HRT-5K2 Induction Heating Device Manual

Navio Co., Ltd.

Product Name: Induction Heating Device

Model: HRT-5K2

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Meter　HRT-5K2-APM-G01

Wiring diagram　HRT-5K2-W01

Safety Precautions

・High Voltage Charging Section:

Do not touch the terminals of the connected transformer with bare hands as it may cause electric shock.

・Output Connection Precautions:

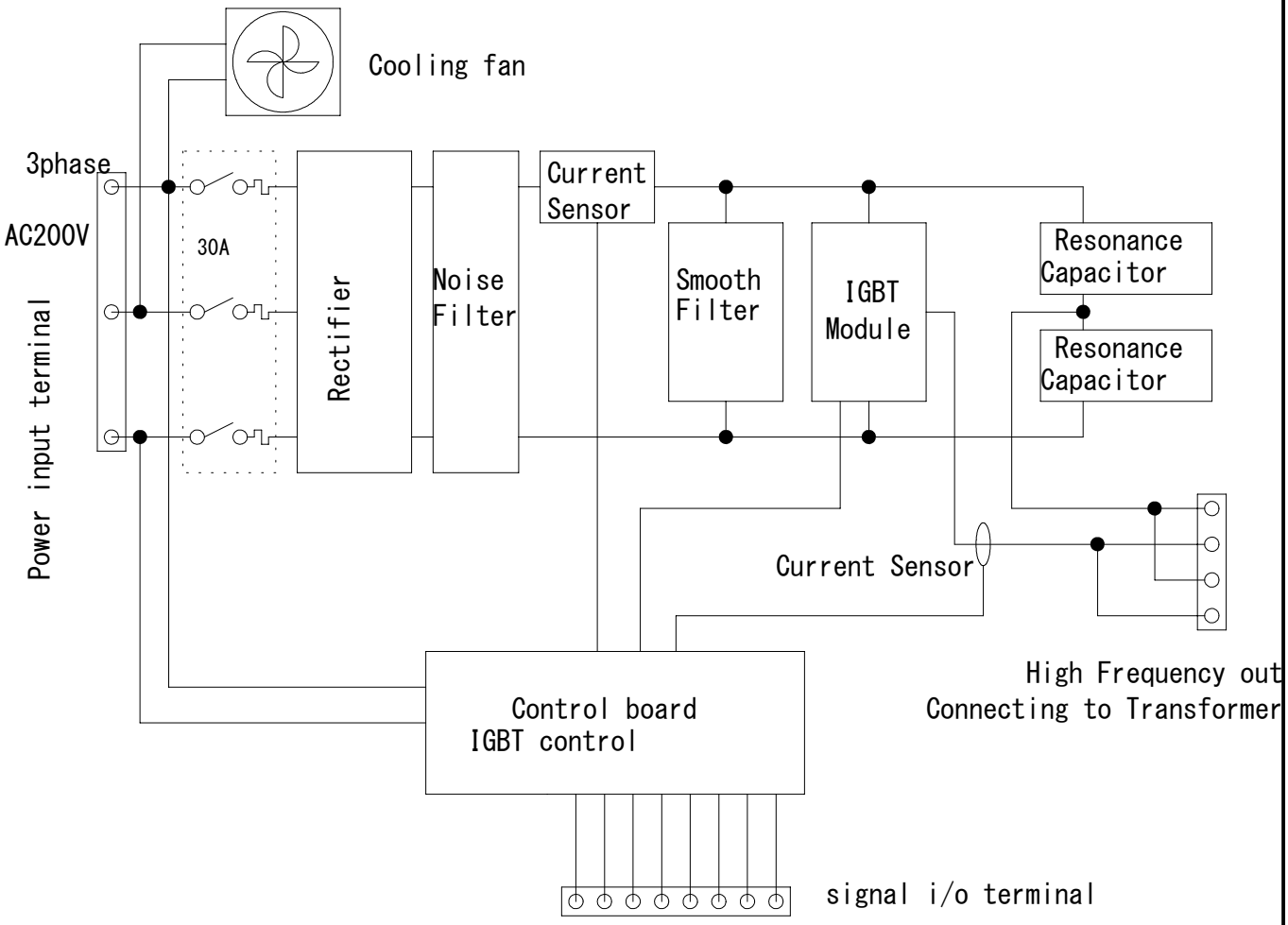
When connecting the device's output terminals to the transformer, ensure that wires of different colors are not connected to the same terminal to prevent short-circuiting, which could lead to device failure.

1. Overview

The HRT-5K2 induction heating device is designed to control non-contact heating by passing high-frequency current through heating coils.
The heating operation is controlled externally, allowing for temperature regulation via a temperature controller or on-off control by a sequencer.

2. Configuration

Induction Heating Device Power Block Diagram



３. Specifications

・Power Source Voltage: 3-phase AC 200V ± 20V, 50/60Hz, max 5kW

・Absolute Maximum Input Rating: 5kW

・Internal Resonance Capacitor Capacity: 2.296μF ± 5% (can be reduced to 0.984μF)

・Matching coil :　３０～５０μH（Q≦５）、５０～１１０μH（Q≦１０）　at 10kHz

・Output Frequency: 10kHz to 20kHz

・Output Current: Rated 100A rms

・Protect Functions
- ・Internal Temperature Abnormality: Stops operation at 75° C
- ・Output Overcurrent Abnormality: Stops operation at 170A peak
- ・Input Protection Leakage Breaker: 30A, Leakage current 30mA

・Display Functions
- ・High-Frequency Output Lamp (Green)
- ・Internal Temperature Abnormality Lamp (Red)
- ・Output Overcurrent Abnormality Lamp (Red)
- ・Heating Output Meter (Separate, Full Scale 7.5kW)

・I/O
- ・Heating Operation Stop/Start Input(1bit)
- ・System Error Output (1bit,photocoupler open collector)
  Internal Temp Abnormality
  and Output Overcurrent Abnormality Output
- ・External Control Signal Connection
  for Heating Power Adjustment (4-20mA Control Current Input)
- ・Power Meter Output
  Connecting Meter Accessories

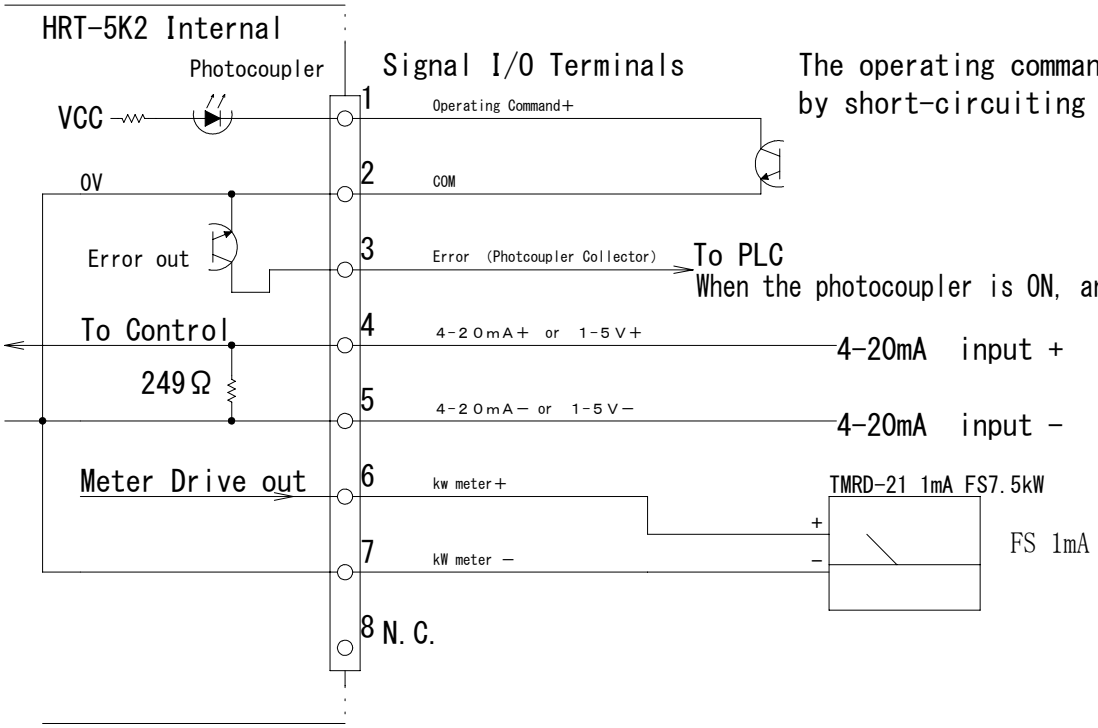
・Operating Tempreture　０℃～４０℃(Derating is required at 30 to 40° C.)

4. Operating Instructions

1) Power Supply Description

The input power supply is AC 3-phase 200V 50/60Hz.
Please ensure that all terminal connections are securely made before turning on the leakage breaker during equipment installation.

2) Signal I/O Terminals Instructions



Inside the HRT-5K2: The 4-20mA control current is converted to a 1-5V voltage signal by the internal 249Ω resistor, controlling the input power between 20% and 100%.
The HRT-5K2 stops operation for inputs below 1V (4mA).

3) Front Display Lamps

① High-Frequency Output (Green) 高周波出力中 (緑)
Lights up when high-frequency output is generated during heating operation.

② Internal Temperature Abnormality (Red) 内部温度異常 (赤)
Lights up and stops operation when the internal temperature reaches 75° C for protection.

③ Output Overcurrent Abnormality (Red) 出力過電流異常 (赤)
Lights up and stops operation when overcurrent occurs.
To resume, the power must be turned off and restarted.

4) Heating Output Meter

Indicates the current heating output through an externally connected power meter.

5. Control Methods

① Temperature Controller Control

To control the temperature of the heated object using a temperature controller, connect the 4-20mA output of the temperature controller to the temperature input. Once the operating command is input, the temperature will be automatically maintained at a constant level.

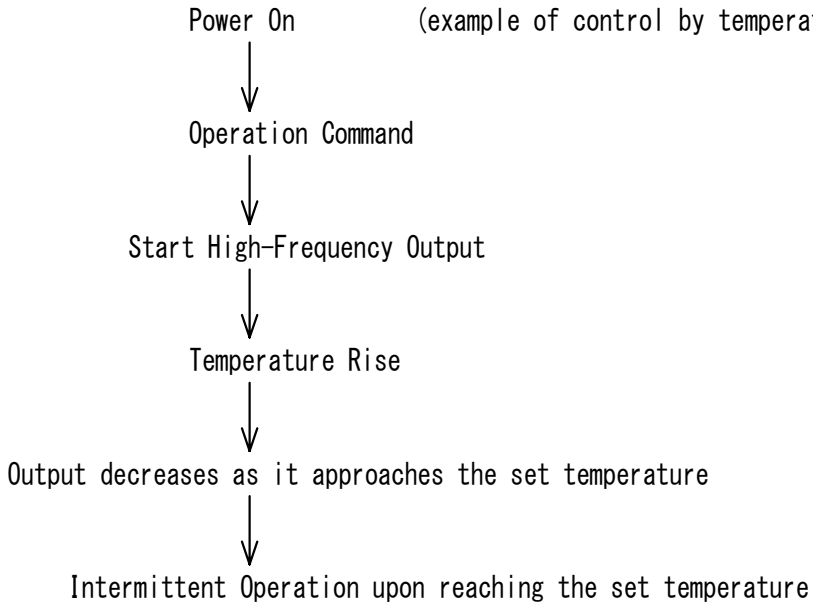
② Timer Control by Sequencer(Programmable Logic Controller)

If you do not use a temperature controller, you can manage heating by controlling the duration of the operation command issued by an external timer. In this case, input either 4-20mA current or 1-5V voltage to the temperature input to maintain a constant heating output during the timer operation of the external sequencer.

Important: Do not input a current or voltage exceeding 24mA or 6V to the temperature input as it may cause device malfunction.

6. Operation Flow

Basic operation flow:



7. Safety Precautions

- High Voltage Charging Section:

  Do not touch the terminals of the connected transformer with bare hands as it may cause electric shock.

- Output Connection Precautions:

  When connecting the device's output terminals to the transformer, ensure that wires of different colors are not connected to the same terminal to prevent short-circuiting, which could lead to device failure.

8. Maintenance

- The cooling FAN

  The cooling fan located at the bottom of the device is a consumable part.
  If the device is operated continuously for 24 hours a day, 365 days a year, it is recommended to replace the fan every two years.

9. Trouble Shooting

- Heating Operation Not Starting:

  Ensure the voltage between the temperature input terminals is 1-5V.
  Even if the operating command is input, heating output will not be generated if the voltage between the temperature input terminals is below 1V.

- Output Overcurrent Abnormality:

  Check if the heating load is properly set in the coil.

  Verify that the device output is not short-circuited.

- Internal Temperature Abnormality:

  If the internal temperature of the device reaches 75° C, the red lamp will light up and the device will stop operation to protect itself.
  Ensure the ventilation is not blocked and the cooling fan is functioning properly.

- Leakage Breaker Trips:

  Inspect for any leakage from the device output or consider the possibility of device failure. If the breaker continues to trip after correcting the suspected leakage point, contact the manufacturer for assistance.

１０. Installation Checkpoints

The HRT-5K2 device, upon delivery, is not connected to the oscillator, transformer, or heating coil. Therefore, assembly is required after unpacking. Please confirm the following management data during assembly:

①Tightening Torque During Assembly:

Ensure the tightening torque for the three-phase power supply terminal is between 2.2 and 2.8 N·m.

②Current Waveform Confirmation Between Oscillator and Transformer:

Use a current transformer (CT) and an oscilloscope to confirm the high-frequency current waveform flowing between the oscillator and transformer.
The CT should be connected with a resistor at both ends. When alternating current flows through the wire clamped by the CT, a current proportional to the turns ratio will flow through the resistor, allowing the measurement of AC current.

For example, if the CT has 3000 turns and the terminal resistor is 100Ω, you can calculate the current using the formula:

$$I = \frac{V}{R} \times N = \frac{3.3}{100} \times 3000 = 99A$$

V is the peak voltage waveform observed on the oscilloscope.
I is the current between the oscillator and the transformer.
R is the terminal resistance value.
N is the number of turns of the CT.

Ensure the observed waveform is a continuous sine wave, typically at a frequency of 10-20 kHz.
Any discontinuity in the waveform might indicate a phase loss in the three-phase power supply or assembly issues.
At a rated output of 5kW, the peak output current should be approximately 140A.

１１. Internal Components list

１）Leakage Circuit Breaker
FujiElectric　　ＤＧ３３Ｃ　３０Ａ　３０ｍＡ

２）Diode Bridge Rectifier
Sanrex　ＤＦ６０ＢＡ８０

３）ＩＧＢＴ
FujiElectric　２ＭＢＩ３００Ｕ２Ｂ－０６０

４）Smooth Capacitor
Shizuki　ＭＥＣ　６００Ｖ　１００μＦ

５）Resonance capacitor board
Navio　　３Ｂ８２３Ｊ－１２

６）Current Sensor１
Shiina　ＴＣＴ　０６－Ａ１

７）Current Sensor２
Ｕ＿ＲＤ　ＣＴＬ－１６－ＣＬＳ

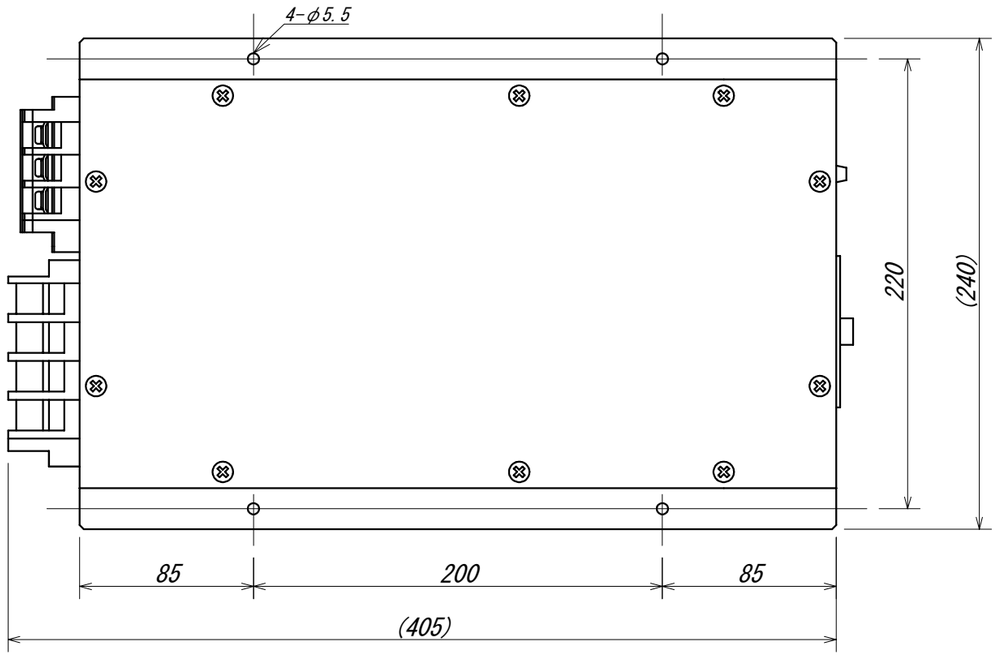
８）Control Board
Navio　ＡＰＢ－１２１１

９）Cooling FAN
ＯＭＲＯＮ　Ｒ８７ＦＡ４Ａ８３Ｈ

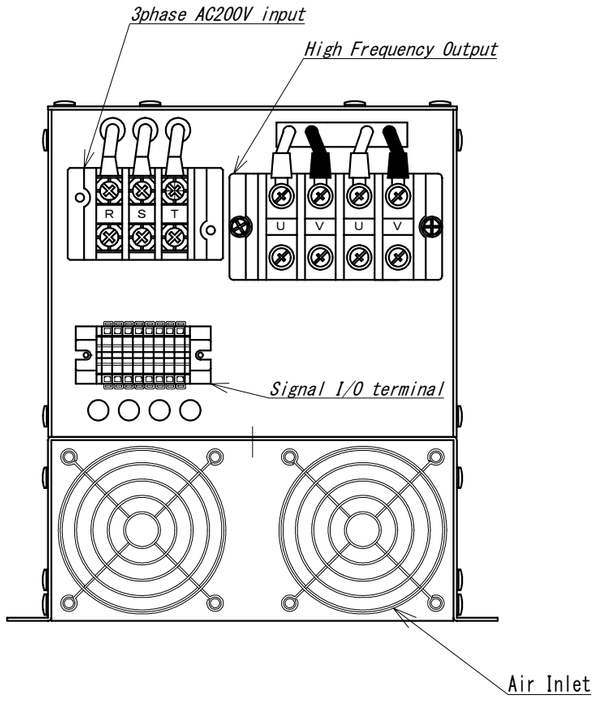
１０）Heat output Meter
tsuruga　TMRD-21 1mA FS7.5kW

信号入力端子台仕様	
1	Operation Command＋
2	COM
3	Error(Photocoupler Collector)
4	4-20mA＋ Input
5	4-20mA－Input
6	Power Meter＋ Output
7	Power Meter－ Output
8	No Connection

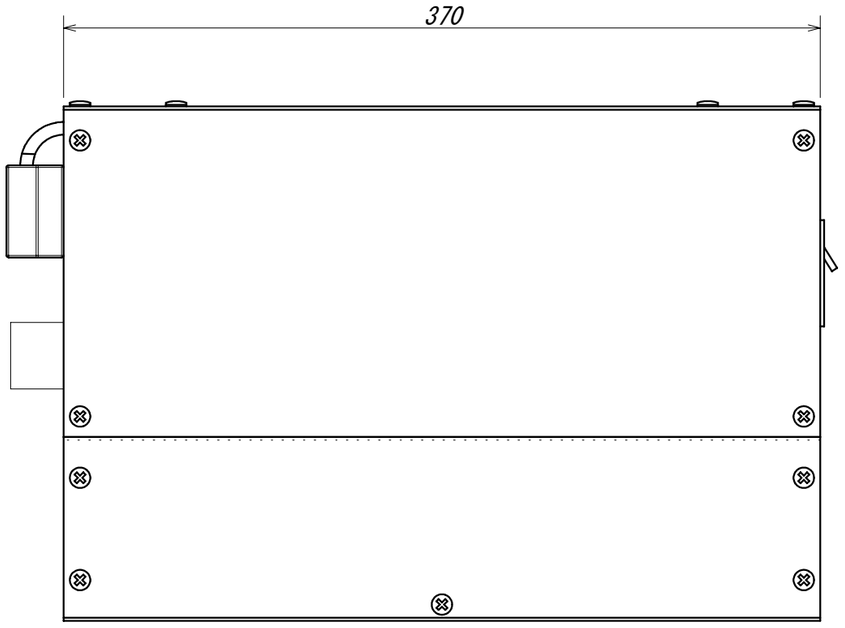
Top



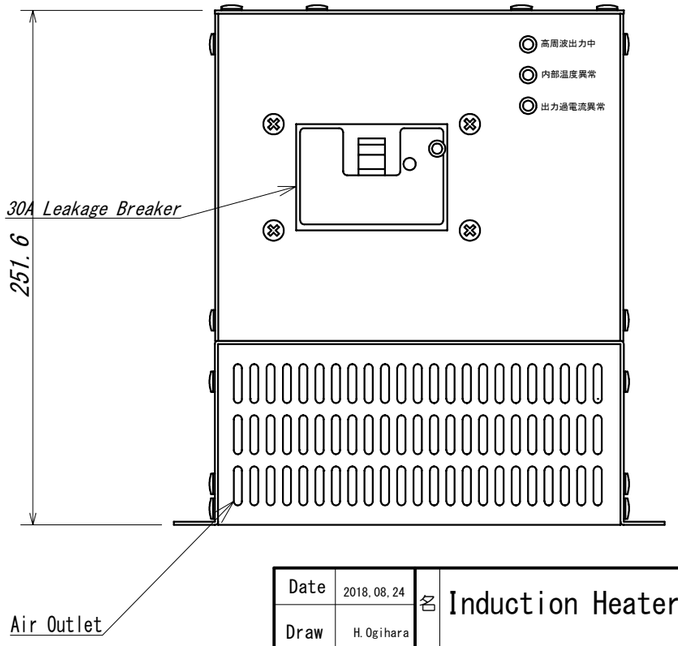
Rear



Side



Front



Date	2018.08.24	名称	Induction Heater
Draw	H.Ogihara		
Inspect	Y.Ogihara	図番	HRT-5K2-G01
Approval	A.Ogihara		
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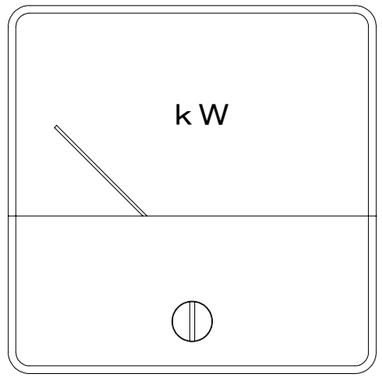
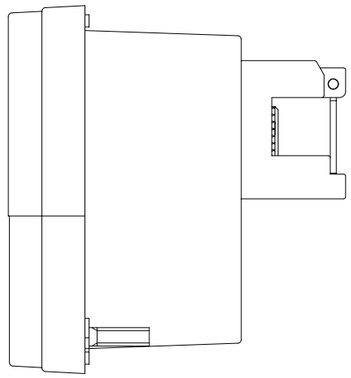
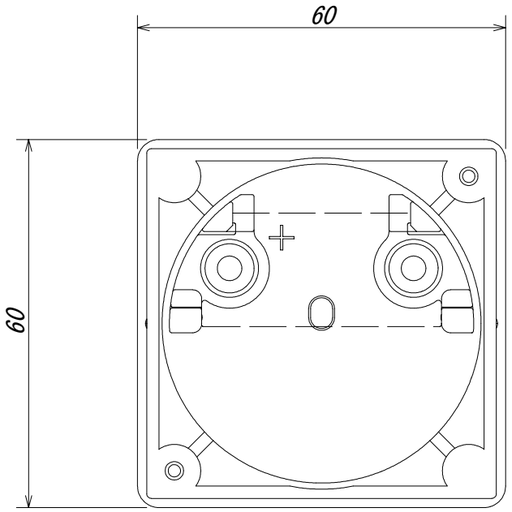
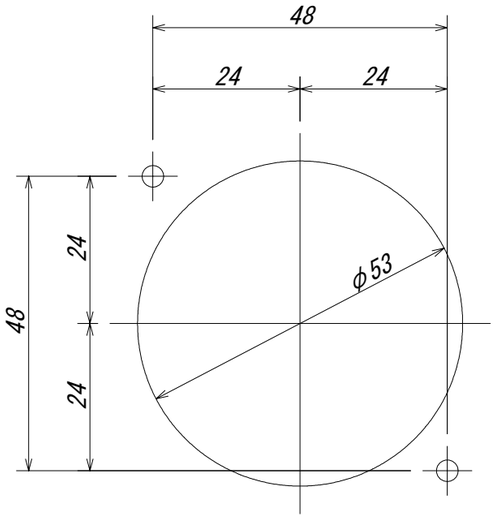
TSURUGA　TMRD-21　FS1mADC　7.5kW









panel cut

Rev	Date	Draw	Inspect	Change Datails

Date	18.08.24
Draw	H.Ogihara
Inspect	Y.Ogihara
Approval	A.Ogihara

名称　Meter

図番　HRT-5K2-APM-G01

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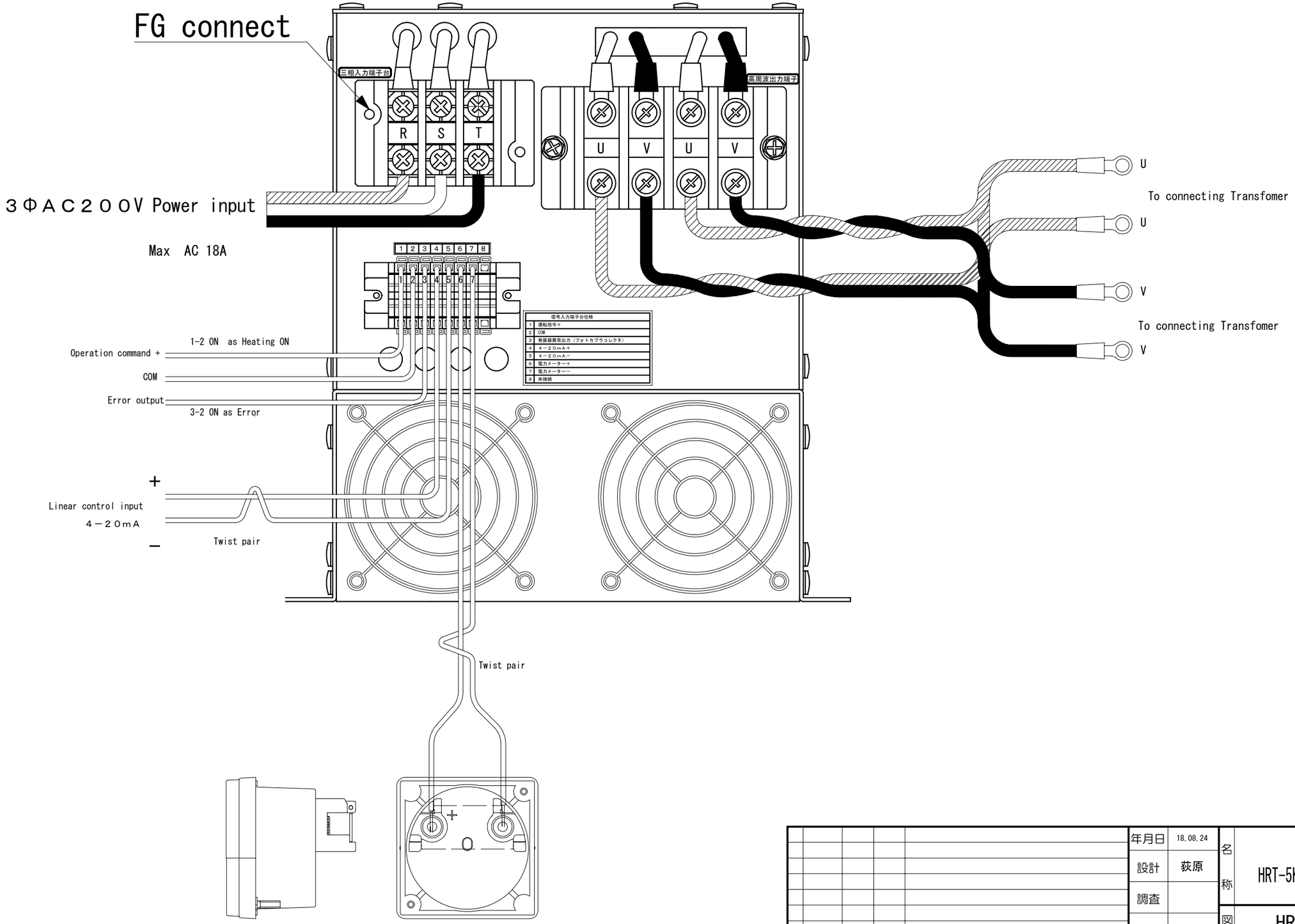
Navio A3DS20

HRT-5K2 Induction Heater



版	年月日	設計	調査	変更内容

年月日	18.08.24
設計	荻原
調査	
承認	

名称: HRT-5K2 Wiring diagram

図番: HRT-5K2-W01

ナビオ株式会社

Navio A3DS20