



Document No. : ND00338<2>

INSTRUCTION MANUAL

POWER SUPPLY

For the pump

MODEL:	TC163H	TC203
	TC223	TC353
	TC523H	TC1104

IMPORTANT

Read rule carefully for safe installation, operation and instruction.
Please keep this instruction manual by your side.

OSAKA VACUUM, LTD.



Document No. : ND00338<2>

—INTRODUCTION—

The power supply provides the pump with power for operation.

Prior to operating the power supply, we recommend you to read this instruction manual carefully to understand various functions and correct handling thoroughly.

If you keep this manual by your side, it will be helpful when you are not sure of something during operation or you have something wrong.

—WARRANTY—

Our company warrants the quality of power supply in accordance with the conditions of warranty prescribed in “STANDARD WARRANTY CONDITIONS”.

—PRECAUTIONS—

Please read carefully the precautionary instruction on the operation and installation given on from page 2 to page 3.

Special care should be taken for the parts with the following heading, “Caution” and “Warning” signs throughout in this manual.

! CAUTION: An important consideration is described in order to operate the pump and the power supply safely.

! WARNING: An important consideration is described in order to avoid any injuries or a risk of electric shock when operating the pump and the power supply.
--

Document No. : ND00338<2>

1) Input power

! CAUTION

Input power voltage is AC90~121V or AC180~253V.

Set the input voltage select switch inside the power supply according to the input voltage.

Supply the power excluding noise, surge and voltage fluctuation to the power supply.

2) Combinations between the power supply and the pumps.

! CAUTION

Match the power supply with the correct pump.

Prior to operation, supply the input power and press the F1 button, and then check the model indicated on the top in display.

Correct combinations of the power supply and the pumps are as follows:

Pump model	Power supply model	Display
TH162/163	TC163H	TC163H Rev.A
TG200/203 TS50	TC203	TC203 Rev.A
TG220F	TC223	TC223 Rev.A
TG350F TG450F	TC353	TC353 Rev.A
TH520/TH522	TC523H	TC523H Rev.A
TG800F TG1100F	TC1104	TC1104 Rev.A

The power supply is set to the model matched to the pump at shipping from our company.

The model nameplates are stuck on the side and bottom panels of the power supply at shipping from our company.

When requesting our company for repair or making other inquiries on the product, please do not forget to tell us the serial number.

3) Fan mode selection

! CAUTION

Set the fan mode select switch inside the power supply depending on air-cooled type or water-cooled type of the molecular pump.

Air-cooled type pump	“FAN”
Water-cooled type pump	“NO FAN”

The fan mode select switch is set to “FAN” at shipping from our company.



Document No. : ND00338<2>

4) Earth

! WARNING

Be sure to connect the earth line of the INPUT connector to EARTH/GROUND.

5) Connections of cables

! CAUTION

DO NOT disconnect the cables or connectors of the power supply in operation.

5) Disassembly and modification

! CAUTION

DO NOT disassemble or modify the pump, the power supply and the cable.

It may result in failures or accidents and fails safety.

6) Electric shock

! WARNING

DO NOT touch the inside of the alive power supply.

DO NOT inspect or operate the power supply within 5 minutes after turning the input power off, or you may get electric shock.

7) Ambient temperature/humidity

! CAUTION

Avoid locations where the power supply is exposed to high temperature and humidity.

8) Water drop

! CAUTION

Avoid locations where the water drops wet the power supply.

9) Dust and flammable/corrosive gas

! CAUTION

Avoid locations where dust, flammable gas or corrosive gas may affect the power supply.

10) Electric/magnetic field

! CAUTION

Avoid locations where strong electric field or magnetic field exists.

11) Vibration

! CAUTION

Avoid locations where excessive vibration exists.



Document No. : ND00338<2>

12) Space

! CAUTION

Be sure to provide sufficient space around the cooling fan on the rear of the power supply.

—OPENING THE CRATE—

Check that the power supply and attachments are not damaged caused during transportation. There are spare parts and attachments below in a standard set of the power supply.

Input power connector	1 pc.
Remote connector	1 pc.
Serial communication connector	1 pc.
Instruction manual of power supply	1 copy
Instruction manual of serial communication	1 copy
“AC100/110V” seal	1 sheet



CONTENTS

Introduction	-----	1
Warranty	-----	1
Precautions	-----	1
Opening the crate	-----	4
1. Feature	-----	7
2. Specifications	-----	8
3. Buttons and display	-----	9
3.1 Input voltage select switch		
3.2 FUNCTION buttons (F1,F2,F3)	-----	9
3.3 START button	-----	9
3.4 STOP button	-----	9
3.5 Display	-----	9
3.5.1 Indication of each operation status		
3.5.2 Indication by Function buttons		
4. MAINTENANCE MODE	-----	11
4.1 Function for no-load test	-----	11
4.2 Function for resetting cumulated operation time	-----	12
4.3 Function for canceling protection signal	-----	12
4.4 Function for detecting fan disconnected	-----	13
4.5 Function for selecting LOCAL/REMOTE/SERIAL COMMUNICATION	-----	13
4.5.1 LOCAL mode		
4.5.2 REMOTE mode		
4.5.3 SERIAL COMMUNICATION mode		
4.6 Function for using CRC code	-----	13
4.7 Function for error (alarm) log	-----	13
5. Protective functions	-----	15
5.1 Protective function	-----	15
5.2 Warning	-----	17
6. Reset of error	-----	18
6.1 Over frequency and System error	-----	18
6.2 The others	-----	18
7. Installation and electrical connections	-----	18
7.1 Installation	-----	18
7.2 Electrical connections	-----	19
7.2.1 Connection of input power cable		
7.2.2 Connection of motor cable		
7.2.3 Connection of fan cable		
7.2.4 Connection of remote cable		



Document No. : ND00338<2>

8. Maintenance and inspection	-----	24
8.1 Tuning	-----	24
8.2 Adjusting the depth of character in display (LCD contrast)	-----	24
8.3 No-load test of power supply	-----	24
9. Others	-----	25

Appendix

Attached drawings

Outside view drawing of the power supply	-----	drawing number : X3-00080
Input/output Communications of the power supply	-----	drawing number : X3-00081

Standard warranty conditions

Document No. : ND00338<2>

1. Feature

This power supply is a high-frequency inverter to drive the pump. The power supply controls motor current to a fixed value and set the output voltage proportional to output frequency. Thus the power supply gives full play to its ability and can start the pump in a short time.

The power supply shows the status of the pump and power supply on the display of the front panel, for example, output frequency, operation status and so on.

! CAUTION

Table 1 shows the combinations of the power supply and the pumps. Check the model and match the power supply with the correct pump.

Table 1. Combinations of power supply and the pumps

Power supply model	⇒	Pump model
TC163H	⇒	TH162/163
TC203	⇒	TG200/203 TS50
TC223	⇒	TG220F
TC353	⇒	TG350F TG450F
TC523H	⇒	TH520/TH522
TC1104	⇒	TG800F TG1100F

Document No. : ND00338<2>

2. Specifications

Table 2 shows the specifications of the power supplies.

Table 2. Specifications of the power supplies

Power supply model		TC163H	TC203	TC223	TC353	TC523H	TC1104
Applicable the model of pump		TH162 TH163	TG200 TG203 TS50	TG220F	TG350F TG450F	TH520 TH522	TG800F TG1100F
Ambient	Temperature	- 5 - 40°C					
	Humidity	35 - 85%					
	Pollution degree	2					
Input	Phase	Single					
	Voltage ¹⁾	AC90 - 110 or AC180 - 253[V]					
	Frequency	50/60[Hz] ± 2[%]					
	Max Power	490[VA]	610[VA]	590[VA]	610[VA]	590[VA]	610[VA]
	Rating Power	210[VA]	210[VA]	96[VA]	92[VA]	210[VA]	86[VA]
	Over voltage category	II					
Output	Phase	3 phases					
	Voltage ²⁾	45[V]	60[V]	60[V]	60[V]	60[V]	60[V]
	Frequency ²⁾	800[Hz]	800[Hz]	800[Hz]	750[Hz]	400[Hz]	560[Hz]
Brake method		DC constant current					
Brake operation time		4[min]	7[min]	4[min]	9[min]	14[min]	30[min]
Weight		Approx. 2.7[kg]					
Max. EARTH/GROUND leakage current		1.0[mA]					
IP Rating		IP20 (Service area or operation area)					
Withstand Voltage ³⁾		Viso. INPUT(supply)-EARTH/GROUND				1.5[kV]	
		Viso. INPUT(supply)-REMOTE(interface)				2.3[kV] (SELV)	
		Viso. INPUT(supply)-SERIAL(interface)				2.3[kV] (SELV)	

- 1) Set the input voltage switch inside the power supply according to the input voltage.
- 2) Value of normal operation
- 3) Don't perform the withstand voltage test. When testing, the inner parts must remove.

! CAUTION

DONT perform the withstand voltage test.

Document No. : ND00338<2>

3. Buttons and display

This section explains buttons and display of the power supply.

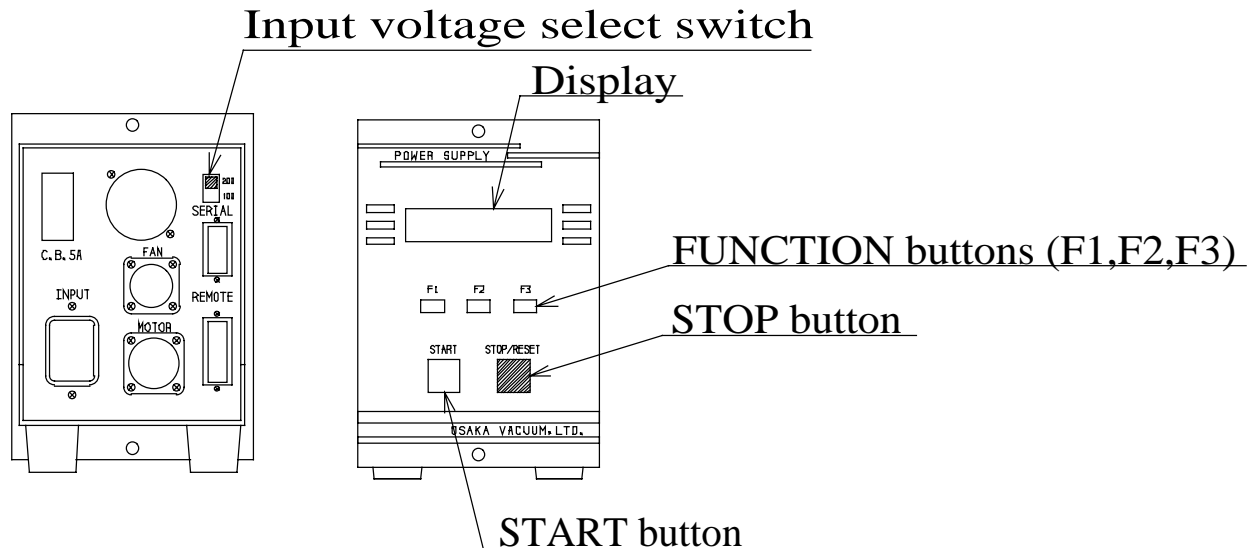


Figure 1. Front panel of the power supply

3.1 Input voltage select switch

! CAUTION

Input power voltage is AC90~121V or AC180~253V.

Set the input voltage select switch rearside the power supply according to the input voltage.

Supply the power excluding noise, surge and voltage fluctuation to the power supply.

Input voltage select switch is set to “200” at shipping.

3.2 FUNCTION buttons (F1,F2,F3)

These buttons are for entering into MAINTENANCE MODE , confirming or altering value of parameters on each functional items in MAINTENANCE MODE. Besides, confirming or altering value of parameters for serial communication. How to operate MAINTENANCE MODE is shown at section 4. MAINTENANCE MODE. How to operate serial communication is separately shown at INSTRUCTION MANUAL SERIAL COMMUNICATION.

3.3 START button

Press to start driving when the operation mode in MAINTENANCE MODE is set to “LOCAL”.

Document No. : ND00338<2>

3.4 STOP button

Press to stop driving when the operation mode in MAINTENANCE MODE is set to LOCAL. Also, press to reset the power supply stopped with error whether the Operation Mode is set to LOCAL or to REMOTE or to SERIAL COMMUNICATION.

3.5 Display

3.5.1 Indication of each operation status

The display indicates rotating speed, operation status, total operation time, operation mode ,error message and others during operation of the pump. Details of display are shown at following Table 3.

Table 3. The indication of display

Operation Status	Contents	Display Note.3
Power ON	Top: model of the power supply (for 5 seconds) Bottom: revision number of the power supply (for 5 seconds)	TC1104 Rev. A
Under Standby or Under rotating at Free Run	Top: operation status and operation mode Bottom: rotating speed and total operation time Note.1	Standby L 0rpm 12345h
Under Acceleration	Top: operation status and operation mode Bottom: rotating speed and total operation time Note.1	Acceleration L 3000rpm 12345h
Under rotating at Normal	Top: operation status and operation mode Bottom: rotating speed and total operation time Note.1	Normal L 33600rpm 12345h
Under Acceleration from normal operation Note.2	Top: operation status and operation mode Bottom: rotating speed and total operation time Note.1	Acceleration L 18000rpm 12345h
Under deceleration	Top: operation status and operation mode Bottom: the rest of braking time and total operation time	Brake L 30:00 12345h
Under MAINTENANCE MODE	Top: parameter Bottom: value of parameter	Shown at section 4
Under Working Protective Functions	Top: error message Bottom: total operation time	Shown at section 5

Note.1) rotating speed means output frequency times 60.

Note.2) **Acceleration** means blinking.

Note.3) "L" in display means operation mode is set to Local Mode. Each "R", "S" means operation mode is set to REMOTE, SERIAL COMMUNICATION. "operation mode" means the way for operating the power supply.



Document No. : ND00338<2>

3.5.2 Indication by FUNCTION buttons

The display is indicated as follows by pressing the FUNCTION buttons under except MAINTENANCE MODE or working protective functions.

The model and revision number of the power supply are indicated as follows by pressing the F1 button.

TC1104 Rev. A

The value of parameters for serial communication is indicated as follows by pressing the F1 button again. How to alter the value of parameters is shown at INSTRUCTION MANUAL SERIAL COMMUNICATION.

RS232C Echo:OFF 9600 8bit N 1sp

“LCD Contrast” is indicated as follows by pressing F1 button again.

LCD Contrast 5

You can adjust the depth of character on this page. Details of “LCD Contrast” is shown at section 8.2. The display returned to the first indication by pressing the F1 button again.

4. MAINTENANCE MODE

You can select value of parameter in some functional items at MAINTENANCE MODE.

At first ,press F3 button and F1 button (press F3 button before F1 button) on front panel for 5 seconds when “Standby” is indicated on display, and “Maintenance Mode” is indicated on display. Next, press F2 button, and the present value of each parameters are indicated every time F1 button is pressed. In case of altering the value of parameter, select the value of parameter to alter by pressing F2 button, and press F3 button on the value to be set. Refer to Figure.2

4.1 Function for no-load test

ON: Able to operate with no load (Refer to section 8.3)

OFF: Unable to operate with no load

Function for no-load test is set to “OFF” at shipping.
--

! CAUTION

Be sure to set the function for no-load test to “OFF” usually.



Document No. : ND00338<2>

4.2 Function for resetting total operation time

- ON: The total operation time indicated on the display is reset to zero . When this functional item is left ON, the total operation time will be reset to zero every time input power is supplied.
- OFF: The total operation time is not reset to zero.

Function for resetting total operation time is set to “OFF” at shipping.

4.3 Function for canceling protection signal

- ON: Protection signal is effective.
- OFF: Protection signal is cancelled.

The protection signal means interlock signal connected to the remote connector on the rear panel. Set this function to “OFF” when operating the power supply without closing this protection signal.

Function for canceling protection signal is set to “ON” at shipping.

! CAUTION

Be sure to set the function to “ON” in closing protection signal in the remote connector on the rear panel so as to interlock.

4.4 Function for detecting fan disconnected

- ON: Detection of Fan trouble is effective, and the power (DC24V) for fan is supplied from the fan connector on the rear panel while input power is supplied.
- OFF: Detection of Fan trouble is cancelled, and the power for fan is not supplied.

Set to “ON” or “OFF” according to cooled way of the pump.

Function for detecting fan disconnected is set to “ON” at shipping if the pump has both air-cooled type and water cooled-type .
Function for detecting fan disconnected is set to “OFF” at shipping if the pump has only water cooled-type, in that case it is impossible to set to “ON”.

4.5 Function for selecting operation mode LOCAL/REMOTE/SERIAL COMMUNICATION

Function is to select the way for operating the power supply.

4.5.1 LOCAL MODE

You can use START/STOP buttons on the front panel in LOCAL mode.

You cannot use START/STOP signals of the remote connector and serial communication connector on the rear panel because the signal is ignored.



Document No. : ND00338<2>

4.5.2 REMOTE MODE

You can use START/STOP signals of the remote connector on the rear panel.

You cannot use START/STOP buttons on the front panel and START/STOP signals of the serial communication connector.

4.5.3 SERIAL COMMUNICATION MODE

You can use START/STOP signals of the serial communication connector on the rear panel.

You cannot use START/STOP buttons on the front panel and START/STOP signals of the remote connector.

Refer to the INSTRUCTION MANUAL SERIAL COMMUNICATION that is a separate volume.

Function for selecting operation mode is set to “LOCAL” at shipping.

4.6 Function for using CRC code

ON: CRC code is effective.

OFF: CRC code is not effective.

Details of CRC code are shown at INSTRUCTION MANUAL SERIAL COMMUNICATION.

Function for using CRC code set to “OFF” at shipping.

4.7 Function for error (alarm) log

You can look at error (alarm) log in the past 8 times. If you press F3 button, error(alarm) log will be cleared to “No Failure”

Document No. : ND00338<2>

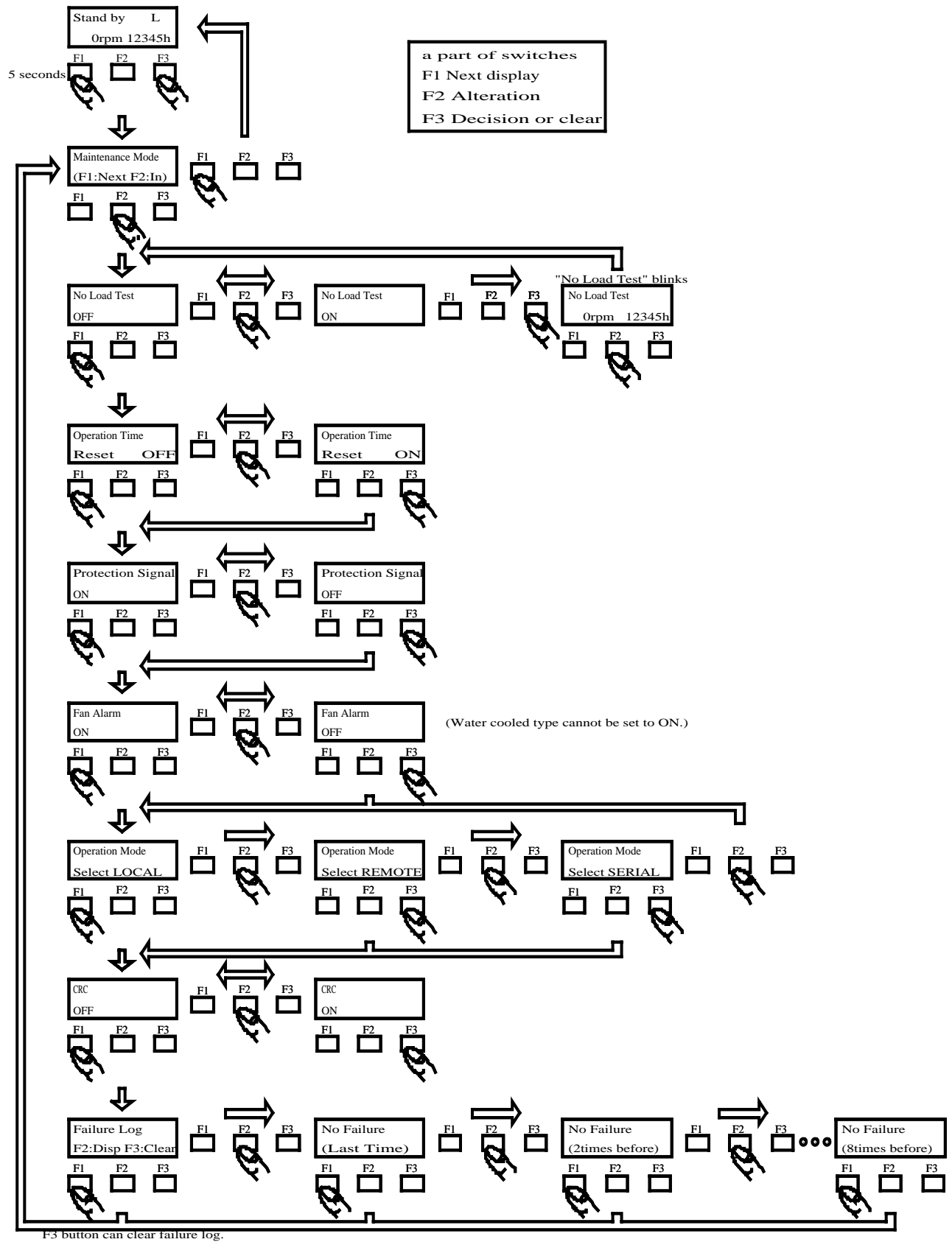


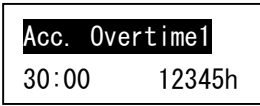
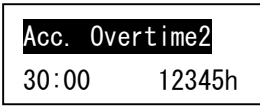
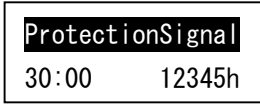
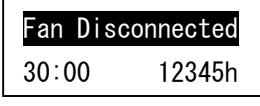
Figure 2. MAINTENANCE MODE

5. Protective functions

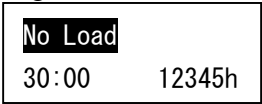
5.1 Protective function

If following error happens on the power supply or the pump, protective function works, suitable error message is indicated and blinking on the display. The pump stops with brake when errors shown in Table.4-1 occur, and the pump stops without brake when errors shown in Table.4-2 occur. The power supply holds indication of the error message and the FAILURE signal from the remote connector.

Table 4-1. Protective functions

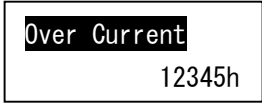
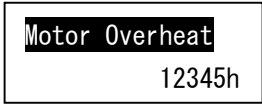
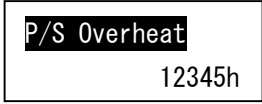
Kind of errors Display	Contents	Measures
Acceleration overtime 	When the power supply does not become in NORMAL condition within the specified time in spite of start button was pressed. * As for limit of acceleration time, see table 5.	Check the followings on the pump: <ul style="list-style-type: none"> ▪ Backing pressure of the pump is lower than the specified value. ▪ The system does not have leakage. ▪ Gas flow to the pump does not exceed.
Re-acceleration overtime 	When the power supply does not become in NORMAL condition within a specified time after the indication of the display changes from in NORMAL condition to in ACC condition. (When the power supply becomes in ACC condition again, “acceleration” indication blinks.) * As for limit of re-acceleration time, see table 5.	Check the followings on the pump: <ul style="list-style-type: none"> ▪ Backing pressure of the pump is lower than specified value. ▪ The system does not have leakage. ▪ Gas flow to the pump does not exceed.
Protection signal open 	When protection signal connected to the pin No. 2 and 10 of the remote connector on the rear panel of the power supply is open. Note.1	Check the interlock signal.
Fan disconnected 	When the fan cable is not connected. Note.1	Check the followings: <ul style="list-style-type: none"> ▪ Air-cooled type pump Check the connection of fan cable is correctly connected. ▪ Water-cooled type pump Set the function for detecting fan disconnected to “OFF”. (Refer to section 4.4)

Document No. : ND00338<2>

Light load 	When output current from the power supply to the motor of the pump is extremely low.	Check the followings on the power supply. • The lubricating oil is not less than the specified amount. If the lubricating oil is less than the specified amount, the output current decreases and the power supply will stop with this trouble . ! CAUTION However, DO NOT check and control the amount of the lubricating oil by the indication of this trouble code. As for proper amount of oil, refer to instruction manual of the pump.
	When the motor cable is broken. (In this case, the pump stops by free run.)	Check the motor cable.

Note.1) The power supply does not indicate these error messages before pressing the START button.
“Stand-by” indication changes to one of these error messages indication only after the START button was pressed.

Table 4-2. Protective functions

Kind of errors Display	Contents	Measures
Output over-current 	Abnormal over-current flows because of short in output or others.	Operate the power supply in no-load operation mode. Check whether the error is caused by the power supply or by the pump and contact OSAKA VACUUM,LED. * Procedure for no-load test of the power supply is shown at section 8.3.
Pump overheat 	When the thermal protector built in the pump works. Note.1	Check the followings on the pump: • The system does not have leakage. • Gas flow to the pump does not exceed. • Water-cooled type pump Cooling water fall off.
P/S overheat 	Power supply is overheated.	Check the followings on the power supply: • The cooling fan inside of the power supply works normally.

Document No. : ND00338<2>

Input voltage dropping <div>InputVoltageLow 12345h</div>	When input voltage to the power supply is lower than the specified value. This trouble message is indicated in the range of the input voltage in which the control circuit of the power supply can work. Also, if the input power is cut and the power recovers within 2 second, the power supply continues to operate. The power supply stops if the input power does not recover within 2 second, and indicates this trouble message . Note.1	Check the input voltage.
Over frequency <div>Over Speed 12345h</div>	When output frequency from the power supply is higher than about 105% of rated output frequency.	Contact OSAKA VACUUM,LTD
System error <div>System Error 12345h</div>	When there is some trouble(s) inside power supply.	Contact OSAKA VACUUM,LTD

Note.1) The power supply does not indicate these error messages before pressing the START button.
“Stand-by” indication changes to one of these error messages indication only after the START button was pressed.

Table.5 Detected time for Acceleration / re-acceleration overtime (unit: minute)

Power supply model	TC163H	TC203	TC223	TC353	TC523H	TC1104
Acceleration overtime	10	10	2	4	20	25
Re-acceleration overtime	5	5	1	2	10	10

5.2 Warning

When operation time reaches 90% of bearing lifetime, “Change Bearing” is displayed at front panel, concerning the pump which uses grease type bearings. Operation status(Standby, Acceleration, Normal, Brake)and “Change Bearing” are displayed alternately every 1.5 seconds..

Document No. : ND00338<2>

6 Reset of error

6.1 Over frequency and System error

Turn off the power supply and then turn on again.

6.2 The others

Press the STOP button on the front panel of the power supply to reset the power supply, whether it is in LOCAL operation or in REMOTE operation or in SERIAL COMMUNICATION operation. Prior to reset, verify the error and resolve the error. The power supply does not restart when the power supply was in REMOTE operation and the START signal was left in closed even if the power supply was reset. Make the START signal opened and then make it closed to restart the power supply.

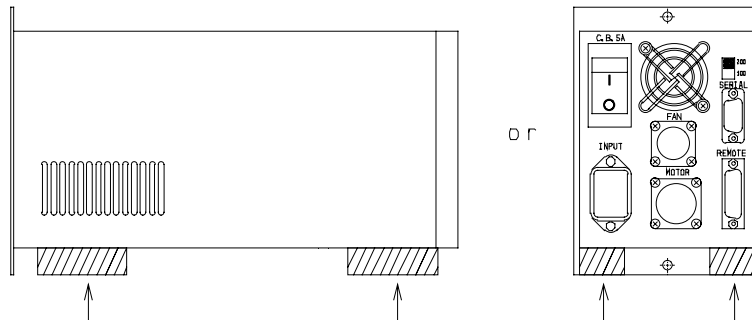
7. Installation and electrical connections

7.1 Installation

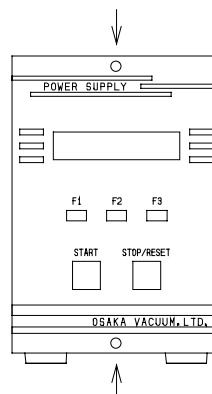
The power supply is suitable for installation in rack or on floor.

Install the power supply in rack as follows.

- 1, Remove the rubber legs on the bottom of the power supply.
- 2, Support the power supply's weight with either rails or plates.



- 3, Screw front panel of the power supply on rack at 2 points.



Document No. : ND00338<2>

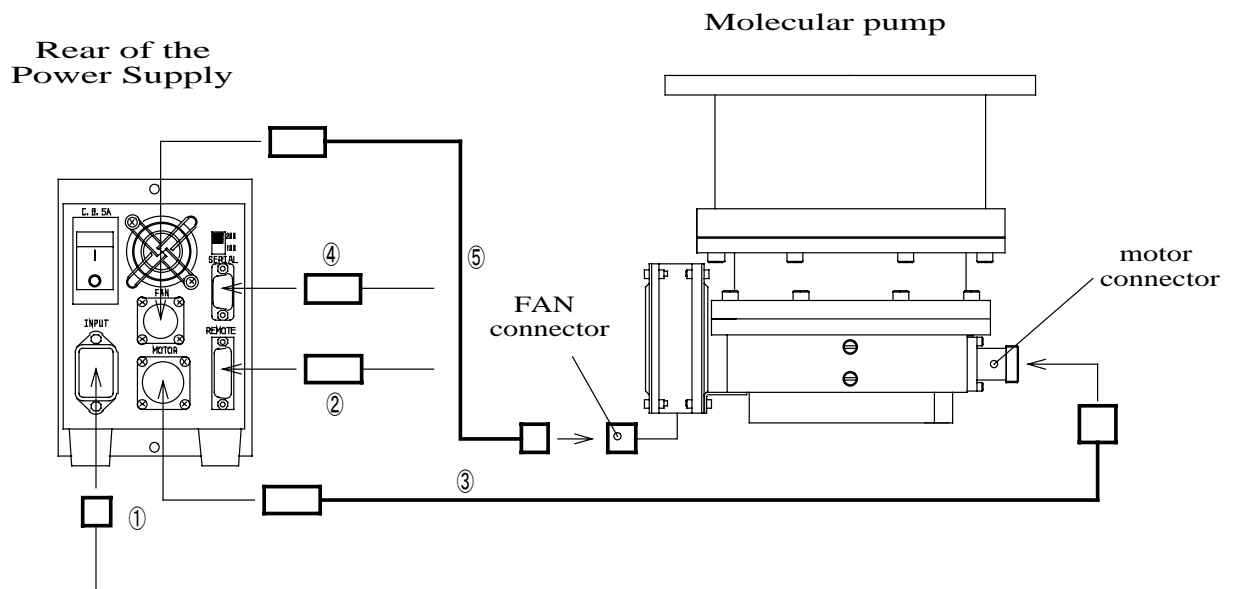
! CAUTION

In case of installing the power supply in rack, be sure to support its weight with either rails or plates. Weight of power supply is approximately 2.7kg.
Be sure to provide space more than 10mm around both sides of the power supply.
Be sure to provide 150mm space for cable connections around the rear of the power supply.

DO NOT install the power supply such locations as below:

1. Location in high temperature and/or high humidity
2. Location where the water drops wet the power supply
3. Location where is dusty
4. Location where is harmful gas such as acid, alkali, corrosive gas and so on.
5. Location where is flammable/explosive gas.
6. Location where is strong electric/magnetic field.
7. Location in big and/or much vibration

7.2 Electrical connections



Connection of the cables between the power supply and the pump is shown at Figure 3.

Figure 3. Electrical connections

Refer to table.6 as for ① to ⑤ in Figure 3.

Document No. : ND00338<2>

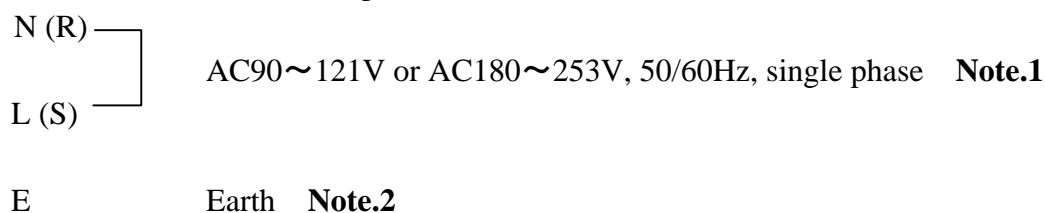
Table 6. Attached connectors and cables

	Name	Connector type of the power supply side	Connector type of the pump side	Remarks
①	Input power connector	Avantec AT-01L3B4B.S		accessory
②	Remote connector	DDK 17JE-23150-02(D8A)		accessory
③	Motor cable	Nanaboshi NJC-207-PM-UL	TC223,TC353	Exclusive cable
			Bendix PT-06A-12-8S(SR)	
			TC163H,TC203 TC530H,TC1104	Exclusive cable
④	Serial communication connector	DDK 17JE-13090-02(D8A)		accessory
⑤	Fan cable (only to air cooled type pump)	Nanaboshi NJC-165-PM-UL	AMP 172159-1	Exclusive cable

7.2.1 Connection of input power cable

Connect the cable to the input power connector (attachment).

- 1) Select the cable size from the Table7.
- 2) Strip sheath of the cable about 30mm from the end.
- 3) Set the solderless terminals at the end of the cable, and cover the part of the cable which is clamped by a protective tube.
- 4) After thread the cable through a bushing, screw the solderless terminals at each pin of the connector, and screw the cable clamp.



! Warning

Note.1) Prior to supplying power, be sure to set the input power select switch according to the input voltage.

Note.2) Be sure to earth the power supply.

Document No. : ND00338<2>

5) Connect the input power cable to the “INPUT” connector on the rear panel of the power supply.

Recommended the wiring size of the input power cable is shown at following Table 7. In case of setting breaker at primary side of the power supply, use rating 10A(100V)/5A(200V) breaker.

Table 7. Recommended the wiring size of the input power cable

Power supply model	TC163H,TC203,TC223,TC353,TC523H,TC1104
Cable size	PVC cable (Outer diameter max.9mm / 0.75mm ² / 3core)

7.2.2 Connection of motor cable

Connect the attached motor cable to the “MOTOR” connector on the rear panel of the power supply and the connector of the pump.

7.2.3 Connection of fan cable

Air-cooled type: Connect the attached fan cable to the “FAN” connector on the rear panel of the power supply and the fan.

Water-cooled type: Set the function for detecting fan disconnected to “OFF”.

Document No. : ND00338<2>

7.2.4 Connection of remote cable

Connect the remote cable to the remote connector on the rear panel of the power supply to send control signals. Figure 4 show I/O communications and timing chart of the power supply. Remote connector is SELV.

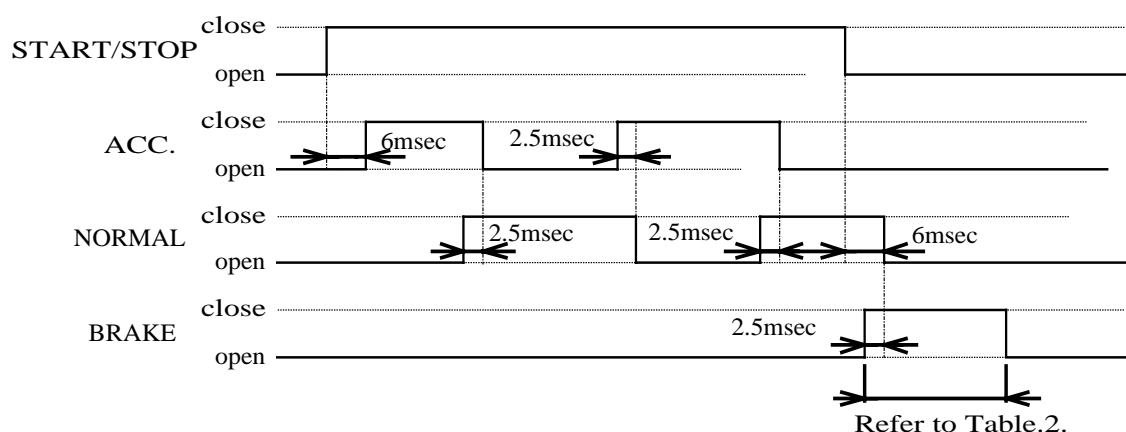
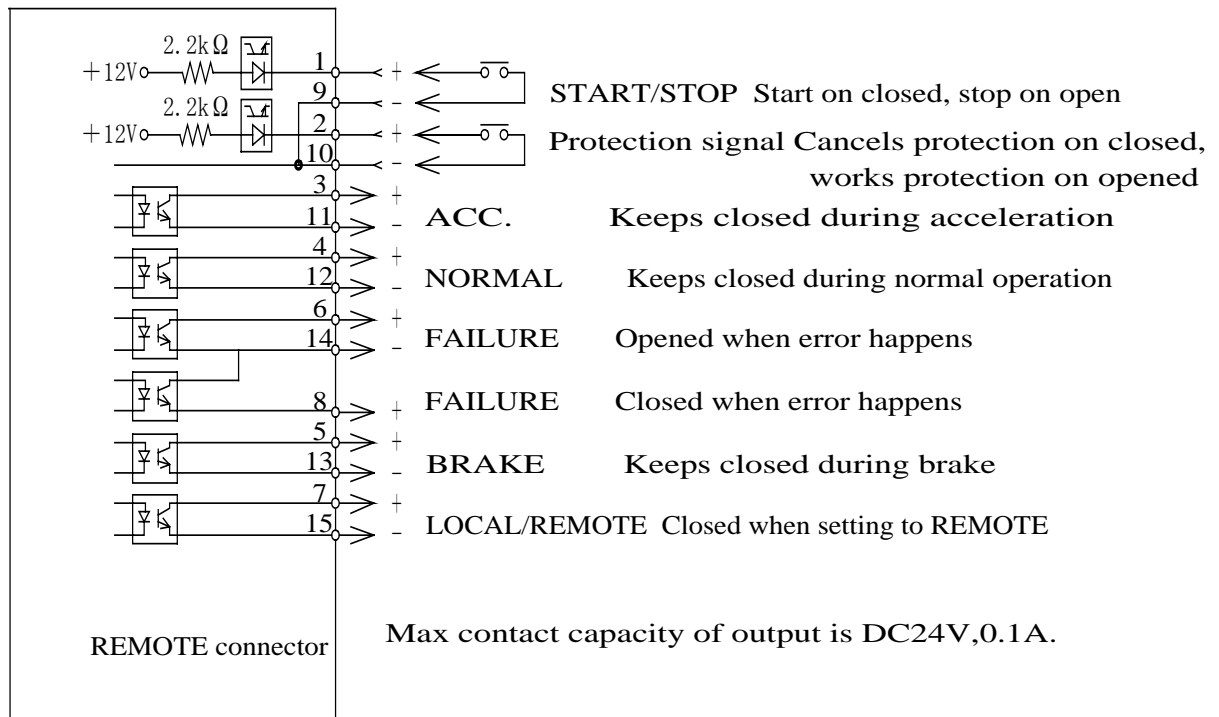


Figure 4. I/O communications and timing chart of the power supply

Document No. : ND00338<2>

1) START/STOP signal

This signal starts and stops the pump by remote connector in setting the operation mode LOCAL/REMOTE/SERIAL COMMUNICATION to “REMOTE”.

2) Protection signal

This signal works as interlock for the purposes below:

- To stop the power supply when cooling water for the pump is cut off.
- To stop the power supply when backing pressure of the pump rises up.
- To stop the power supply for other reason.

Connect these interlock signals so that they are closed in normal condition. When operating the power supply without connecting the protection signal, set function for cancelling protection signal to “OFF” or short pin No. 2 and 10 of remote connector.

The pin No. 2 and 10 of the remote connector is not shorted at shipping.

! CAUTION

When shorting No. 2 and 10 of remote connector, be sure to set switch for cancelling protection signal to “ON”, or interlock will be canceled.

3) ACC. signal(pin no.3-11)

This signal is closed during acceleration of the pump after started.

4) NORMAL signal (pin no.4-12)

This signal is closed during normal operation of the pump.

5) FAILURE signal (pin no.6-14)

This signal is opened during indication of error message that means protective function of the power supply works.

6) FAILURE signal (pin no.8-14)

This signal is closed during indication of error message that means protective function of the power supply works

7) BRAKE signal(pin no.5-13)

This signal is closed while braking pump.

8) LOCAL/REMOTE signal(pin no.7-15)

This signal is closed when the operation mode LOCAL/REMOTE/SERIAL COMMUNICATION is set to “REMOTE”.



Document No. : ND00338<2>

! CAUTION

3) ~8) are output of photocoupler . The max contact capacity is DC24V, 0.1A.

8. Maintenance and inspection**8.1 Tuning**

The power supply is tuned sufficiently before shipping. Tuning before operation is unnecessary.

8.2 Adjusting the depth of character in display (LCD contrast)

You can adjust the depth of character in display.

Press the F1 button by section 3.4.2, and the display is indicated as follows.

LCD Contrast
5

The number on bottom in display changes as follows every time pressing the F2 button.

5⇒6⇒7⇒8⇒9⇒0⇒1⇒2⇒3⇒4⇒5⇒ . . . Higher number means the depth of character is deep. You can decide the depth of character by pressing the F3 button, and the display returned to the first indication. The display also returned to the first indication by pressing the F1 button again. In this case, the depth of character dose not change.

LCD contrast is set to “5” at shipping.
--

8.3 No-load test of power supply

No-load test of the power supply is to start/stop the power supply without connecting to the pump for the purpose of checking the power supply.

Follow the procedure as below for no-load operation test.

- 1) Turn off the power supply.
- 2) Disconnect all the cables except input cable. Make the power supply to which only the input cable is connected.

! CAUTION

Prior to disconnect cables, sure to turn off the power supply, or it can cause electric shock.

- 3) Turn on the power supply.
- 4) Set the function for selecting operation mode LOCAL/REMOTE/SERIAL COMMUNICATION to “LOCAL”. Refer to section 4 about how to set to “LOCAL”.
- 5) Set the function for no-load test to “ON. Refer to section 4 about how to set to “ON”. The display is indicated as follows.

No Load Test	L
0rpm	12345h

Note.1) “No Load Test” means the indication is blinking.

Document No. : ND00338<2>

- 6) Press the START button. If the power supply is normal, the display is indicated rated speed of rotation of pump several seconds after pressed START button. The display is indicated as follows. The rated speed of rotation is shown at following Table.8.

No Load Test	L
33600rpm	12345h

Table 8. The rated speed of rotation

Power supply model	TC163H	TC203	TC223	TC353	TC523H	TC1104
The rated speed of rotation (unit:rpm)	48000			45000	24000	33600

- 7) Press the STOP button and stop the power supply. The display is indicated as follows.

No Load Test	L
05:00	12345h

After the rest of braking time is indicated, “0rpm” is indicated again like above-stated 5).

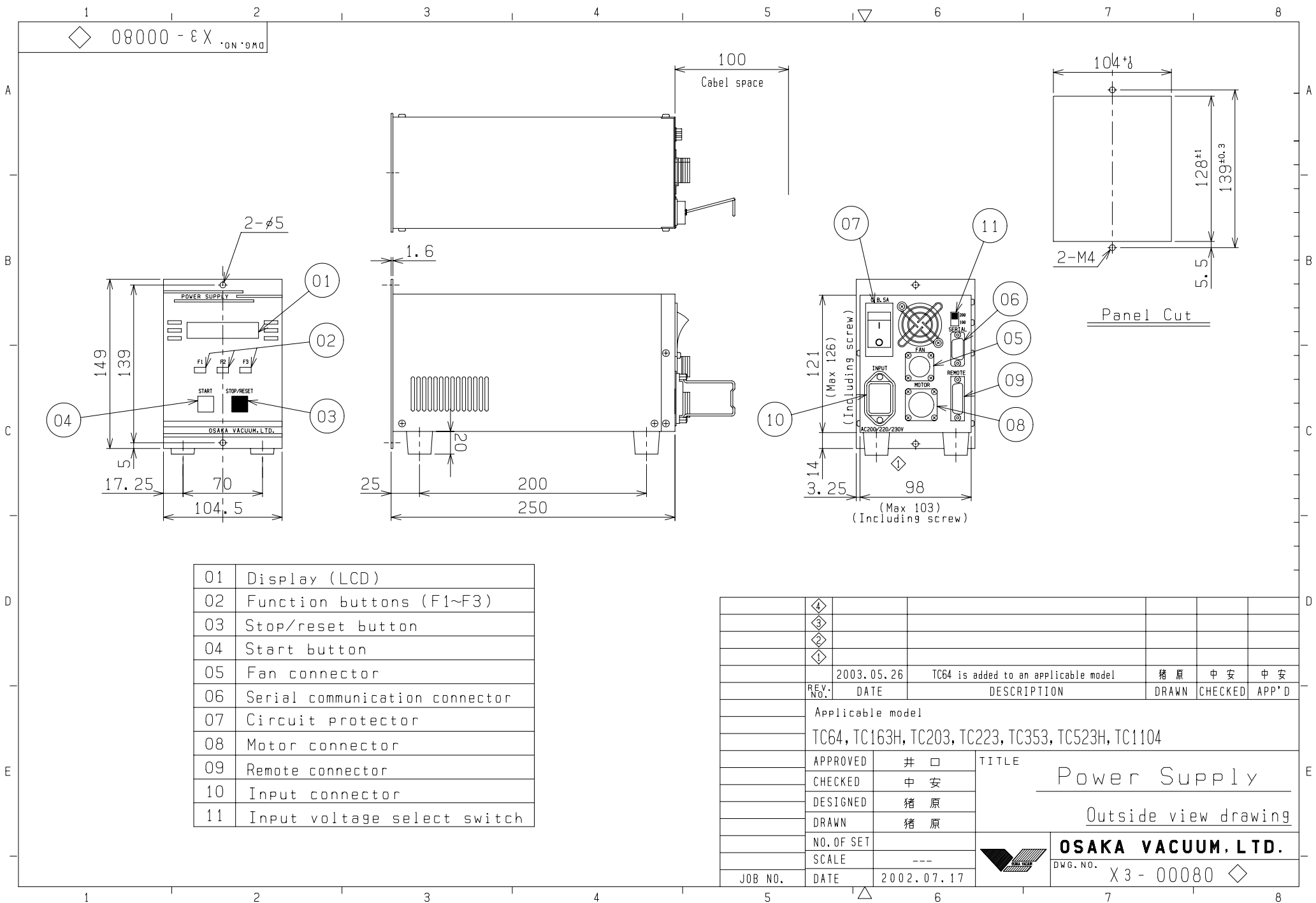
- 8) That is all the procedure of no-load test. If the display indicates error message in no-load test, it is certain that the power supply has error. In such a case, please contact our company.

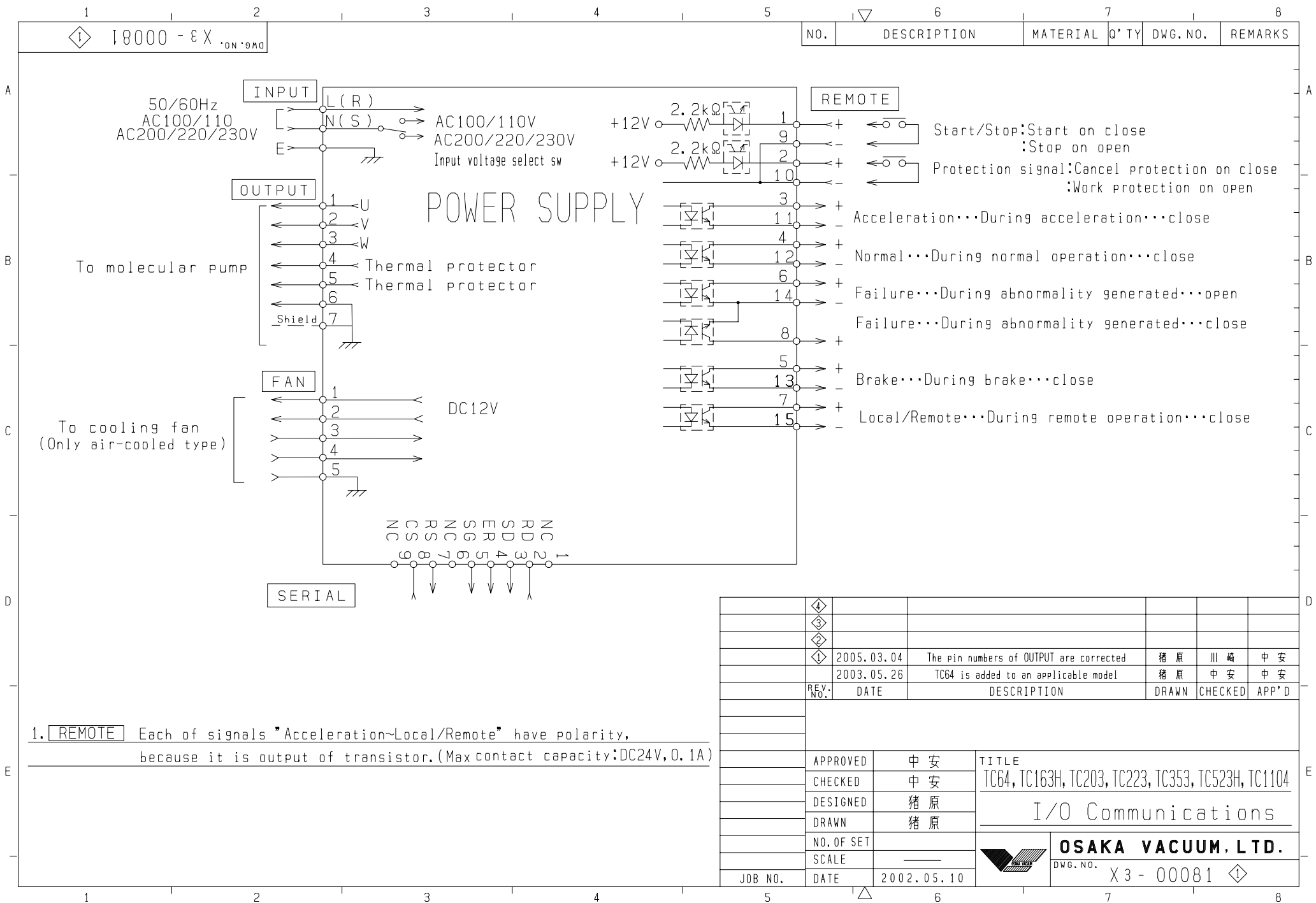
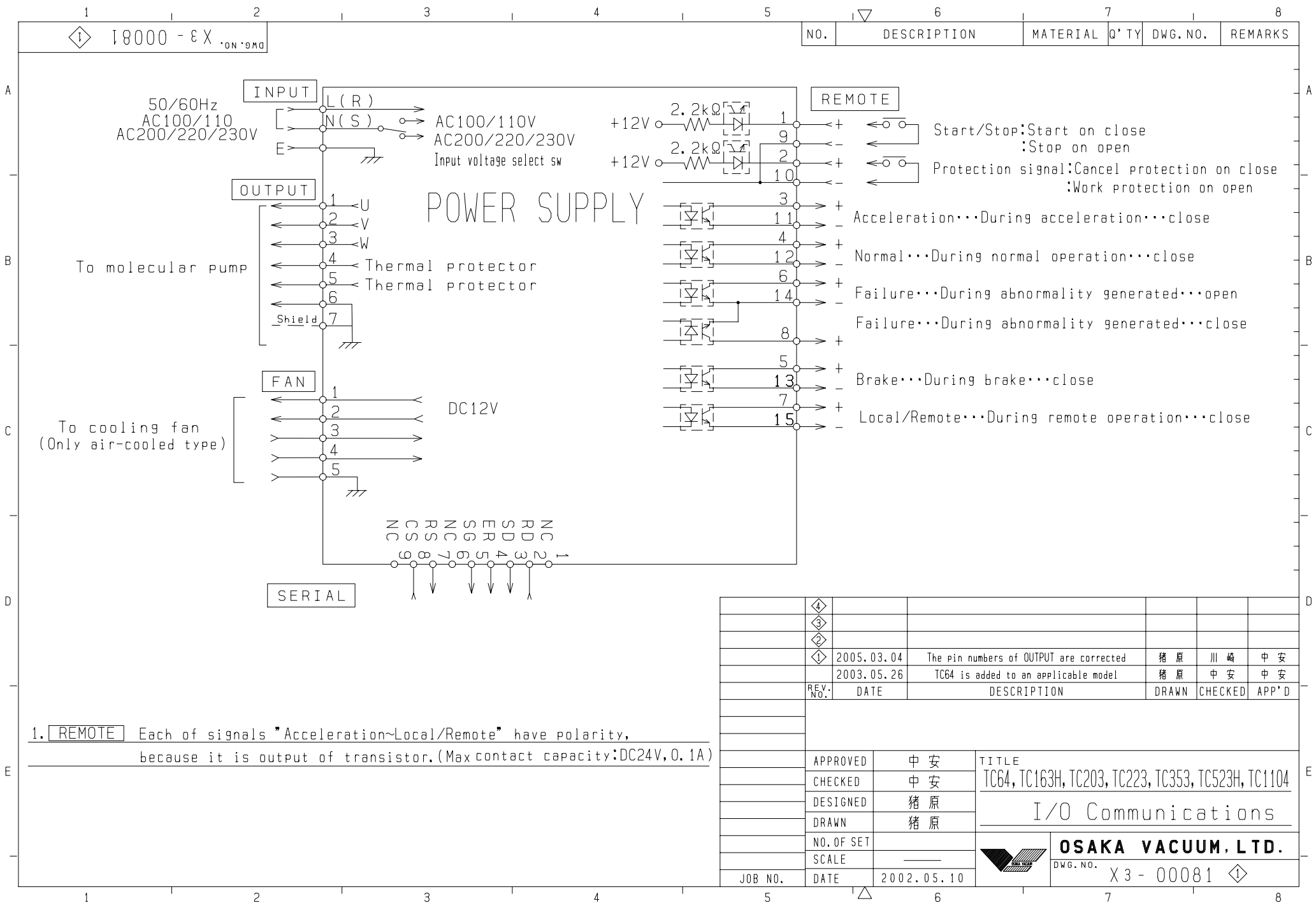
! CAUTION

When the no-load test has finished, be sure to set the function for no-load test to “OFF”.

9. Others

- 1) Start/stop the pump with the START/STOP buttons on the front panel or START/STOP signal connected to the remote connector or SERIAL COMMUNICATION connector on the rear panel.
DO NOT operate or control the pump by the output to start/stop the pump, for example, to connect/disconnect the motor cable and so on.
- 2) Supply the power excluding noise, surge and voltage fluctuation to the power supply.
- 3) DO NOT touch the inside of the power supply that is alive.
- 4) Handle the power supply as industrial waste when discarding it.







OSAKA VACUUM, LTD.

Document No. : ND00338<2>

Osaka Vacuum, Ltd.

Head office : Nissei Yodoyabashi Bldg. 9F, 3-5-29 Kitahama, Chuo-ku, Osaka
541-0041 Japan
Phone +81-6-6203-3981 Fax +81-6-6222-3645

Tokyo office : Ginza Showa-dori Bldg. 2F, 8-14-14 Ginza, Chuo-ku, Tokyo
104-0061 Japan
Phone +81-3-3546-3731 Fax +81-3-3546-1560

California office : 911 Bern Court, Suite 140, San Jose, CA 95112
Phone +1-408-441-7658 Fax +1-408-441-7660

Seoul office : #605, Leaders Bldg., 274-4, Seohyeon-Dong, Bundang-Gu,
Seongnam-City, Kyeonggi-Do 463-824, Korea
Phone +82-31-707-0002 Fax +82-31-707-3339

Shanghai office : 21. Floor, HSBC Tower, 101 Yin Cheng East Road,
Pudong New Area, Shanghai 200120, China
Phone +86-21-2890-3360 Fax +86-21-2890-3030

Service center

Osaka Vacuum, Ltd. Hachioji factory :	Phone +81-426-64-5301	Fax +81-426-64-6420
Osaka Vacuum, Ltd. California office :	Phone +1-408-441-7658	Fax +1-408-441-7660
Shanghai Osaka Vacuum, Ltd.(China) :	Phone +86-21-5301-1522	Fax +86-21-5301-1523
Sin Won Tech Co., Ltd.(South Korea) :	Phone +82-32-814-8441	Fax +82-32-814-7301
Cutes Corporation(Taiwan) :	Phone +886-3-452-6161	Fax +886-3-451-1347

STANDARD WARRANTY CONDITIONS

OSAKA VACUUM, LTD.

Article 1 Warranty

In delivery of the product indicated in the Delivery Specifications and/or the Instruction Manual ("Product"), we warrant that the Product is designed and manufactured in accordance with our regulation, standard or rule etc. with respect to design, purchase, manufacture and quality control under ISO9001 Standard or ISO9002 Standard as well as the specifications in the sales contract, and that there is no defect in design, materials or manufacture of the Product.

Article 2 Indemnification

In relation to the Product, in case any defect in design, materials or manufacture obviously attributable to us is found within the warranty period, one year from the delivery date of the Product (unless otherwise stipulated in written documents), and a notice of such defect is immediately given to us, we will, at our election, correct, repair or replace such defective part, or replace the whole Product without charge. The replacement is available only for standard Products, and no replacement may be allowed for any Custom-made Product.

Article 3 Exception

The warranty and relevant indemnification shall be applied only when the Product is properly installed or fixed, handled, used, stored and appropriately maintained by a user in accordance with the instructions stipulated in the Delivery Specifications, the Instruction Manual of the Product, other handling instructions of ours and/or the Related Technical Documents which we provide ("Related Technical Documents"). Unless otherwise stipulated in other written document, the warranty and relevant indemnification shall not be applied to the cases described below;

- (1) Any failure due to any usage of the Product not described in the Related Technical Documents of the Product, or any other irregular usage of the Product;
- (2) Deterioration of the Product due to corrosive gases, organic solvent, radioactive rays, electromagnetic field etc.;
- (3) Expendable parts and wearable parts such as lubricant etc.;
- (4) Any failure due to repair or reconstruction by any party other than us;

- (5) Repaired Products (the Standard Warranty Conditions for Repaired Products will apply to the repaired Products) ;
- (6) An insignificant deviation from the specifications in the sales contract which has no effect on performance or function of the Product;
- (7) Any failure due to fire, flood, earthquake, lightning strike or any other event caused by force majeure.

Article 4 Scope of Indemnification

The scope of our indemnification shall be limited to the correction, repair or exchange of defective parts of the Product delivered, or replacement of the whole Product (in case of the standard Product only) , and shall not include any compensation for the consequential damages and business losses including the following;

- (1) Costs and expenses accrued in connection with the removal of the failed Product from the equipment in which the Product has been installed; or
- (2) Costs and expenses accrued in connection with installment of the repaired Product or replacement to the equipment.

In addition, the total amount of the indemnification shall be limited to the contract price of the Product.

As for “ Usage of the Product not described in the Related Technical Documents of the Product ” stipulated in Article 3 of this Standard Warranty Conditions, such usage shall be included in the scope of indemnification under this Standard Warranty Conditions only when we agree in writing prior to the use of the Product.