BEARING HEATER
ETOH

# BEARING HEATER

# <INVERTER DRIVEN INDUCTION HEATER>

## INSTRUCTION MANUAL

## IHE Series

Single Phase: IHE0110A, IHE0120G
Three Phase: IHE0320G, IHE0340G, IHE0620G, IHE0640G
IHE1120G, IHE1140G, IHE2320G, IHE2340G

ETOH
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Manual No. TO-IHE-0608-E

## Inverter Driven Bearing Heater IHE Series Instruction Manual Contents

## *1. PREFACE*

Thank you for purchasing the Inverter Driven Bearing Heater (IHE series). This product is designed to heat a ring, usually a bearing, for the shrink-fitting process of the ring.
This manual is designed to provide correct and suitable application information.

**Read this manual before attempting to install, operate, maintain or inspect IHE series heaters. Keep this manual in a safe, convenient location for future reference. Understand all precautions and safety information before attempting use.**

## *2. GENERAL PRECAUTIONS*

(A) Any illustration, photograph or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable.
(B) The products and specifications described in this manual can be changed without notice.
(C) If the equipment is used in a manner not specified in this manual, the protection provided by the equipment may be compromised.
(D) This product is designed to metal rings such as bearing and gear etc. only.
(E) When ordering a new copy of the manual due to damage or loss, please provide the manual number shown on the front page.

## *3. SAFETY INFORMATION*

(A) Do not heat bearings above 120℃ (248°F).
(B) Wear heavy gloves to prevent burns.
(C) Keep magnetic materials such as watches, computers, hearing aids etc. away from the unit.
(D) People with pacemakers shall not be in the vicinity of the heater(s).
(E) Do not touch the main core or I-type core during heating.
(F) Check supply voltage regularly.
(G) To provide continued protection against electric shock, connect to properly grounded outlets only.
(H) Read Safety Instruction in Appendix 2 before using.
(I) Don't attempt to modify or alter the bearing heater.
(J) Follow the instruction manual at all times.
(K) Turn off the main power when not in use.
(L) Turn off the main power and unplug the machine when a lightning strike may occur.
(M) In initial state of heating, the inverter output frequency changed from high to low to find the optimal frequency most suitable for heating efficiency for the load.
(Ref: 6.1 (A) Constant Apparent Power Control)
Temperature detection is still operated after set frequency. The heating temperature may over the target while the frequency is adjusted depending on the condition.

| |
|---|
| The products which ship now, the frequency decrease is set in about 1 second at shipment.<br>Regarding the products which ship <u>from May 2009 to September 2015</u>, it takes at maximum about 8 seconds. |

## *4. TRANSPORTATION PRECAUTIONS*

The product is packed to minimize the impact of shock, vibration, and humidity on the product. Especially aware the items as below.

- Excessive shocking and vibration
- Throwing and dropping in the freight handling
- Turning the package upside down
- To wet the cardboard box

## *5. WARNING LABEL*

There is a warning label on the unit. Always follow the warnings given on this label.

危険
WARNING
AVERTISSEMENT

注意事項 Warning Avertissement:

・据付・加熱の前には必ず，取扱説明書を読んで、その指示に従ってください。

May Cause injury or electrical shock. Please follow the instructions in the manual before installation or operation.

Peut entraner des blessures ou des chocs éîlectriques. Veuillez suivre les instructions du manuel avant l'installation ou l'utilisation.

・感電のおそれがあります。確実に接地を行ってください。

Connect to properly grounded outlet only or use proper grounding techniques,to provide continued protection against electrical shock.

Branchez uniquement sur une prise correctement mise à la terre ou utilisez les techniques de mise à la terre qui conviennent, afin d'offrir une protection continue contre les chocs électriques

・機器と電源の電圧があっていることを確認してください。

Check voltages of the power supply and the product.

Vrifiez les tensions de lé'alimentation et du produit

.

・ペースメーカを使用している人は、通電中近づかないでください。

Persons with Heart Pacemaker shall not be in the vicinity of the product during heating.

Les personnes porteuses d'un pacemaker ne doivent pas se tenir dans le voisinage du produit pendant le chauffage

・時計・鉄片等の磁性体は近づけないでください。

Do not put watches or any magnetic materials or sheet of metal near the product.

Ne posez ni montre ni matériau magnétique ou feuille métallique à proximité du produit

# *6. INTRODUCTION*

The IHE series bearing heater is an induction heater designed for the shrink fit process by using the thermal expansion of heated cylindrical parts (bearing etc.) due to the temperature rise caused by the electric resistance Joule heat generated from electro-magnetically induced current from the built-in induction coil.
Since the inverter is built-in, regardless of I-type core and the bearing load conditions, fixed apparent electric power is supplied to an excitation coil, effectively shortening the heating time.

## 6.1 Features and Functions

The IHE series has the advanced features and functions described below, in addition to conventional induction bearing heaters.

### (A) Constant Apparent Power Control

Shorter heating time compared with a conventional type induction-bearing heater is achieved by constant apparent power control. The built-in inverter supplies its maximum fixed apparent power to excitation coils with variable frequencies, regardless of I-type core and various load conditions (bearing dimensions, weight, electrical characteristics of material used in bearings).
As soon as heating is started, the frequency is adjusted and fixed.

### (B) Simple Operation

The IHE series is user-friendly with operational panel ensuring ease and simplicity of operation. Using the LED panel along with its simple-to-use digital controls, increases productivity.

### (C) Two Operational Modes

The IHE series has two operational modes: time and temperature. A simple one-touch operation changes the control modes.
In the temperature control mode, it can changeover Celsius or Fahrenheit.
After the temperature reaches the set temperature, the temperature is kept (controlled) at the set temperature.

### (D) Automatic Demagnetization and Higher Demagnetization Level

The demagnetization process is performed automatically on pressing the stop button after the set temperature is reached(Temperature control mode) or when the timer count reaches zero (Timer control mode). The bearing can be demagnetized manually if necessary. The demagnetization level is no more than 3Gauss (1000microT) at any point on the bearing surface.

### (E) I-type Core Removal Device (Built into Slide Type Bearing Installation Table) (Except IHE0110A, IHE0120G)

For middle and large types, I-type core removal device is equipped for easy installation of I-type core and bearing.

### (F) Safe and Reliable

The IHE has the protect function by the circuit breaker and built-in inverter, it has also the protect function against coil over temperature and temperature sensor abnormal.

### (G) Finishing Acoustic Signal

Built-in buzzer emits 75 +-10dB (reference sound pressure 20uPa) electronic beep sounds when the desired temperature is reached (Temperature Control mode) and the time is counted down to zero (Timer Control mode).

### (H) Heating Controllability

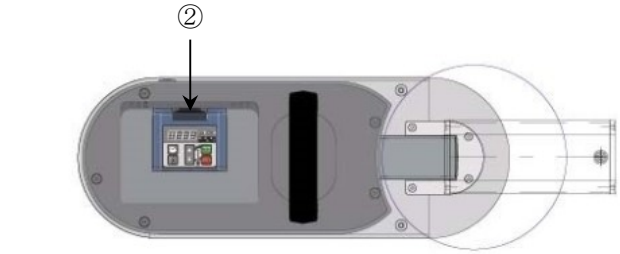
The IHE series designed to have Power Reduction Function by setting the reduction rate 100-50% by 10% steps.

### (I) Sequence Operation

In addition to Control Panel Operation, Sequence Operation is also available.

## 6.2 Full View and Part Description

IHE0110A, IHE0120G




| | |
|---|---|
| ① | Circuit Breaker |
| ② | Operation Panel |
| ③ | Temperature Sensor Socket |
| ④ | Main Core |
| ⑤ | Foldable Core Cover |
| ⑥ | I-type Core |

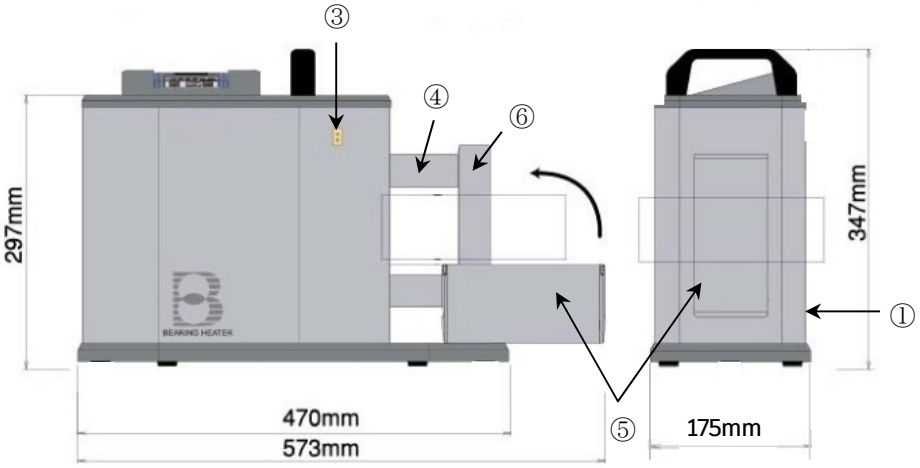
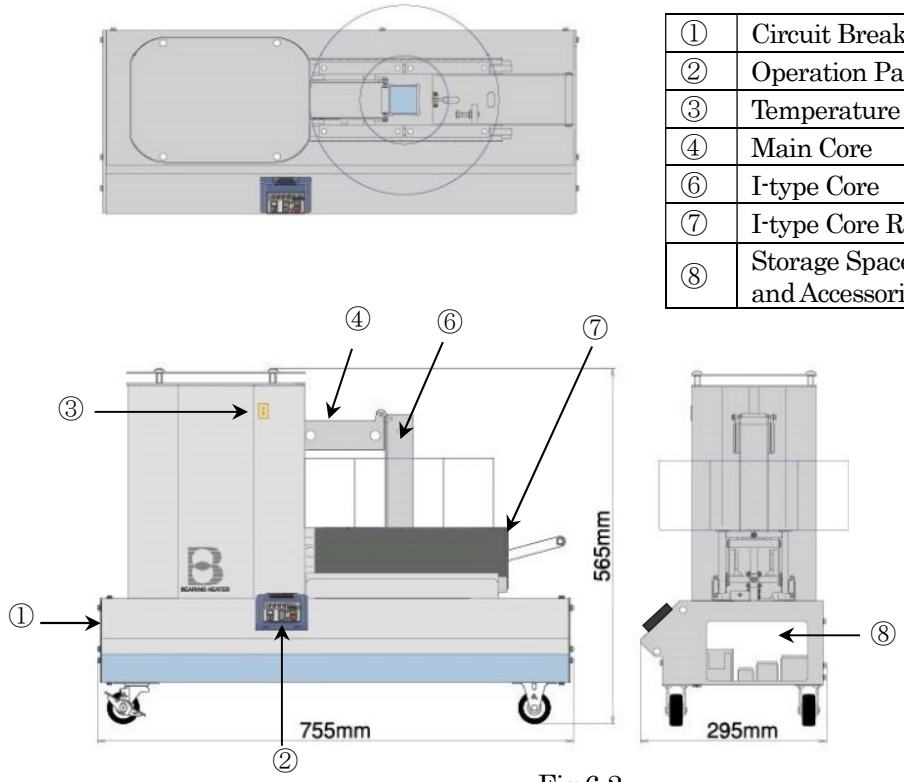



Fig 6-1




| | |
|---|---|
| ① | Circuit Breaker |
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| ③ | Temperature Sensor Socket |
| ④ | Main Core |
| ⑥ | I-type Core |
| ⑦ | I-type Core Removal Device |
| ⑧ | Storage Space for I-type Cores and Accessories |

Fig 6-2



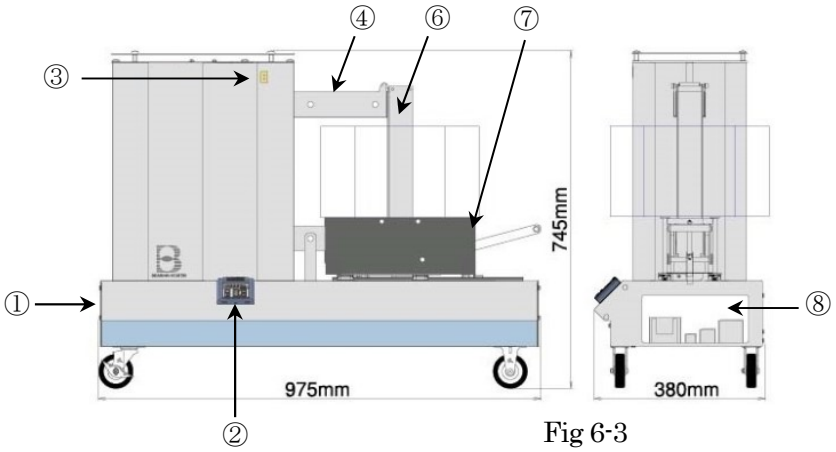


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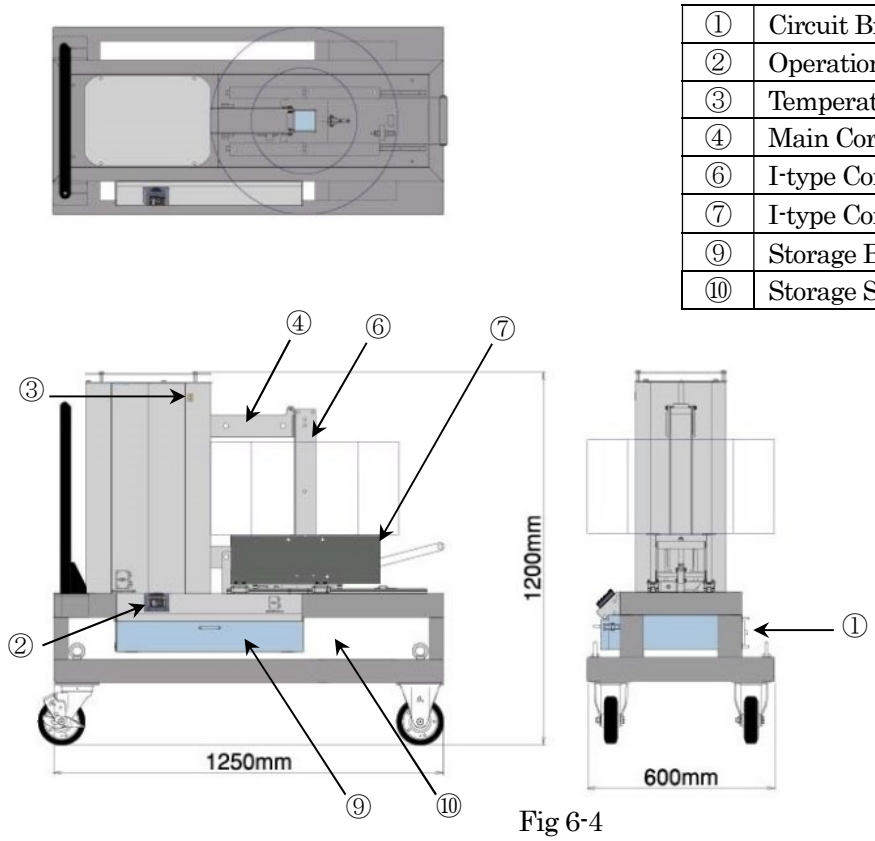
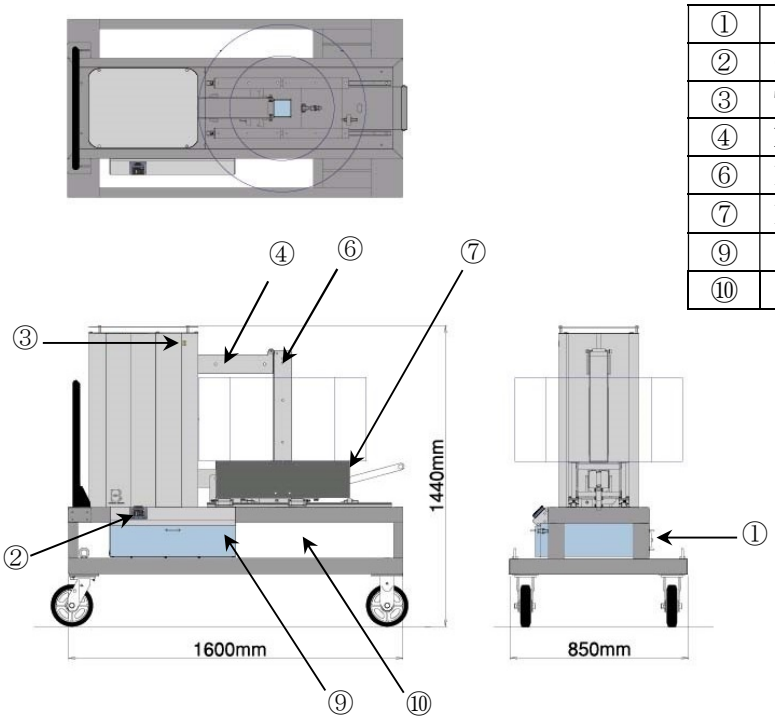
Fig 6-3




| | |
|---|---|
| ① | Circuit Breaker |
| ② | Operation Panel |
| ③ | Temperature Sensor Socket |
| ④ | Main Core |
| ⑥ | I-type Core |
| ⑦ | I-type Core Removal Device |
| ⑨ | Storage Box for Accessories |
| ⑩ | Storage Space for I-type Cores |

Fig 6-4






| | |
|---|---|
| ① | Circuit Breaker |
| ② | Operation Panel |
| ③ | Temperature Sensor Socket |
| ④ | Main Core |
| ⑥ | I-type Core |
| ⑦ | I-type Core Removal Device |
| ⑨ | Storage Box for Accessories |
| ⑩ | Storage Space for I-type Cores |

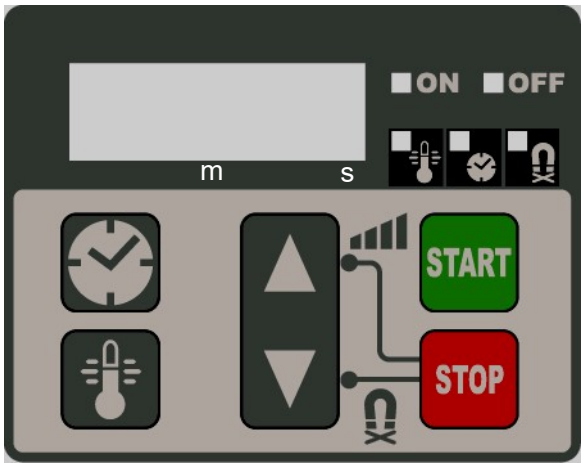
Fig 6-5

### (1) Circuit Breaker

The circuit breaker protects the main circuit and all electrical components downstream.

### (2) Operation Panel

The 7-Segment LED displays digital figures such as setting or actual temperature in Temperature Control Mode and setting time or the time counted down in Timer Mode. On the right-hand of the 7-segment LED display, there are five LEDs indicating the state.




The meanings of the stage LEDs are described as below.

① ON: Lighting during heating
② OFF: Lighting after heating
③ Thermometer Icon: Lighting in Temperature control mode
④ Timer Icon: Lighting in Timer control mode
⑤ Magnet Icon: Lighting during demagnetization (Automatic/Manual)

The meanings of the function buttons are described as below.


Heating Start


Heating Stop (Reset)

Setting value increase

Setting value decrease

Temperature control mode selection, setting temperature, current temperature, and Rise ratio (double click during heating) is displayed.

Timer control mode selection, setting time is displayed.


Manual demagnetization


Power reduction mode (Default setting:100%)

then

Setting the reduction rate 100-50% by 10% steps

＊Once the circuit breaker is turned down, the power reduction setting is returned default setting(100%)

＊It is not necessary for the normal heating to set the power reduction mode. Depending on the work piece, the quick heating may cause the damage to the work piece.

By setting the power reduction, the power can be adjusted by 10% steps, from 100% to 50%.


Temperature display changeover
Default setting (Factory shipment): Celsius
It is effective only when the machine is in the STOP state.

＊Don't change the temperature display during operation as it may cause any malfunction.

＊Confirm the temperature displayed (Celsius or Fahrenheit) is the one you intend to use during operation.

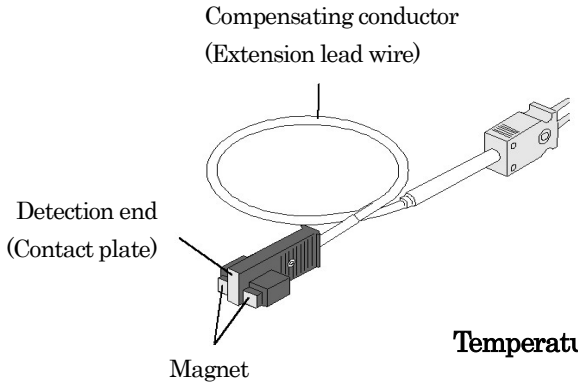
### (3) Temperature Sensor Socket

Connect the temperature sensor to the sensor socket.
Be aware of the polarity (+ and – of the sensor)

- **Temperature Sensor**

The temperature sensor is equipped with a permanent magnet to secure the sensor to the inner ring during heating. Make sure the detection edge of the sensor is not damaged. Mount the sensor so that the detection edge securely contacts the surface of the ring being heated. Don't change or alter the extension lead wire of the thermocouple, or it may not measure correctly.
Confirm on the operation panel that the temperature is increasing during heating.

**The upper limit of working temperature of the sensor is 250℃ (482°F)**




**Temperature Sensor**

### (4) Main Core

Main magnetic flux flows through the main core. Make sure the polished faces are always greased. This will protect the ends of the main core against rust, scaring and scratches. The lack of grease may cause the abnormal vibration and/or loud noise.

### (5) Foldable Core Cover (IHE0110A and IHE0120G only)

Fold up the foldable core cover for protecting the polished faces of the main core when the IHE series isn't used. The cover should be kept upright to prevent dust or damage to the polished faces of the main core.

### (6) I-type Core

For heating bearing, install an I-type core through the inner bore of the bearing. (See Table 6-1) Choose the largest I-type core for heating. The larger cross-section of the I-type core that is chosen, the shorter the heating time. Meet the polished faces of the I-type core and main core both at the top and bottom. Make sure the polished faces are always greased. During heating, the I-type core is attracted to the main core by magnetism, be careful that your fingers do not become caught between the I-type core and the main core.

Table 6-1 Standard and Optional I-type Cores

| Type of body | Type of I-type core | Dimensions D×W×L (mm) | Bore diameter of bearing (mm) |
|---|---|---|---|
| IHE0110A IHE0120G | N-CI-1808 (OP) | 8×8×185 | 12～20 |
| | N-CI-1815 | 15×15×185 | 20～35 |
| | N-CI-1825 | 25×25×185 | 35～50 |
| | N-CI-1835 | 35×35×185 | Above 50 |
| IHE0320G IHE0340G | N-CI-2515 (OP) | 15×15×250 | 20～35 |
| | N-CI-2525 | 25×25×250 | 35～50 |
| | N-CI-2535 | 35×35×250 | 50～70 |
| | N-CI-2545 | 45×45×250 | Above 70 |
| IHE0620G IHE0640G | N-CI-3715 (OP) | 15×15×370 | 20～35 |
| | N-CI-3725 | 25×25×370 | 35～50 |
| | N-CI-3735 | 35×35×370 | 50～80 |
| | N-CI-3755 | 55×55×370 | Above 80 |
| IHE1120G IHE1140G | N-CI-5225 (OP) | 25×25×520 | 35～50 |
| | N-CI-5235 | 35×35×520 | 50～80 |
| | N-CI-5255 | 55×55×520 | 80～100 |
| | N-CI-5270 | 70×70×520 | Above 100 |
| IHE2320G IHE2340G | N-CI-6725 (OP) | 25×25×670 | 35～50 |
| | N-CI-6735 | 35×35×670 | 50～80 |
| | N-CI-6755 | 55×55×670 | 80～130 |
| | N-CI-6785 | 85×85×670 | Above 130 |

*OP・・・Option

**(7)I-type Core Removal Device (Built into Slide Type Bearing Installation Table) (standard for IHE0320G , IHE0340G , IHE0620G , IHE0640G , IHE1120G , IHE1140G , IHE2320G , and IHE2340G)**

This device helps remove the I-type core by levering it up along the polished face of the main core for easier removal.

**(8) Storage Space for I-type cores and Accessories (IHE0320G , IHE0340G , IHE0620G , IHE0640G)**

I-type core, I-type core guide, temperature sensor are found in the storage space.

**(9) Storage Box for Accessories (IHE1120G , IHE1140G , IHE2320G , IHE2340G)**

I-type core guide, temperature sensor, I-type core lift-up tool are found in the storage box.

**(10) Storage Space for I-type cores (IHE1120G , IHE1140G , IHE2320G , IHE2340G)**

I-type core are found in the storage space.

# *7. HANDLING IHE series*

## 7.1 Confirmation Upon Delivery

Check the following items in Table 7-1 when bearing heater IHE series is delivered.

Table 7-1 Checks

| Items | Method |
|---|---|
| Are Standard accessories and optional accessories included? | According to Table 7-2, check the parts on hand. |
| Has the correct model of the IHE been delivered? | Check the model number in the rating name seal on the IHE. Refer to Fig 7-1A, Fig 7-1B, Fig 7-1C |
| Damage? | Inspect the appearance of the entire unit for any damage due to transportation. |

Table 7-2 Standard and Optional Accessories

| Type | IHE0110A | IHE0120G | IHE0320G<br>IHE0340G | IHE0620G<br>IHE0640G | IHE1120G<br>IHE1140G | IHE2320G<br>IHE2340G |
|---|---|---|---|---|---|---|
| I-type Core | N-CI-1808 (OP) | N-CI-1808 (OP) | N-CI-2515 (OP) | N-CI-3715 (OP) | N-CI-5225 (OP) | N-CI-6725 (OP) |
| | N-CI-1815 | N-CI-1815 | N-CI-2525 | N-CI-3725 | N-CI-5235 | N-CI-6735 |
| | N-CI-1825 | N-CI-1825 | N-CI-2535 | N-CI-3735 | N-CI-5255 | N-CI-6755 |
| | N-CI-1835 | N-CI-1835 | N-CI-2545 | N-CI-3755 | N-CI-5270 | N-CI-6785 |
| I-type Core Guide | - | - | N-CS-2515 (OP) | N-CS-3715 (OP) | N-CS-5225 (OP) | N-CS-6725 (OP) |
| | - | - | N-CS-2525 | N-CS-3725 | N-CS-5235 | N-CS-6735 |
| | - | - | N-CS-2535 | N-CS-3735 | N-CS-5255 | N-CS-6755 |
| I-type Core lift –up tool | - | - | - | - | N-CL-578 | N-CL-578 |
| Accessory Storage Bag | N-CA-0001 | N-CA-0001 | - | - | - | - |
| Temperature Sensor | N-CTC-300 | N-CTC-300 | N-CTC-500 | N-CTC-500 | N-CTC-1000 | N-CTC-1000 |

* (OP)···Option

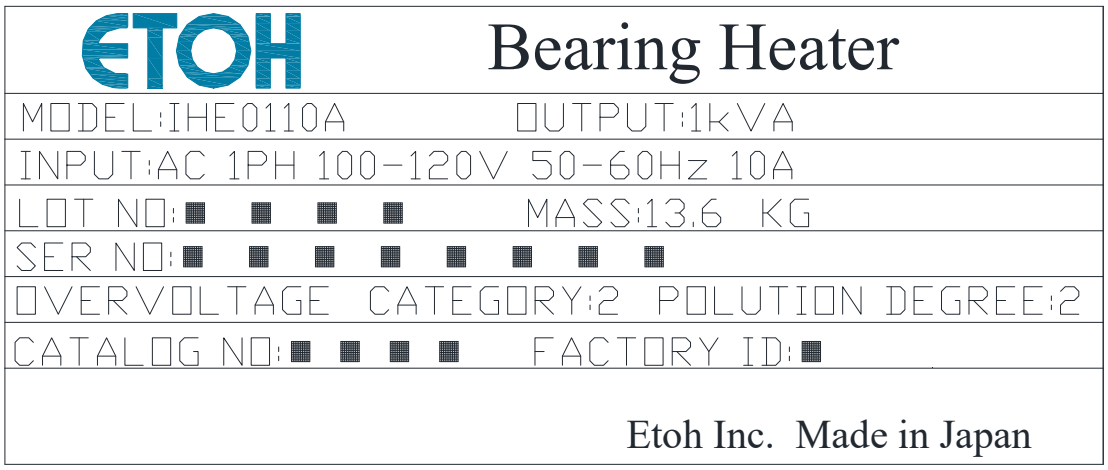



Fig 7-1A IHE0110A Rating Name Seal

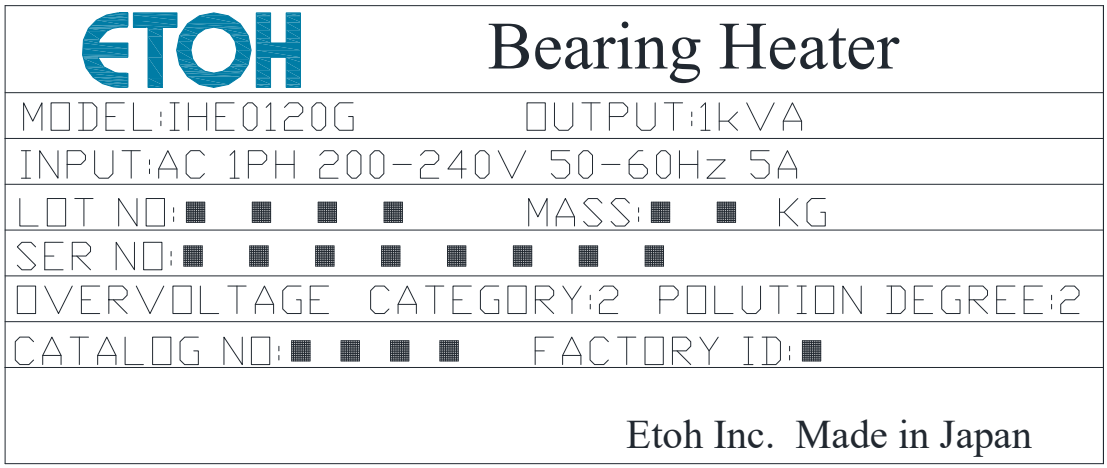



Fig 7-1B IHE0120G Rating Name Seal

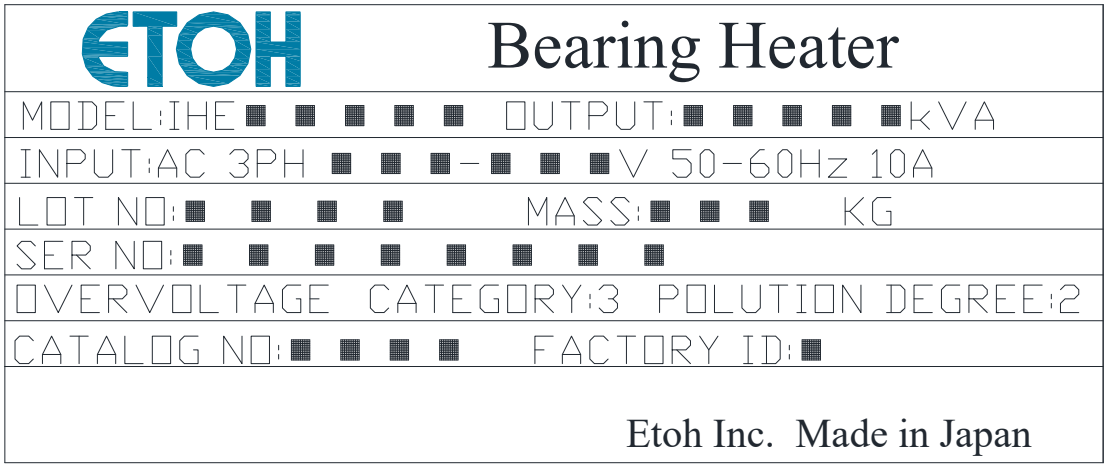
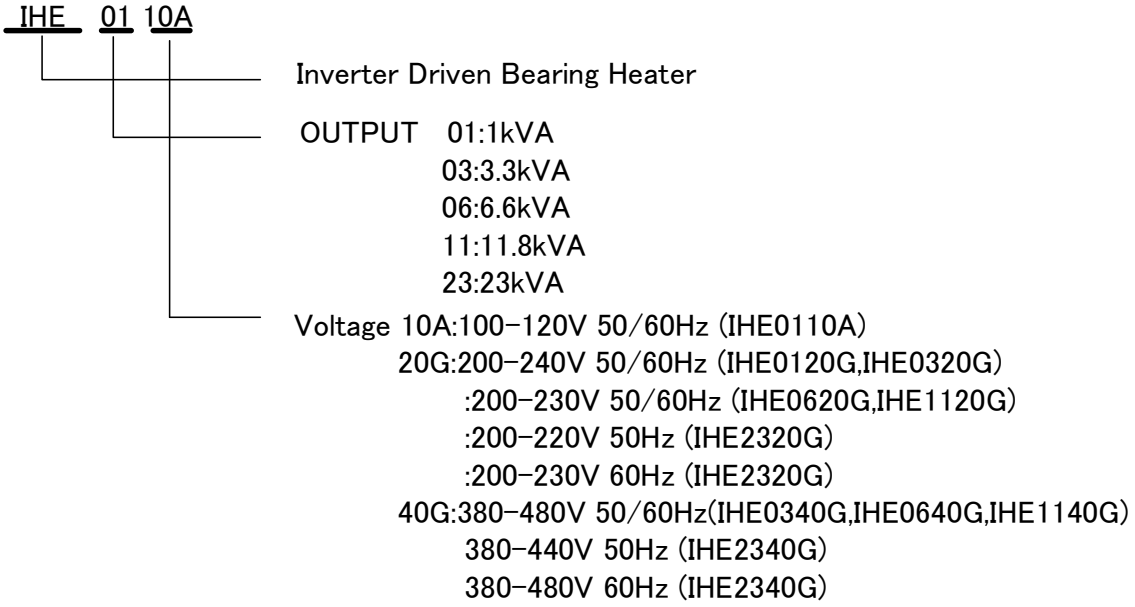



Fig 7-1C IHE0320G,IHE0340G,IHE0620G,IHE0640G,IHE1120G,
IHE1140G IHE2320G and IHE2340G Rating Name Seal




IHE Model Number

## 7.2 Usage and Installation

**(A) Power Supply**

Make sure that the power voltage meets the required specifications.

**(B) Installation Site**

Install the machine on a flat and stable surface.

Always lock the safety stoppers on the wheels except moving of the machine. (All types except IHE0110A and IHE0120G)

Do not place the machine in areas subject to high temperature, high humidity, splash, or bad ventilation. Also, avoid using in places subject to dust, metal shavings, or vibration.

Install the machine on a flat level surface.

Do not place the flammable material in the vicinity of this products.

Do not place this product in the place blocking up the vent.

**(C) Inside the Machine**

Do not open the machine for inspection or repair. It may cause damage or injury.

**(D) Unplug the Machine When Not in Use.**

**WARNING**

**(i) Do not install the IHE series in an area that makes it difficult to operate the appliance inlet in a safe manner.**

**(ii) Do not use the IHE series in any manner other than its intended purpose as specified by the manufacturer. To do so could impair the safety features and user protection provided by the equipment.**

### 7.2.1 Connecting the Power Supply for IHE0320G , IHE0340G ,IHE0620G , and IHE0640G

Open the field wiring compartment cover

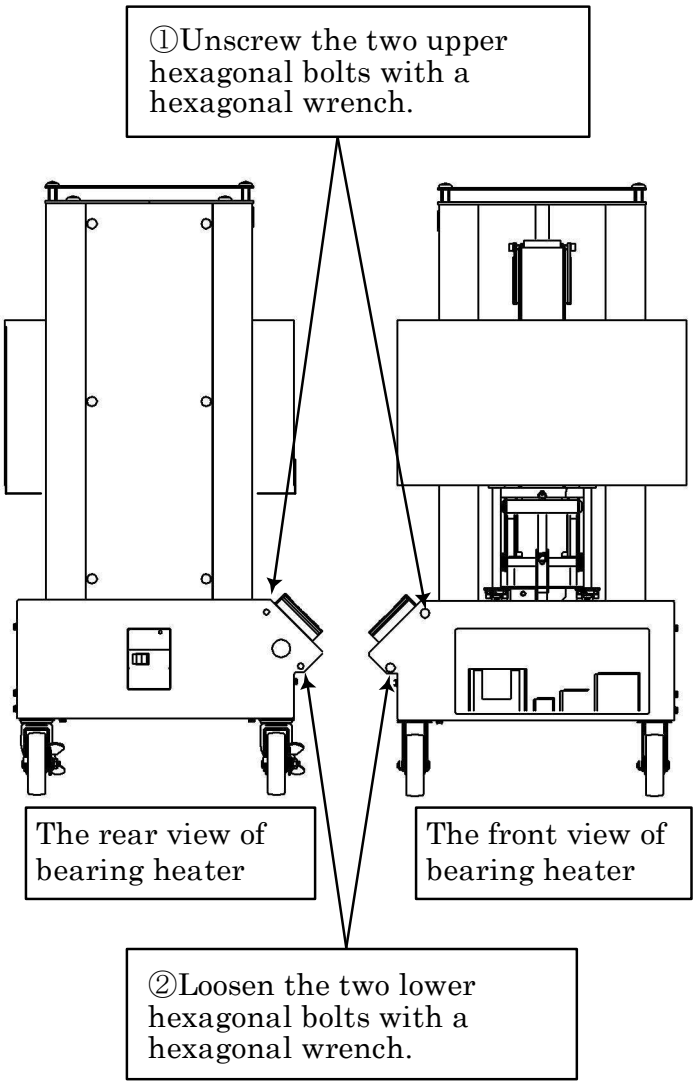



Fig 7-1

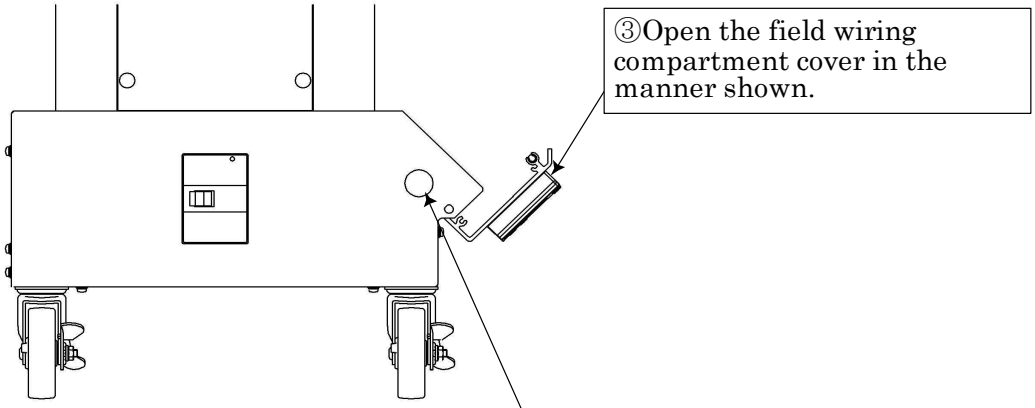

③Open the field wiring compartment cover in the manner shown.
④Penetrate the power supply cable with the strain relief listed in Table 7-3 through the conduit.
IHE0320G,IHE0620G : Conduit Diameter1/2NPT(22.2mm)
IHE0340G,IHE0640G : Conduit Diameter 1/2NPT (22.2mm)

Fig 7-2

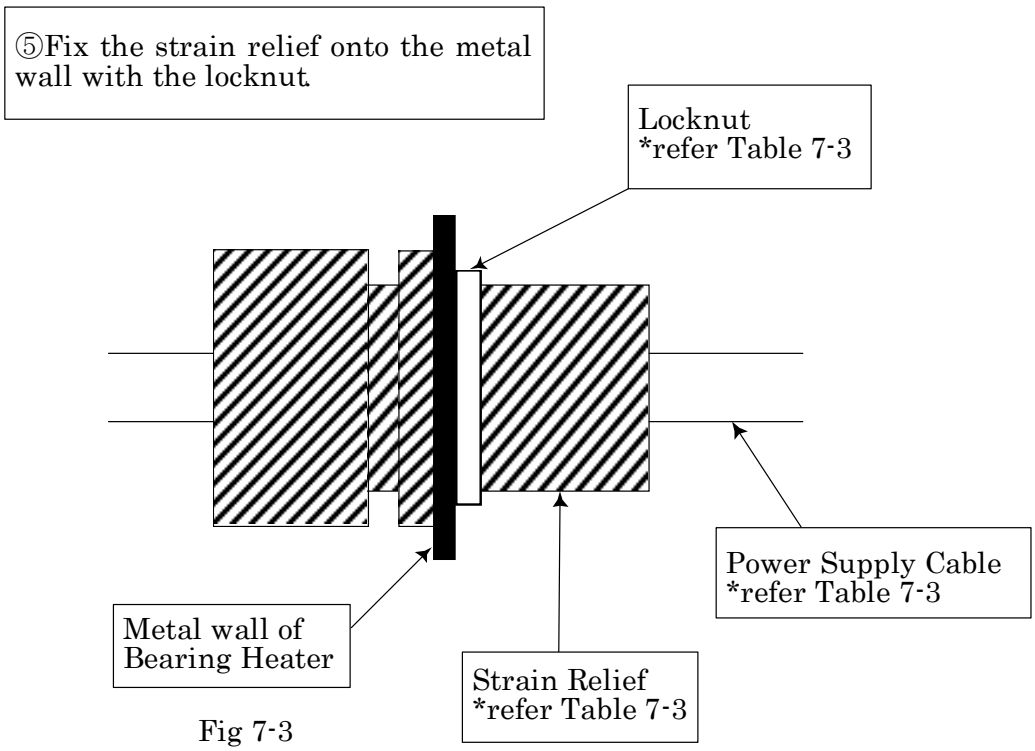

⑤Fix the strain relief onto the metal wall with the locknut.
Locknut
*refer Table 7-3
Power Supply Cable
*refer Table 7-3
Metal wall of
Bearing Heater
Strain Relief
*refer Table 7-3

Fig 7-3

⑥Connect the terminals of the power supply cable to the terminal block.

Terminal Blocks
IHE0320G:TXM10　04(Kasuga Electric)・・・Mounting Screw M3.5(Torque1.0～1.3N･m)
IHE0620G:TXM20　04(Kasuga Electric)・・・Mounting Screw M4(Torque1.4～1.8N･m)
IHE0340G:TXM7 04(Kasuga Electric)・・・Mounting Screw M3(Torque0.6～0.9N･m)
IHE0640G:TXM7 04(Kasuga Electric)・・・Mounting Screw M3(Torque0.6～0.9N･m)

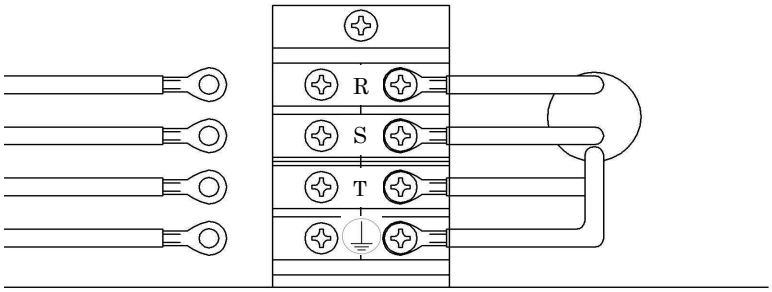



Fig 7-4

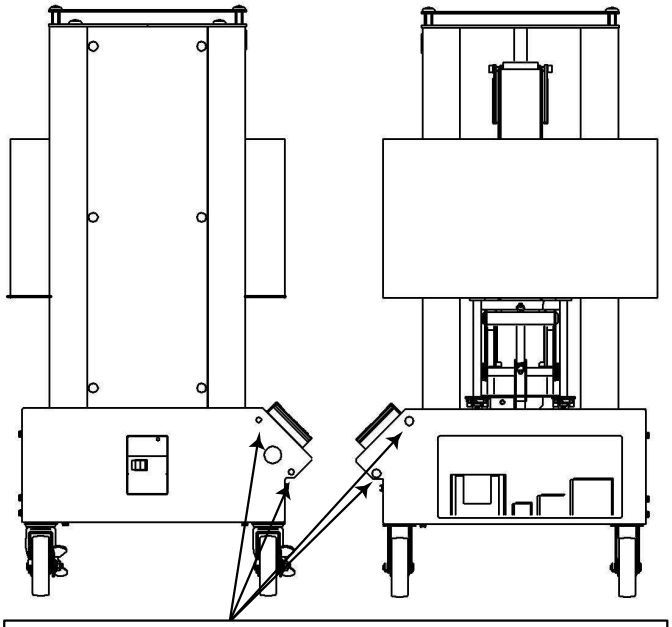


Fig 7-5

⑦Shut the cover and tighten the four hexagonal bolts with a hexagonal wrench .

### 7.2.2 Connecting the Power Supply for IHE1120G ,IHE1140G ,IHE2320G and IHE2340G

Open the field wiring compartment cover

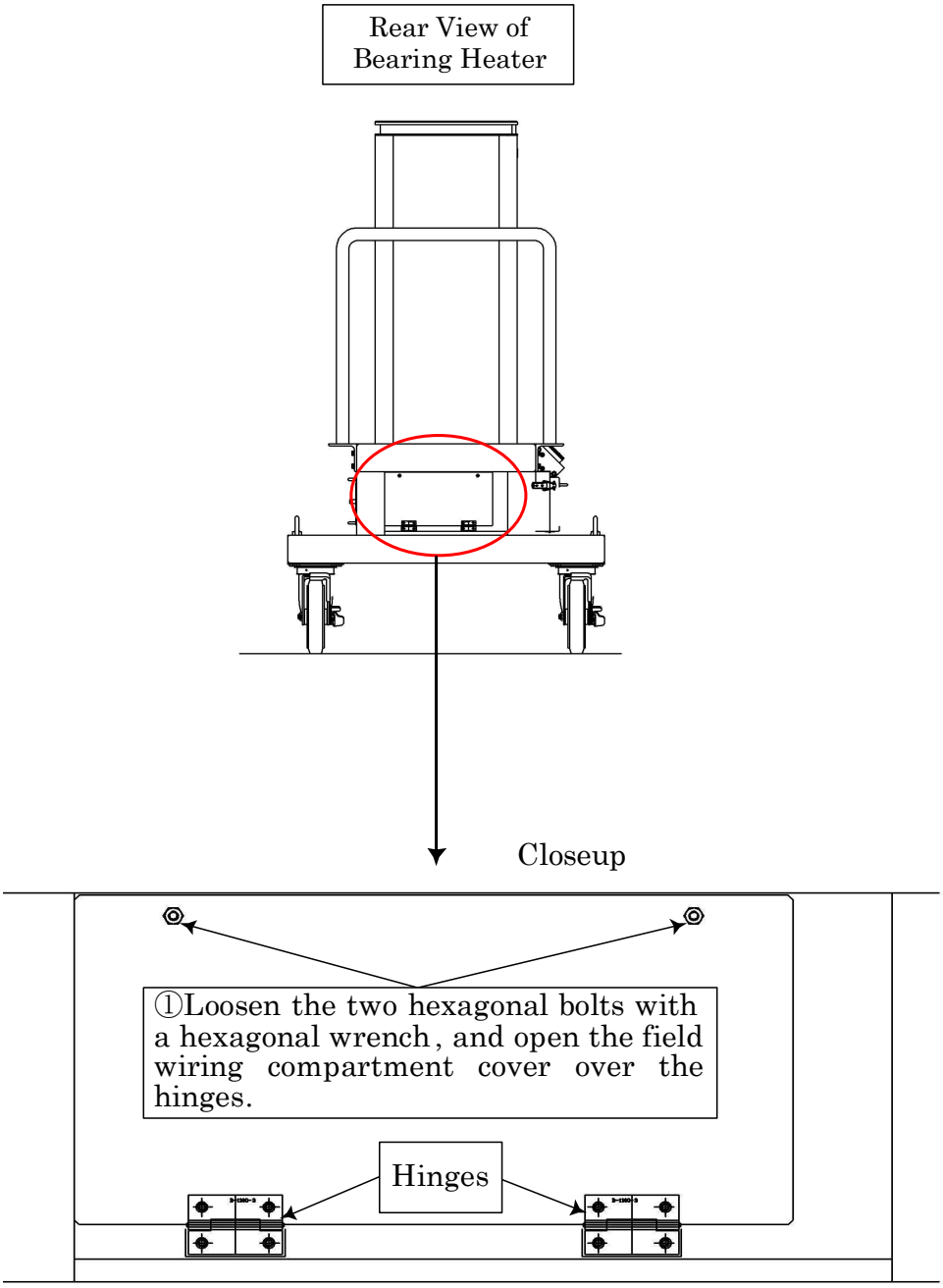
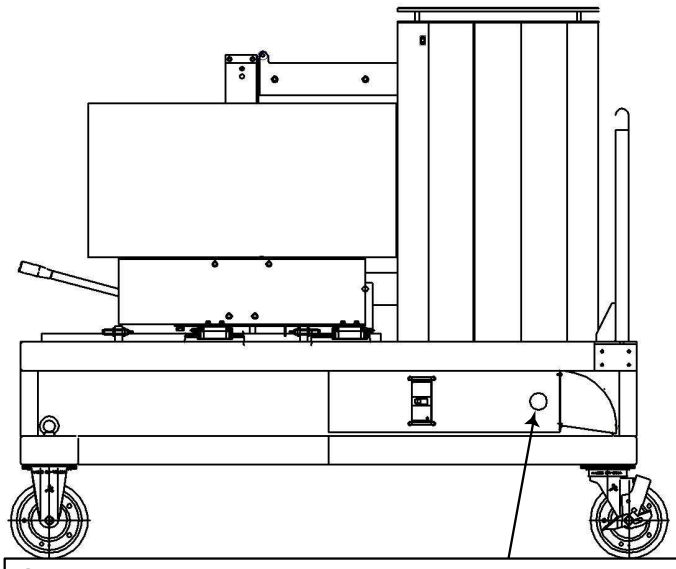



Fig 7-6



②Penetrate the cable with the strain relief listed in the Table 7-3 through the conduit.
IHE1120G,IHE1140G,IHE2340G
Conduit diameter 1/2 NPT(22.2mm)
IHE2320G:Conduit diameter 1 NPT(34.5mm)

Fig 7-7

③Fix the strain relief onto the metal wall with the locknut

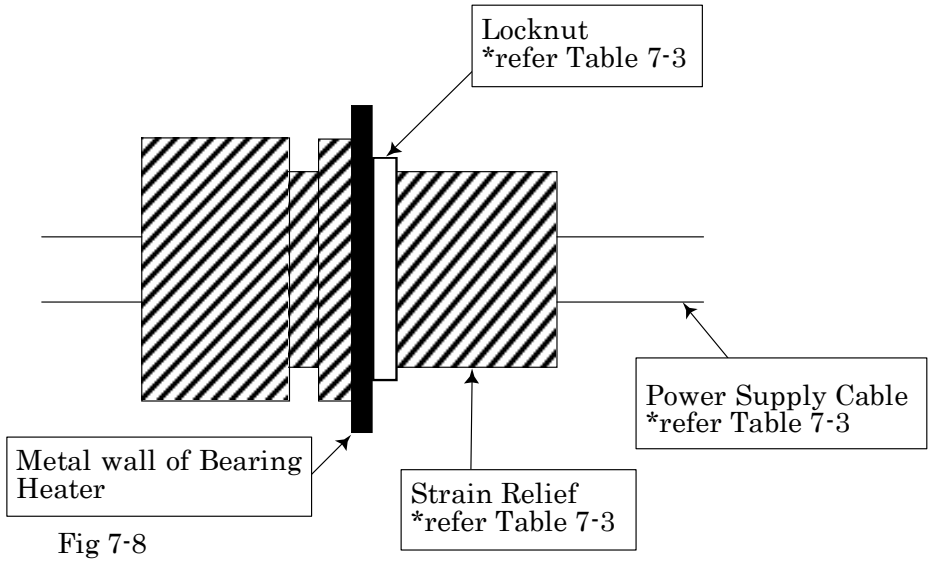
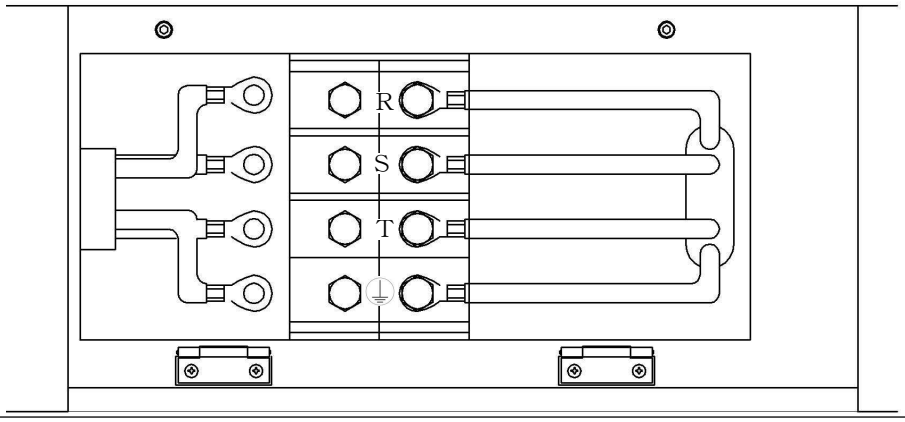



Fig 7-8




④Connect the terminals of the power supply cable to the terminal block.

Terminal Blocks
IHE1120G:TXM50 04(Kasuga Electric)・・・Mounting screw M5(Torque2.2～2.8N・m)
IHE2320G:UKU35H0-4CU(Yoshida Electric)・・・Mounting screw M5(Torque2.0～3.0N・m)
IHE1140G:TXM10 04(Kasuga Electric)・・・Mounting screw M3.5(Torque1.0～1.3N・m)
IHE2340G:TXM20 04(Kasuga Electric)・・・Mounting screw M4(Torque1.4～1.8N・m)

Fig 7-9

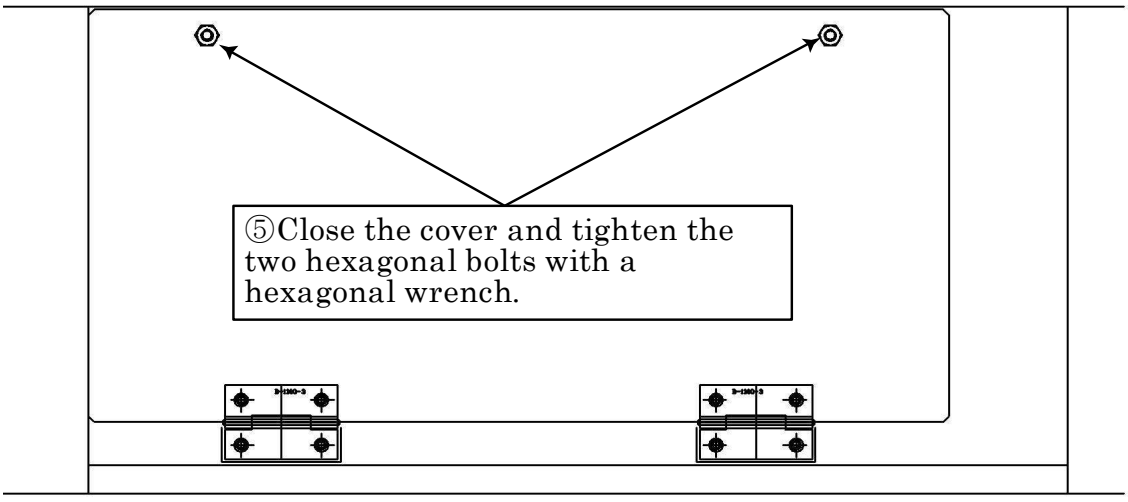



Fig 7-10

Table 7-3 Recommended cables and parts for replacement

| IHE0320G | | | | |
|---|---|---|---|---|
| **Parts** | **Type** | | **Vendor** | **Applicable Cable Size** |
| Power Supply Cable | RO-FLEX 7700T AWG16*4 3m<br>PartNo.7700 0015004<br>Standard UL62<br>Cable Designation STO (600V,105C) | | NICHIGOH | – |
| Plug Cap | Industrial Hart-Lock Locking Device<br>Part No. CWL1520P<br>3 pole 4 wiring ground<br>3phase 250V,20A, NEMA L15-20 | | Cooper Wiring Devices | – |
| Strain Relief | Max-Loc 1/2NPT<br>Straight Male | Part No.5528 | DANIEL WOODHEAD | 0.375-0.437 inch<br>(9.5-11 mm) diameter |
| | | Part Number: 130098-0069 | Molex | |
| Locknut | 1/2 NPT | Part No.5601 | DANIEL WOODHEAD | – |
| | | Part No.130099-0143 | Molex | |

| IHE0620G | | | | |
|---|---|---|---|---|
| **Parts** | **Type** | | **Vendor** | **Applicable Cable Size** |
| Power Supply Cable | RO-FLEX 7700T AWG16*4 3m<br>PartNo.7700 0015004<br>Standard UL62<br>Cable Designation STO (600V,105C) | | NICHIGOH | – |
| Plug Cap | Industrial Hart-Lock Locking Device<br>Part No. CWL1520P<br>3 pole 4 wiring ground<br>3phase 250V,20A, NEMA L15-20 | | Cooper Wiring Devices | – |
| Strain Relief | Max-Loc 1/2NPT<br>Straight Male | Part No.5528 | DANIEL WOODHEAD | 0.375-0.437 inch<br>(9.5-11mm) diameter |
| | | Part Number: 130098-0069 | Molex | |
| Locknut | 1/2 NPT | Part No.5601 | DANIEL WOODHEAD | – |
| | | Part No.130099-0143 | Molex | |

| IHE1120G | | | | |
|---|---|---|---|---|
| **Parts** | **Type** | | **Vendor** | **Applicable Cable Size** |
| Power Supply Cable | RO-FLEX 7700T AWG14*4 5m<br>PartNo.7700 0025004<br>Standard UL62<br>Cable Designation STO (600V,105C) | | NICHIGOH | – |
| Plug Cap | Industrial Hart-Lock Locking Device<br>Part No. CWL1520P<br>3 pole 4 wiring ground<br>3phase 250V,20A, NEMA L15-20 | | Cooper Wiring Devices | – |
| Strain Relief | Max-Loc 1/2NPT<br>Straight Male | PartNo.5534 | DANIEL WOODHEAD | 0.562-0.625 inch<br>(14.3-15.9mm)diameter |
| | | Part No.130097-0327 | Molex | |
| Locknut | 1/2 NPT | Part No.5601 | DANIEL WOODHEAD | – |
| | | Part No.130099-0143 | Molex | |

| IHE2320G | | | | |
|---|---|---|---|---|
| **Parts** | **Type** | | **Vendor** | **Applicable Cable Size** |
| Power Supply Cable | RO-FLEX 7700T AWG8*4 5m<br>PartNo.7700 0100004<br>Standard UL62<br>Cable Designation STO (600V,105C) | | NICHIGOH | – |
| Plug Cap | Industrial Hart-Lock Locking Device<br>Part No. CWL1530P<br>3 pole 4 wiring ground<br>3phase 250V,30A, NEMA L15-30 | | Cooper Wiring Devices | – |
| Strain Relief | Max-Loc 1 NPT<br>Straight Male | PartNo.5560 | DANIEL WOODHEAD | 0.875-1.000 inch<br>(22.2-25.4mm)diameter |
| | | Part No.130098-0166 | Molex | |
| Locknut | 1 NPT | Part No.5603 | DANIEL WOODHEAD | – |
| | | Part No.130099-0145 | Molex | |

| IHE0340G | | | | |
|---|---|---|---|---|
| **Parts** | **Type** | | **Vendor** | **Applicable Cable Size** |
| Power Supply Cable | RO-FLEX 7700T AWG18*4 3m<br>PartNo.7700 0007504<br>Standard UL62<br>Cable Designation STO (600V,105C) | | NICHIGOH | – |
| Plug Cap | Industrial Hart-Lock Locking Device<br>Part No. CWL1620P<br>3 pole 4 wiring ground<br>3phase 480V,20A, NEMA L16-20 | | Cooper Wiring Devices | – |
| Strain Relief | Max-Loc 1/2NPT<br>Straight Male | Part No.5528 | DANIEL WOODHEAD | 0.375-0.437 inch<br>(9.5-11 mm) diameter |
| | | Part Number: 130098-0069 | Molex | |
| Locknut | 1/2 NPT | Part No.5601 | DANIEL WOODHEAD | – |
| | | Part No.130099-0143 | Molex | |

| IHE0640G | | | | |
|---|---|---|---|---|
| **Parts** | **Type** | | **Vendor** | **Applicable Cable Size** |
| Power Supply Cable | RO-FLEX 7700T AWG18*4 3m<br>PartNo.7700 0007504<br>Standard UL62<br>Cable Designation STO (600V,105C) | | NICHIGOH | – |
| Plug Cap | Industrial Hart-Lock Locking Device<br>Part No. CWL1620P<br>3 pole 4 wiring ground<br>3phase 480V,20A, NEMA L16-20 | | Cooper Wiring Devices | – |
| Strain Relief | Max-Loc 1/2NPT<br>Straight Male | Part No.5528 | DANIEL WOODHEAD | 0.375-0.437 inch<br>(9.5-11mm) diameter |
| | | Part Number: 130098-0069 | Molex | |
| Locknut | 1/2 NPT | Part No.5601 | DANIEL WOODHEAD | – |
| | | Part No.130099-0143 | Molex | |

| IHE1140G | | | | |
|---|---|---|---|---|
| **Parts** | **Type** | | **Vendor** | **Applicable Cable Size** |
| Power Supply Cable | RO-FLEX 7700T AWG16*4 5m<br>PartNo.7700 0015004<br>Standard UL62<br>Cable Designation STO (600V,105C) | | NICHIGOH | – |
| Plug Cap | Industrial Hart-Lock Locking Device<br>Part No. CWL1620P<br>3 pole 4 wiring ground<br>3phase 480V,20A, NEMA L16-20 | | Cooper Wiring Devices | – |
| Strain Relief | Max-Loc 1/2NPT<br>Straight Male | PartNo.5528 | DANIEL WOODHEAD | 0.375-0.437 inch<br>(9.5-11mm) diameter |
| | | Part Number: 130098-0069 | Molex | |
| Locknut | 1/2 NPT | Part No.5601 | DANIEL WOODHEAD | – |
| | | Part No.130099-0143 | Molex | |

| IHE2340G | | | | |
|---|---|---|---|---|
| **Parts** | **Type** | | **Vendor** | **Applicable Cable Size** |
| Power Supply Cable | RO-FLEX 7700T AWG14*4 5m<br>PartNo.7700 0025004<br>Standard UL62<br>Cable Designation STO (600V,105C) | | NICHIGOH | – |
| Plug Cap | Industrial Hart-Lock Locking Device<br>Part No. CWL1620P<br>3 pole 4 wiring ground<br>3phase 480V,20A, NEMA L16-20 | | Cooper Wiring Devices | – |
| Strain Relief | Max-Loc1/2NPT<br>Straight Male | PartNo.5534 | DANIEL WOODHEAD | 0.562-0.625 inch<br>(14.3-15.9mm)diameter |
| | | Part No.130097-0327 | Molex | |
| Locknut | 1/2 NPT | Part No.5601 | DANIEL WOODHEAD | – |
| | | Part No.130099-0143 | Molex | |

## 7.3 Accessory Storage

### 7.3.1 Accessory Storage for IHE0110A and IHE0120G

The accessories of I-type cores N-CI-1815, N-CI-1825, and N-CI-1835 are found in the accessory storage bag (N-CA-0001). I-type core, the temperature sensor N-CTC-300, and the power supply cable are stored inside in the main body of the bearing heater.

Unlock the side-panel lock by lowering the snap-fit and open the side-panel.

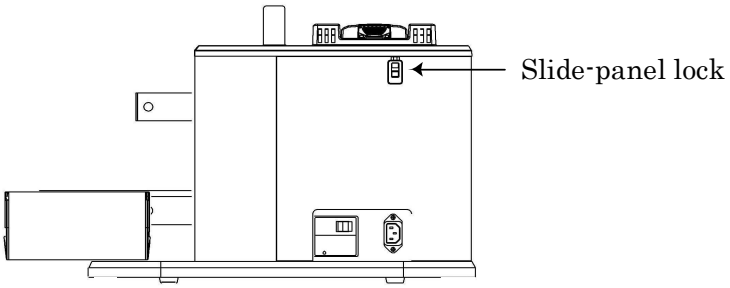



Fig 7-11

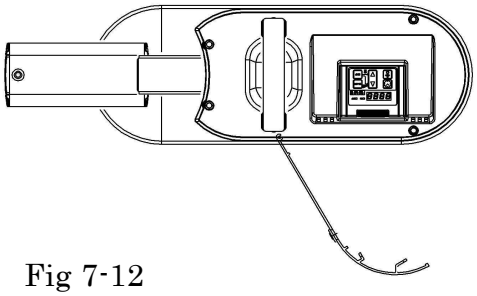


Fig 7-12

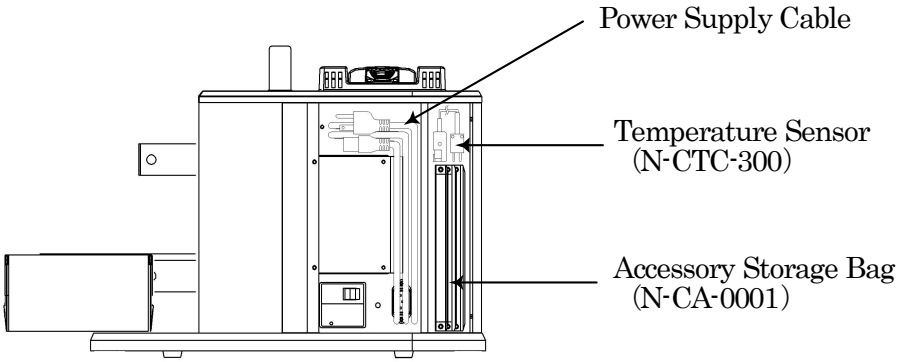



Fig 7-13

### 7.3.2 Accessory Storage for IHE0320G, IHE0340G, IHE0620G, and IHE0640G

The following accessories are stored in the main body of bearing heaters.

(A) 3 types of I-type cores
N-CI-2525, N-CI-2535 and N-CI-2545 for IHE0320G and IHE0340G
N-CI-3725, N-CI-3735 and N-CI-3755 for IHE0620G and IHE0640G

(B) 2 types of I-type core guides
N-CS-2525 and N-CS-2535 for IHE0320G and IHE0340G
N-CS-3725 and N-CS-3735 for IHE0620G and IHE0640G

(C) Temperature Sensor N-CTC-500

Find the accessories in the opening section at the side (see figure below).

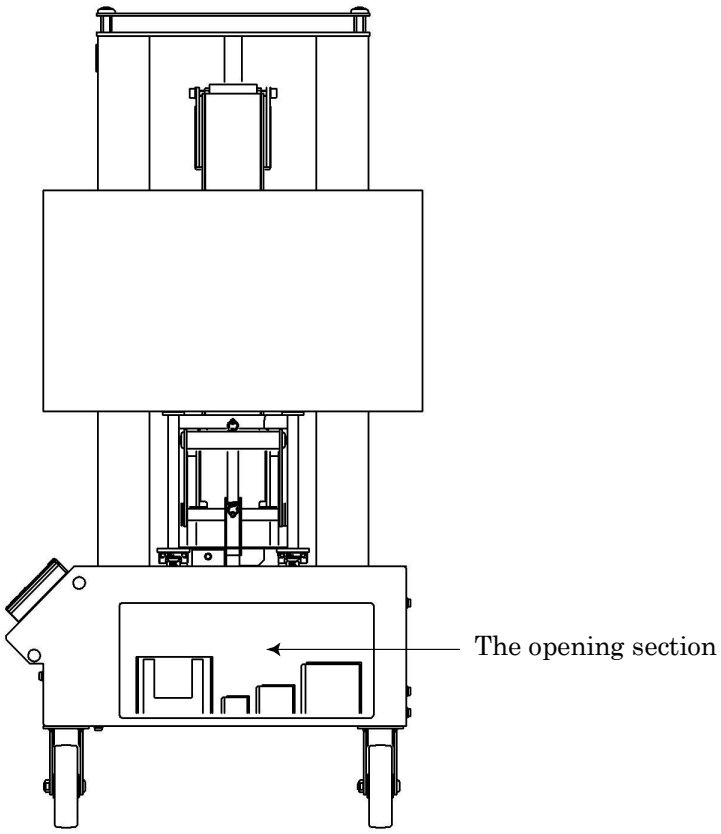



Fig 7-14

### 7.3.3 Accessory Storage for IHE01120G, IHE1140G, IHE2320G, and IHE2340G

The following accessories are stored in the main body of bearing heaters.

(A) 3 types of I-type cores
N-CI-5235, N-CI-5255 and N-CI-5270 for IHE1120G and IHE1140G
N-CI-6735, N-CI-6755 and N-CI-6785 for IHE2320Gand IHE2340G

(B) 2 types of I-type core guides
N-CS-5235 and N-CS-5255 for IHE1120G and IHE1140G
N-CS-6735 and N-CS-6755 for IHE2320G and IHE2340G

(C) I-type core lift up tool… Accompanying sheet, I-type core lift up tool instruction manual is attached.
N-CL-578 for N-CI-5255, N-CI-5270, N-CI-6755, N-CI-6785

(D) Temperature sensor N-CTC-1000

Find the I-type cores on the right part of the support frame and the other accessories in the storage compartment as shown in the figure below.

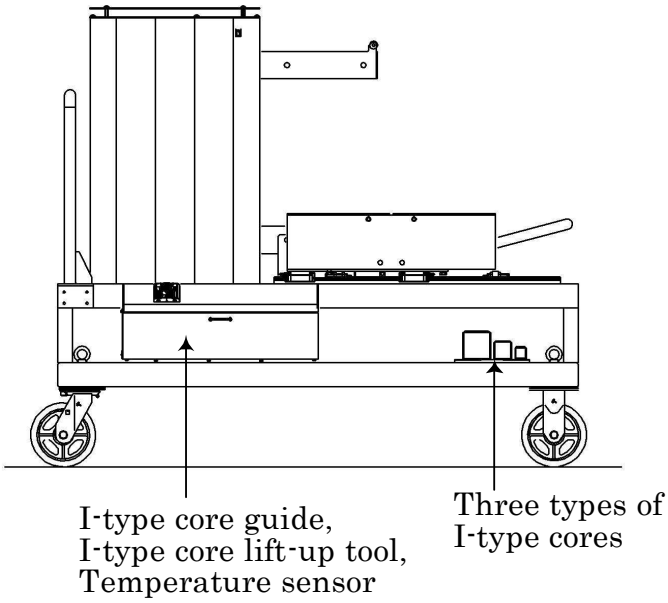



Fig 7-15

## 7.4 The method of I-type core removal device (Built into Slide Type Bearing Installation Table)

(IHE0320G, IHE0340G, IHE0620G, IHE0640G, IHE1120G, IHE1140G, IHE2320G, IHE2340G)

1) Operating instructions for the I-type core removal device
(Before heating process starts)
(i) Ensure that the ① I-type core removal device is drawn to the far-right portion as shown in Figure 7-16.
(ii) Select one of the three different types of I-type cores to suit the inside diameter of the bearing to be used.
Refer to I-type core in Table 6-1 for the meaning of I-type core type.
(iii) If you use the ② I-type core other than the largest cross-section for the type, insert the I-type core guide shown in Figure 7-17 into the core insertion part of the I-type core removal device. (The side with the stainless steel board is to be upside.)
(iv) Place the ③ bearing on the I-type core removal device
(v) Stand the ② I-type core on the ① I-type core removal device as indicated in Figure 7-16.
(vi) Lower the ④ lever and slide it toward the ⑤ main core.
(vii) Release the ④ lever after the ② I-type core touches the ⑤ main core as indicated in Figure 7-18.

2) Operating instructions for the I-type core attaching and detaching device
(After completion of heating process)
(i) From the state of Figure 7-18, lower the ④ lever and pull it until it is as shown in Figure 7-16.
(ii) Detach the ② I-type core.
(iii) Remove the ③ bearing from the I type core removal device. When you do this, be sure to use gloves since the bearing is hot.

Using the I-type core removal device　(Start of heating)

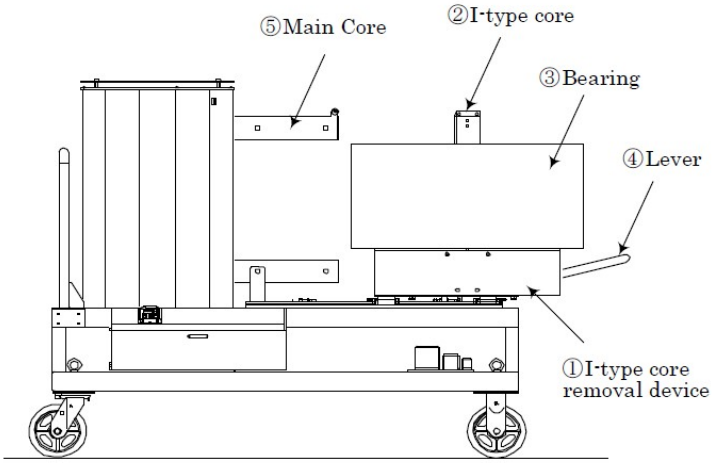
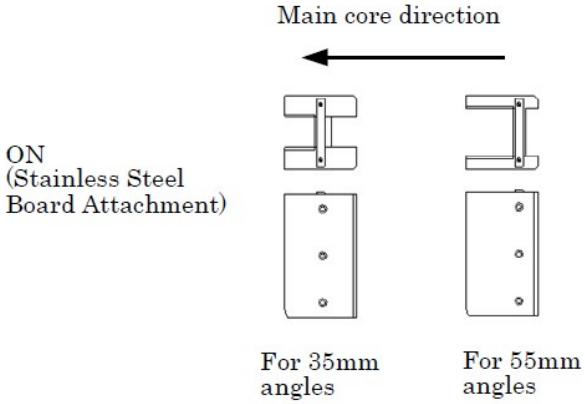



Fig 7-16




I-type core guide

Fig 7-17

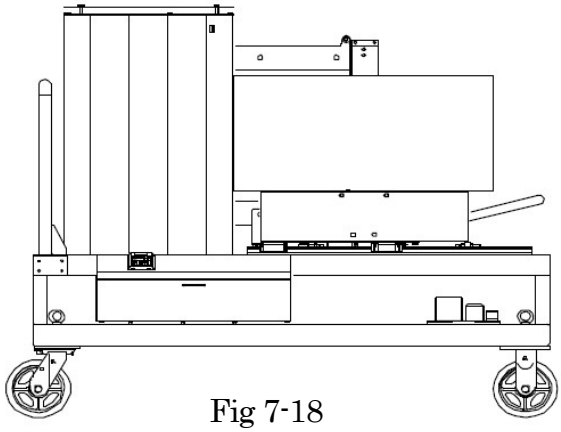


Fig 7-18

# *8. HEATING PROCEDURES*

## 8. 1 Control Panel Operation

### 8.1.1 Preparing for heating

(1)Ensure that the machine placement complies with all the safety requirements as outlined on page 3 and with the warnings on the attached safety-warning label on page4.

(2)Connect power supply cable. Make sure the plug is correctly inserted in the socket and connect to properly grounded outlet only.

(3) Apply grease enough the polishing face of I-type core and the main core.

The lack of grease may cause rust, noise, and vibration. Also, metal shavings, dust etc between the I-type core and the main core may cause the vibration and noise.

＊Use the low combustive grease.

### 8.1.2 Heating Procedures

There are two control modes, Temperature Control Mode and Timer Control Mode.

For heating procedure, refer "8.1.3 Flow Chart. For the operation of the control panel, follow explanation of operation panel as described in part "6.2 Full View and Part Description (2) Operation Panel".

1) Set the bearing and install I-type core so that it pass through the bore of the bearing and the polished faces of the main core and the I-type core meets each other.

2) For Temperature Control Mode, connect a temperature sensor to the yellow socket of the main body and mount the detection end of the temperature sensor so that it firmly contacts the inner rim of the bearing.

3) Turn the circuit breaker to the ON position. （ON→RED）

4) Please enter the set temperature. (The initial value of 110 ° C is displayed.) Select either the Temperature Control Mode or the Timer Control Mode. Set the setting temperature (Temperature Control Mode) or input the heating time (Timer Control Mode).

*In Temperature Control Mode, confirm that the temperature display proper to the location used (Celsius or Fahrenheit) is selected.

*In the case necessary, especially in the case where it is necessary to heat slowly, set the power reduction to prevent the damage to the bearing due to quick heating.
By setting the power reduction, the power can be adjusted by 10% steps, from 100% to 50%.

5) Press the start button.

6) During the operation, the operation panel will display either the current temperature of the inner rim of bearing (Temperature Control Mode) or the time countdown (Timer Control Mode).

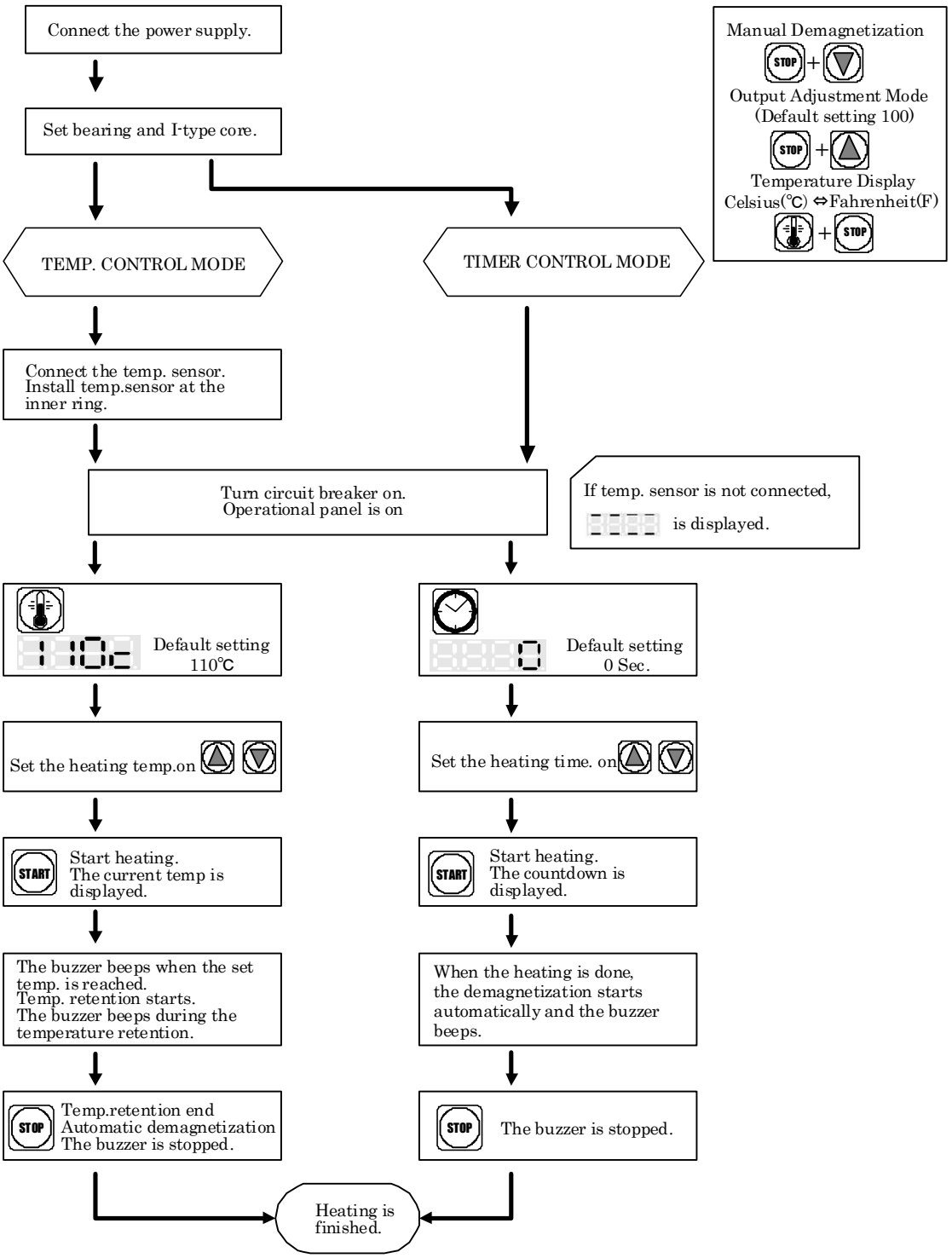
7) Once the heating is completed, the buzzer will sound. In Temperature Control Mode, the temperature of the inner ring is retained with the blinked indication of "H" in the display, until the stop button is pressed, as the automatic demagnetization is followed. In Timer Control Mode, the automatic demagnetization is followed on the completion of heating and buzzer is stopped when the stop button is pressed.

8) Remove the bearing (use heavy gloves to prevent burning).

9) Turn the circuit breaker to the OFF position. (OFF→GREEN) In the case of continuous heating, after installing the bearing, type I core, and temperature sensor follow the procedure from 4) to 8).

### 8.1.3 Flow Chart

**A heating operation flow chart is pictured as below. Ensure that operators follow the correct operating procedures at all times.**



## 8.2 Sequence Operation (External terminal operation)

In addition to heating on Control Panel Operation (Standard), it is possible that the heater can be controlled by PLC (programmable logic controller) or other FA controller in a customer's automation system.

It has six input terminals and two output terminals, and the functions as below.

(1) The operation mode can be changed from Control Panel Operation to Sequence Operation and vice versa with an input terminal signal.
(2) Sequence Operation has two control modes, temperature control mode and forced heating mode (open loop heating), and able to select the mode as necessary.
(3) In temperature control mode, it is possible to set three temperature setting values at maximum preset at our factory shipment other than the setting on the operation panel.
(4) It outputs the operation condition of bearing heater and informs the upper controller of the heating situation.

**Control Panel Operation is standard in IHE series.**
**If you need the sequence operation, please contact Etoh Inc.**

# *9. MAINTENANCE AND SPARE PARTS*

Do not disassemble the product(s) for repair without any manufacturer's permission and/or authorization.

## 9.1 Preventative Maintenance

**(A) The polished face of the main core**

The polished faces of the main core are susceptible to rust and/or scratch. Keep the polished face greased to prevent oxidization. Any kind of rust and/or scratches may cause vibration and loud acoustic noise around the main core during heating.

**(B) I-type core**

The polished face of I-type core is also susceptible to rust and/or scratching. Keep the surface greased to prevent oxidization. Also, I-type core consists of multiple thin, fragile layers of electrical steel sheets that may be damaged if dropped or exposed to equivalent mechanical shock.

Do not use the broken I-type core.

## 9.2 Spare Parts

I-type core and the temperature sensor are susceptible to damage. It is recommended that the I-type cores and the temperature sensor are kept as spare parts for your uninterrupted operation. Contact the shop where you purchased the unit or the manufacturer in the front page if you would like to purchase the items listed in Table 7-2.

## 9.3 Cleaning Instruction

When the product(s) become dirty, wipe with a cloth and proper cleaning agent. Also, avoid cleaning during heating and immediately thereafter. Do not wash the product(s) with water.

## *10. TROUBLESHOOTING*

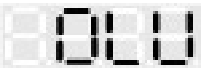
**Table 10-1 Main Problems and Possible Solutions**

| Problems | Cause | Possible solution |
|---|---|---|
| The operation panel displays nothing. | The power supply is not correctly connected. | Check if the power supply is correctly connected. |
| | The circuit breaker has tripped. | Confirm the circuit breaker ON/OFF<br>－A possible cause is a short circuit or electrical overload. After removing the cause, reset the circuit breaker.<br>－The inside of IHE may be broken and short circuited. Consult manufacturer. |
| | The cable may have disconnected from the operation panel or the cable is broken. | Contact manufacturer. |
| | For causes other than described above. | Contact manufacturer. |
| Abnormal vibration or loud noise occurs during heating. | Rust and/or scratch on the polished face of I-type core and/or main core. | Clean the mating faces of the main core and the I-type core. Grease before operation. |
| | Broken the I-type core | Replace the new I-type core. |
| | Broken the main core | Consult manufacturer. |

If any of the breakdown indications shown in Table 10-2 occur, press the reset (stop) button. When the cause of a breakdown has been found and removed, the operation panel should return to normal display.

## Breakdown indications on the operation panel and countermeasures

Table 10-2.

| Display Panel | Meaning | Cause & Possible Solution |
|---|---|---|
|  ==== | The temperature sensor is not connected or has a broken wire. | ・Check the connection of the temperature sensor. Be aware of the polarity (+ and -) of the sensor.<br>・Check for a broken wire. Replace sensor with new unit. |
|  uuuu | Improper installation of the temperature sensor | ・The temperature sensor has not been installed correctly. Place the detection end of the temperature sensor so that it contacts with the inner rim of the bearing. Note that deforming the contact plate will result in the incorrect measurement of the temperature.<br>・The contact plate of the temperature sensor is damaged. The thin wires of the thermocouple are welded inside the contact plate. Applying excessive stress to this part may cause internal damage.<br>・Temperature setting is 32℃ and under. Set the temperature 33℃ and more. |
|  COIL | Overheating of main coil | ・If the heating coil is overheating due to some cause, this protection feature automatically activates. Wait for the heating coil to cool down. Reset unit. |
|  LV | Low-voltage protection | ・The voltage of input power source has decreased. Check if the power-supply voltage is lower than the rated value. |
|  Lin | Input open-phase protection | ・The wiring of one phase is disconnected or broken. Check if this is the case. |
|  OC | Over-current protection | ・Consult manufacturer. |
|  OV | Over-voltage protection | ・The input voltage is higher than the rated voltage. Check the power-supply voltage. Consult manufacturer |
|  OH | Inverter overheating protection | ・Check if the outside air temperature is not in the rated range.<br>・Check the cooling fan on the inverter to make sure it has not malfunctioned.<br>・For causes other than described above, consult manufacturer. |
|  OLV | Over-load protection | ・Contact manufacturer if it occurs continuously. |
|  0℃ | 0℃ | ・Contact manufacturer. |

If the power adjustment (Power Reduction) is set in Temperature Mode, make sure again that the temperature sensor is properly installed because the “uuuu” protection is bypassed in this case.

## *11. SPECIFICATIONS*

| 型式 | | | IHE0110A | IHE0120G | IHE0320G | IHE0340G | IHE0620G | IHE0640G | IHE1120G | IHE1140G | IHE2320G | IHE2340G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Heating Capacity | kVA | | 1kVA | | 3.3 kVA | | 6.6 kVA | | 11.8 kVA | | 23 kVA | |
| Applicable Bearing Size | Minimum bore diameter (mm $\phi$) | | 20 | | 35 | | 35 | | 50 | | 50 | |
| | Maximum outside diameter (mm $\phi$) | | 200 | | 300 | | 400 | | 600 | | 800 | |
| | Thickness (mm) | | 70 | | 110 | | 200 | | 300 | | 400 | |
| | Weight (kg) | | 12 | | 40 | | 80 | | 300 | | 600 | |
| Heating Bearing type | Can heat pre-greased bearing | | Yes | | | | | | | | | |
| | Can heat sealed bearing | | Yes | | | | | | | | | |
| Power Supply Characteristics | Phase | | Single | | Three | | Three | | Three | | Three | |
| | Voltage (V) | | 100 - 120 | 200 - 240 | 200 - 240 | 380 - 480 | 200 - 240 | 380 - 480 | 200 - 240 | 380 - 480 | 200-220(50Hz) 200-230(60Hz) | 380-440(50Hz) 380-480(60Hz) |
| | Frequency (Hz) | | 50 / 60 | | 50 / 60 | | 50 / 60 | | 50 / 60 | | 50 / 60 | |
| | Rated Current (A) | | 10 | 5 | 10 | 5 | 10 | 5 | 20 | 10 | 40 | 20 |
| Dimensions of body | H(mm) | | 347 | | 565 | | 745 | | 1200 | | 1440 | |
| | W(mm) | | 175 | | 295 | | 380 | | 600 | | 850 | |
| | L(mm) | | 470 | | 755 | | 975 | | 1250 | | 1600 | |
| | Body weight (kg) (accessory weight) | | 13.6(2.4) | 13.2(2.4) | 43(6.6) | | 81(12.5) | | 200(33.7) | | 335(54.2) | |
| Control Specifications | Temperature Control Mode | Range | 33－250℃ | | | | | | | | | |
| | | Temp sensor type | K-type | | | | | | | | | |
| | | Accuracy | 1℃ | | | | | | | | | |
| | Timer Control Mode | Range | 0－99 分 59 秒 | | | | | | | | | |
| | | Accuracy | 1s | | | | | | | | | |
| | Power Reduction | By 10% | 50 － 100% | | | | | | | | | |
| | Demagnetization | | 300 $\mu$T(3G) | | | | | | | | | |
| Heating Core Specifications | Maximum Flux (T) | | 1.5T | | | | | | | | | |
| | Core cross section (mm) | | 42×35 | | 56×45 | | 62×55 | | 75×70 | | 95×85 | |
| Operation Specifications | Operation | | Operator with LEDs | | | | | | | | | |
| | Sequence Operation | | Yes | | | | | | | | | |
| Temp Display | Temp Display | | Celsius/Fahrenheit | | | | | | | | | |
| Environment Specifications | Application site | | Indoor (No corrosive gas, dust, direct sunlight, condensation etc) | | | | | | | | | |
| | Over voltage Category | | 2 | 2 | 3 | | 3 | | 3 | | 3 | |
| | Pollution Degree) | | 2 | 2 | 2 | | 2 | | 2 | | 2 | |
| | Ambient Operating Temp. | | －10℃～35℃ | | | | | | | | | |
| | Altitude | | 2000m max | | | | | | | | | |
| | Ambient Operating Humidity. | | 85% RH max | | | | | | | | | |

## Table 11.1 Standard and Optional Accessories

| Type | | IHE0110A | IHE0120G | IHE0320G IHE0340G | IHE0620G IHE0640G | IHE1120G IHE1140G | IHE2320G IHE2340G |
|---|---|---|---|---|---|---|---|
| I-type core | N-CI-1808(diameter:12-20) | Option | Option | | | | |
| | N-CI-1815(diameter:20-35) | O | O | | | | |
| | N-CI-1825(diameter:35-50) | O | O | | | | |
| | N-CI-1835(diameter:50 over) | O | O | | | | |
| | N-CI-2515(diameter:20-35) | | | Option | | | |
| | N-CI-2525(diameter:35-50) | | | O | | | |
| | N-CI-2535(diameter:50-70) | | | O | | | |
| | N-CI-2545(diameter:70 over) | | | O | | | |
| | N-CI-3715(diameter:20-35) | | | | Option | | |
| | N-CI-3725(diameter:35-50) | | | | O | | |
| | N-CI-3735(diameter:50-80) | | | | O | | |
| | N-CI-3755(diameter:80 over) | | | | O | | |
| | N-CI-5225（diameter:35-50） | | | | | Option | |
| | N-CI-5235（diameter:50-80） | | | | | O | |
| | N-CI-5255(diameter:80-100) | | | | | O | |
| | N-CI-5270(diameter:100 over) | | | | | O | |
| | N-CI-6725(diameter:35-50) | | | | | | Option |
| | N-CI-6735(diameter:50-80) | | | | | | O |
| | N-CI-6755(diameter:80-130) | | | | | | O |
| | N-CI-6785(diameter:130 over) | | | | | | O |
| I-type core guide | N-CS-2515(for N-CI-2515) | | | Option | | | |
| | N-CS-2525(for N-CI-2525) | | | O | | | |
| | N-CS-2535(for N-CI-2535) | | | O | | | |
| | N-CS-3715（for N-CI-3715） | | | | Option | | |
| | N-CS-3725（for N-CI-3725） | | | | O | | |
| | N-CS-3735（for N-CI-3735） | | | | O | | |
| | N-CS-5225（for N-CI-5225） | | | | | Option | |
| | N-CS-5235（for N-CI-5235） | | | | | O | |
| | N-CS-5255（for N-CI-5255） | | | | | O | |
| | N-CS-6725（for N-CI-6725） | | | | | | Option |
| | N-CS-6735（for N-CI-6735） | | | | | | O |
| | N-CS-6755（for N-CI-6755） | | | | | | O |
| I-type core lift-up tool | N-CL-578 | | | | | O | O |
| Temperature Sensor | N-CTC-300（length:300mm） | O | O | | | | |
| | N-CTC-500（length:500mm） | | | O | O | | |
| | N-CTC-1000（length:1000mm） | | | | | O | O |
| Accessory Storage Bag | N-CA-0001 | O | O | | | | |

## *12. LIMITED WARRANTY*

### (1) Warranty period

The warranty period is one year from the date of purchased or 3000 hours on total power activation hours, whichever occurs first
Accessories, such as I-type cores and temperature sensor, are not included in this warranty.

### (2) Warranty Coverage

Regarding any trouble under normal operation when used in compliance with Instruction manual, the repair of product is covered.

Warranty is limited as mentioned as above.
Indirect or consequential damages including damage of other devices, loss of business, loss of opportunity, loss of profits are not covered.

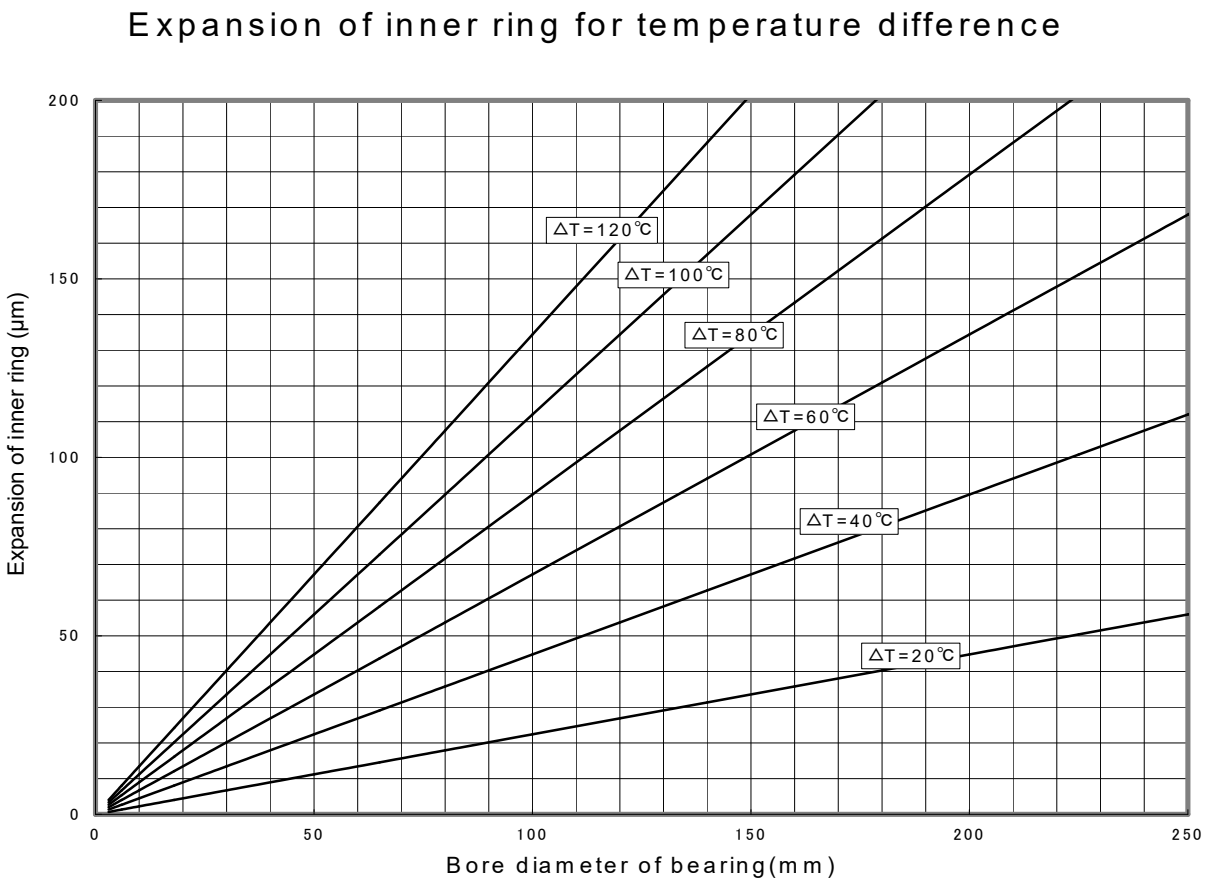
### (3) Disclaimer

The warranty does not apply to products if the trouble is caused by any of following:

① Improper installation, environment, the usage except the description in the instruction manual and User's guide
② Causes originating from other than this product (Bearing Heater)
③ Repairs or alteration not authorized by manufacturer
④ Causes which could not have been foreseen with the level of science and technology at the time of shipping from manufacture
⑤ External causes which are out of manufacture's responsibility such as fire, earthquake, war, flood, lightning strike, abnormal voltage etc.

# *Appendix*

## *Appendix 1: Inner Diameter Expansion Temperatures*




Reference

According to the diagram as above, temperature difference needs to be above 50℃ in the situation ,the bore diameter :100mm, shaft fitting: n6.
Fitting would be difficult if the bore of bearing get cold after the heating.
It is recommended that the target temperature is 20~30℃ higher than required temperature.
Don't heat above120℃ when you heat the bearing.

## *Appendix 2: Safety Instruction*

### *Appendix 2.1 Definition of Warning Symbols*

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Indicates that mishandling may result in unexpected danger and that the operator may be at risk of injury or the equipment is at risk for damage.

Indicates caution. Specific cause may be stated in this symbol.

Indicates forbiddance. Specific cause may be stated in this symbol.

Indicates compulsion or direction. Specific cause maybe stated in this symbol.

### *Appendix 2.2 Warnings*

Do not plug in or pull out power cord or operate the machine with a wet hand. **Failure to observe this may result in severe injury through electric shock.**

Never put finger, other body parts or foreign materials in the machine. **Failure to observe this may result in unexpected injury.**

This machine is for industrial use. Inexperienced personnel and children should not touch the machine. **It could cause unexpected injury.**

Turn the power off and unplug machine prior to replacing any parts or during maintenance of this machine. **Failure to observe this may result severe injury.**

Do not use this machine for anything other than its specified applications. **Use of the machine for unintended applications can cause unexpected injury or machine failure.**

*Appendix 2.3 Caution*

Do not wet the machine. Do not install the machine at a location that is at risk of water splash. Failure to comply with this warning could cause unexpected injury, electric shock or machine failure.

Never modify or disassemble the machine. It can cause unexpected injury or failure of the machine.

Don't use the machine at the place where external noise and surge may intrude.
It can cause unexpected injury or failure of the machine.

Don't use the machine when a lightning strike may occur.
Turn off the main power and unplug the machine.
It can cause failure of the machine, electric shock or fire.

Turn off the main power when not in use.
It can cause unexpected injury or failure of the machine.

Always plug in or pull out the power cord holding the power plug. Never pull on the cord.
Pulling on the cord may cause electric shock, short, and fire.

Never put any foreign objects into the machine. It can cause machine failure.

Operator's presence is always required during the operation. Turn off the main power and unplug the machine when not in use.

Do not damage the power cord.
The power supply cable should not be touched in the heated parts.
It can cause electric shock, short circuit, or ignition.

Insert the power plug securely into an electric outlet. A lose fitting plug may result in generation of heat and fire.

Do not operate in places where temperature, moisture, dirt, or dust may be excessive. It can cause machine failure.
Do not place the flammable material in the vicinity of this products. It may cause the fire.
Do not place this product in the place blocking up the vent.
It may cause the fire.

Install the machine on a flat and stable surface.
Dropping of the machine may cause injury or machine failure.
Always lock the safety stoppers on the wheels except moving of the machine.

To provide continued protection against electric shock, connect to properly grounded outlets only.