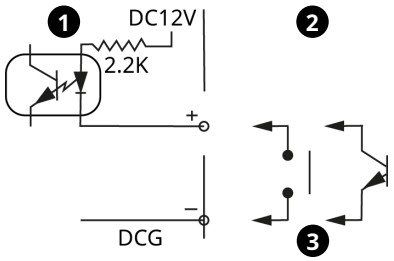
Pin 41 and Pin 42 are connected by dry contact or open collector, which can control process on signal to pump start.

As shown in the *"Pump Start & Stop Sequence"* [➔ 33] below. T is the time delay and wait for the pressure switch to actuate.

Note: The control mode of the pump must be in the SEMI mode. Check the setting in the LCD controller.

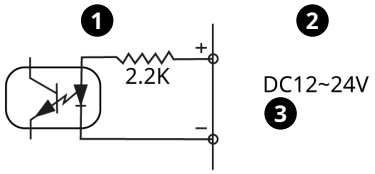
Signal Types

Input (Type A)



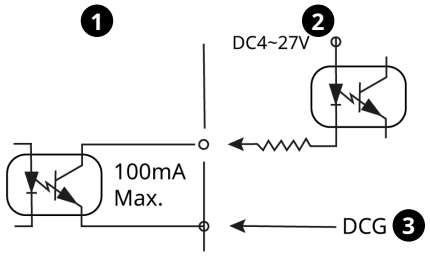
Description			
1	Inside Pump	2	Customer Side
3	For Example		

Input (Type B)



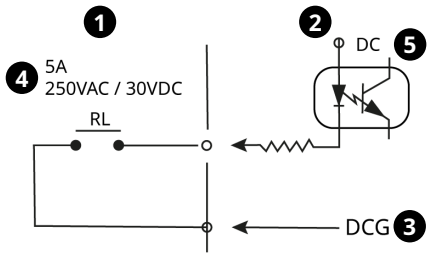
Description			
1	Inside Pump	2	Customer Side
3	Input		

Output (Type C)



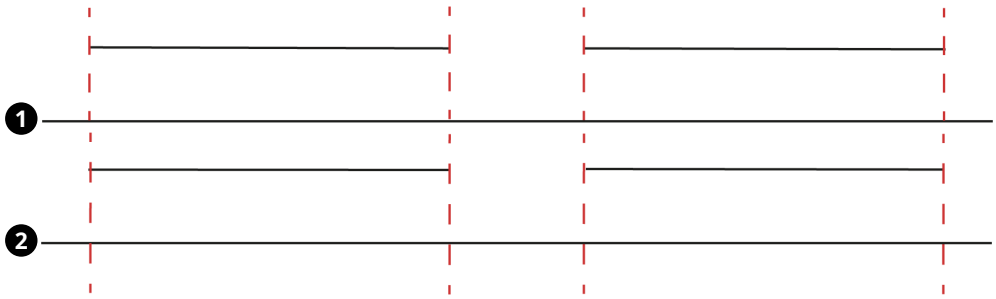
Description			
1	Inside Pump	2	Customer Side
3	For Example		

Output (Type D)



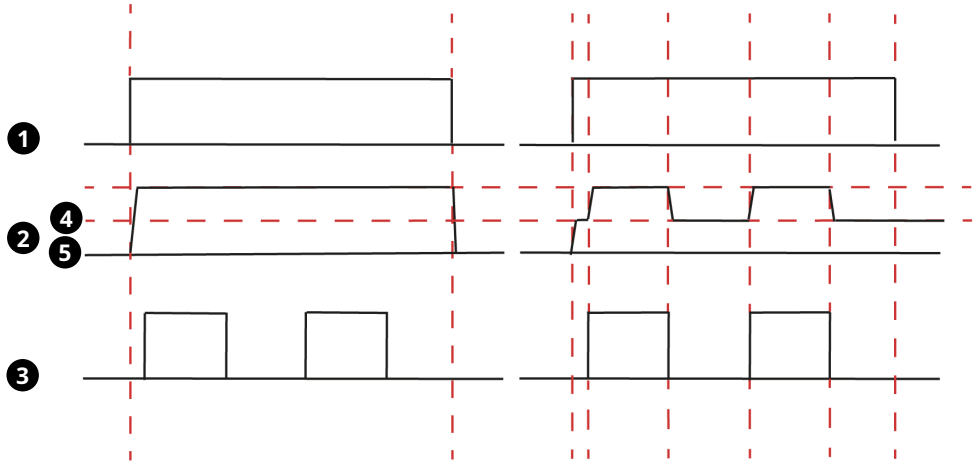
Description			
1	Inside Pump	2	Customer Side
3	For Example	4	Rating
5	Voltage		

Pump Start & Stop Sequence



Description			
1	Remote Start Pump (Pin 37, Pin 38)	2	DP Start / Stop Status (Pin 5, Pin 6)

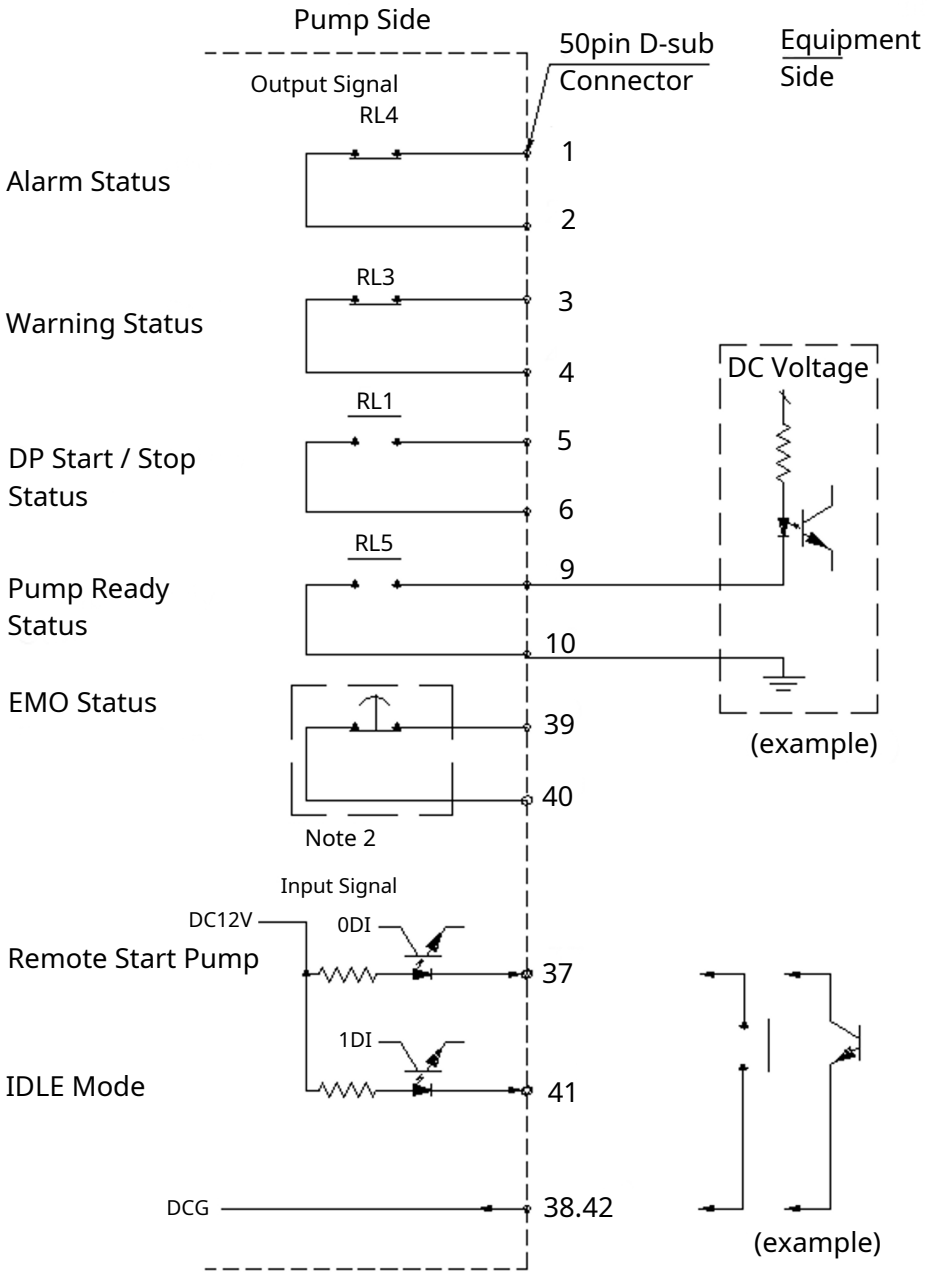
Process on Signal Sequence



Description			
1	Remote Start Pump (Pin 37, Pin 38)	2	Pump Speed
3	Process ON (Pin 41, Pin 42)	4	Full Speed
5	IDLE Speed		

Interface Circuit Diagram and Connection Method

Interface signal



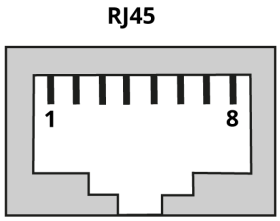
Note 1: The rating of the relay contacts RL1 ~ RL5 is 5A 250VAC / 30VDC.

Note 2: EMO Status (pin 39,40) will be functioned when the pump equips with: SEMI S2 BO" (Planned).

7.5.3 Modbus TCP Interface Port

Pump can provide Modbus TCP communication interface; it connects to the equipment through the Ethernet port to read the operating status of the pump. The port is the standard RJ45 connector. Contact the manufacturer for the communication protocol.

RJ45 Interface Port

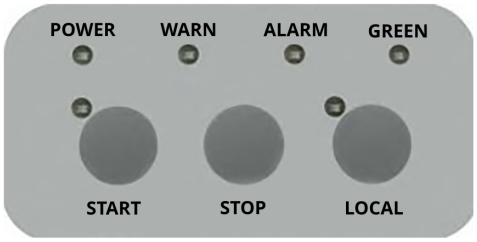


Pin	Signal
1	Tx+
2	Tx-
3	Rx+
4	Rx-

8 Operation

8.1 Simple Control Panel

The pump front frame is equipped with a control panel, it provides simple operation and display of the pump status. The buttons and LED functions are described as follows:



LED Indicator

- POWER (Green): Lighting when system is powered.
- ALARM (Red): Flashing when pump is in Alarm status.
- WARNING (Orange): Flashing when pump is in Warning status.
- GREEN (Green): Lighting when the IDLE model is start.

Button

- START (Green): Start pump will light after pump starting.
- STOP: Stop pump.
- LOCAL (Green): Press about 5 sec, light goes on. Gained the control right. The START and STOP buttons are valid.

Press about 5 sec again, the light goes off, the START and STOP buttons have no

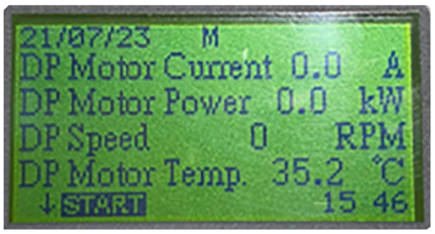
effect, which can prevent people from touching the buttons by mistake.

8.2 MMI Controller Port

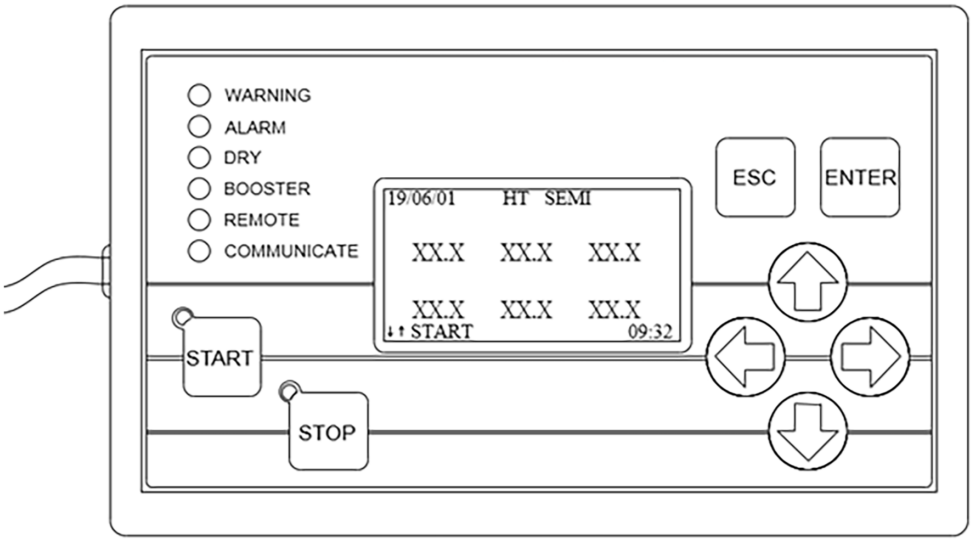
When MMI controller is plugged into the port (RJ45), it will load the parameter setting of pump, shown as below:

MMI parameter loading screen

MMI screen



8.3 LCD Control Panel



LED Indicator

- WARNING (Orange): Flashing when pump is in Warning status.
- ALARM (Red): Flashing when pump is in Alarm status.
- DRY (Green): Lighting when the Dry pump is running.
- BOOSTER (Green): Lighting when the Booster pump is running.
- REMOTE (Green): Flashing when pump is in Remote mode.
- COMMUNICATE (Green): Flashing when data is in communicated.

Button

- START (Green): Start pump, will light after pump starting.
- STOP (Red): Stop pump, will light after pump stopping. Stop the Buzzer.
- ESC: Back to last page, Cancel Warning and Alarm status.
- ENTER: Confirm Next page.
- Arrow Keys: Scroll page.

LCD Display

- “19/06/01”: Date (Y/M/D).
- “HT”: N2 heater is operating.
- “SEMI”: Pump is in remote controlling mode.
- “BP”: Pump will run with booster pump, flashing when booster pump is running.

- “IDL”: Pump is running under IDLE mode.
- “↓ ↑ START”: Help information for Key broad.
- “09：32”: Time.

8.4 Control Panel Operating Introduction

- Refer to *“Control Panel Operating Flowchart”* [➔ 40].

The pump control function can be divided into four layers. The first layer indicates the status of the pump including pump currents, motor temperature, casing temperature, water flow, N2 mass flow, exhaust pressure, etc.

The second layer can check the warning, alarm records and the lasting hours before maintenance. The UP and DOWN key can be used to scroll the display to show more information.

- “12.1.18”, user can select °C or °F for temperature unit display.
- "12.1.19", user can select "Torr, mbar, kPa, psi, kgf/cm2" for pressure unit. (Note: "kgf/cm2" is displayed in "kgf")

The controller provides two modes to control the pump operation. For “local” mode, the START and STOP buttons on the LCD control panel are used to start/stop the pump. For “SEMI” mode can control pump start/stop by the external signal.

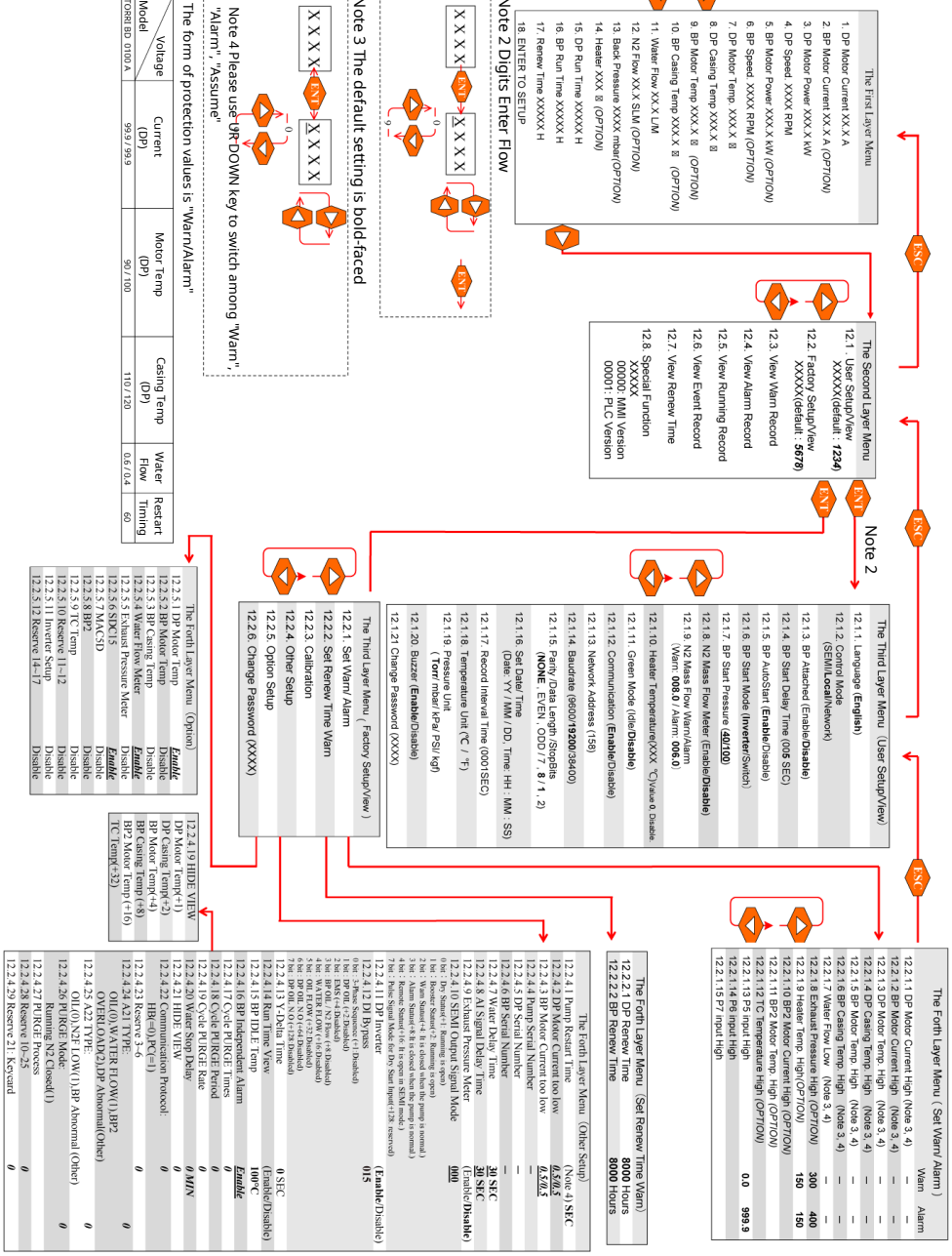
The third layer “12.1 User Setup” provides user to change the system setting which includes:

- Setting for language at “12.1.1”
- Settings for MB at “12.1.3, 12.1.4, 12.1.5, 12.1.6, 12.1.7”
- Settings for N2 flow meter at “12.1.8, 12.1.9, 12.1.10”
- Settings for connecting with PC at “12.1.12, 12.1.13, 12.1.14, 12.1.15”
- Setting for temperature unit at “12.1.18”
- Setting for pressure unit at “12.1.19”, "12.1.11"

“12.2 Factory Setting” provides warning and alarm value setting during pump operation. Normal users do not need to change the parameters of this part. If there is special demand, contact the manufacturer.

When "Water flow protection (without temperature) "is setup at 0 at "12.2.4.12 DI setting", if water flow is lower than the alarm but the motor temperature or the casing temperature is normal, then the message "W06 Cooling water flow too low" will be generated. This message will not stop the pump immediately; until the temperature of the motor or casing exceeds the warning setting, the message "A06 Cooling water flow too low" will be generated and stop pump.

Control Panel Operating Flowchart



8.5 Start / Stop the Pump

8.5.1 Before Starting

Proceed with the following items before connecting the vacuum pump with the power cable.

1. Check if the vacuum pump is in its position and the adjustment foot are fixed.
2. Turn on the cooling water and check if the pipe is connected and not leaking.

CAUTION

If any valve on the exhaust piping is closed, the pump will be shut down due to overloading.

3. Check the exhaust piping. If there is any valve closed on the exhaust piping, open it.
4. Check if the inlet port of the pump and the vacuum system are connected properly.

CAUTION

If the water flow is too low, the temperatures of the pump body and the motor will rise and possibly cause rotor contact and other problems.

5. Check if the cooling water supply of the pump is sufficient. Higher than 1 l/min (15°C -28° C) for TORRI BD 0100 A and 2 l/min (15°C - 28°C) for TORRI BD 0300 A, BD 0600 A & BD 1200 A.
6. If there is any other abnormal message on the LCD controller, refer to chapter 5 and solve it. Then press ESC to clear the warning or alarm message before the pump can be started.

8.5.2 Start or Stop Pump

WARNING

Risk of burns!

It is strictly forbidden to touch the pump body, the exhaust piping and the hot N2 piping before they have cooled down completely.

Keep the pump body and the exhaust piping away from contact with personnel and flammable substances.

Cool the pump down with the cooling water for at least ten minutes; after that, stop the cooling water supply.

CAUTION

To prevent any corrosive gases or byproducts inside the pump, do not stop the pump until after at least 30 minutes after stopping the flow of process gases.

Local Mode Start / Stop

When the setting “12.1.2 control mode” is「 LOCAL 」, press the START key to start the pump and the STOP key to stop the pump.

Remote Mode Start / Stop

When the setting “12.1.2 control mode” is「 SEMI 」, REMOTE lights go on, user can control the pump by the external signal. The START and STOP buttons have no effect.

9 Troubleshooting

Message Code	Cause	Action
W01 (A01) DP Current High	Exhaust pressure rises	Check exhaust piping and silencer
	Pump with noise, and rotors are in contact	Replace or overhaul pump
	Power supply failure	Check power supply
W02 (A02) BP Current High	Pump start pressure is too high	Check vacuum pressure switch setting
	Pump with noise, and rotors are in contact	Replace or overhaul pump
	Power supply failure	Check power supply
W03 (A03) DP Motor Temp. Hi	Insufficient cooling	Check water flow and temperature
	Motor failure	Replace the motor
W04 (A04) DP Casing Temp. Hi	Insufficient cooling	Check water flow and temperature
	Insufficient coolant in the water jacket	Refill the coolant
	Byproduct is clogged	Replace or overhaul pump
W06 (A06) Water Flow Low	Water piping leaks	Check the fittings
	Differential pressure is too small	Check the inlet and outlet pressure of water piping
	Water piping is clogged	Clean or replace piping
	Outlet/inlet is reverse	Clean or replace piping
	Flow meter failure	Replace flow meter
W09 DP Renew Time	DP needs to be maintained.	Check the setting. Overhaul the DP
W10 BP Renew Time	BP needs to be maintained.	Check the setting. Overhaul the BP
W21 PLC Version Update	-	Update PLC Version
W23 Comm. Error	The PLC / VSD failed	Replace the PLC / VSD in electrical box
W31 (A31) BP Motor Temp. Hi	Water Flow is too less	Check water flow and temperature
	Insufficient cooling	Check water flow and temperature
W32 (A32) BP Casing Temp. Hi	Water Flow is too less	Check water flow and temperature
	High gas loading	Reduce the flow and temp. of process gas
	Long term pumping	Reduce the pumping time
A16 DP Motor Fail (Lose Speed)	The VSD control of the motor is abnormal, and the restart is continuously disabled	Power off and restart Replace or overhaul pump
A17 BP Motor Fail (Lose Speed)	The VSD control of the motor is abnormal, and the restart is continuously disabled	Power off and restart Replace or overhaul pump

Message Code	Cause	Action
A19 DP Motor Overload	Exhaust pressure rises	Check the exhaust piping and silencer
	Byproduct or object clog	Replace or overhaul pump
A20 BP Motor Overload	Operating pressure is too high	Check vacuum pressure switch setting[*2]
	Byproduct or object clog	Replace or overhaul pump
	Rotors are in contact	Replace or overhaul pump

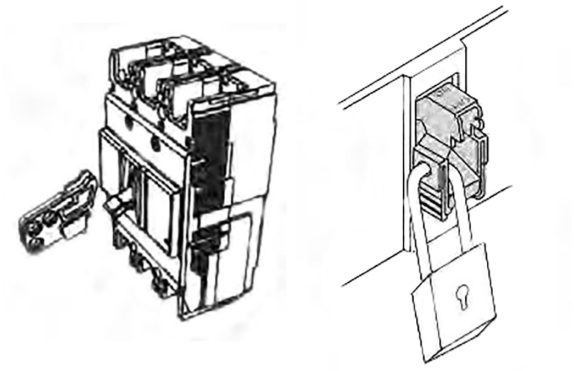
10 Maintenance

10.1 Notes

WARNING

Follow the safety notes listed below. Improper operation will cause dangerous accidents and serious injuries.

1. Any maintenance work must be performed by qualified personnel. The personnel must be familiar with the safety rules related to the pump and must use the suitable tools to dismantle and clean the contaminated parts. Protective equipment is necessary.
2. When starting maintenance process, use personal protective equipment, such as activated carbon mask, Silicone gloves.
3. In order to prevent any danger, do not move or disassemble the pump before it has stopped completely; switch off the power supply to the pump before starting maintenance work.
4. Lock the breaker (lockout) and show the notification before connecting power, service or trouble shooting as following:



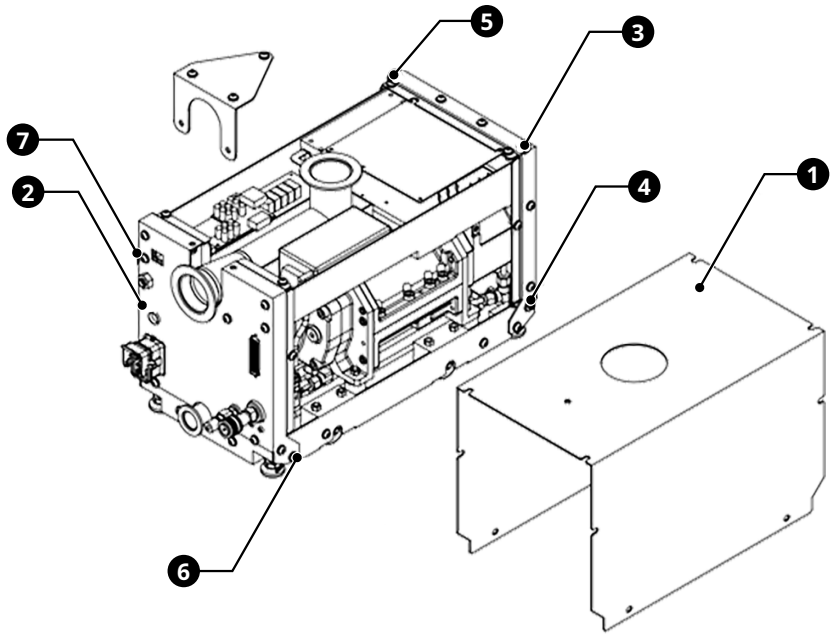
- Turn off power supply, remove power connector.
- Turn off the breaker and set Lockout Device.
- Install the Lockout device.
- Hang up the sign and install the lock.
- After the maintenance is completed, remove the sign& lock out device in order.
- Reconnect and restart the power supply. (If safety circuit external enclosure is installed, press the reset button after power transmission)
- Restart pump by LCD control panel or simple control panel.

1. The pump casing, the exhaust piping and the heating piping are extremely hot during operation and remain hot for some time after stopping. Keep the personnel and flammable substances away from the hot area.
2. Close cooling water and N2 purge gas supply before remove the piping line and fit the plug in the inlet/outlet port.
3. There can be toxic gases or materials remaining in the pump, check that there is nothing remaining before the disassembly.
4. After removing the pump and exhaust piping, seal all inlet/outlet port with blind plate.
5. Do not reuse any O -ring. Be careful to clean all flange surfaces and check they are undamaged. Check for gas leaks after installing and maintaining the piping.

6. Do not touch or inhale the thermal breakdown products of fluorinated materials which can be present if the pump has been overheated to 260 °C and above. These breakdown products are very dangerous. Fluorinated materials in the pump may include oils, greases, and seals. The pump can have overheated if it was misused, if it malfunctioned or if it was in a fire.
7. Disposal of process byproducts, lubricating oil, vacuum grease, and other wastes must be in strict accordance with all local and national environmental and safety regulations.

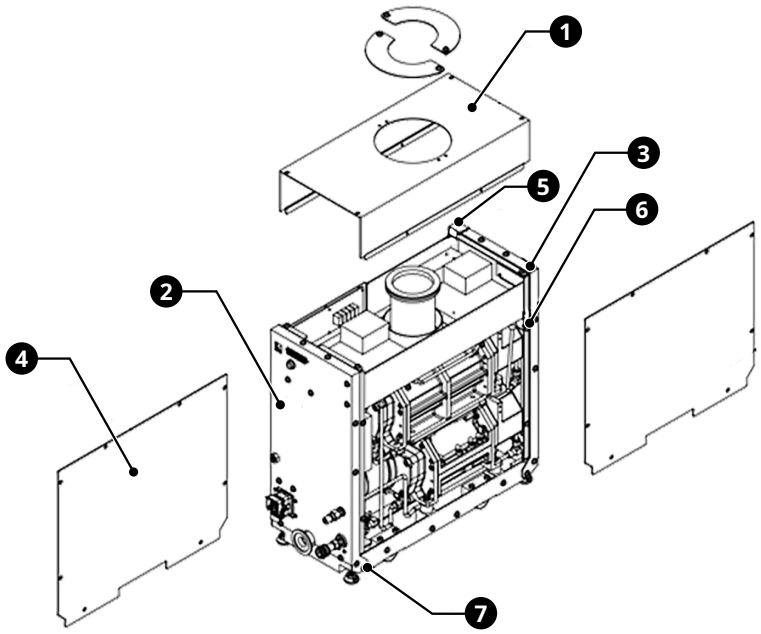
10.2 Dismantle / Assemble Pump Plates

TORRI BD 0100 A



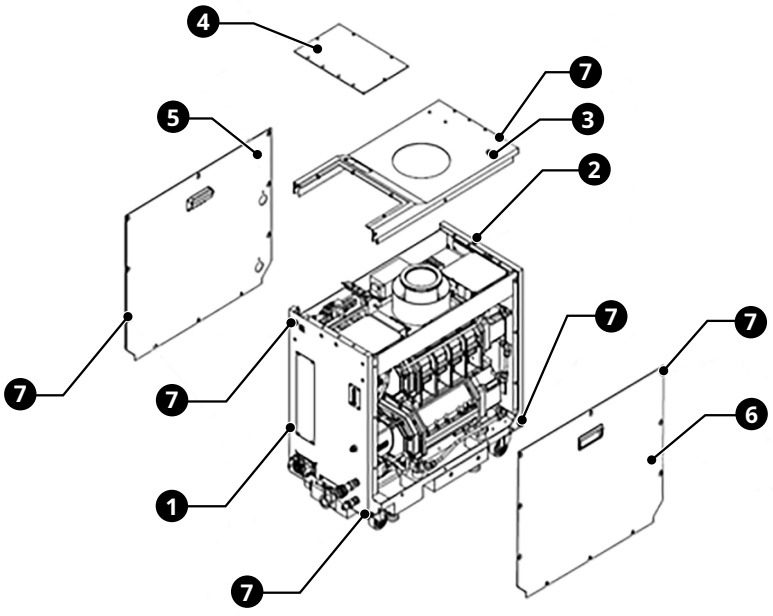
Description			
1	Top Plate	2	Front Plate
3	Rear Plate	4	Hex Socket Screws M6*12
5	Hex Socket Screws M6*12	6	Hex Socket Screws M6*12
7	Hex Socket Screws M6*12		

TORRI BD 0300 A / 0600 A



Description			
1	Top Plate	2	Front Plate
3	Rear Plate	4	Side Plate
5	Hex Socket Screws M6*8	6	Hex Socket Screws M6*8
7	Hex Socket Screws M6*8		

TORRI BD 1200 A



Description			
1	Front Plate	2	Rear Plate
3	Top Plate	4	Control box plate
5	Left Plate	6	Right Plate

Description			
7	Hex Socket Screws M6*12		

10.3 Lubricating Oil

WARNING

There can be toxic process gas and material inside the gear box, avoid the contact with your eyes or skin.

CAUTION

The lubricating oil must be used according to the instructions of the manufacturer.
The manufacturer will not be responsible for any damage of the vacuum pump or vacuum system.

CAUTION

Do not start filling oil until the pump interior reaches atmospheric pressure. During pump operation, the chamber containing the oil is under vacuum. Removing the oil fill plug while the pump is running will damage the pump.

The waste oil must be disposed by the professional and qualified waste disposal dealer.

The lubricating oil for the vacuum pump is Fluorinated lubricant oil. Another kind of oil cannot be used or replaced; otherwise, it will cause a major damage of the vacuum pump.

When replacing the oil, the used oil inside the pump must be drained out completely, otherwise, it will reduce lifetime of the new oil. The procedures to replace the oil are listed as follows.

- Dismantle the oil fill plug at the oil inlet hole.
- Dismantle the drain plug at the oil outlet hole; purge all the used oil out of the oil box or make use of a proper pump to draw out the used oil.
- Replace all the O-rings. Check all plugs are tightened. The O-rings can be found from PM kit package.
- Use authorized vacuum oil from the manufacturer and re-supply the oil to a proper level.

10.4 Piping Connector

A regular leakage check must be performed over all the connecting parts of the piping. It must include a check of any crack on the hoses. Washers, O-rings and hoses must be replaced according to their condition. All parts must be tightened again or re-sealed if necessary.

10.5 Pump Inlet Flange

Dismantle the pump inlet flange regularly for cleaning the dirt on the mesh and change with a new O-ring.

10.6 Cooling Water Piping

After operating for a period of time, the cooling water piping can encounter the problem of a poor cooling effect because of the dirt adhering to the piping. It will cause the pump casing temperature to rise. A regular cleaning is necessary, and the cleaning frequency is dependent on the quality of the water. The cooling tower and the filter must also be cleaned regularly. If the piping has already been adhered with the dirt, the piping must be cleaned with a cleaner or be replaced.

10.7 Decontamination Procedures

In order to avoid pump internal corrosion or producing by products, pump can be shut down after production process has stopped for at least 30 minutes.

Note: Pump is only for load lock, it does not require special decontamination procedures.

10.8 Scrap Procedure

Depending on the damage of the motor, rotor, housing, terminal box, and gearbox, whether it can be reused, is determined. The remaining valve parts, bearings, and circuit boards are considered as waste, and must be disposed in accordance with environmental regulations.

10.9 Maintenance Plan

The plan shown as below details the maintenance operations we recommend to maintain the pump in normal operation. To perform the maintenance periodically and effectively will keep the pump in a normal working condition and will not suffer with the loss causing from the breakdown and failure of the pump. The frequency of the maintenance is dependent on your process. In clean processes, you can decrease the frequency of the maintenance; in harsh processes, you may have to increase the frequency of the maintenance.

Table Maintenance Plan

Item	Content	Weekly	Monthly 500hr	Yearly 8000hr	2 years 24000hr
LCD controller	Check if abnormal	2			
Motor temperature	Check if warning	2			
Casing temperature	Check if warning	2			
Motor current	Check if warning	2			
Cooling water flow	Check if warning	2			
Cooling water piping	Clean			2	
Piping connector	Check		2		
Lubricating oil level and color	Check		2		
Lubricating oil	Replace oil				1
Emergency switch	Function test			2	
Pump inlet flange	Check / Clean			2	
Silencer	Check / Clean			2	
Bearing	Complete overhaul				3
O-ring	Complete overhaul				3

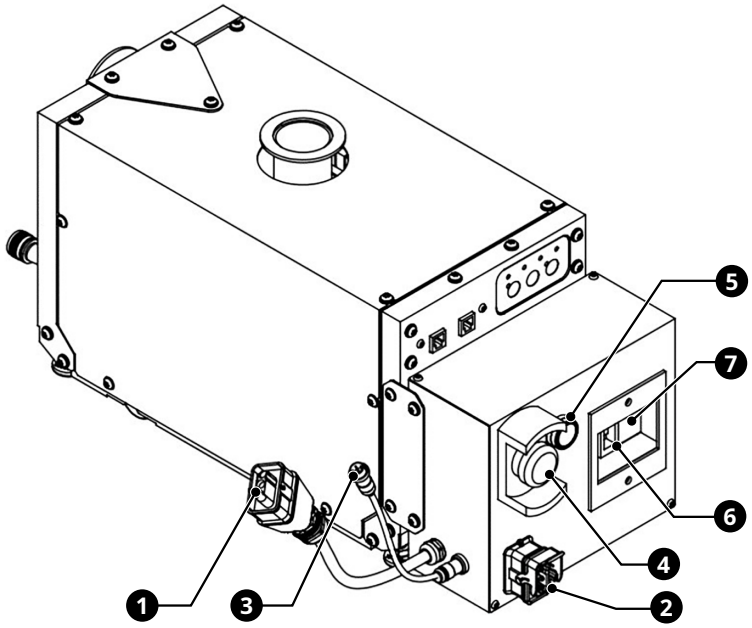
1 Replacement recommended.
2 Check / clean recommended.
3 Complete overhaul recommended.

11 Options

To comply with the SEMI S2 standard, a "Safety Circuit External Enclosure" must be installed. This accessory provides a complete EMO function and includes a leakage circuit breaker and an electromagnetic contactor for the safety protection of the circuit. When this accessory is installed, press the "power reset button" the pump power will be restarted.

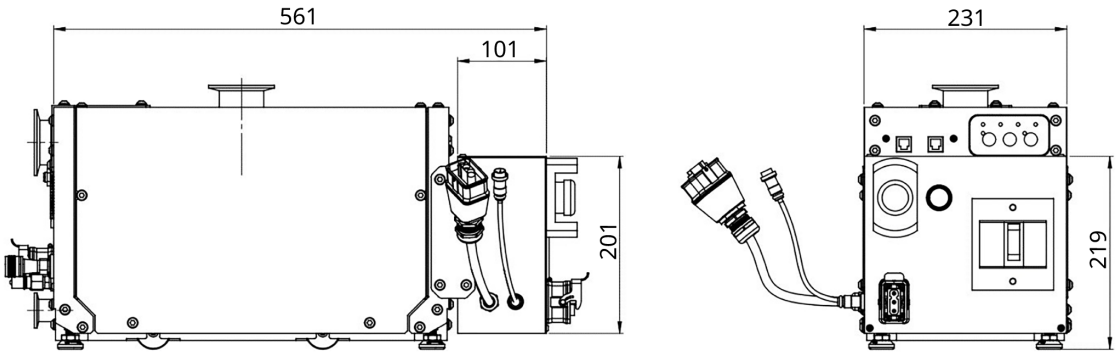
The relevant system configuration and dimensions are described in the two bellow drawings. The circuit is described in *"Circuit Diagram"*. [➔ 52]

Series External Circuit Protection Enclosure System Configuration Diagram

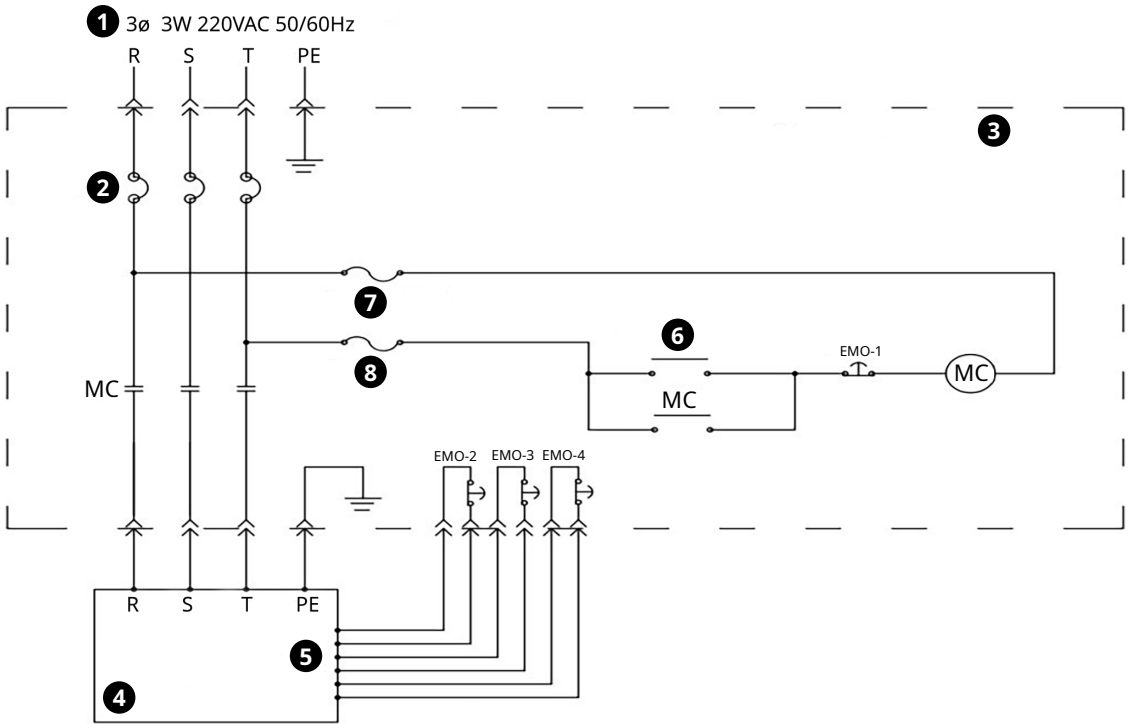


Description			
1	Power Outgoing	2	Power Incoming
3	EMO Signal connection port	4	Emergency stop button
5	Power Reset Button	6	Electricity Leakage Breaker
7	Magnetic Contactor		

Safety Circuit External Enclosure ”Dimensions”



Circuit Diagram



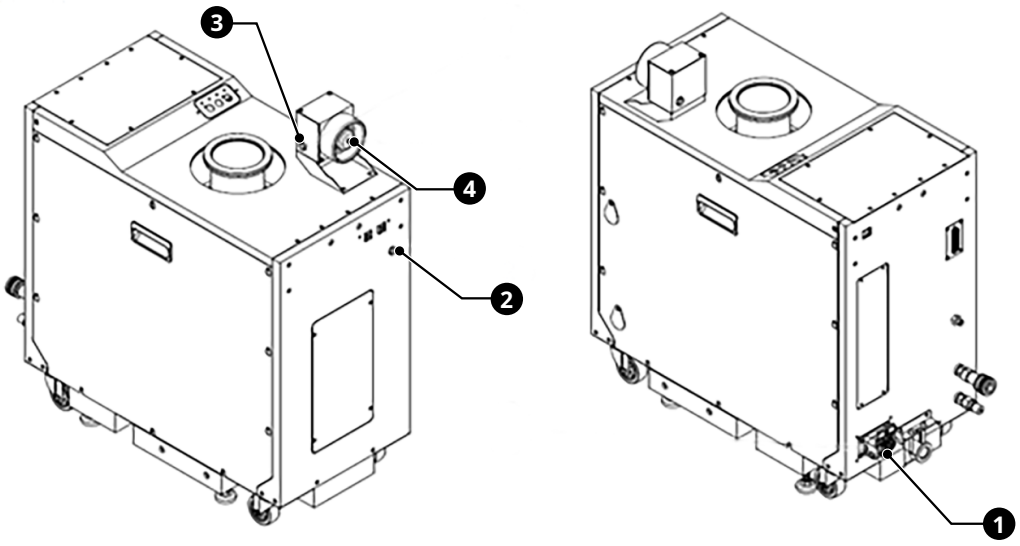
Description			
1	Power Supply	2	Main Breaker
3	Safety Disconnect Box	4	Pump
5	EMO Interlock	6	Reset Button
7	Fuse 1: 1.25 A	8	Fuse 2: 1.25A

For TORRI BD 1200 A:

It needs to be equipped with an "EMO protective cover" and ELB (NOTE 1, FUJI, EW125JAG 3P series). Refer to the table below and ELB information for specifications selection, including (rated current, leakage circuit breaker specifications, Icu/Ics @220V, ATL mark (ex: TÜV Rheinland, CCC...)), must be consistent.

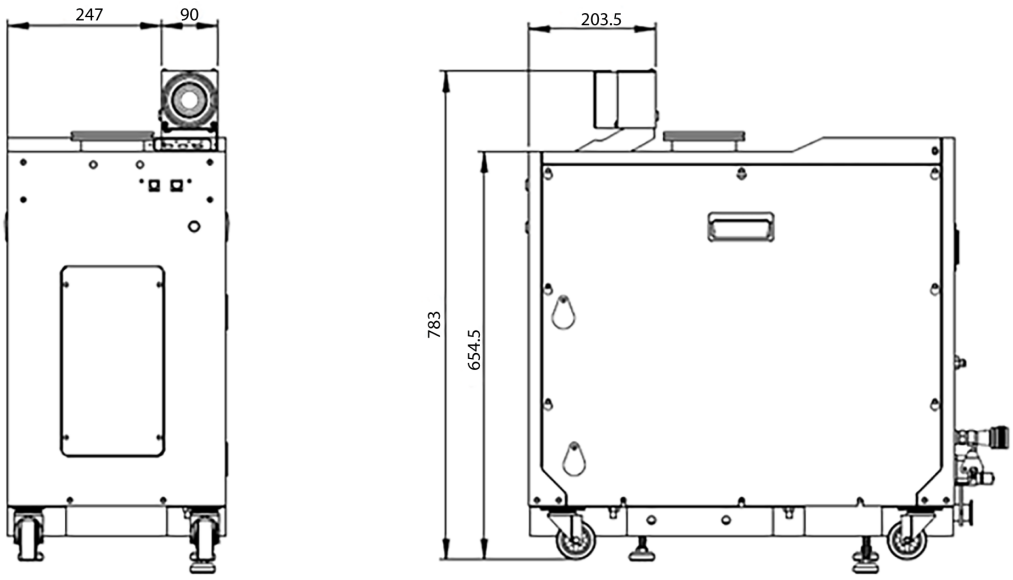
Ampere Frame		EW 125 JAG
Rate current – Reference amb. Temperature (40°C)	In (A)	15, 20, 30, 40
Leakage protection function	Rate Voltage Range (AC V)	100-230-440
	Rate Sensitive Leakage Current (mA)	30
	Response Time (s)	0.1
Icu / Ics (kA)	EN60947-2 (230V)	50 / 25
Standard Certified	Product Safety of Electrical Appliance ¬ Materials (PSE)	X
	JISC8201-2-2	X
	IEC60947-2	X
	EN60947-2 (CE Certification)	X
	GB14048.2 (CCC Certification)	X

Note 1 : ELB specification.

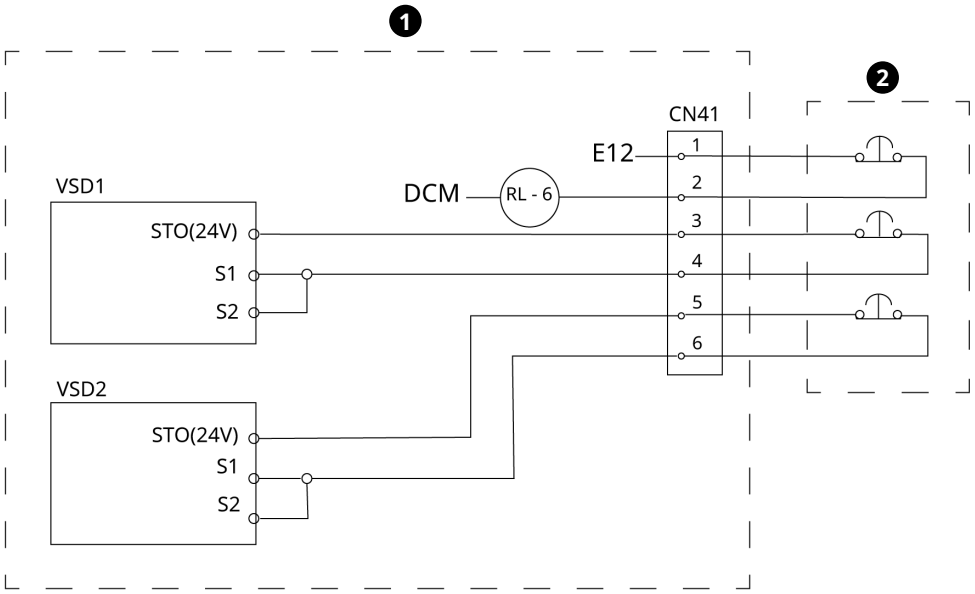


Description			
1	Power Incoming	2	EMO Port pump side
3	EMO Port	4	EMO Button

“EMO button” Dimension



Simplified Circuit Diagram



Description			
1	Controller	2	EMO Box

12 EU Declaration of Conformity

This Declaration of Conformity and the CE-markings affixed to the nameplate are valid for the machine within the Busch scope of delivery. This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

When this machine is integrated into a superordinate machinery the manufacturer of the superordinate machinery (this can be the operating company, too) must conduct the conformity assessment process for the superordinate machine or plant, issue the Declaration of Conformity for it and affix the CE-marking.

The manufacturer

Busch Manufacturing Korea, Ltd.
189-51, Soicheon-ro, Majang-myun
Icheon-si, Gyunggi-do, 467-813
Republic of Korea

declares that the machine: TORRI BD 0100 A; TORRI BD 0300 A; TORRI BD 0600 A

fulfill(s) all the relevant provisions from EU directives:

- 'Machinery' 2006/42/EC
- 'Electromagnetic Compatibility' (EMC) 2014/30/EU
- 'RoHS' 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (incl. all related applicable amendments)

and comply(-ies) with the following harmonized standards that have been used to fulfill those provisions:

Standard	Title of the Standard
EN ISO 12100 : 2010	Safety of machinery - Basic concepts, general principles of design
EN 1012-2 : 1996 + A1 : 2009	Vacuum pumps - Safety requirements - Part 2
EN 60204-1 : 2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN ISO 13857 : 2019	Safety of machinery - Safety distances to prevent hazard zones being reached by the upper and lower limbs
EN ISO 2151 : 2008	Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)
EN IEC 61000-6-2 : 2019	Electromagnetic compatibility (EMC) - Generic standards. Immunity for industrial environments
EN IEC 61000-6-4 : 2019	Electromagnetic compatibility (EMC) - Generic standards. Emission standard for industrial environments

Legal person authorized to compile the technical file and authorized representative in the EU (if the manufacturer is not located in the EU):

Busch Dienste GmbH
Schauinslandstr. 1
DE-79689 Maulburg

Icheon-si, 19.12.2023

Jeihong Kim

General Manager

Busch Manufacturing Korea, Ltd

13 UK Declaration of Conformity

This Declaration of Conformity and the UKCA-markings affixed to the nameplate are valid for the machine within the Busch scope of delivery. This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

When this machine is integrated into a superordinate machinery the manufacturer of the superordinate machinery (this can be the operating company, too) must conduct the conformity assessment process for the superordinate machine or plant, issue the Declaration of Conformity for it and affix the UKCA-marking.

The manufacturer

Busch Manufacturing Korea, Ltd.
189-51, Soicheon-ro, Majang-myun
Icheon-si, Gyunggi-do, 467-813
Republic of Korea

declares that the machine: TORRI BD 0100 A; TORRI BD 0300 A; TORRI BD 0600 A

fulfill(s) all the relevant provisions from UK legislations:

- Supply of Machinery (Safety) Regulations 2008
- Electromagnetic Compatibility Regulations 2016
- Restriction of the use of certain hazardous substances in Electrical and Electronic Equipment Regulations 2012

and comply(-ies) with the following designated standards that have been used to fulfill those provisions:

Standard	Title of the Standard
EN ISO 12100 : 2010	Safety of machinery - Basic concepts, general principles of design
EN 1012-2 : 1996 + A1 : 2009	Vacuum pumps - Safety requirements - Part 2
EN 60204-1 : 2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN ISO 13857 : 2019	Safety of machinery - Safety distances to prevent hazard zones being reached by the upper and lower limbs
EN ISO 2151 : 2008	Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)
EN IEC 61000-6-2 : 2019	Electromagnetic compatibility (EMC) - Generic standards. Immunity for industrial environments
EN IEC 61000-6-4 : 2019	Electromagnetic compatibility (EMC) - Generic standards. Emission standard for industrial environments

Legal person authorized to compile the technical file and importer in the UK (if the manufacturer is not located in the UK):

Busch (UK) Ltd
30 Hortonwood
Telford – UK

Icheon-si, 19.12.2023

Jeihong Kim

General Manager

Busch Manufacturing Korea, Ltd

Notes

BUSCH GROUP

The Busch Group is one of the world's largest manufacturers of vacuum pumps, vacuum systems, blowers, compressors and gas abatement systems. Under its umbrella, two well-known brands: Busch Vacuum Solutions and Pfeiffer Vacuum +Fab Solutions. Together, they offer solutions to a wide range of industries. A global network of highly competent local teams in 44 countries ensures that expert, tailor-made support is always available near you. Wherever you are. Whatever your business.

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