

Vacuum Pump Unit EVP03 Serial Communication Owner's Manual

Setting Software Owner's Manual: pages 1 to 12

Modbus Communication Owner's Manual: pages 13 to 21



Vacuum Pump Unit EVP03

Setting Software Owner's Manual

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Software license agreement

Version 1.0

This Agreement specifies the license terms for the setting software (hereinafter referred to as "this software". If any updates for this software are supplied after the agreement date, such updates shall be included in "this software".) supplied by KOGANEI CORPORATION (hereinafter referred to as "KOGANEI") for you, the customer, to operate the product created by KOGANEI, "vacuum pump unit (EVP03)" (hereinafter referred to as "this product").

By selecting "I accept", you shall be deemed to have accepted all the contents of this Agreement, so that you can start installation. (The date you execute installation shall be deemed as the "agreement date".) If you cannot accept the contents of this Agreement, you cannot execute installation.

1. Intellectual property rights

- (1) Intellectual property rights to this software, such as copyrights, are reserved by KOGANEI, and this software is protected by the copyright law of Japan and other applicable laws and regulations.

2. Grant of right

- (1) Under this Agreement, KOGANEI shall grant you a non-exclusive right to use this software to the extent of the purpose specified in the following paragraph under the terms of this Agreement.
- (2) You may use this software for the sole purpose of operating this product with the KOGANEI-designated method.
- (3) KOGANEI shall permit you to sublicense the use of this software to your customer for the purpose specified in the preceding paragraph, provided that the requirements ① and ② below are met. You shall not permit your customer to further sublicense the use without prior written consent of KOGANEI.
 - ① You sell this product and a PC in which this software is installed as a set.
 - ② You place your customer under the same obligations as the ones under this software license agreement.
- (4) This Agreement shall not grant you any rights to this software other than the license mentioned in Paragraph 1 and the sublicense mentioned in the preceding paragraph.
- (5) You may install only as many instances of this software as are necessary for using it yourself for the purpose mentioned in Paragraph 2 in multiple PCs.

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- (1) You may not reverse engineer, decompile, or disassemble this software.
- (2) Unless explicitly granted otherwise in this Agreement, you may not use this software or reproduce or alter it wholly or in part.
- (3) You may not license, lend, or lease this software to a third party.

4. Restriction of liability

- (1) KOGANEI shall make no warranty whatsoever for this software, including the warranty for the performance and functions of this software, the operability of this software in your operating environment, and this software's freedom from defects.
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5. Agreement period

- (1) This Agreement shall take effect on and after the agreement date.
- (2) If you violate any of the terms of this Agreement, KOGANEI may immediately terminate this Agreement without notice or demand to you.
- (3) If this Agreement is terminated, you shall immediately discard this software, as well as all reproductions thereof and all related materials.

6. Compensation for damage

If you violate this Agreement, causing damage to KOGANEI, you shall immediately compensate for any damage, direct or indirect, caused to KOGANEI.

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You may not transfer or lend to a third party the contractual status or any rights granted to you by KOGANEI under this Agreement without explicit prior written consent of KOGANEI.

8. Governing law and jurisdiction

- (1) This Agreement shall be governed by the law of Japan.
- (2) The Tokyo District Court shall have exclusive jurisdiction of the first instance over all disputes arising in connection with this Agreement and this software.

1. Introduction

This software is software for Windows for making settings for and displaying the status of KOGANEI vacuum pump unit (model: EVP03).

Before using this software, be sure to read through the Catalog S6018 for the vacuum pump unit EVP03.

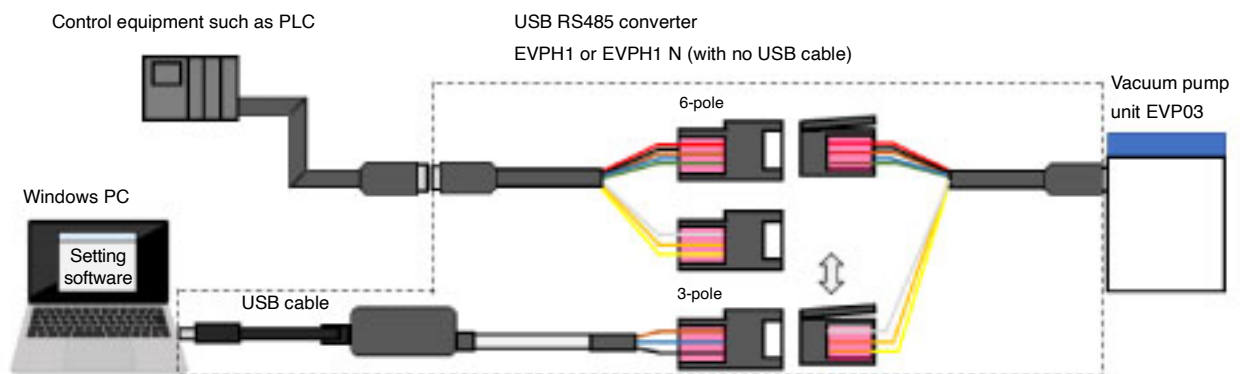
2. System requirements

- Compatible OS
Windows 7 SP1, Windows 8.1, Windows 10, Windows11
- CPU
32-bit (x86) or 64-bit (x64) processor of 1 GHz or higher
- Memory
2 GB or more
- Hard disk drive
Free space of 500 MB or more
* Excluding the free space required for .NET Framework.
- Display
Resolution of 1024x768 or higher
- Other
.NET Framework 4.8

3. Component configuration

To connect the vacuum pump unit (model: EVP03) to a PC, the separately sold USB-RS485 converter (model: EVPH1 or EVPH1-N) is required. Get the converter ready.

To switch between the configuration for connecting to control equipment such as PLC and the configuration for using the setting software, insert the 3-pole connector appropriately.



4. Preparations to make before use

If it is necessary to install .NET Framework, obtain it from the official download center of Microsoft and install it according to the procedure specified by the installer.

For inquiries about Windows and .NET Framework, contact Microsoft Support.

4.1 Obtaining the necessary software

- 1) Download the software from KOGANEI website.

If you cannot obtain the software because, for example, you do not have a network environment, contact your nearest KOGANEI sales office or the KOGANEI overseas group.

- 2) Decompress the obtained file "EVP03_SupportSoft_xxxx.zip".

EVP03_SupportSoft_V*.*



To install each item, you need administrator privileges.

4.2 Installing USB-RS485 converter driver

This is not required if the KOGANEI USB-RS485 converter (such as EVPH1/IBM2A-H) driver has already been installed.

- 1) Execute the installer "CDM20814_Setup.exe", which is in the Driver folder.
- 2) Installation of the USB-RS485 converter driver is started. Perform installation according to the instructions.

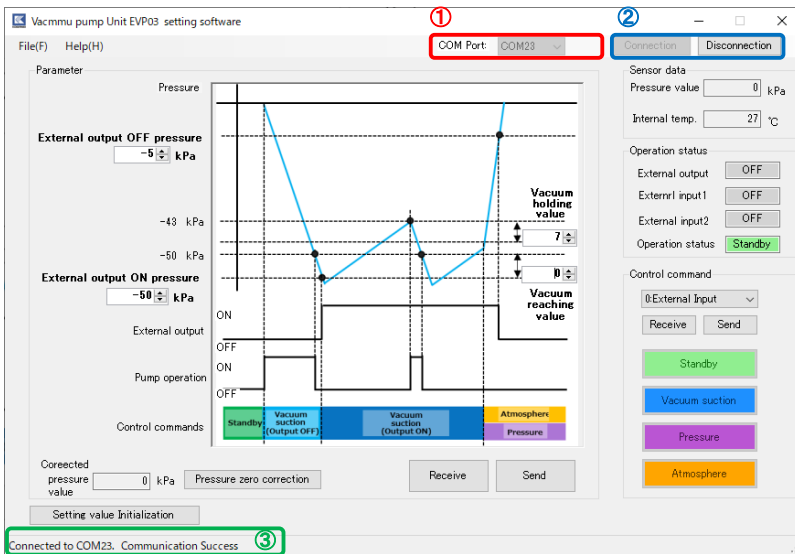
4.3 Installing the support software

- 1) Execute the installer "EVP03_SupportSoft_Setup.msi", which is in the SupportSoft folder.
- 2) The installer starts, and installation is started. Perform installation according to the instructions.

5. Using the software

* **See also the catalog (S6018) for the vacuum pump unit.**

5.1 Communication connection/disconnection



① COM port

A list of COM ports installed in your PC is displayed. Select the port* to which the USB-RS485 converter to use is allocated.

* When the USB-RS485 converter to use is connected to a USB port, the COM port will be added to the COM port list.
If the COM port list does not change, the driver may not have been installed. Install it, referring to 4.2.

② Connect/Disconnect

Make a serial communication connection/disconnection between the PC and vacuum pump unit EVP03.

Connect button: Makes a connection to the selected COM port.
During the connection, communication is always performed between the PC and vacuum pump unit.

Disconnect button: Cuts off the connection from the COM port used to end the communication.

③ Communication status display>

Connection status: "Connected to COM*." is displayed (where COM* represents the connected COM port).

During the connection, communication is always performed between the PC and vacuum pump unit EVP03.

The communication status is displayed after the connection status.

Communication Success: Normal communication status

Communication Timeout: No response from the vacuum pump unit EVP03

CRC Error: CRC data mismatch

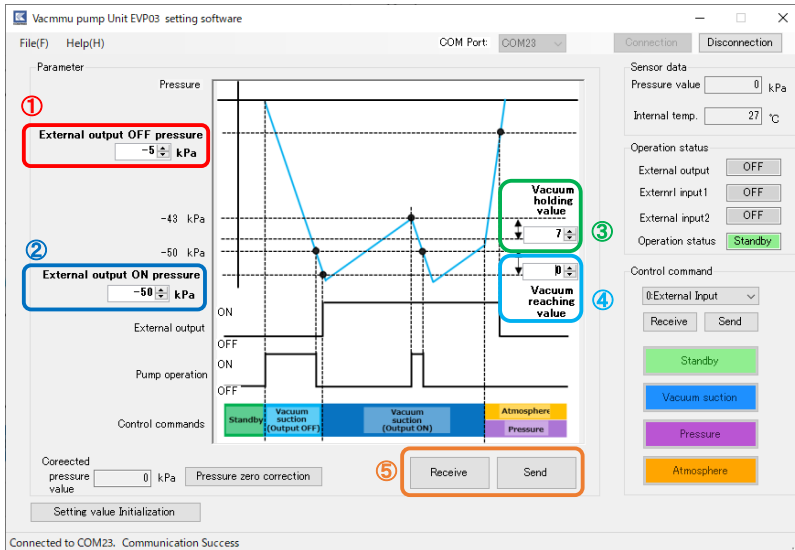
Disconnection status: "Not connected." is displayed.

If it is not possible to make a connection or perform communication and for other errors, perform the following checks:

- Is the power supplied to the vacuum pump unit EVP03 properly?
- Is the communication cable connected properly without a break in the wiring/lead/wire?
- Is the USB-RS485 converter driver installed?
- Is the COM port specified properly?

Perform other checks, as needed.

5.2 Parameter settings



① External output OFF pressure

Pressure at which the external output is OFF.

This pressure is used to judge whether a workpiece is released.

Factory setting: -5 kPa

Setting range: -5 to -10 kPa

② External output ON pressure

Pressure at which the external output is ON

This pressure is used to judge whether a workpiece is clamped by vacuum.

Factory setting: -50 kPa

Setting range: -40 to -60 kPa

③ Vacuum holding value

The vacuum pump is restarted when the pressure decreases from the external output ON pressure by the pressure value of the vacuum holding value.

Factory setting: 7 kPa

Setting range: 7 to 10 kPa

④ Vacuum reaching value

Depending on the external output ON pressure setting, secondary side volume, and other conditions, a pressure overshoot may occur against the external output ON pressure. This is a setting for compensating for it.

If the occurrence of an overshoot does not present any problems, the value need not be changed from the factory setting.

Factory setting: 0 kPa

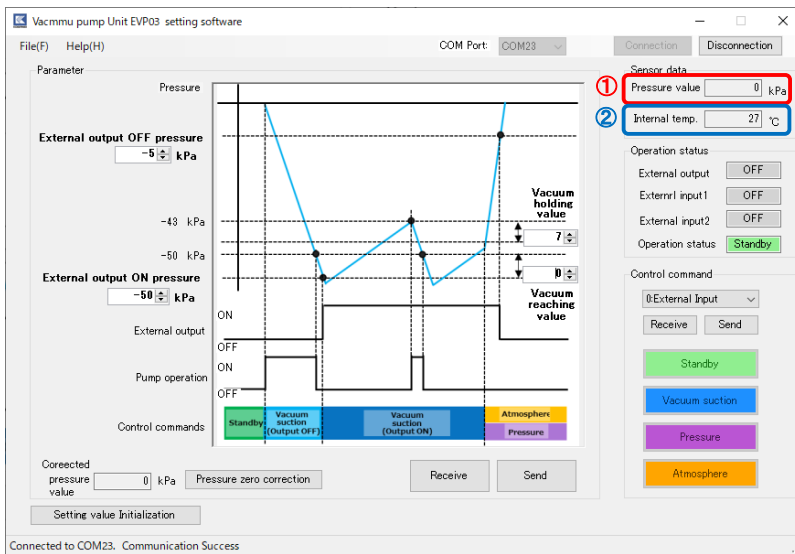
Setting range: 0 to 5 kPa

⑤ Send/Receive buttons

Send: Sends parameters that have been set to the vacuum pump unit at a time and writes them to nonvolatile memory.

Receive: Updates the parameter values on the screen to the currently set values at a time.

5.3 Sensor data



① Pressure value

The current pressure value is displayed.

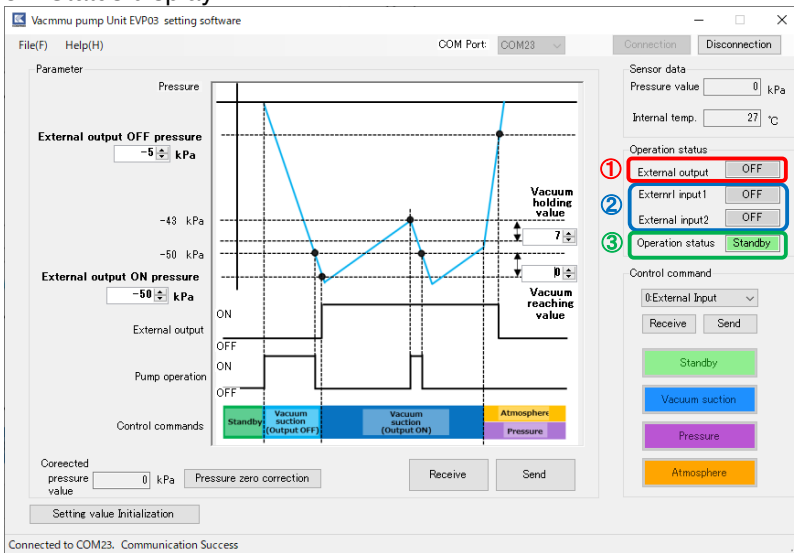
② Internal temperature

The temperature inside the vacuum pump unit is displayed.

* If the internal temperature exceeds 57°C, a high temperature alarm is generated and the operation of the vacuum pump unit stops.

The unit cannot be used until the internal temperature falls. The alarm can be canceled by turning the power OFF.

5.4 Status display



① External output

The status of the external output is displayed.

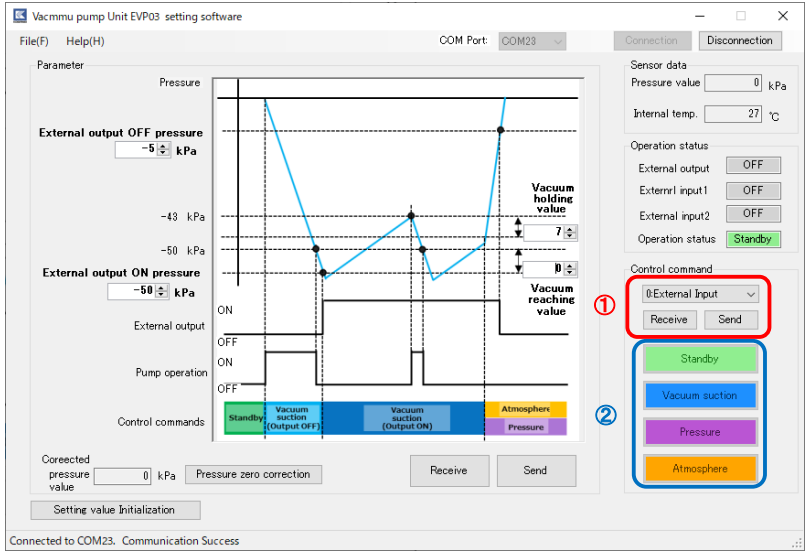
② External input 1, External input 2

The status of each external input is displayed.

③ Operating status

It is indicated which status the unit is in, Standby, Vacuum suction, Pressure, Atmosphere, and error (high temperature/overcurrent).

5.5 Control commands



* Switching from "Pressure"→"Atmosphere" is not accepted.

① Control command selection

Used to select between specifying a control command from external inputs and specifying one from communication.

Select the control command to set and then click the "Send" button to send the setting value to the vacuum pump.

The current setting value can be checked by clicking the "Receive" button.

- 0. External inputs: Used to execute a control command with an external input combination. When external inputs are selected, no control command from communication is accepted.

External input 1	External input 2	Operating status
OFF	OFF	Standby
ON	OFF	Vacuum
OFF	ON	Positive pressure
ON	ON	Atmosphere

* When inputs 1 and 2 OFF.

If the power is turned on with either external input ON, the unit enters the input signal OFF undetected status (the green LED blinks).

This is for preventing erratic operation at startup.

selecting "0. External inputs", turn on the power with external

- 1. Communication input: Used to execute a control command from communication (support software/Modbus communication).

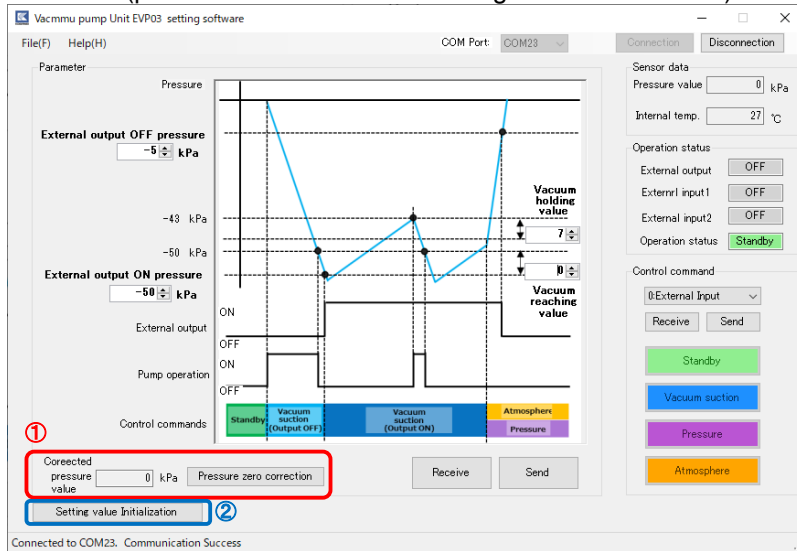
When communication input is selected, no control command from external inputs is accepted.

② Control command buttons

By clicking the "Standby", "Vacuum suction", "Pressure", and "Atmosphere" buttons, the control command is switched accordingly.

Switching with the control command button uses communication. Thus, if Control command is set to "0. External inputs", set it to "1. Communication input" before switching.

5.6 Other (pressure zero correction/setting value initialization)



① Pressure zero point correction

Used to correct the zero point of the pressure sensor built into the vacuum pump unit.

Execute it when the unit is in the atmospheric pressure status.

If an attempt is made to execute it with the pressure value set to ± 10 kPa or higher, it will not be executed because the unit is regarded as not being in the atmospheric pressure status.

The corrected pressure value is displayed in the corrected pressure value field.

The corrected pressure value is written to nonvolatile memory.

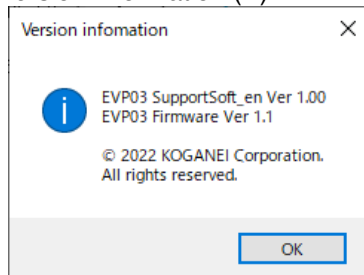
② Setting value initialization

Used to initialize the setting value to restore factory settings.

5.7 Version check

Used to check the versions of the support software and the software for the vacuum pump unit.

Help (H) - Version information (V)



Vacuum Pump Unit EVP03 Modbus Communication Owner's Manual

Modbus Communication Owner's Manual

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1. Introduction

This manual explains the Modbus communication for the vacuum pump unit (EVP03). For matters other than those related to Modbus communication, see the Catalog S6018 for the vacuum pump unit (EVP03).

2. Communication settings

Item	Description
Communication protocol	Modbus-RTU
Physical layer	RS-485
Communication method	Half-duplex & asynchronous
Maximum number of units that can be connected	1
Communication speed	115.2kbps
Data bits	8 bit
Start bits	1 bit
Stop bits	1 bit
Parity	Even
Flow control	Not applicable

3. Communication frame configuration

Start	Component address (1)	Function code (1-6)	Data	Error check CRC	End
Silent interval of 3.5 characters (350 us) or more	1byte	1byte	n byte	2byte	Silent interval of 3.5 characters (350 us) or more

The start and end of a frame are judged at the silent interval of 3.5 characters (no-communication time).

4. Supported function codes

The following six function codes are supported:

Function code	Function name	Description
1	Read Coil Status	Read the DO status (0/1).
2	Read Input Status	Read the DI status (0/1).
3	Read Holding Register	Read the holding register.
4	Read Input Register	Read the input register.
5	Force Single Coil	Rewrite the DO status (0/1).
6	Preset Single Register	Rewrite the holding register.

5. Component address

The component address of this component is fixed to "1", so that the communication between the upper component and vacuum pump unit EVP03 is 1:1 communication.

6. Data addresses

The data addresses of this component are explained below.

Note) Never access any address spaces not contained here or any of the reserved areas. Doing so may cause unexpected operations and failures. (Such spaces and areas may be used with internal parameters.)
If such spaces or areas are rewritten by mistake, execute parameter initialization and turn off the power and back on. (All parameters will be initialized, returning to factory settings.)

6.1 DO (coil)

ON/OFF and other 2-value data is placed here. The data can be read and rewritten.

It is read with function code 1 and rewritten with function code 5.

In the event of an error, it is not automatically cleared to 0 and must be cleared to 0 by the user.

Data address	Name	Description
0	INIT	Parameter initialization Change the data from 0 to 1 with function code 5 to execute initialization. Upon normal termination, automatically cleared to 0 (which can be checked with function code 1). If it is not cleared to 0 even after an elapse of 100 ms, an error will result.
1	ZERO_ADJ	Zero point correction Execute it in the vent to atmosphere status. If the pressure P satisfies $IPI < 10 \text{ kPa}$, it is regarded that pressure is applied, resulting in an error. Change the data from 0 to 1 with function code 5 to execute initialization. Upon normal termination, automatically cleared to 0 (which can be checked with function code 1). If it is not cleared to 0 even after an elapse of 100 ms, an error will result. The pressure zero point correction value is stored in data address [6] of the holding register. To check and clear the correction value, use function code 3 and function code 5.
2 to 31	- Reserved -	Reserved area

6.2 DI (input status)

ON/OFF and other 2-value data is placed here. It is read-only data.

It is read with function code 2.

Data address	Name	Description
0	OUT	External output status 0: OFF, 1: ON
1	IN1	External input status 0: OFF, 1: ON
2	IN2	External input 2 status 0: OFF, 1: ON
3	- Reserved -	Reserved area
4	TEMP_ERROR	Temperature rise error 0: Normal, 1: Abnormal
5	OUT_CURRENT_ERROR	Overcurrent error 0: Normal, 1: Abnormal
6 to 31	- Reserved -	Reserved area

6.3 Input Register

Read-only 16-bit data is placed here. It is read with function code 4.

Data is signed 16-bit data.

All data is signed 16-bit integers.

Data address	Name	Description	Unit
0	PRESSURE	Pressure sensor detection value -100 to 220	kPa
1	MAJOR_VERSION	Major version (firmware version of the vacuum pump unit)	-
2	MINOR_VERSION	Minor version (firmware version of the vacuum pump unit)	-
3	STATE	Operating status 0: Before status confirmation 1: Standby 2: Vacuum suction 3: Positive pressure 4: Atmosphere 5: Error	-
4	- Reserved -	Reserved area	
5	TEMP_SENSOR	Temperature inside the unit	°C
6	OUT_CURRENT	External output current value	mA
7	MOTOR_CURRENT	Pump motor current value	mA
8 to 63	- Reserved -	Reserved area	

6.4 Holding Register

16-bit data that can be read and rewritten is placed here.

All data is signed 16-bit integers.

Except data address 3 operating status specification (STATE), the values of the holding registers will be held even after the power is turned off.

It is read with function code 3 and rewritten with function code 6.

Data address	Name	Description	Initial value	Maximum value	Minimum value	Unit	Whether held after the power is turned OFF
0	P_ON	External output ON pressure threshold value	-55	-40	-60	kPa	Held
1	P_OFF	External output OFF pressure threshold value	-5	-5	-10	kPa	Held
2	STATE_SW	Operating status switching input selection 0: External inputs (VAC/BLW) 1: Communication input To be specified with STATE in data address 3 of the holding register.	0	1	0	-	Held
3	STATE	Operating status specification 1: Standby 2: Vacuum suction 3: Positive pressure 4: Atmosphere Effective when the STATE_SW setting in data address 2 of the holding register is set to 1 (communication input).	1	4	1	-	Not held
4	P_KEEP	Vacuum holding value The stopped vacuum pump is restarted when the pressure value reaches the external signal ON pressure value plus the vacuum holding value.	7	10	7	kPa	Held
5	P_REACH	Vacuum reaching value The vacuum pump is operated until the pressure value reaches the external signal output ON pressure value plus the Vacuum reaching value.	0	5	0	kPa	Held
6	P_ADJ_DATA	Pressure zero point correction value	0	10	-10	kPa	Held
7 to 63	- Reserved -	Reserved area	-	-	-	-	-

7. Communication examples

Communication examples with the individual function codes and responses are explained below.

7.1 Function code 01 (Read Coil Status)

Zero point correction execution status check

	Data	Send data (hex)
Component address (fixed to 1)	1	0x01
Function code	1	0x01
Start data address	1	0x00 0x01
Number of data items obtained	1	0x00 0x01
CRC	Calculated value	0xAC 0x0A

Response if 0

	Data	Receive data (hex)
Component address (fixed to 1)	1	0x01
Function code	1	0x01
Number of data bytes	1	0x01
Data	0	0x00
CRC	Calculated value	0x51 0x88

7.2 Function code 02 (Read Input Status)

If the external output status (data address 0 of DI) is to be obtained

	Data	Send data (hex)
Component address (fixed to 1)	1	0x01
Function code	2	0x02
Start data address	0	0x00 0x00
Number of data items obtained	1	0x00 0x01
CRC	Calculated value	0xB9 0xCA

Response if the external output status is ON (1).

	Data	Receive data (hex)
Component address (fixed to 1)	1	0x01
Function code	2	0x02
Number of data bytes	1	0x01
Data 1 (00-07)	1	0x01
CRC	Calculated value	0x60 0x48

7.3 Function code 03 (Read Holding Register)

If the external output ON pressure threshold value (data address 0 of the holding register) and the external output OFF pressure threshold value (data address 1 of the holding register) are to be obtained.

	Data	Send data (hex)
Component address (fixed to 1)	1	0x01
Function code	3	0x03
Start data address	0	0x00 0x00
Number of data items obtained	2	0x00 0x02
CRC	Calculated value	0xC4 0x0B

Response if the external output ON pressure threshold value is "-55 kPa" and the external output OFF pressure threshold value is "-5 kPa".

	Data	Receive data (hex)
Component address (fixed to 1)	1	0x01
Function code	3	0x03
Number of data bytes	4	0x04
Data 1 External output ON pressure threshold value	-55	0xFF 0xC9
Data 2 External output OFF pressure threshold value	-5	0xFF 0xFB
CRC	Calculated value	0x1A 0x6A

7.4 Function code 04 (Read Input Register)

If the current pressure value (data address 0 of the input register) is to be obtained.

	Data	Send data (hex)
Component address (fixed to 1)	1	0x01
Function code	4	0x04
Start data address	0	0x00 0x00
Obtained data	1	0x00 0x01
CRC	Calculated value	0x31 0xCA

If the pressure value is "-56 kPa"

	Data	Receive data (hex)
Component address (fixed to 1)	1	0x01
Function code	4	0x04
Number of data bytes	2	0x02
Data	-56	0xFF 0xC8
CRC	Calculated value	0xF9 0x56

7.5 Function code 05 (Force Single Coil)

Execution of zero point correction.

	Data	Send data (hex)
Component address (fixed to 1)	1	0x01
Function code	5	0x05
Start data address	1	0x00
		0x01
Data to change	1	0xFF
		0x00
CRC	Calculated value	0x8C
		0x3A

Data to change To make it 0 (OFF): 0x00,0x00
 To make it 1 (ON): 0xFF,0x00

Response if the change can be made normally (same as the data sent.)

	Data	Receive data (hex)
Component address (fixed to 1)	1	0x01
Function code	5	0x05
Address	1	0x00
		0x01
Data to change	1	0xFF
		0x00
CRC	Calculated value	0x8C
		0x3A

7.6 Function code 06 (Preset Single Register)

If the operating status specification (data address 3 of the holding register) is set to vacuum suction (2).

	Data	Send data (hex)
Component address (fixed to 1)	1	0x01
Function code	6	0x06
Start data address	3	0x00
		0x03
Data to change	2	0x00
		0x02
CRC	Calculated value	0xF8
		0x0B

Response if the change can be made normally (same as the data sent.)

	Data	Send data (hex)
Component address (fixed to 1)	1	0x01
Function code	6	0x06
Start data address	3	0x00
		0x03
Data to change	2	0x00
		0x02
CRC	Calculated value	0xF8
		0x0B

7.7 Responses (error/exception)

Responses during communication are as below.

- 1) If processing is performed normally
→Normal response (For details, see the communication examples in 7.1 to 7.6.)
- 2) If the vacuum pump unit side was unable to receive data due to a communication error (such as a break in the wiring/lead/wire)
→No response (No response is made. Perform time-out processing on the master side.)
- 3) If the vacuum pump unit side was able to receive data but the CRC did not match
→No response (No response is made. Perform time-out processing on the master side.)
- 4) If the unit side was able to receive data normally but was unable to perform processing because an exception occurred
→Exception response (Judge the contents from the exception codes below.)

Exception code	Description	Check item
1	The function code is illegal.	Check if a function contained in "4. Supported function codes" is used.
2	The data address is illegal.	Check if the data address is within the range, referring to "6. Data addresses".
3	The data is illegal.	Check if the data conforms to "3. Communication frame configuration".
4	The setting data is out of range.	Check the setting range, referring to "6.4 Holding Register".

Communication examples when exceptions occur

If an attempt is made to set the external output ON pressure threshold value (data address 0 of the holding register) to "55 kPa".

	Data	Send data (hex)
Component address (fixed to 1)	1	0x01
Function code	6	0x06
Start data address	8	0x00
		0x00
Data to change	55	0x00
		0x37
CRC	Calculated value	0xC8
		0x1C

Response if exception code 4 occurs because the setting data "55 kPa" is out of the setting range (setting range: -40 to -60 kPa).

In the event of an exception response, 0x80 is added to the function code.

	Data	Send data (hex)
Component address (fixed to 1)	1	0x01
Function code + 0x80	6 (+0x80)	0x86
Exception code	4	0x04
CRC	Calculated value	0x43
		0xA3

8. CRC

The CRC for use with Modbus-RTU is as below.

Generator polynomial: 0xA001

Initial value: 0xFFFF

Output calculation: No inversion

Shift direction: Right

If you have questions about the contents of this manual, or about other technical issues, please consult the KOGANEI overseas group shown below.

<<Contact information>>

KOGANEI overseas group, KOGANEI CORPORATION

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