Troublerésa II PLUS

Instruction Manual

(Remote Unit)

Malfunction Detector for Rotating Machinery

監視　　異常

とらぶるレーサII PLUS

Showa Denki Group
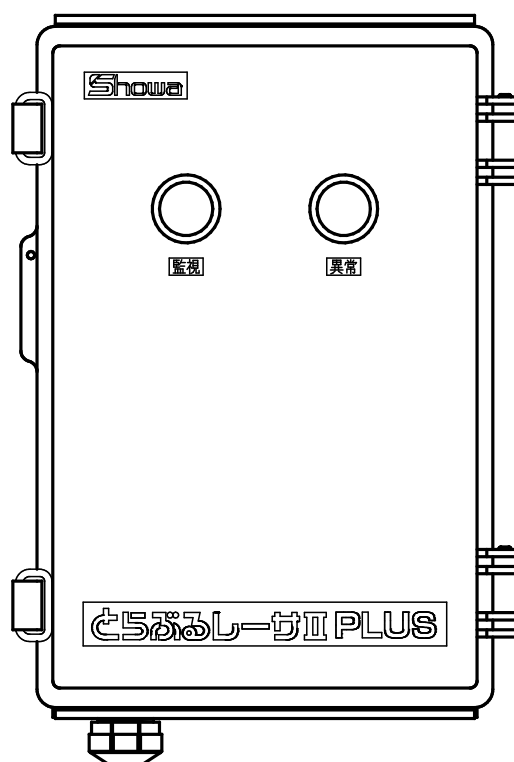
Introduction

Thank you very much for purchasing Showa Denki's Troubleresa Ⅱ PLUS MiruTEN Malfunction Detector for Rotating Machinery.

As a specialist manufacturer of blowers and dust collectors, Showa Denki is dedicated to creating products based on "flow technology" and "rotating machinery technology." The Troubleresa Ⅱ PLUS is a simple diagnostic device for rotating machinery, developed utilizing our wealth of expertise in maintenance and repairs. To get the best performance from this product and to ensure safe use and a long, trouble-free life, please take the time to read this instruction manual carefully.

This manual is designed for use by the following persons.
Persons with knowledge of rotating machines and related peripheral equipment:
・Persons who install or connect control equipment
・Persons who perform routine management (inspection, maintenance) of rotating equipment
・Persons who manage work sites where rotating equipment is used

1. How to read the instruction manual

The parts of this manual denoted by the [⚠ **Warning**] mark indicate that incorrect handling may result in [accidents leading to death or serious injury] or [outbreak of fire]. Parts denoted by the [⚠ **Caution**] mark indicate that incorrect handling may result in [accidents leading to injury] or [product damage]

2. Meaning of graphical symbols

🚫　　　indicates actions that must be avoided (object is unspecified)

❗　　　indicates instructions that should be followed.

⚠　　　indicates that incorrect handling may lead to an accident.

🚫　　　indicates that disassembly must be avoided.

⏚　　　indicates that an earth wire must be connected.

⚡　　　indicates the risk of electric shock.

Please take care to observe all warnings, cautions, and instructions.

Table of Contents Page

[⚠ W a r n i n g] This product is designed for general industrial applications.
It is not designed for use in applications that present the
risk of serious human harm or property damage.

⚠ This product is designed for the purpose of detecting and reporting
abnormalities that may lead to malfunction or failure of rotating
equipment. It does not prevent or resolve abnormalities. Please note
that abnormalities that cannot be detected by this product may occur.

⚠ This product is designed to support routine inspection work. It is
assumed that when using this device, maintenance inspections are
appropriately performed in accordance with the instructions provided
in the manuals for the blower or on the connected rotating equipment.

⚠ This product is designed for communication with our company's product (Base Unit).
Problems or failure in communication with products other than our product (Base Unit)
are not covered by the warranty.

❗ If there is a risk that malfunction or failure of this product may
cause serious damage or loss, make sure to provide systematic
backup and failsafe※1 features.

❗ Whenever the product detects an abnormality, make sure to stop operation
of the rotating equipment and take the necessary corrective measures.

❗ Installing each of the sensors requires specialist knowledge o
Electricity and rotating equipment. Make sure that sensors are
Installed only by technicians with the appropriate expertise.

❗ Do not leave the MiruTEN and powered Remote Unit for a long time
Without communication enabled between the two. If the indicator
Light that signals a communication problem is left flashing the life
of the Remote Unite will be shortened.

❗ Install the Remote Unit in a place where it will not be exposed to
water or dust. For applications in which exposure to water or dust
is unavoidable, we recommend use of the outdoor model(TCM-NF2PS).

❗ If using the outdoor model(TCM-NF2PS) for applications that require
IP65-level dust-resistance, water-resistance, and protection make sure to
apply appropriate protective measures to electrical wiring outlets.

❗ Make sure to connect sensors to terminals correctly. Electrical
wiring errors or connecting sensors with output values beyond their
usage range may not only cause a failure to detect abnormalities,
but also lead to short-circuits or sensor damage.

※1 : This means a design concept that aims to ensure safety in the event
Of a mistake by a worker or faulty operation of a sensor or device.

Make sure to shut off the power supply when performing electrical wiring connections. Otherwise, there will be a risk of an accident or product damage.

Do not install the product in a place exposed to radio waves or electromagnetic noise. Otherwise, there will be a risk of a communication malfunction or malfunction of the Remote Unit.

When using a wireless network for communication with this product, make sure to test operation in advance. If there is a high degree of electromagnetic noise or if there are other wireless networks in the area, communication may not work reliably.

Make sure to operate the touch controls on the screen only by hand. If excessive force is applied to the screen, or if the touch controls Are operated using a hard or sharp object the touch screen may become damaged.

Take care not to drop this product or sensors, or subject them to excessive physical shock. Otherwise, their internal elements may be damaged or malfunction may result, even if they appear to be normal.

Take care to connect the sensor lead wires in a way that does not impose repeated bending stress or tension. Otherwise, the wires may break.

Do not bundle sensor cables with or place them near to the main electrical circuit or a power line. Otherwise, malfunction may occur due to noise.

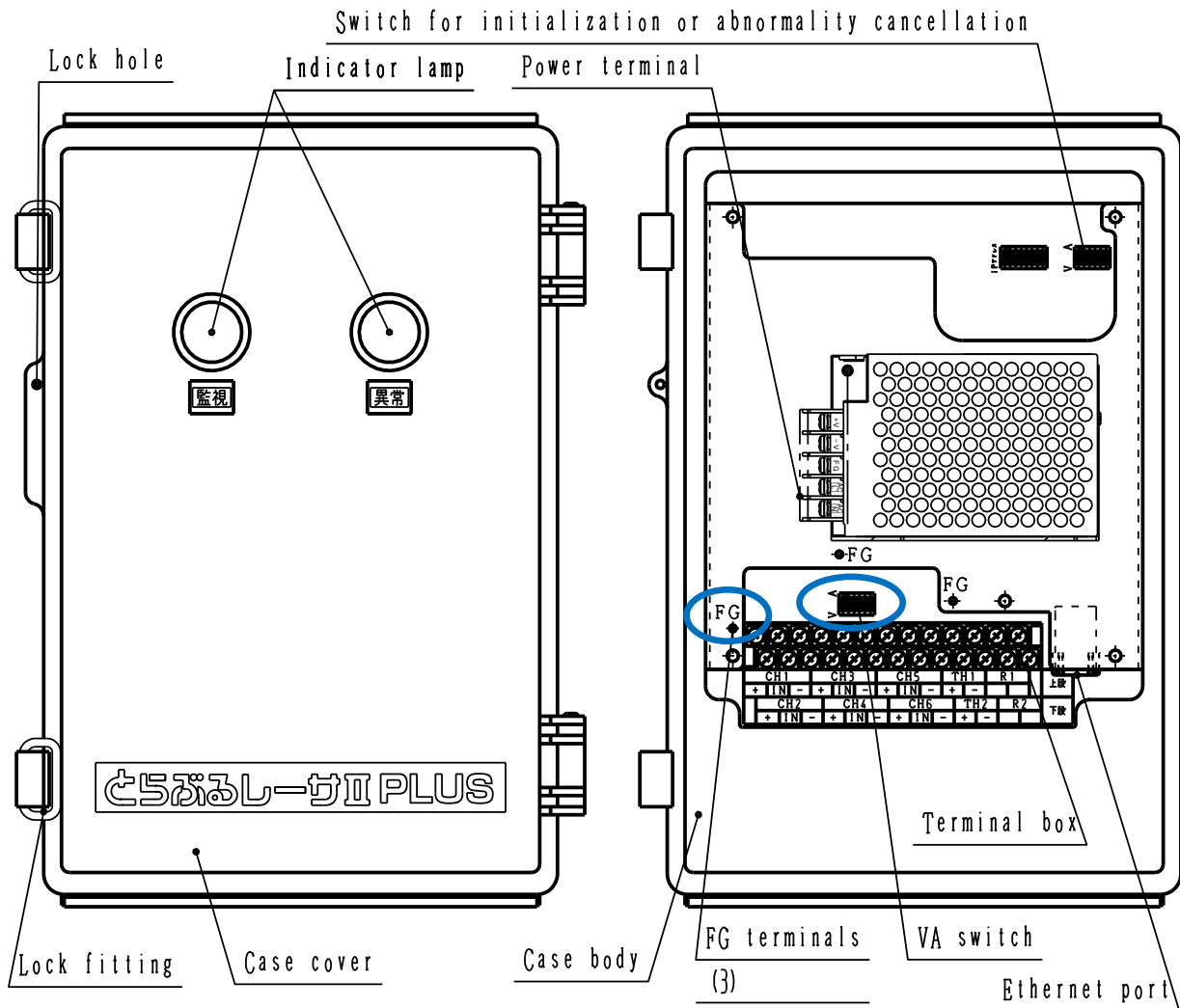Do not subject the product to any sudden change in temperature, Otherwise, insulation performance may deteriorate due to condensation, resulting in operation failure.

This product is a precision device, so make sure to avoid subjecting it to any strong physical shock, for example by dropping it.

Do not cover this product with a cloth or sheet, because this Causes heat radiation performance to deteriorate.

Do not connect this product or a Toublerasa II PLUS Remote Unit to the same network used by any similar product by another company. Otherwise the product may malfunction or become damaged.

Do not expose the product directly to oil, chemicals, solvents, or salt of any kind.

If this product shows any signs of abnormal heat generation, cracks, deformation, or strange smells, stop using it immediately.

● Part names

Switch for initialization or abnormality cancellation

Lock hole　　　　Indicator lamp　　Power terminal

監視　　異常

とらぶるレーサⅡPLUS

Lock fitting　　Case cover　　　　Case body

FG terminals
(3)

VA switch

Ethernet port

Terminal box

CH1　CH3　CH5　TH1　R1
+ IN - + IN - + IN - + - + -
CH2　CH4　CH6　TH2　R2
+ IN - + IN - + IN - + - + -

Front view　　　　　　**Internal view**

Disassembly must be avoided, otherwise product failure may occur. So do not touch any pars other than those designate

● Set contents
 ・ Remote Unit body
 ・ Instruction manual (for Remote Unit)
 ・ Screws for fixing the case cover
　　　Secure the case cover to prevent it being opened or closed easily.
　　　Pass the bolt through the locking hole and secure it using the included nut.
　　　(Make sure to fix the case cover if it is necessary to conform to IP65-level
　　　protection to protect the TCM-NF2PS.)

● Vibration sensors
Vibration sensor are fitted to a bearing stand or other suitable place to
Detect vibration.
Abnormalities such as changes in vibration (compared to normal operation)
or a vibration level that is outside the allowable range are detected.
The sensors VS-2502-01 and VS-V103-01 detect acceleration
The sensors VS-2502-02 detects velocity
The sensors VS-2502-03 detects displacement

● Magnet for vibration sensor（ＭＧ－０１）
 This can be used for temporary placement of vibration sensors.
 For long-term monitoring it is recommended that sensors are
 fixed securely using screws.

● Temperature sensors
Temperature sensors are fitted to bearing housings on both the load side
and drive side to detect bearing temperature.
(Note that if the bearing housing is thick at the point where the sensor is
 Fitted, the displayed temperature may be lower than the real temperature.)

● Current sensors
A current sensor is installed on one of the motor power supply cables
—R,S,or T—to detect an operation signal, insufficient load, excessive
load, etc. Current sensor can also be used to measure operation time.

A threshold value is the value at the boundary between normal and abnormal. with the Troubleresa Ⅱ PLUS, the threshold value is the reference value for judging whether a measurement is normal or abnormal.

Typically, there are two ways used to judge abnormality of vibration level or temperature-with an absolute criterion or a relative criterion.
In the case of an absolute criterion, abnormality is judged by comparing the measurement value with an absolute reference value, determined by a JIS or other Standard.
In the case of a relative criterion, abnormality is judged by measuring the normal value and then judging whether the value exceeds (or falls below) a threshold value that is a specified amount higher (or lower) than the normal value. Generally when measuring vibration or temperature, before abnormality is reached The value varies as shown in the graph below.

Concept of abnormal values
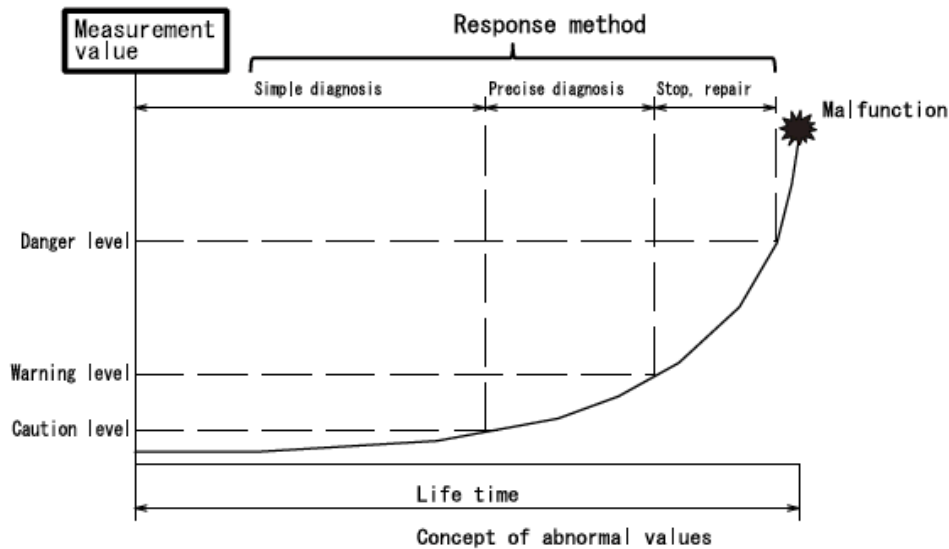
This product detects and signals abnormalities at an early stage by means of a simple diagnosis. Therefore, when an abnormality is detected, the customer Needs to conduct a precise diagnosis, to identify the location and degree of Abnormality and take the necessary corrective measures.

● Vibration threshold value

Generally, vibration values are judged to be abnormal if they fall outside a range of allowable values, as shown in the graph at right.
However, the suitable threshold value varies According to where and how the rotating equipment is installed. the balance of rotation, rotational speed, and other factors.
For this reason, a relative criterion is most suitable, With an appropriate setting of relative threshold value abnormalities can be detected for a wide variety of different equipment.(As a general yardstick, threshold values for vibration are set to around 1.6 to 2 times the normal value.)
Also, even in cases where the vibration value during normal operation is far lower than the allowable value specified by a standard, for example, it is not advisable to use an absolute criterion only a relative threshold value should also be set up.

7
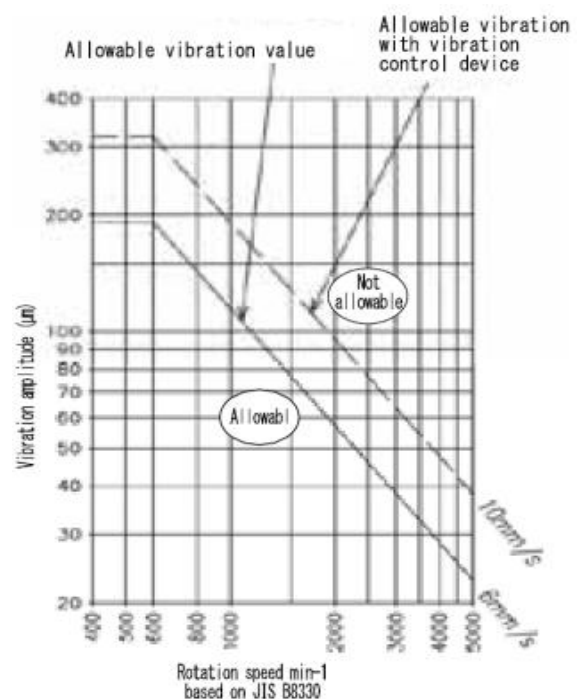
Next, how to convert vibration amplitude values into velocity and acceleration is explained.
The vibration frequency is needed as a parameter for the conversion.
The formula for conversion is as follows.

$$\text{Velocity}\ (V) = \frac{2\pi\, fD}{2000} \qquad\qquad \text{Acceleration}\ (A) = \frac{(2\pi\, f)^2\, D}{2 \times 10^6}$$

V : Velocity [mm/s]

A : Acceleration [m/s^2]

D : Amplitude　(peak to peak) [μ m^{P-P}]

f : Frequency[Hz]

However, since acceleration may not match with the conversion value under some conditions. The threshold value for acceleration is generally defined as a relative value.

Ex） If amplitude＝３０μm、frequency＝５０Ｈz （３０００min^{-1}）,

Allowable acceleration will be :

$$\text{Acceleration}\ (A) = \frac{(2\pi\, f)^2\, D}{2 \times 10^6} = \frac{(2 \times \pi \times 50)^2 \times 30}{2 \times 10^6} \fallingdotseq 1.48[\text{m/s}^2]$$

> Vibration sensors are not always able to accurately measure vibrations generated by transmission of external vibration or by resonance.

● Temperature threshold value （setting range 0 to 150℃）
The temperature of bearings increases gradually after the start of operation, reaching a stable value in 1 to 2 hours. Temperature threshold values are generally set according to the following procedure.

（1） Bearing temperature rise ＝ Bearing temperature after approx.
　　 2 hours － Ambient temperature
（2） Threshold value ＝ Bearing temperature ＋４５℃

There may be a significant difference between the sensor temperature value and the actual bearing temperature, depending on the position where the sensor is fitted. So, at the time of initial adjustment, it is advisable to measure the surface temperature of the bearing housing and to take into account the difference between this and the sensor value in deciding the threshold value.

●Current threshold value （setting range : 5 to 500A）
　Changes in motor load are detected according to changes in electric current.
　If an overload protection device in the main control board is activated
　earlier, abnormality cannot be detected. Reductions in load, due to
　abnormalities in a drive transmission process, due to a cut or loose
　V-belt for example, are detected as a lack of current (undercurrent)

　For undercurrent threshold value, the no-lad current of the electric motor is used.
　For the overload threshold value, the rated current of the electric motor is used.
　・If an inverter is used to reduce speed, the no-load current at the
　　operating frequency can be used as the undercurrent threshold value.
　・If an inverter is used for variable speed operation, it may not be possible
　　to use undercurrent (belt failure detection function) for the current
　　threshold value.

●Lower and upper threshold values
　In the case of lower threshold values, abnormality is detected when
　the value measured by the Remote Unit falls below the lower threshold.
　（If a lower threshold value is not needed, the lower threshold value should
　　be set to 0 ）
　In the case of upper threshold values, abnormality is detected when the
　value measured by the Remote Unit rises above the upper threshold.

●Operating time threshold value （setting range : 1 to 65535 hours）
　This threshold value calculates cumulative operation time (whenever a load
　is applied to the motor). The proper threshold value depends on the type of
　lubricant (grease or oil), the surrounding environment, and usage conditions.
　Customers need to take into account all the operation conditions of their
　Rotating equipment to decide on a suitable value.

●Delay time （0 to 120 seconds）
　To help prevent detection errors due to sudden increases in measurement
　values, an abnormality is not indicated until the measurement value is
　judged to remain abnormal for longer than the delay time setting.
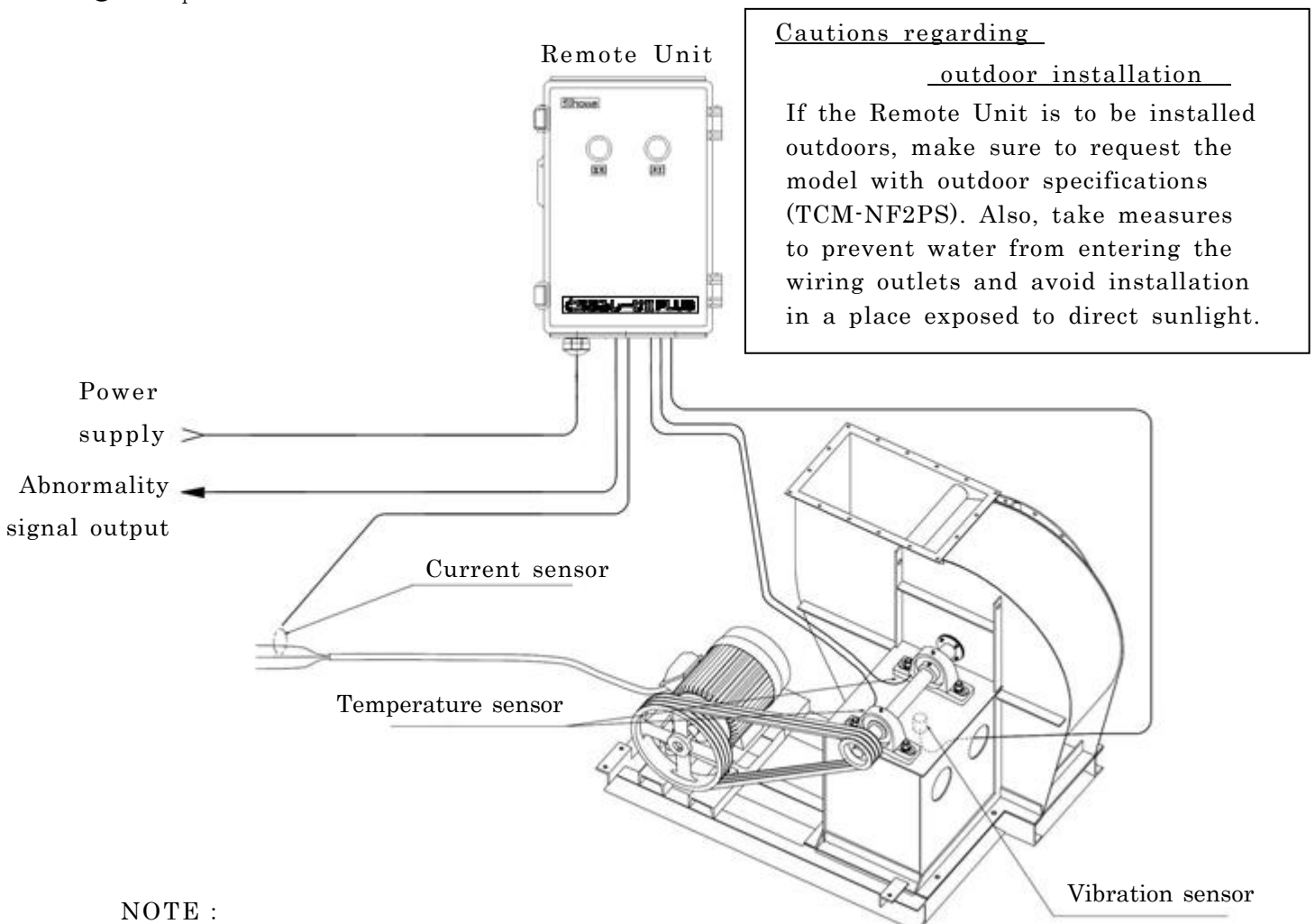　Approximately 10 seconds is usually a suitable value.

・Install the Remote Unit in a place that is not subject to vibration or exposed to direct sunlight.

● Installation procedure
    (1) Installing the Remote Unit (see P12)
    (2) Fitting the sensors (see P13)
    (3) Wiring the Remote Unit terminals (see P16)
    (4) Remote Unit settings (see P18)
    (5) Connecting the power supply (see P19)
    (6) Base Unit setting (see P19)

● Example installation

Remote Unit

<u>Cautions regarding</u>
<u>outdoor installation</u>
If the Remote Unit is to be installed outdoors, make sure to request the model with outdoor specifications (TCM-NF2PS). Also, take measures to prevent water from entering the wiring outlets and avoid installation in a place exposed to direct sunlight.

Power supply

Abnormality signal output

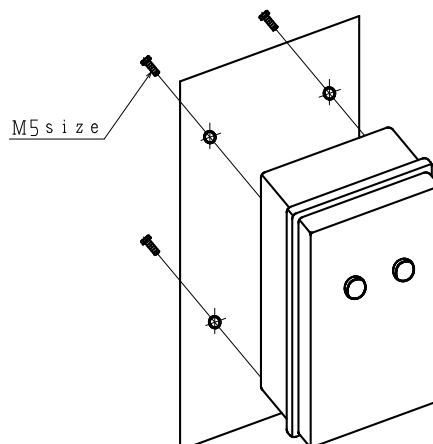Current sensor
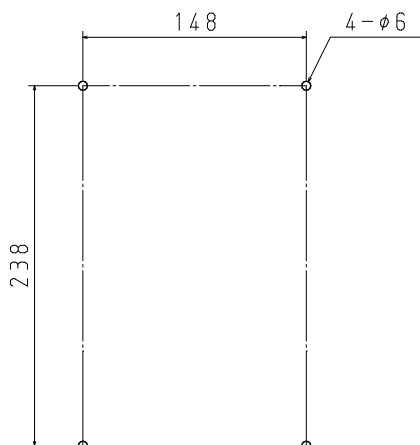
Temperature sensor

Vibration sensor

NOTE :
For the purpose of illustration,
the safety guard is omitted
from the diagram.

## (1) Installing the MiruTEN and Remote Units

① If installing directly

Prepare holes of the dimensions shown below and fix the Remote Unit
form behind with screws. (The tap depth of the Remote Unit is 10mm.)

148   4-φ6

238

M5size

② Installing with fittings for wall mounting

Prepare holes of the dimensions shown below and fix the Remote Unit
with attached wall mounting fittings from the front with screws.
(The thickness of the wall mounting fittings is 8.5mm)

230   4-M5

238

Screw hole

M5size

148   4-M5

319

Screw hole

M5size
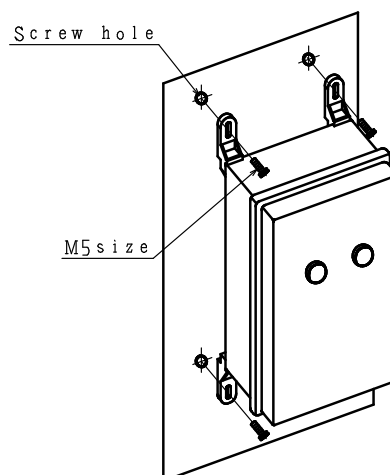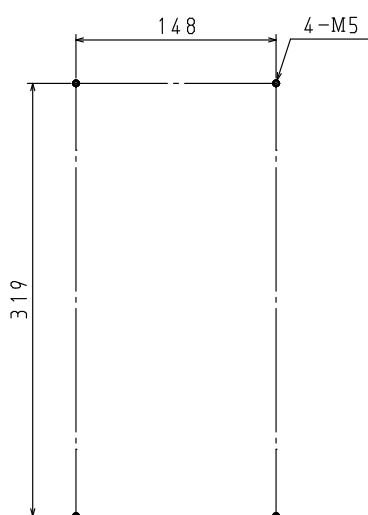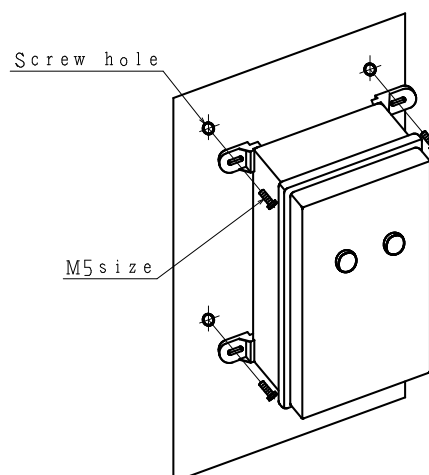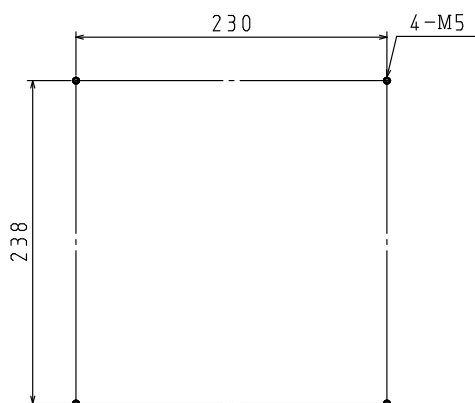
【 ⚠ Caution】 Set up the Remote Unit in a cool place that is not exposed to
direct sunlight. Using the product in a high-temperature
environment will shorten its life.

11

(2)Fitting the sensors
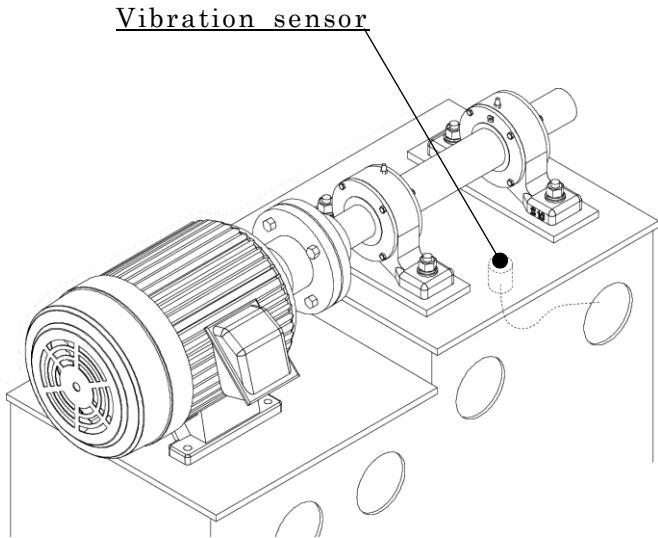## ①Vibration sensor

Make a Φ6.5 hole in the bearing stand and secure the sensor surface shown with hatched lines tightly from underneath. (Optimum tightening torque is approx. 5N±0.2.)

Install the sensor close to the bearing housing where resonance is not likely to occur.

Fix the cable and connect it to the terminal block of the Remote Unit.

Vibration sensor

Vibration sensor

Coupling drive

V-belt drive

M6 nut

M6 bolt

Make φ6.5 hole

M6(depth 5)
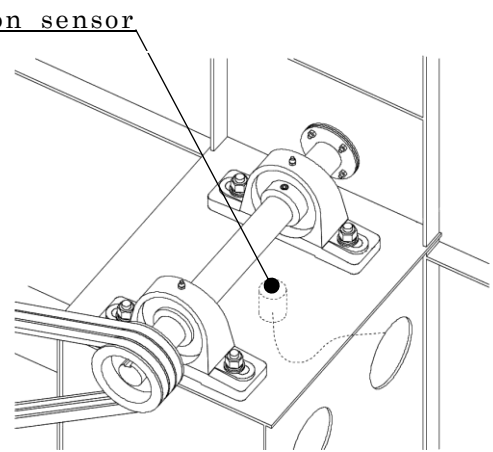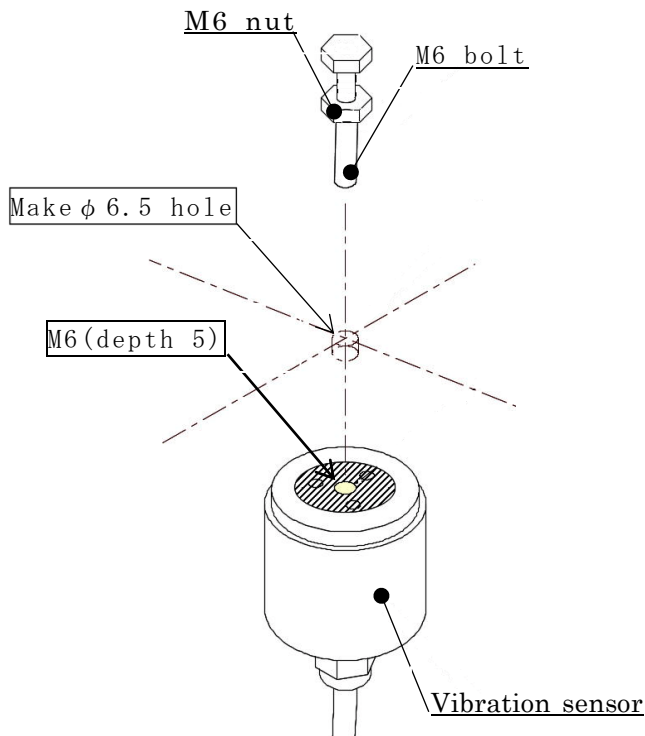
Vibration sensor

Details of fitting vibration sensor
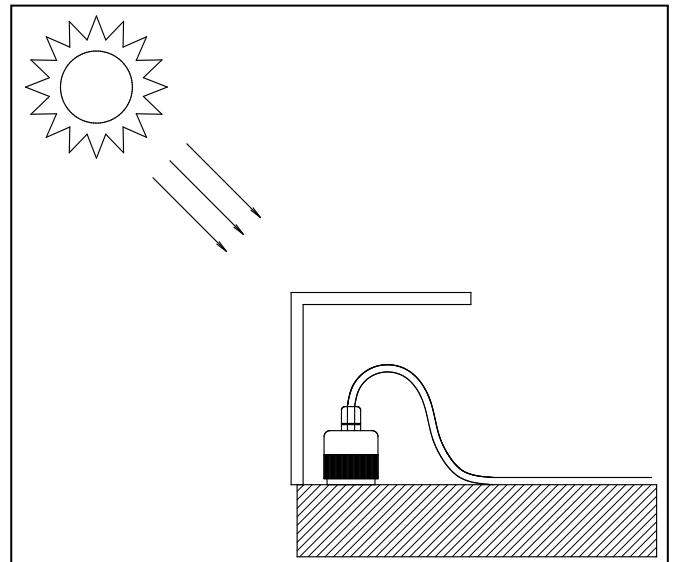
If the vibration sensor is positioned in a place that is exposed to direct sunlight, streaming water, or to external forces, make sure to take protective measures, e.g., fitting a protective cover.

🚫 When fitting the vibration sensor, do not rotate the sensor itself while the cable is fixed. Otherwise, the cable may break. Always rotate the sensor body and cable together.
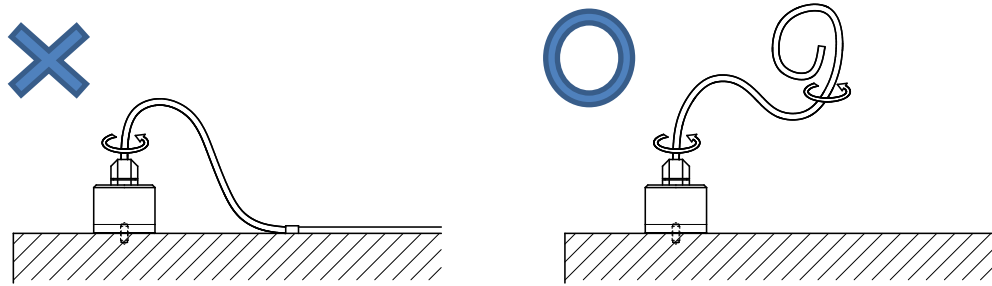
🚫 This sensor is designed to detect minute vibrations. Excessive physical shock will ruin the sensor. Do not apply physical shock to the sensor to check that it is working.
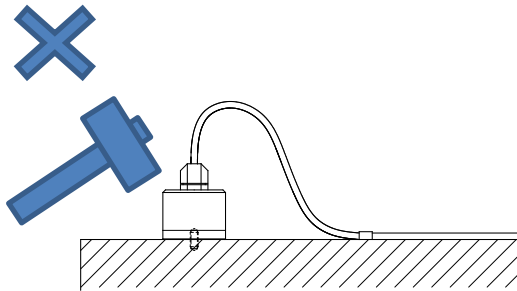
②Temperature sensor

 Tap a hole in the bearing housing and fit the temperature sensor. Choose a position that allows easy transfer of heat from the bearing and where there is sufficient thickness for tapping a hole.
The temperature sensor is a Type K (CA) thermocouple, with a 2 m lead wire.
To extend the lead wire use only a dedicated extension wire.

Temperature sensor

Temperature sensor

M4 × 8

M4 tap
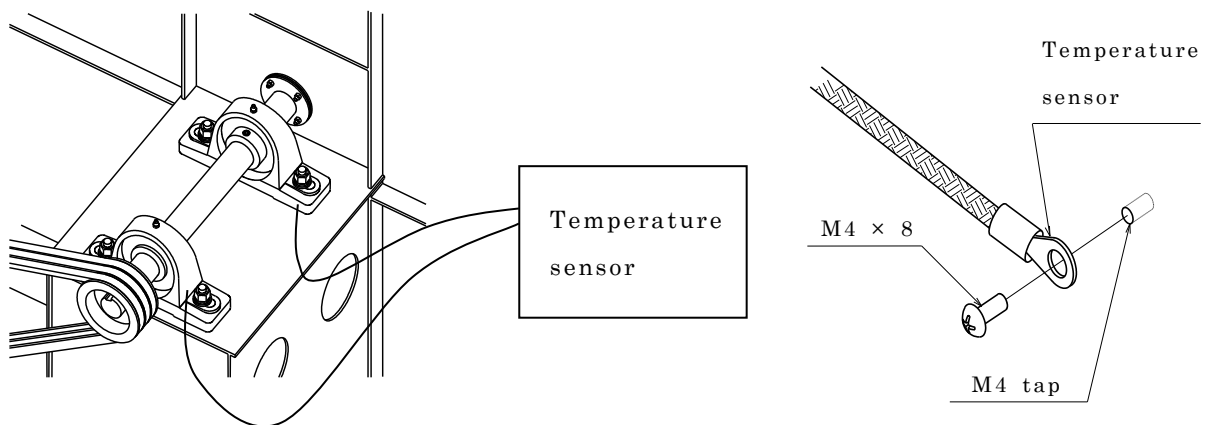
Details of fitting temperature sensor
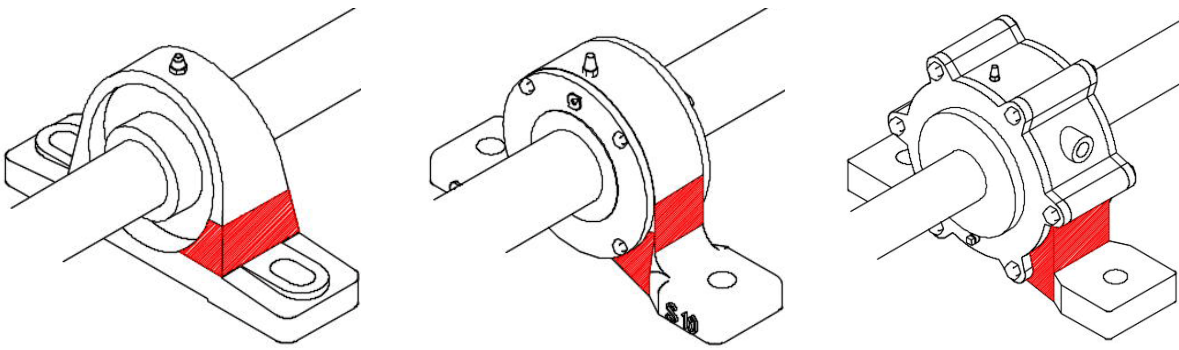
Recommended position for temperature sensor (▨ part)

🛈 Take care to match polarity when connecting the temperature sensor.

🛈 When tapping a hole in the bearing housing, take care not to penetrate through to the inside of the housing.

③Current sensor

Fit the sensor by clipping one of the three motor wiring cables (R, S, T),as shown.
For wiring, use 2-core signal wire of 0.75 to 2.0 mm^2.
When using a starting circuit (Y − Δ) or inverter, install the sensor on the primary side.
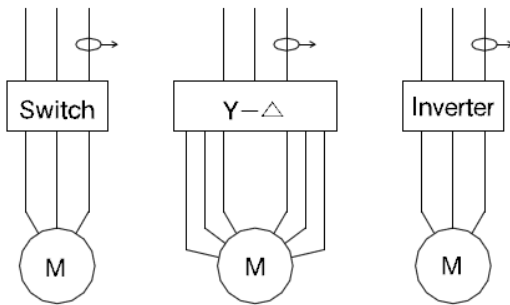
Current sensor wiring diagram

Current sensor is not water-resistant. Fit the sensor in a position where it is not exposed to water, e.g., in a motor terminal, box or switchboard.

Motor wiring

Current sensor

Motor wiring
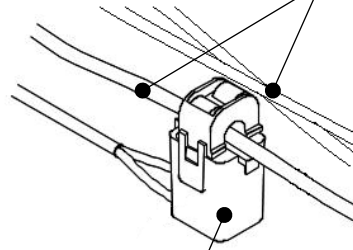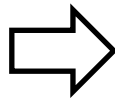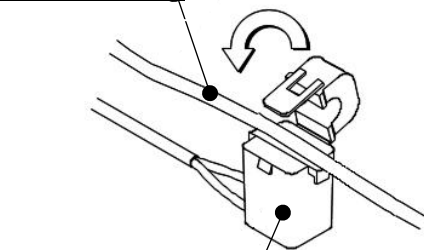
Current sensor

Details of fitting current sensor

🛈 Signal wire for the current sensor must be provided by the customer.
Take care to match polarity when connecting the current sensor.

14

(3) Wiring of the Remote Unit

The terminal block, shown in the diagram below, includes 6 analog input terminals,
2 temperature input (Type K thermocouples)terminals, and 2 abnormality detection
output terminals.
Also, to reduce the influence of electromagnetic noise, an FG terminal
(earth connection) is provided for use when necessary.

FG terminal (earth) (3)	Analog input terminal	
	Temp. input terminals	Abnormality outpour terminals
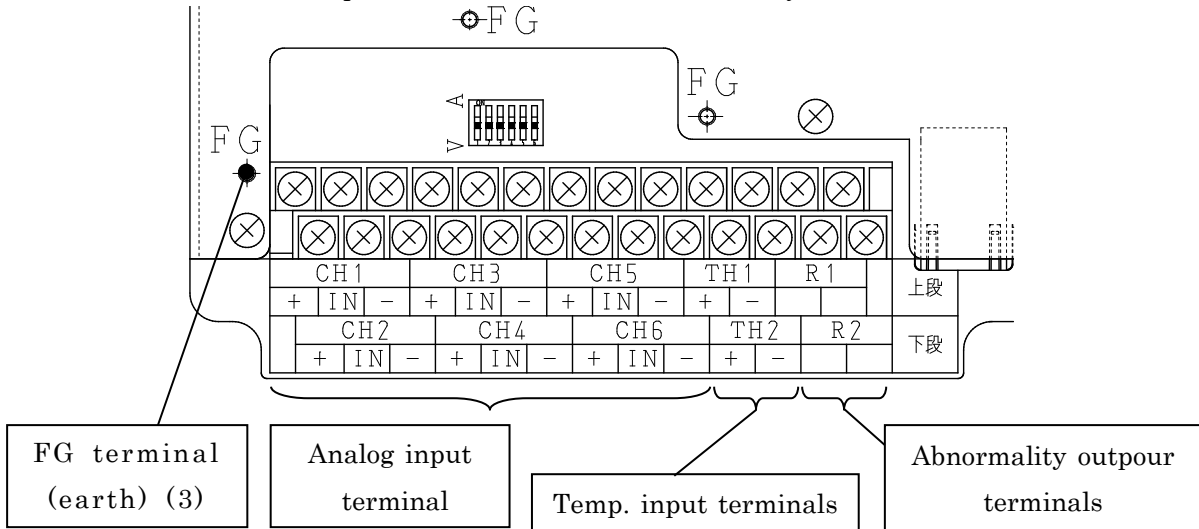
① Wiring of analog input terminals

These are terminals for connecting sensors with analog output.

Vibration sensors, current sensors, and various other kinds of sensors can be

connected, in accordance with monitoring objectives.

One set, consisting of three terminals, is called a channel (or "CH"). Six channels

are provided, CH1 to CH6.

The function of terminals is shown by the circuit diagram below.

Terminal "＋" : 24V DC positive electrode
Terminal "IN" : Analog input terminal
Terminal "－" : 24V DC negative electrode; reference potential for analog input terminal

Analog input terminal circuit diagram
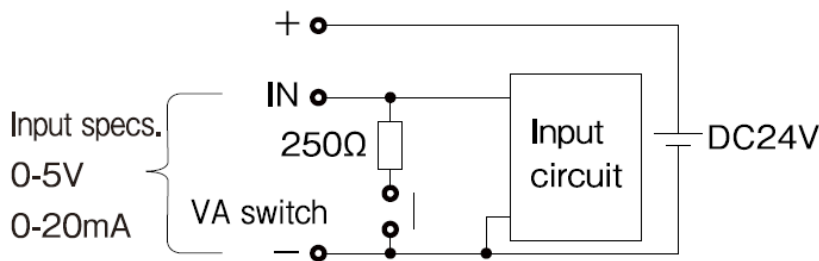
When performing wiring, always make sure the power supply is shut off, to avoid the risk of electric shock.

For details about the VA switch, refer to P19 (5) 1)
"Analog CH input settings"

15

Some examples of sensor wiring connections are shown below.

● Connecting the vibration sensor VS-2502-□□ (*No polarity)
 （Current output-type sensor）

CH□		
+	IN	−
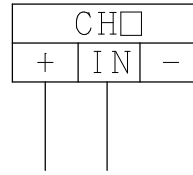
● Connecting the vibration sensor VS-V103-01 (3+1 lines)
 （Voltage output-type sensor）

※ Take care not to make any wiring errors.

CH□			FG terminal
+	IN	−	○
Yellow	White	Blue	Green/yellow
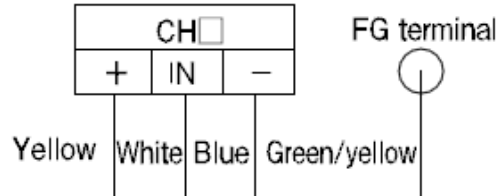
● Connecting the current sensor CTT-□□-CLS-CV (2 lines)
 （Voltage output-type sensor）

※ Take care about the "+" and "-" polarities.

CH□		
+	IN	−
	+	−
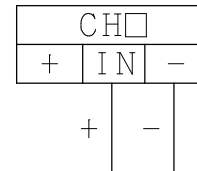
② **Wiring of temperature input terminals**
   These terminals are for connecting temperature sensors (Type K thermocouples).
   ・ Connect sensors to the "TH1" and "TH2" terminals.
   ・ Take care to match polarity by connecting the "red" sensor lead wire to the
     "+" side and the "white" sensor lead wire to the "-" side.

③ **Abnormality output terminals**
   The contacts "R1" and "R2" of the terminal block can each be used to convey
   signals associated with the occurrence of abnormalities.
   They can be used to operate a buzzer or patlite, or as an abnormality input
   signal to the controller of a rotating machine.

   > These relay contacts (a contacts) can be connected
   > to loads up to 250 V AC/5 A.

（4） Remote Unit settings

In order to operate the Remote Unit correctly, it is necessary to configure settings for analog channel inputs. The settings are configured using the switches on the board.
To change switch settings use a precision screwdriver.

V-A switch

Switch for settings
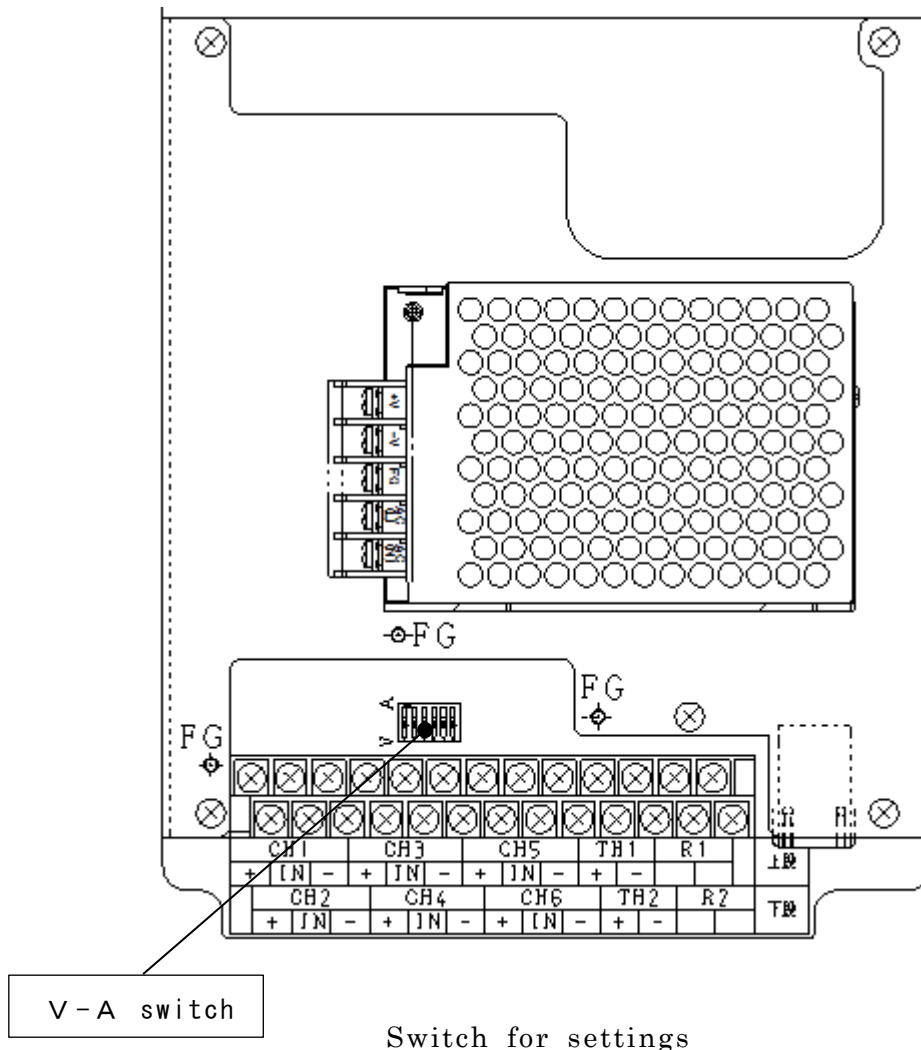
①Analog CH input settings

It is necessary to set the analog CH inputs of the Remote Unit to match the output specifications of the connected sensors.
Settings are made at "VA switch".

If the sensor output is a voltage output (0-5[V], 1-5[V]), set the switch to the "V (lower)" side. If the sensor output is a current output (0-20 [mA], 4-20 [mA]), set the switch to the "A (upper)" side.
The numbers written on the switch correspond to the CH No.

②Setting the IP address of the Remote Unit (Remote Unit No.)

Setting of the Remote Unit is performed using the "Browser settings." (Refer to P. 21 or later page of the Instruction manual (Remote Unit Edition)).
After completing the settings, write down the Remote Unit No. in the "Remote Unit No." field on the back of the box cover.

（5） Connecting the power supply

Connect the power supply cable (1-phase, 100-240 V) to each terminal.

Also, connect an earthing wire to the FG terminal (earth).

If an earth connection is not provided, malfunction may occur due to electromagnetic noise.

※Power supply cable must be provided by the customer.

※Make sure to connect the cables only to the designated positions.

※Make sure not to modify the wiring of the "+V" and "-V" terminals.

FG terminal (earth)

Power input terminal (1-phase 100-240 V AC)
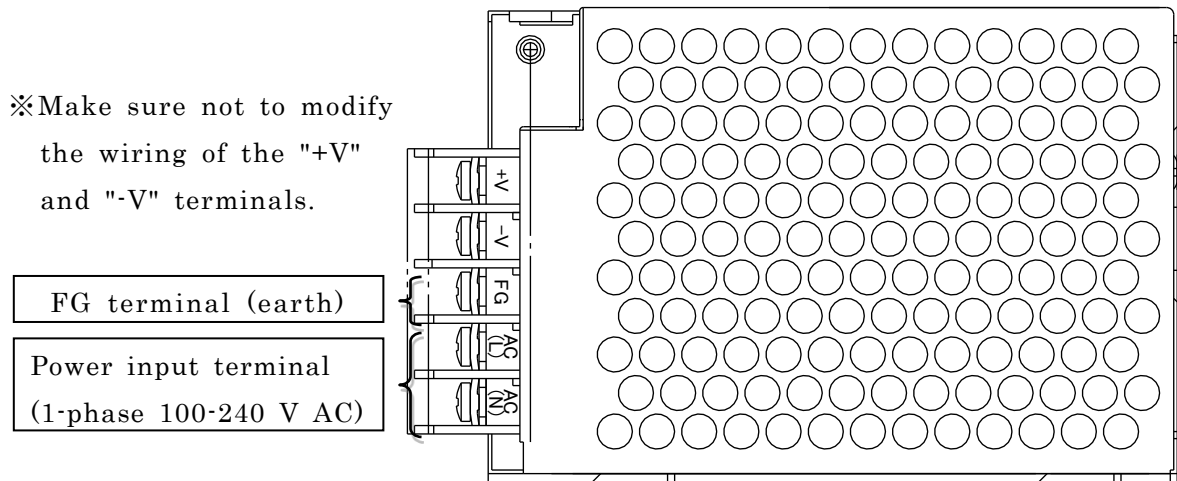
Power supply connection diagram (inside the MiruTEN)

【 ⚠ Warning】 When performing wiring connection work, always shut off the power supply, to avoid the risk of electric shock.
After completing the work, replace the terminal cover as it was.

（6） Base Unit setting

After setting all the Remote Units, set the monitor(Base Unit).

Details are provided in the instruction manual for the Base Unit.

"Standard monitoring" means monitoring equipment using a combination of sensors recommended by Showa Denki.
This method simplifies the setup process and allows threshold values to be set automatically.
The combination of sensors needed for one rotating machine is as follows.

　・Vibration sensor 1

　・Temperature sensor 1

　・.Current sensor 1

Up to two rotating machines can be connected to one Remote Unit for monitoring.
The setup procedure is the same as that given in "4. Guidelines for installation", but there are some cautions to note. Check the following points before commencing work.

Cautions
● **Wiring Remote Unit terminals**

　Connect each sensor to following channels.

　First monitored item (Unit1)

　・Vibration sensor 　　 : CH1

　・Current sensor 　　　 : CH2

　・Temperature sensor 　: TH1

　Second monitored item (Unit2)

　・Vibration sensor 　　 : CH4

　・Current sensor 　　　 : CH5

　・Temperature sensor 　: TH2

● **Automatic setting of threshold values**

　(For details about threshold values, see "3. Setting threshold values" on P10)

　Threshold values are set automatically based on the results of measurements of

　operation of the item initiate communication between the MiruTEN and Remote Unit.

　(It takes about two hours of communication before the threshold values are

　Automatically set.)

※ **Before performing automatic setting make sure to check that the item of equipment is operating normally. If threshold values are set automatically while the equipment is operating abnormally, the threshold values will not be appropriate.**

> If the vibration value of the monitored item of equipment is high, an abnormality may be detected immediately after the threshold value is automatically set. If this happens, check that there is no problem with the equipment and then reset the threshold value manually. (See P26)

Abnormalities can be determined for this device independently according to the threshold value.
This chapter introduces the setting method of the IP address, threshold values, etc.
(2) to (6) can be operated by the browser screen of the Remote Unit.

（１） How to display the browser screen

The IP address of the Remote Unit at delivery is set as "192.168.0.1," and the subnet mask is set as "255.255.255.0."
After changing the IP address of the PC to be used to set the Remote Unit to an appropriate value (ex.: 192.168.0.123), connect the Remote Unit to the PC using a LAN cable. Open the Internet browser to set the Remote Unit.
Procedures are as follows.

①Connect the Remote Unit to the power supply.

②Connect the Remote Unit to the PC for settings using a LAN cable.

③Set the IP address of the PC for settings.

PC

LAN Cable

PC for settings
 IP address:
 (ex.) 192.168.0.123
 Subnet mask:
 (ex.) 255.255.255.0

Troubleresa Ⅱ PLUS
 IP address:
 192.168.0.1 (initial setting)
 Subnet mask:
 255.255.255.0(initial setting)
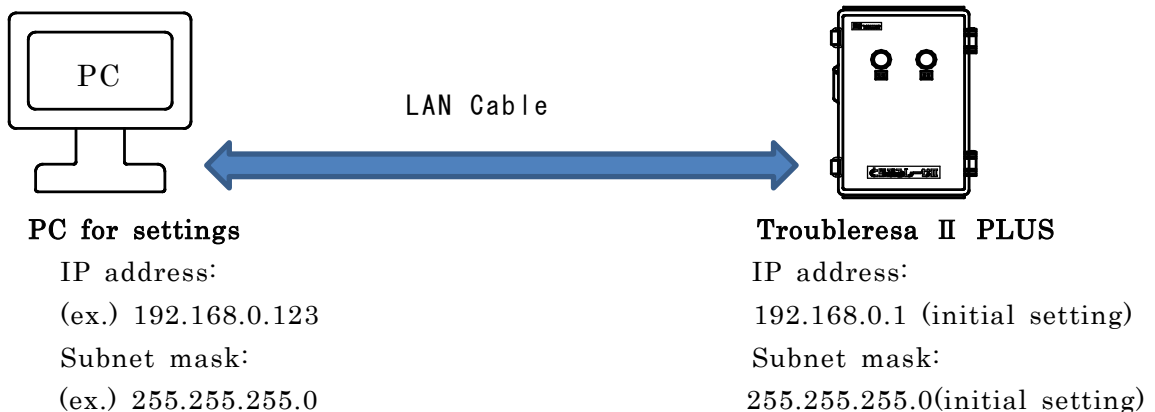
●Setting the IP address of the PC
  1. Click the icon at the bottom right corner of the desktop screen,
     and click "open network and the share center."
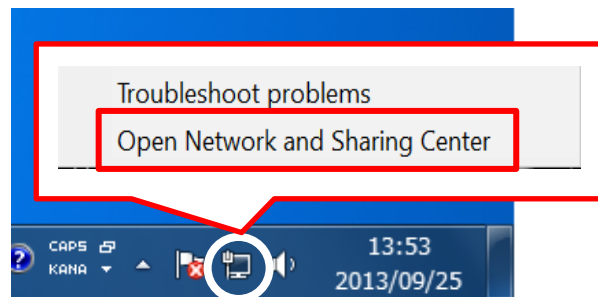
  2. Click "①Local Area Connection"
     This screen can also be opened by clicking "Start" - "Control Panel" -
     "Network and Internet" - "View network status and tasks".
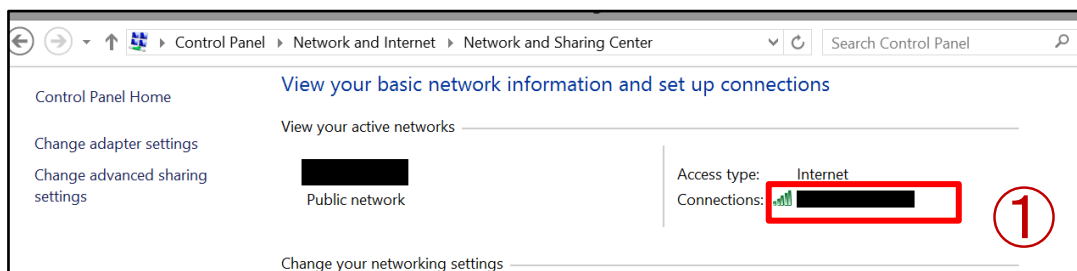
  3. Click "②プロパティ（Properties）"
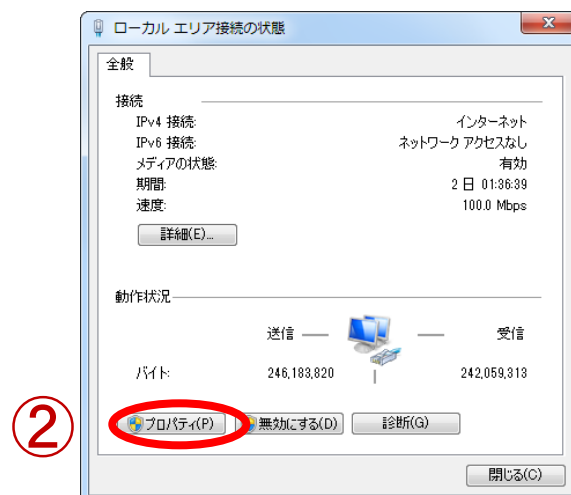
4. Select "③Internet Protocol Version 4 (TCP/IPv4)" and
   click "④Properties."

5. Finally, enter the IP address and subnet mask, then press "OK."
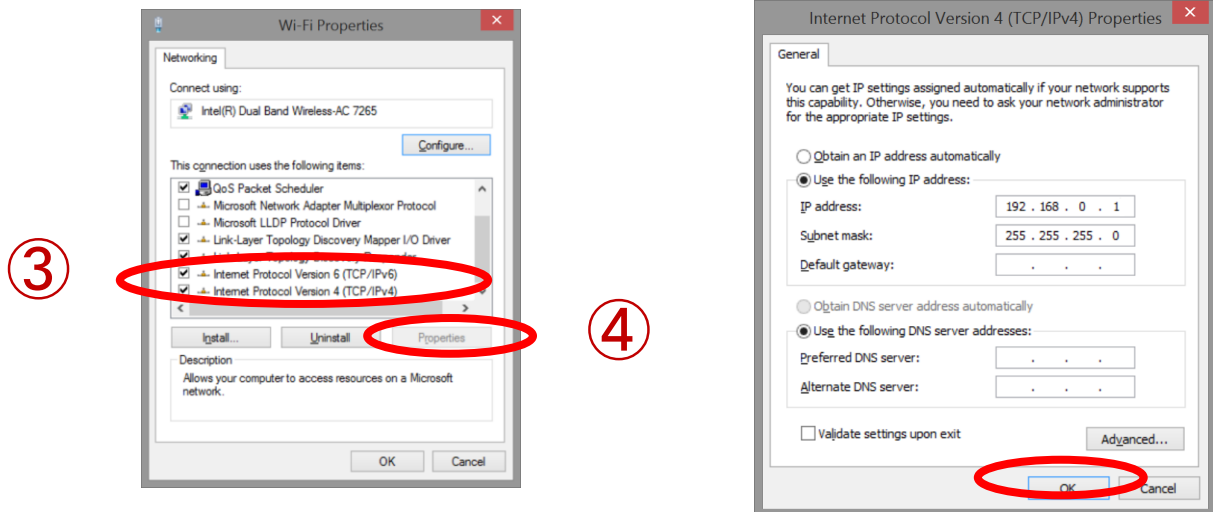
This completes the PC IP address set up.

④Open the Internet browser (Internet Explorer), enter the IP address of the
  Remote Unit in the address column as "(ex.)192.168.0.1," and open the setting
  screen by pressing "Enter".

Input "192.168.0.1" and press "Enter"

※Internet Explorer versions IE8~ IE11 are recommended

6. The following address cannot set an IP address to use
   it in a special use.
   Please be careful about the setting of the IP address.

The IP address that I cannot set.		
IP address	RFC	Remarks
0, 0, 0, 0 / 8	RFC 1122	Current network
10, 0, 0, 0 / 8	RFC 1918	private address
100, 64, 0, 0 / 10	RFC 6598	ISP Shared address
127, 0, 0, 0 / 8	RFC 1122	Local Host address
169, 254, 0, 0 / 16	RFC 3927	LINK LOCAL address
172, 16, 0, 0 / 12	RFC 1918	private address
192, 0, 0, 0 / 24	RFC 5736	IETF Protocol Assignment
192, 0, 2, 0 / 24	RFC 5737	test network address
192, 88, 99, 0 / 24	RFC 3068	IPv6 to IPv4
192, 168, 0, 0 / 16	RFC 1918	private address
198, 18, 0, 0 / 15	RFC 2544	network performance test
198, 51, 100, 0 / 24	RFC 5437	test network
203, 0, 113, 0 / 24	RFC 5737	test network
224, 0, 0, 0 / 4	RFC 3171	Class D
240, 0, 0, 0 / 4	RFC 1112	Class E
255, 255, 255, 255	RFC 919, 922	Broadcast

（２） **Top screen of the Internet browser**

　　　The top page of the Remote Unit is displayed and individual settings can be carried out.

① Setting items are displayed. Individual settings can be carried out by clicking on the item.

・CH Data	:	Displays the measured value, stores the CSV file to PC, Displays the number of data stored in the Remote Unit
・IP Address	:	IP address setting of the Remote Unit
・Remote Unit Recommend	:	Recommended setting of the threshold value
・Remote Unit Manual	:	Manual setting of the threshold value
・Error CH	:	Displays and cancels an abnormality

② After pressing [SET], setting of the date and time is complete.　　※1

③ Switches the Remote Unit status.

　　The Remote Unit status can be switched between standby (Idle) and monitoring (Independent).

　　When set as "Independent," single monitoring by the Remote Unit is possible.

④ Measurement value of the sensor connected to Remote Unit is displayed.　※2

⑤ From the top [Number of measurement data saved][Number of measurement data deleted].

　　Refer to P. 29 regarding how to save the measurement data on the PC

[Note] Settings cannot be changed while communicating with the Base Unit (monitoring software and MiruTEN). Perform settings after turning off communication with the Base Unit.

※1　In the event of a blackout, the unit must be reset since the clock time must be adjusted to the proper time.

※2　The value at the point of browser display will be shown. Click the "CH Date" button to update.

（３） **Setting the IP address of the Remote Unit**

Set the IP address of the Remote Unit, and the Base Unit which will communicate with the Remote Unit.

[Setting Procedures]

① Select [IP address] from the setting items.

② Enter [No.]   ： Number of the Remote Unit to be set

  [IP address]   ： IP address of the Remote Unit

  [sub net]   ： Subnet mask of the Remote Unit

  [default gateway]   ： Default gateway

                          (IP address of the router) *1

③ Enter [Base Unit]   ： IP address of the PC with the monitoring software
                          installed

  [SUB Unit SUB1 ~ 4] ： IP address of the devices which will be used to
                          communicate with the Remote Units, such as
                          MiruTEN, a tablet, etc.

* Note ・・・Base units which are not registered in [Base Unit] [SUB Unit SUB1~ 4] cannot be communicated with.

Finally, click the [SET] button on the bottom right corner of the screen.

*1 If the IP address changes, turn off the power to the Remote Unit.
    The IP address will be switched when the power is turned on again.

（４） **Threshold value setting**
When setting the standard monitoring set (refer to P. 20), select the recommended setting "Remote Unit Recommend".
For detailed settings of the CH sensor, select the manual setting "Remote Unit Manual."
● For the recommended setting "Remote Unit Recommend"

[Setting Procedures]
① Select [Remote Unit Recommend] from the setting items.

② [Unit Name]   : Name of the Remote Unit
　[Archive interval]   : Saving cycle of the measurement data.
　 (In the recommended settings, the saving cycle is fixed at 30 min.)

③ Select [Unit 1 or 2]. (Refer to P. 20 for details)
　 When the frame turns blue, [4] and [5] can be set.

④ [Rated Current]   : Enter the rated current of the device to be monitored.
　[No-load Current]   : Enter the no-load current of the device to be monitored.
　[Normal OP Current] : Enter the ambient temperature at normal operation of the device to be monitored.

⑤ [Current Sensor Type] : Select the current sensor to be used.
　[Vibration Sensor]   : Select the vibration sensor to be used.
　 ＊Set the VA switch on the board to the same as the settings of [5].
　(Refer to P. 18)

<u>Finally, click the [SET] button on the bottom right corner of the screen.</u>

● For manual setting "Remote Unit Manual"

		Use	Sensor Name	Units	Alarm	Delay	Threshold low	Threshold high	Sensor output	Scale min	Scale max
CH1		☑	Vibration1	A	Alarm1 ▼	10	0.0	10.0	0-5[V] ▼	0.0	20.0
CH2		☑	Current1	A	Alarm1 ▼	10	0.0	20.0	0-5[V] ▼	0.0	30.0
CH3		☑	AnalogCH3	V	Alarm1 ▼	10	0.0	30.0	1-5[V] ▼	0.0	40.0
CH4		☑	Vibration2	V	Alarm2 ▼	10	0.0	40.0	0-20[mA] ▼	0.0	50.0
CH5		☑	Current2	mm/s	Alarm2 ▼	10	0.0	50.0	0-20[mA] ▼	0.0	60.0
CH6		☑	AnalogCH6	mm/s2	Alarm2 ▼	10	0.0	60.0	4-20[mA] ▼	0.0	70.0
TH1		☑	TempCH7	℃	Alarm1 and 2 ▼	5	0.0	25.0			
TH2		☑	TempCH8	℃	Alarm1 and 2 ▼	5	0.0	25.0		SET	

Unit Name :

Archive interval : 1 ▼ minutes

Remote Unit Manual

[Setting Procedures]

① Select [Remote Unit Manual] from the setting items

② [Unit Name]   : Input the name of the Remote Unit.
   [Archive interval] : Saving cycle of the measurement data.
                        Select either 1 min, 5 min, 10 min, 30 min, or 60 min.

③ [Use]   : Check CH or TH to use.
   [Sensor Name] : Input the name of the sensor.
   [Units]   : Enter the unit of the measurement value.
   [Alarm]   : Select the startup point of contact when an
                    abnormality is determined (abnormality output
                    terminals).
                    ⎡ Alarm1: Abnormality output terminal R1 ⎤
                    ⎣ Alarm2: Abnormality output terminal R2 ⎦
   [Delay]   : Time from detection of the abnormality until the red light turns
                    on
                    Set (0 to 120 seconds).
   [Threshold]   : Set the lower limit (low) and upper limit (high) of the threshold
                    value to be standard for abnormality judgment.
                    If "0" (zero) is entered for the lower limit, abnormality judgment
                    will not be performed for the lower limit.
   [Sensor output] : Select the analog output of the sensor connected to the
                    Remote Unit.
                      * Likewise set the VA switch on the board.
                        (Refer to P. 18)
   [Scale]   : Setting of the display and scale
                    Enter the lower measurement limit (Min) and the upper
                    measurement limit (Max) of the sensor connected to the
                    Remote Unit.

Finally, click the [SET] button on the bottom right corner of the screen.

（5） **Cancellation of abnormality judgment**

Each CH and TH (temperature) which are judged as abnormal are displayed.
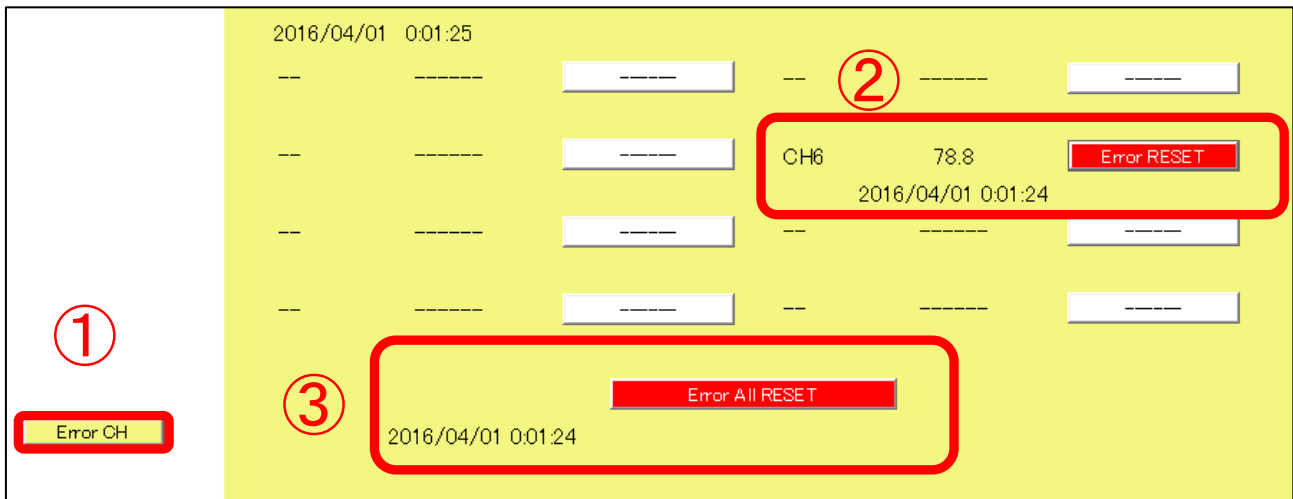
[Contents]
① Select [Error CH] from the setting items.

②[Error RESET]　　：　Abnormality reset button
　　　　　　　　　　　To cancel abnormality of CH or TH push this button.

③[Error all RESET]　：　Abnormality all reset button
　　　　　　　　　　　Abnormality judgment of all CH judged by the
　　　　　　　　　　　Remote Unit as abnormal are canceled.

※Cancellation of an abnormality can also be done by the Remote Unit.

[How to cancel abnormality by the main unit]
①Turn on the power of the Remote Unit.
②Pull up the leftmost dip switch at the upper right of the Remote Unit
　(refer to the following diagram).
③Turn off the Remote Unit, and then turn it on again 2, 3 seconds later.
④When the dip switch is pushed down again, abnormality judgment of
　all CH judged by the Remote Unit as abnormal are canceled.

Pull up the dip switch, and turn off the power.
Turn on the power, and push down the dip switch.
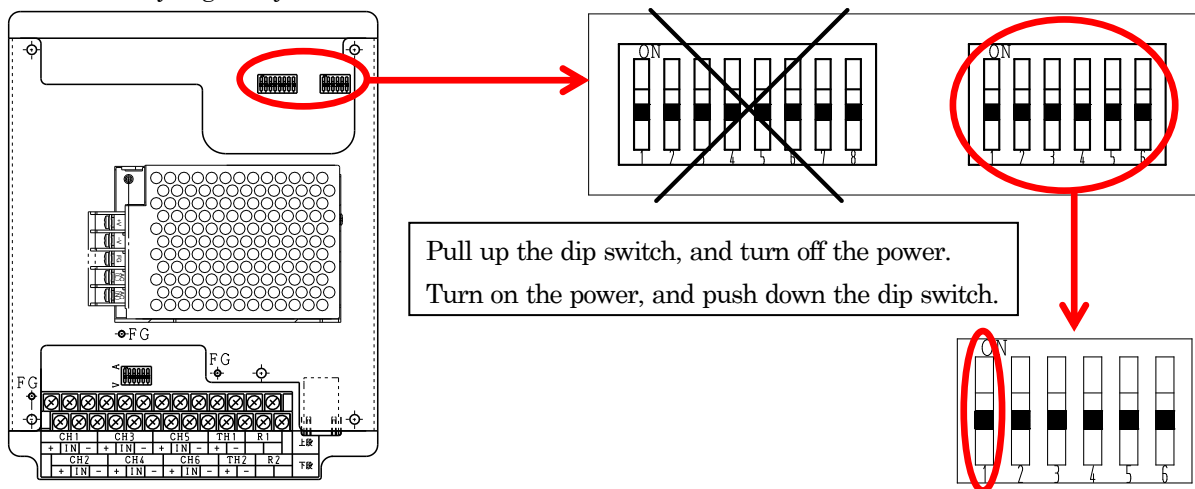
（６） Transfer of a CSV file (copy)

Save data recorded in the internal memory of the Remote Unit to the PC.

Amount of data storage of the Remote Unit is "approx. 10 days for a saving cycle of 30 minutes," and after that, new data overwrites the oldest data.

[Saving method to PC]

On the screen of "CH Data," press "logdata.csv."

Next, select the location to save on the PC.

The following items can be returned to default settings.

     1．IP address ：192.168.0.1

     2．Subnet mask：255.255.255.0

Contents of other settings are not initialized.

Carry out initialization according to the following procedures.
　［Initialization method］
　　① Turn on the power to the Remote Unit.
　　② Pull up the rightmost dip switch at the upper right of the
　　　　Remote Unit circuit board (refer to the following diagram)

Do not use!
↓

Pull up the dip switch, and turn off the power.
Turn on the power, and push down the dip switch.
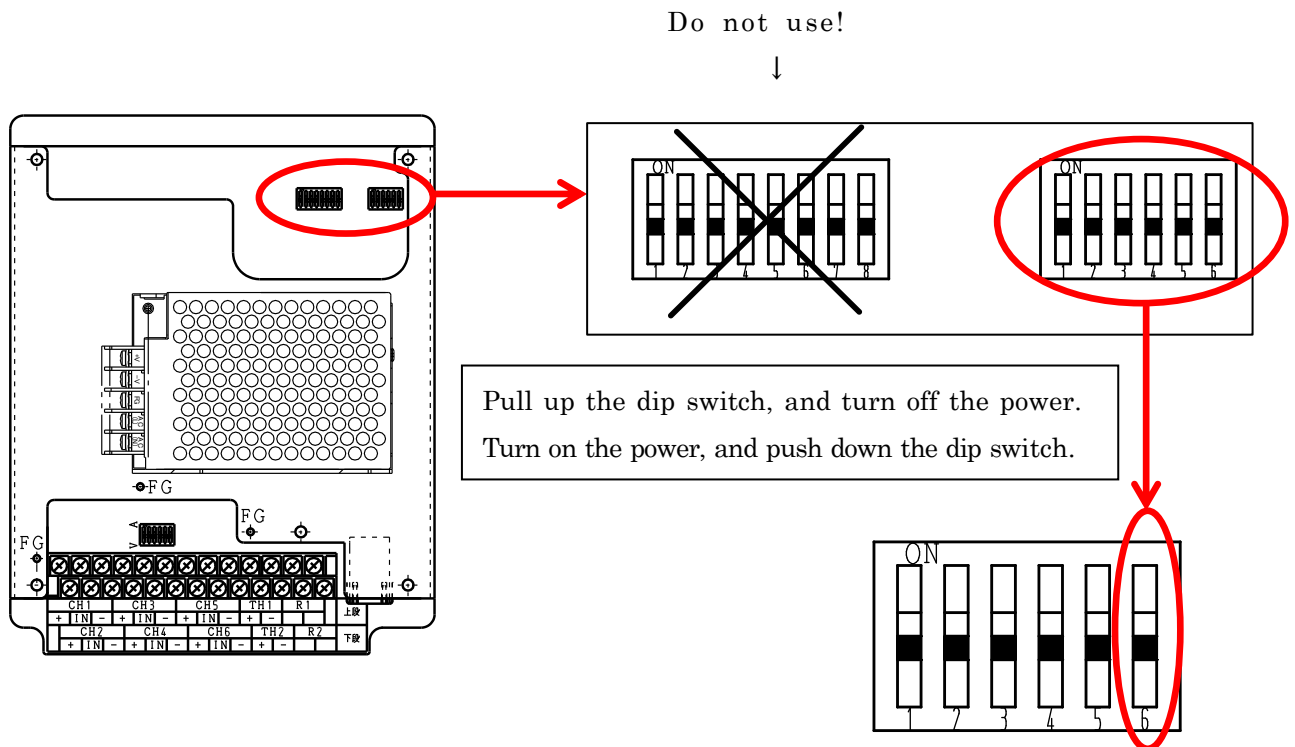
　　③ Turn off the power, and then turn it on again 2, 3 seconds later.
　　④ When the dip switch is pushed down again, initialization occurs.

Examples of causes of abnormality	Vibration	Load-side Bearing temp	Drive-side bearing temp	Under current	Over current
Too little or too much grease		○	○		
Wrong type of grease		○	○		
Abnormal load		○	○		○
Misalignment	○	○	○		○
Bearing damage, bearing life	○	○	○		○
Contamination	○				○
Unbalanced rotation	○				
Loose fixing bolts	○				
Broken belt				○	
Resonance, dangerous speed	○				
Surging	○				
Inadequate heat release (heat build-up)		○	○		
Blockage in duct piping				○	
Contact with rotating parts	○				○
V-belt is too tight			○		○

This table lists only the most likely causes of abnormalities that may Occur after a period of normal operation.

⚠ Cautions

・If the rotating machine is operated beyond its specifications, abnormalities may not be detected in time and serious malfunction or damage may occur suddenly.

・Since vibration sensors and temperature sensors are constantly subject to vibrations, regularly check that the screws securing the sensors are properly tightened.

Lamp color		Status
Green [Monitor]	Red [Abnormal]	
Light Off	Light off	Power is not on
Light on	Light off	Monitoring
Light on	Blinking	Abnormality occurred
Blinking	Light off	・ **When only using the Remote Unit** Standby (not monitoring) ・ **When using it with the Base Unit** Communication with the Base Unit is turned off, and monitoring is carried out with the Remote Unit alone
Blinking	Blinking	・ **When only using the Remote Unit** Standby (Abnormality occurs before standby, but abnormality is not canceled) ・ **When using it with the Base Unit** Communication with the main unit is turned off, and an abnormality occurs when the Remote Unit is monitoring alone. ＊ For details when using the Base Unit, refer to P.32 of this manual ＜What to do if communication with the Remote Unit is unintentionally cut＞

● Inspection

To ensure normal operation of the Troubleresa ⅡPLUS so that it can detect abnormalities in rotating machinery, conduct a regular inspection at suitable interval of time, e.g., every three to six months, according to the intensity of use.

Inspection point	Inspection description
Appearance	Check for deterioration, cracks, or damage of resin parts of the box, external housing, etc. Check for accumulation of debris, dust, etc.
Packing	Check for deterioration or detachment.
Fitting	Check for looseness of fixing screws and check for piping is not wobbly.
Wiring	Check for looseness of terminal screws. Check for damage to electrical wiring and cables.
Sensor appearance	Check for looseness of fixing screws. Check for adhesion of debris or dust.
Sensor operation	Check that there is no significant difference relative to the values measured using a calibrated vibrometer and thermometer at the positions where the vibration sense and temperature sensor are fitted.

● Storage

Store the product in a place of appropriate temperature and humidity that is not exposed to direct sunlight, with protection against dust.

Storage temperature : －１０～５０℃
Storage humidity   : １０～９０RH (no dondensation)

Remote Unit (TCM-NF2P)

Power supply voltage		AC 100 〜 240 V 50/60 Hz
No. of measurement points		8 CH (6 analog inputs、2 Type thermocouple inputs)
Output	Output point	2 point of a contact
	Contact capacity	AC 250 V / DC 30 V 5 A
Usable temp. range		-10 〜 ＋50℃
Usable RH range		10 〜 90％ R H (no condensation)
Power consumption		MAX 10 W (When sensor power supply is 36W)
Dimensions, weight		280D×190W×100Hmm (excl. projections) 、1.5 kg

Vibration sensor (VS-2502-□□)

Measurement mode	Amplitude	Velocity	Acceleration
Measurement range	0〜200μm (P－P)	0〜50mm／s (RMS)	0〜100m／s^2 (Peak)
Frequency range	10〜500Hz	10〜1000Hz	5〜1000Hz
Output current	4〜20mA		
Measurement precisio	±5％ (1／2F.S.) at20℃ 80Hz		
Cable	2-core cabtyre cable (ext. dia. 6.5mm) of 3m		
Dimensions, weight	φ45×H45、105 g (excl. cable)		

Vibration sensor (VS-V103-01)

Measurement mode	Acceleration
Measurement range	0〜5G (0〜49.0m／s^2)
Frequency range	10〜500Hz
Output	0〜5V
Measurement precisio	±10％
Cable	4-core cabtyre cable (ext. dia. 4.5mm) of 3m
Dimensions, weight	φ48×H38、110 g (excl. cable)

Temperature sensor (YYU4KM04B20A)

Conductor type	K (CA)
Class	Class 2 (0.75 class)
Temperature Measurement range	0〜＋150℃
Measurement precision	±2.5℃
Shape	M4 crimp ring terminals, lead wire 2m

Current sensor (CTT-□□-CLS-CV-○○)

Max. measurement current	For 5A	For 10 A	For 25 A	For 50 A	For 100 A	For 250 A	For 500 A
Output	0〜5V						
Resolution	±2％ (F.S.)						
Shape	2×M3 dedicated screws (with cover)						

（１）Scope of warranty

　　　If the product malfunctions or fails within the warranty period Showa Denki shall repair it
　　　free of charge, provided that it has been used in accordance with the instruction manual, the
　　　instructions on the product itself, and all other warnings and cautions.
　　　However, if the product is incorporated into another system or device by the customer, the
　　　removal of the product from the other device and the reinstallation of the product into the
　　　device, any construction expenses resulting from this work, transportation expenses, and any
　　　opportunity loss, operation loss, or other indirect damages resulting to the client shall not
　　　be covered by the warranty.

（２）Warranty period

　　　One year from the date of product delivery.

（３）In any of the following cases, even within the warranty period, repairs
　　　shall generally not be free of charge.

　　①If the product malfunctions or fails as a result of not being used in accordance with
　　　the instruction manual. The product specifications, and all other warnings and
　　　cautions, or if the product has been improperly repaired or modified.

　　②If the product malfunctions or is damaged as a result of being transported, dropped,
　　　etc. after purchase.

　　③If the product malfunctions or is damaged as the result of fire, earthquake, wind or
　　　water damage, lightning, or any other natural disaster, abnormal voltage, or use of
　　　a power supply not within designated specifications (e.g., voltage, frequency).

　　④If the product malfunctions or is damaged as a result of repairs or modifications
　　　(including tapping holes in the product) performed by anyone other than Showa Denki.

　　⑤If the product malfunctions or is damaged as a result of using a part other than
　　　that designated by Showa Denki.

　　⑥If the product malfunctions or is damaged as a result of contamination with any
　　　foreign substance.

　　⑦If the product is discolored or scratched due to natural deterioration with age or to
　　　normal use, or if it malfunctions due to natural wear and tear of consumable parts.

（４）No warranty is provided for damage or less caused by the malfunctioning of this
　　　product during use.

（５）It is assumed that this product is used only within Japan.

　　・This warranty applies only to use of the product within Japan.
　　・Use of the product outside Japan is not covered by this warranty.
　　・For information about use outside Japan, please inquire with your nearest branch office
　　　or sales office.

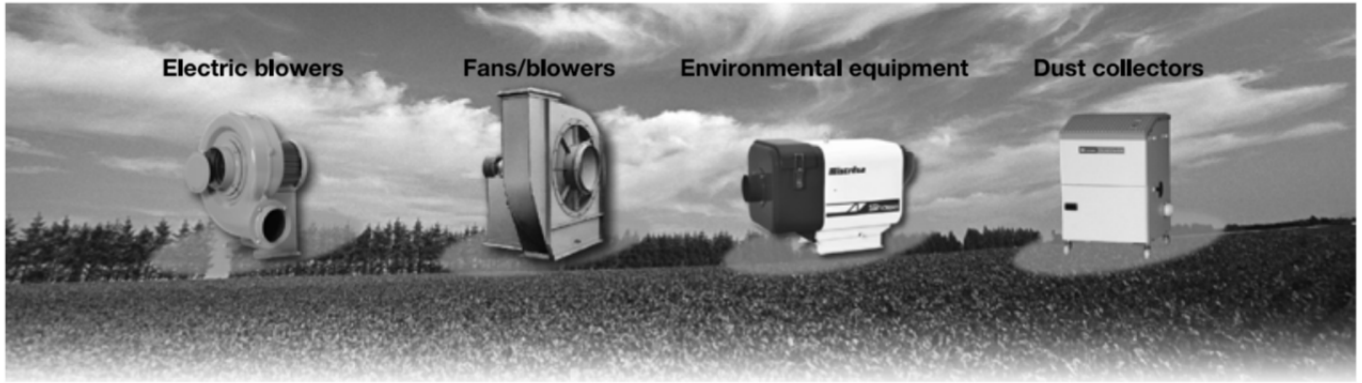（６）The warranty may not be honored if the nameplate is removed from the product.

※NOTES

　　（１）The content of this document is subject to change without prior notice.

　　（２）When making inquires to Showa Denki, please inform us of the model name
　　　　and serial no. written on the nameplate of the product.

MEMO

MEMO

MEMO

Electric blowers   Fans/blowers   Environmental equipment   Dust collectors

Business lines

◤ Electric blowers
- Low-noise series
- High-pressure series
- Multi-stage series
- Compact series
- General-purpose series
- Multi series
- Stainless steel · Steel plate series
- Explosion-proof series
- Large-sized series (Denchoku)
- High pressure vortex series (Gust Blower)
- Agitating/circulating series (Double volute)

◤ Fans/Blowers
- Turbo fan (Delturbo)
- Turbo blower
- Air foil fan
- Sirocco fan
- Plate fan
- Axial fan with a variable pitch (Kairyu)

◤ Abnormality detector
- Troubleresa

◤ Environmental equipment
- Mist collectors (**Mistrēsa**)
- Portable fan (**Windbag**)
- Windracer (**Windracer**)

◤ Dust collectors
- Dustresa
  - Compact series
  - Small-size pulse-jet series
  - Portable open series
  - Pulse-jet series
- Fumeresa

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