SKF TIH 100m

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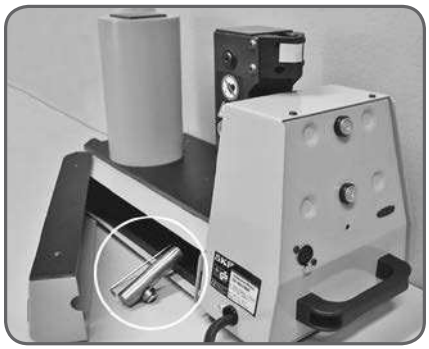

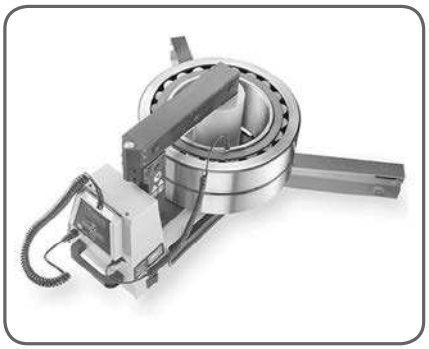

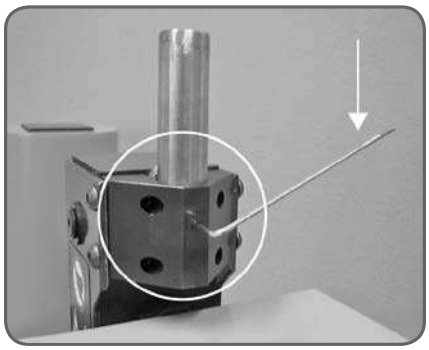

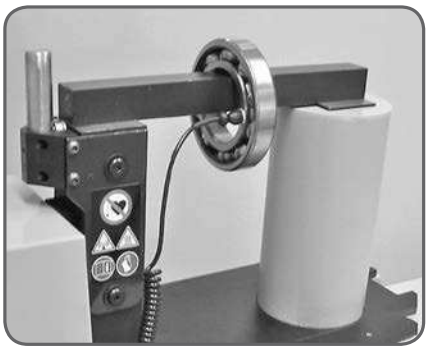

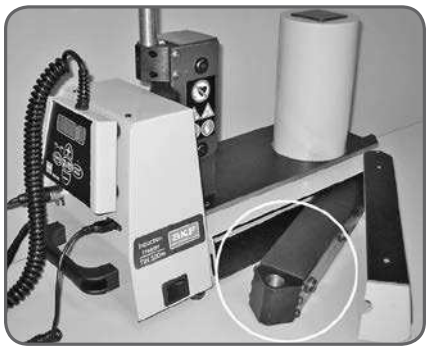

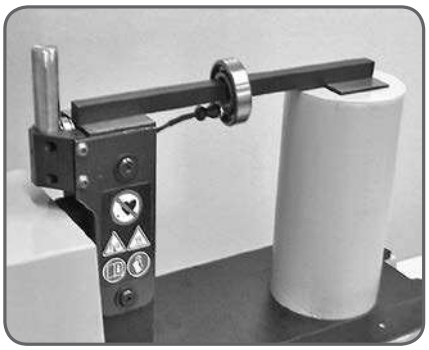

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Original instructions

EC Declaration of conformity

We,
SKF Maintenance Products
Kelvinbaan 16
3439 MT Nieuwegein
The Netherlands

herewith declare that the following product:

SKF Induction Heater
TIH 100m

has been designed and manufactured in accordance with:
EUROPEAN LOW VOLTAGE DIRECTIVE 2014/35/EU
EMC DIRECTIVE 2014/30/EU as outlined in the harmonized norm for
EN61000-6-3:2007 /A1:2011
EN61000-6-2:2005
EN61000-4-2
EN61000-4-3
EN61000-4-4
EN61000-4-5
EN61000-4-6
EN61000-4-8
EN61000-4-11

EUROPEAN ROHS DIRECTIVE 2011/65/EU

Nieuwegein, The Netherlands,
May 2016

Sébastien David
Manager Product Development and Quality

Safety recommendations

- Because the TIH 100m generates a magnetic field, people wearing a pacemaker must not be within 5 m (16 ft) of the TIH 100m during operation. Electronic equipment, such as wristwatches, may also be affected.
- During the heating process observe a safety distance of 50 cm (1.6 ft) with the workpiece, the heater coil or the core.
- Follow the operating instructions at all times.
- Be certain that the voltage supply is correct.
- Electrical arcing may occur when a potential difference exists between the TIH 100m and the workpiece. This is not dangerous to human beings and will not cause damage to the TIH 100m or the workpiece. However, the TIH 100m must never be used in areas where there is a risk of explosion.
- Do not expose the TIH 100m to high humidity.
- Never operate the TIH 100m without a yoke in position.
- Never operate the TIH 100m with the cable of the remote control between the vertical supports of the yoke.
- Do not modify the TIH 100m.
- Use proper handling equipment when lifting heavy workpieces.
- Avoid contact with hot workpieces. Wear the supplied heat resistant gloves to handle hot workpieces.

1. Introduction

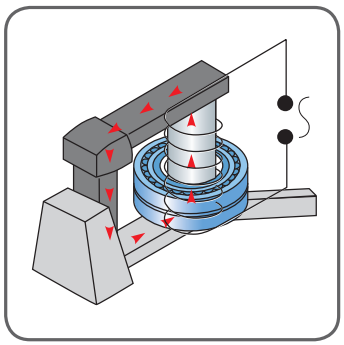
The SKF TIH 100m induction heater is designed to heat bearings, which are mounted with an interference fit onto a shaft. The heat causes the bearing to expand, which eliminates the need to use force during installation. A 90 °C (162 °F) temperature difference between the bearing and shaft is generally sufficient to enable installation. At an ambient temperature of 20 °C (68 °F), the bearing must therefore be heated to 110 °C (230 °F).

1.1 Intended use

The TIH 100m has been designed to heat rolling bearings. However, other metal workpieces that form a closed circuit can also be heated. Examples of acceptable workpieces include bushings, shrink rings, pulleys, and gears. All bearings that fit over the inductive coil and between the vertical supports with the top yoke in place can be heated using the TIH 100m. In addition, smaller bearings can be placed over any of the three standard yokes. See the illustrations at the beginning of this manual for examples.

1.2 Principle of operation

The principle of operation of the TIH 100m can be compared to a transformer. The high voltage, low electrical current flowing through a large number of windings in the TIH 100m's inductive coil induces low voltage, high current electricity in the workpiece. Because the workpiece has the electrical characteristics of a coil with a single, short-circuited winding, the high current generates heat within the workpiece. Because the heat is generated within the workpiece, all of the heater components remain cool.



1.3 Distinguishing features

- **Remote control panel**
  To improve the ease of use and to help reduce the risk of contact with the hot bearing during operation, the TIH 100m heater is supplied with a remote control panel which can be detached from the heater.
- **Inductive coil**
  When heated the workpiece is located at the same position on the core as the inductive coil. This design improves efficiency, resulting in less power consumption and faster heating, which reduces the cost to heat each bearing.
- **Folding bearing supports**
  To support large bearings positioned around the inductive coil, the TIH 100m induction heater is fitted with folding bearing supports. See the illustrations at the beginning of this manual.
- **Swivel yoke**
  To facilitate the handling of the yoke while placing the bearing around the inductive coil or around the top yoke, the TIH 100m is fitted with a swivel arm for the large yoke.
- **Yoke storage**
  All three yokes can be stored inside the heater. The two yoke storages are located behind the folding bearing supports. The small and medium yokes are stored together in one yoke storage. The large yoke is stored alone in the other yoke storage. See the illustrations at the beginning of this manual.

2. Description

The operation of the heater is controlled by the internal electronics in either of two modes. The operator can either select the desired temperature of the bearing in TEMP MODE or set the length of time that the bearing will be heated in TIME MODE. The power level can be adjusted to 100% or 50% for slower heating of sensitive workpieces (for example, bearings with C1 or C2 clearance).

2.1 Components

The TIH 100m induction heater contains a U-shaped iron core with an inductive coil surrounding one of the vertical supports. A detachable remote control panel is included. The remote control electronics and the internal electronics, control the operation of the heater. A removable yoke on the top of the vertical supports, allows the workpiece to be placed onto the heater. The largest of the three yokes can swivel around its vertical post. To accommodate smaller workpieces, two smaller yokes are also provided.
A temperature probe is included with the heater. Heat-resistant gloves are also included.

2.2 Technical data

TIH 100m	
Voltage	TIH 100M/230V : 230V / 50 - 60Hz TIH 100M/MV : 400 - 460V / 50 - 60Hz
Tolerance en voltage	± 10%
Recommended line protection	16 A fuse rating for 230 V 10 A fuse rating for 400 - 460 V
Power consumption (maximum)	3,6 kVA for 230 V 4,0 - 4,6 kVA for 400 - 460 V
Temperature control	0 - 250 °C (32 - 482 °F); in steps of 1°
Probe type	Thermocouple, K type
Probe maximum temperature	250 °C (482 °F)
Time mode	0 - 60 minutes; in steps of 0,1 minute
Power range	100% - 50%
Demagnetization	automatic; residual magnetism <2A/cm
Overall dimensions (w x d x h)	570 x 230 x 350 mm (22.4 x 9.0 x 13.7 in)
Area between supports (width x height)	155 x 205 mm (6.1 x 8.0 in)
Coil diameter	110 mm (4.3 in) For minimum bearing bore diameter of 120 mm (4.7 in)
Weight (with yokes)	42 kg (92 lbs)
Workpiece maximum weight	Bearing: 120 kg (264 lbs) Solid component: 60 kg (132 lbs)
Maximum heating temperature	approx. 250 °C (482 °F) Depending on bearing or workpiece weight. For higher temperatures, please contact SKF.
m_{20}*	97 kg (bearing 23156)
Standard yoke dimensions: 56 x 56 x 296 mm (2.2 x 2.2 x 11.7 in)	For minimum bearing bore diameter of: 80 mm (3.1 in)
28 x 28 x 296 mm (1.1 x 1.1 x 11.7 in)	40 mm (1.6 in)
14 x 14 x 296 mm (0.6 x 0.6 x 11.7 in)	20 mm (0.8 in)

*m_{20} *represents the weight (kg) of the heaviest SRB 231 bearing that can be heated from 20 to 110 °C (68 to 230 °F) in 20 minutes.*

3. Installation of mains plug

A qualified electrician must install a suitable mains plug.
The correct supply voltage is shown in section 2.2.
The wires should be connected as follows:

TIH 100M/230V	
Colour of TIH 100m/230V	Mains supply terminal
yellow / green	ground
blue	neutral
brown	phase

TIH 100M/MV	
Colour of TIH 100m/MV wire	Mains supply terminal
yellow / green	ground
blue	phase
brown	phase

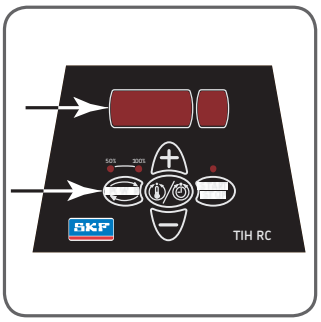
Connect the TIH 100M/MV to only two of the three phases in order to obtain 400-460 V.

4. Preparation for use

- Place the TIH 100m in the horizontal position on a stable surface.
- Connect the mains plug to a suitable mains supply.
- Plug the remote control into the connector on the carrying handle side of the heater.
- Mount the swivel stud on the vertical post side of the swivel arrangement. See the illustrations at the beginning of this manual. Position the large yoke swivel on the swivel stud.
- For workpieces with an internal diameter large enough to fit over the inductive coil, follow these steps:
  - Open the foldable bearing support and position them as shown on the illustrations at the beginning of this manual.
  - Place the workpiece over the inductive coil using appropriate lifting equipment.
  - For best performance, adjust the position of the workpiece so that the inductive coil is in the centre.
  - Close the swivel yoke so that it completely covers the top of both vertical supports.
- For workpieces that do not fit over the inductive coil, follow these steps:
  - Choose the largest of the three yokes that fit through the internal diameter of the workpiece.
  - Slide the workpiece onto the yoke that you have selected.
  - Heavy workpieces (= 9 kg (19.8 lbs)) that must be installed on the top yoke should be supported until the yoke is in the correct position on the coil side post. The heater may tip over if the workpiece is not supported.
  - Position the yoke on the TIH 100m with the bright underside resting evenly on the two vertical supports.
- If you will use TEMP MODE, plug the temperature probe into the connector on the carrying handle side of the heater. Place the magnetic end of the probe on top of the inner ring of the bearing or on the innermost surface of the workpiece.
- Switch on the TIH 100m.
- Observe the self-test of the remote control display and signal tone.

5. Operation

5.1 Function of displays



- The remote control display shows the selected time or temperature for heating.
- The power LED's show the selected power setting.

Display	Indication
t	time in minutes
°C	temperature in degrees Celcius
°F	temperature in degrees Fahrenheit

5.2 Function of buttons

Button	Function
POWER	Press to adjust the power. The selected power is indicated with an LED
MODE	Press to switch between TIME MODE and TEMP MODE
UP (+)	Press to increase the value shown on the remote control display
DOWN(-)	Press to decrease the value shown on the remote control display
START / STOP	Press to start or stop the heater. The LED on the START/ STOP button is lit when the heater is heating and flashes during temperature measurement

5.3 Temp mode

- If the remote control display shows 't', press MODE to select TEMP MODE. The remote control display shows °C or °F in TEMP MODE.
- The selected temperature is shown on the remote control display. The default temperature for bearings is 110 °C (230 °F). If a different temperature is desired, press UP or DOWN to adjust the temperature in steps of 1°.
- It may be desirable to heat bearings to temperatures above 110 °C (230 °F) for increased mounting time. Consult the SKF bearing specifications to determine the maximum permitted temperature. Always ensure the bearing does not lock due to an excessive expansion of the inner ring compared to outer ring. See section 5.8.
- If needed, press POWER to select the power level. Use the guidelines in section 5.8 to determine the correct power setting.
- Make sure the temperature probe is mounted on the bearing inner ring.
- Press START / STOP to start the heater. The remote control display shows the current temperature of the workpiece.
- During heating the selected temperature can be displayed for 1 second by pressing MODE.
- When the selected temperature has been reached, the heater demagnetises the workpiece, switches off, and generates an acoustic signal for 10 seconds or until START / STOP is pressed.
- Press START / STOP to cancel the acoustic signal and stop the heater.
- Remove the workpiece with proper handling equipment.
- If the workpiece remains on the heater, the heater will start again when the temperature of the workpiece drops 10 °C (18 °F). Press START / STOP to stop the heater and demagnetise the workpiece.
- The TIH 100m is now ready to heat another workpiece with the same settings.

5.4 Time mode

- If the remote control display shows °C or °F, press MODE to select TIME MODE. The remote control display shows 't' in TIME MODE.
- Press UP or DOWN to adjust the time in steps of 0.1 minute.
- Press POWER to select the power level. Use the guidelines in section 5.8 to determine the correct power setting.
- Press START / STOP to start the heater. The remote control display shows the time that remains.
- During heating, the temperature measured by the probe can be displayed for a couple of seconds by pressing MODE.
- When the time has elapsed, the heater demagnetises the workpiece, switches off, and generates an acoustic signal for 10 seconds.
- Press START / STOP to cancel the acoustic signal and stop the heater.
- Remove the workpiece with proper handling equipment.
- The TIH 100m is now ready to heat another workpiece with the same settings.

5.5 Temperature measurement

When the heater is not operating, the temperature of the workpiece can be measured by pressing MODE and START / STOP at the same time. The LED on the START / STOP button flashes during temperature measurement. Press START / STOP to cancel temperature measurement.

5.6 Change of temperature unit

Press MODE and UP at the same time to switch between °C and °F. The temperature unit setting remains the same even after disconnection from mains power.

5.7 Demagnetisation

The workpiece is automatically demagnetised when heating is complete. Demagnetisation will not occur if the power is interrupted or the main switch is switched off. To use the TIH 100m for demagnetisation only, select TIME MODE and set the time to 0.1 minute (6 seconds).

5.8 Power level selection

When heating bearings with an induction heater, most of the heat will be generated in the inner bearing race. The heat will then be transferred through the bearing. It is therefore important that bearings with reduced internal clearance are heated slowly. Slow heating ensures that the bearing expands evenly, thereby preventing damage to the bearing.
The shape, weight, size, and internal clearances all affect the amount of time required to heat a bearing. The large variety of bearing types precludes the possibility of providing a specific power level setting for each type. Instead, the following guidelines are provided:

- "For sensitive bearings (including bearings with C1 or C2 internal clearance) or bearings with brass cages, preferably use 50% power.
- "When using the small yoke, never exceed 50% power.

6. Safety features

The TIH 100m is equipped with the following safety features:

- "Automatic overheating protection
- "Automatic current control
- "Over-current circuit breaker.
- "In the TEMP MODE the heater will switch off if the temperature probe does not register a temperature increase of 1 °C (1.8 °F) every 15 seconds (0.25 minute). To increase the interval to 30 seconds (0.50 minute), press MODE and DOWN at the same time.

7. Troubleshooting

A system fault will be indicated by an acoustic signal and one of the following fault codes on the remote control display:

Display	Fault	Action
E03 E	Overheated coil	Wait until the inductive coil cools. Switch the heater OFF and then back ON
E05 E	Temperature increase of less than 1 °C (1.8 °F) every 15 seconds (or 1 °C (1.8 °F) every 30 seconds)	Check the temperature probe connection. If the connection is OK, select the 30 second interval as described in section 6 or operate the heater in TIME MODE
E06 E	Temperature probe not connected (or defective) or excessive temperature drop	Check the temperature probe
E10 E	Electronics communication problem	Switch the heater OFF and then back ON. If problem remains return the TIH to SKF for repair
E11 E	Electronics communication problem	Switch the heater OFF and then back ON. If problem remains return the TIH to SKF for repair
E12E	Electronics communication problem	Switch the heater OFF and then back ON. If problem remains return the TIH to SKF for repair

8. Spare parts

Designation	Description
TIH 100-P230V	Power print 230V - 220-240V, 50 - 60 Hz
TIH 100-PMV	Power print 400 - 460V, 50 - 60 Hz
TIH 100-Y8	Yoke 56 x 56 x 296 mm
TIH 100-Y6	Yoke 40 x 40 x 296 mm
TIH 100-Y4	Yoke 28 x 28 x 296 mm
TIH 100-Y3	Yoke 20 x 20 x 296 mm
TIH 100-Y2	Yoke 14 x 14 x 296 mm
TIH CP	Control print
TIH RC	Remote control
TIH CB16A	Circuit breaker 16A for TIH 100m/230V
TIH CB10A	Circuit breaker 10A for TIH 100m/MV
TIH P20	Temperature probe K type incl. cable and plug