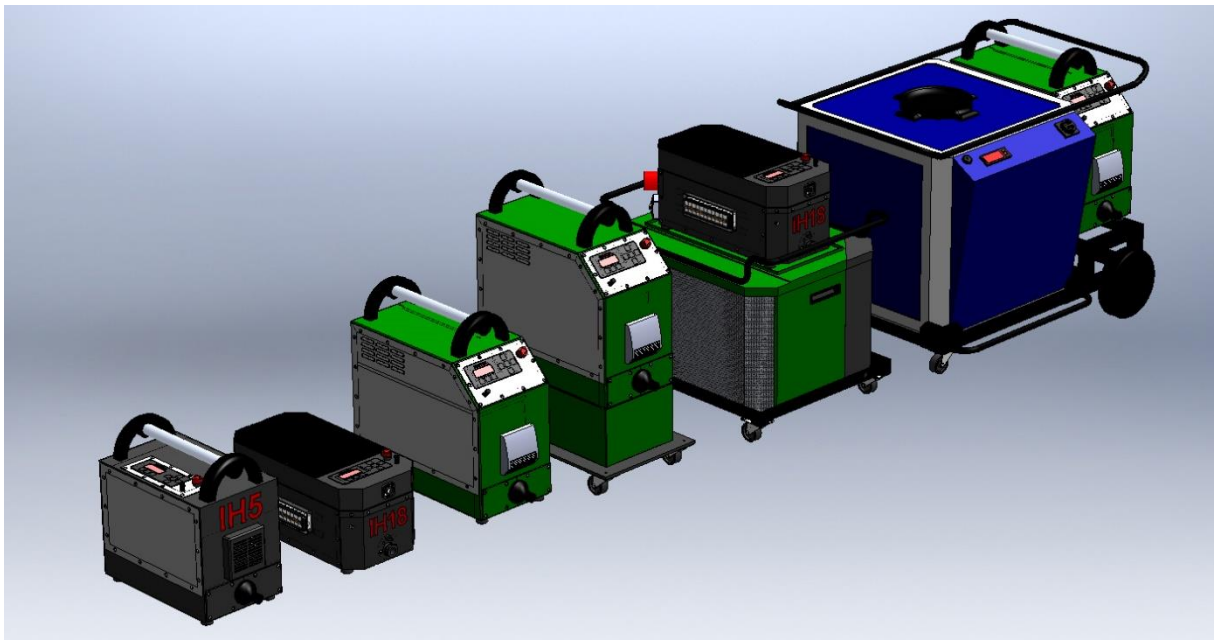
User Manual for Induction Heater INCOIL model IH series



Carefully read the manual!

Table of contents

Introduction

This manual explains how the heater is controlled by the various buttons on the unit. The unit can be operated manually or via a PC / PLC.

Supplied accessories:

- Power cord
- Inductor/tool/coil
- User manual

Optional accessories:

- External water cooler
- Trolley
- Custom inductors
- Workstation with a balancer
- Transport box
- Water pump
- IR-sensor for Temperature control
- Machine fitting
- Deck Heater
- Flex Heater
- Push button cable

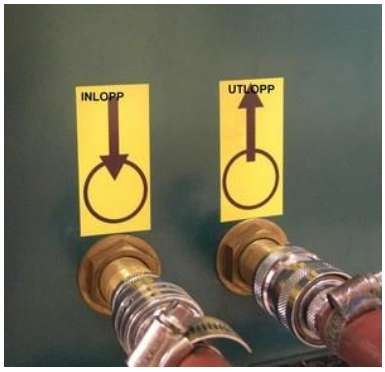
Handling During Transport

- The unit contains sensitive electronic components and it is not shock resistant, never drop the unit.
- Save the original packaging for safe transport.
- When transporting, drain the water system with compressed air. This is important to avoid frost damage.

Draining the Cooling Water

Without cooler

- Exit heating.
- Turn off the water supply
- Replace the water with compressed air in inlet.
- Blow out all the water



With cooler

- Exit heating
- Shut off the cooler
- Blow compressed air in inlet.

Handling Care and Maintenance

- The unit contains sensitive electronic components and is not shock resistant, never drop the unit.
- Do not use the unit, when there is damage to the enclosure, power cord, and transformer with water-cooled cables or coil.
- There is dangerous voltage inside the unit, never open the unit.
- Do not insert objects into it.
- Make sure the power cord / hose package and coolant hoses are not squashed.
- In case of damage to the unit, contact your dealer.
- Do not place any object on the unit that contains water or other liquid and do not expose the unit to moisture.
- Do not use the unit in moist or dusty areas and don't expose it to extreme heat (maximum 35 degrees).
- Do not cover the unit with subjects or others that might prevent cooling.
- Allow space at the back, sides and under the unit.
- Do not use deformed or repaired coils which can cause a short circuit or low water flow.
- If the unit is exposed to the cold, condensation can form, let it therefore remain unconnected indoors for an hour before it is used or connected.
- During electrical storms plugged in units can be damaged, therefore always pull the power cord.
- Never use the unit outdoors in wet weather.
- When the unit is not used for a long time, the power plug is to be pulled out and the water turned off.
- Metallic objects close to the coil can be heated.
- Do not heat too close to electrical equipment; it can be damaged by the magnetic field from the coil.
- People with pacemakers should never reside near magnetic fields.

Cleaning

- Make the unit powerless.
- The unit should only be wiped with a damp cloth.
- The coil is cleaned of soot and dirt to prevent electrical arcing.
- Never rinse the unit since there is a risk that the water penetrates and destroys electronics.

Ventilation

- All openings in the cabinet are for ventilation, don´t block or cover any of these; it also applies under the unit.
- Never insert objects into these openings.
- Replace the air filter in the front of the unit at regular intervals to ensure air flow, recommended replacement about 2-12 times a year depending on the environment.

Service

- There are no parts that can be repaired by the user, at failure contact the dealer.

LOTO: Lock out, tag out

When the machine must be powered down for maintenance, changing the coil or similar tasks. Even in this powered down state the machine is never to be opened up.

1. Turn off the main switch and lock it in its off position
2. If the unit is delivered with a separate cooler that is power from a separate power source then turn off the main switch of the cooler too.
3. Turn off the water flow to the machine.
4. Now the work around the machine is ready to proceed.

Weekly maintenance

- Check the airfilter, change if needed.
- Control the hose package for wear and tear injury.
- If the system is equipped with IR-pyrometer, check that its lens is clean.
- Clean the coil from soot and dirt.
- Cooler if installed:
    - Check that the radiator is free of dirt and dust.
    - Make sure that no debris or trash has fallen into it.
- Check waterfilter if installed.

Monthly maintenance

- Check the waterlevel in the cooler.

Yearly maintenance

All items are handled during more frequent maintenance.

Explanation of Symbols

To get the best out of the unit, read instructions and safety before use.

These symbols are placed on the unit's chassis:

This symbol indicates that there is dangerous voltage inside the unit.
.

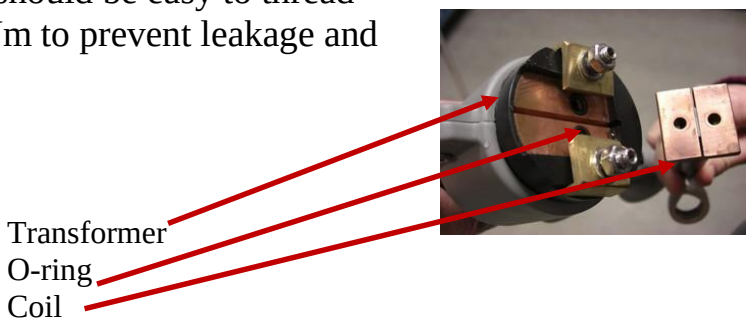
This symbol will alert you that there are important instructions for the handling, care and maintenance in the instructions that come with the product.

This symbol indicates that people with pacemakers should not be staying close to magnetic fields.

This symbol indicates that you should not stand on or charge the unit´s chassis with high weight.

Installation of the coil

The contact surfaces of the coil and transformer must be undamaged and clean
O-rings must be intact and of the right dimension (7x2,5mm standard transformer /6,1x1,6mm lightweight transformer)
The nuts on the bayonet coupling should be easy to thread and be tightened with a torque 4 Nm to prevent leakage and provide good electrical contact.



Installation / start up.

1. Make sure that water of good quality (example: fresh water, process water) and electricity is available.
2. Arrange the workplace so that no cables, hoses or hose assembly is folded or squeezed.
3. The coil should be mounted.
4. Connect the water.
5. Turn on the water.
6. Check that there are no leaks (Paragraph 4-6 does not apply if equipment supplied with preinstalled coolers).
7. Make sure the main switch is turned off.
8. Connect External Control, external emergency circuit, IR-pyrometer and network if this is to be used.
9. Plug in the power cord and turn on the main switch.
10. Allow the machine to boot.
11. Now press the button "**On / Off**" to activate the heater and the cooling circuit.
12. Let the water flow through the cooling circuit and lower the handle to prevent air pockets to be formed in the transformer / coil (especially important when replacing the coil, if the machine has been drained of water, or are unused).
13. Check that no error message appears in the display window.
14. The machine is now ready for heating.

Changing of the coil

1. End heating, turn off the power to the machine, see “Lock out Tag out” above.
2. Loosen the nuts holding the coil.
3. Let the coil slide out of its mounting. Water will flow out of the coil as it is filled with water. This can be avoided by draining the cooling water, see “Draining the Cooling Water” above.
   Wipe up any water that runs out.
4. Check the coil and transformer according to “Installation of the coil” above.
5. Hold up the wings holding the coil and slide it into place. Tighten the nuts with 4 Nm of torque.
6. Wipe up any water after the assembly.
7. Turn on the water flow again.
8. Make sure that no leakage occurs in the coil connection.
9. Continue with items 9 to 14 in “Installation / start up.” above.
10. Check the water level of the cooler and fill up when needed.

Functions

The unit can be operated both manually and externally.
It can also be run with up to 10 unique programs.
These can easily be created directly in the machine's display.
Version L (Limited) can only be run manually.

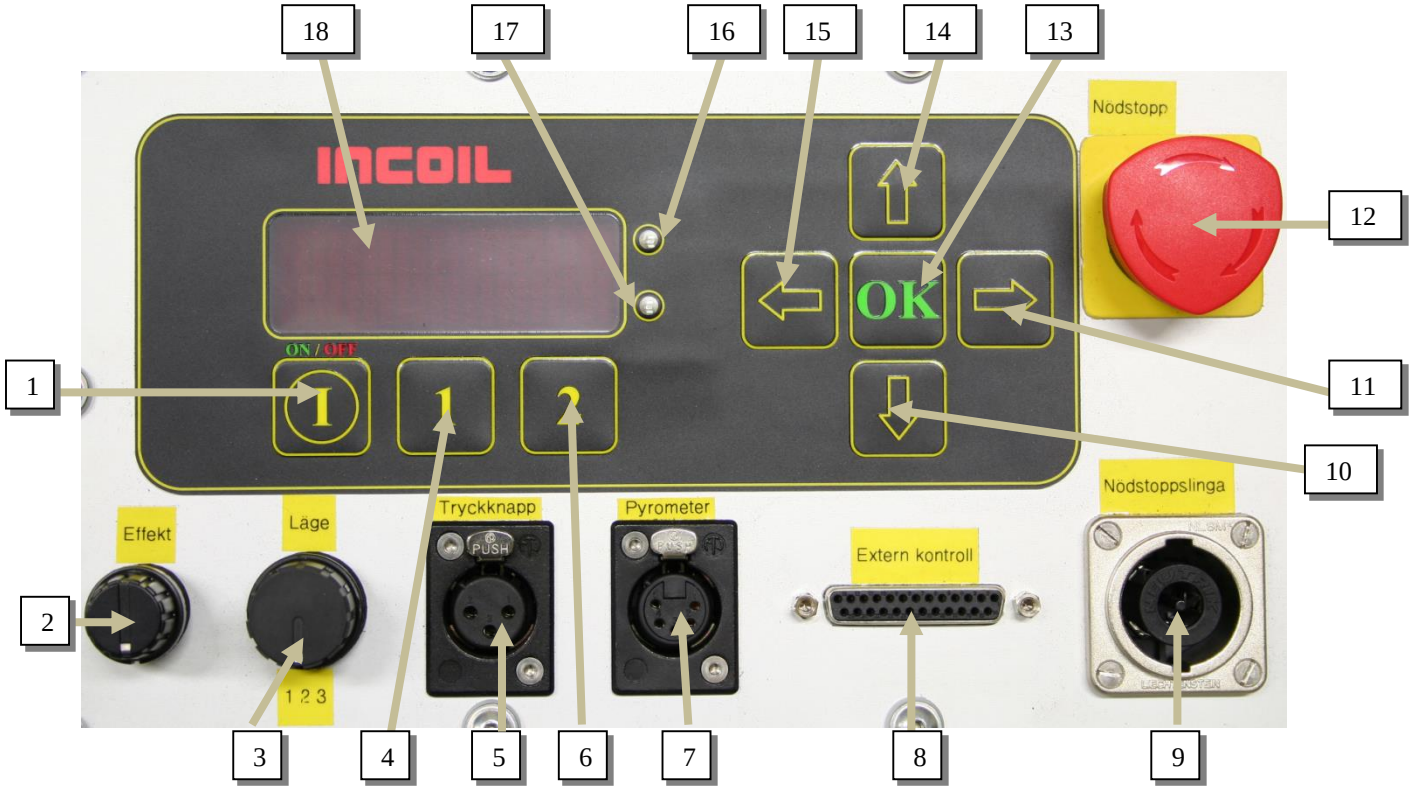
Manual

Run startup procedure as defined previously.
Heating can now be started using Button “1” on display, push button cable or handle button.
Control the power with potentiometer on the unit or on the handle.
Releasing the button stops the heating.

Program

First define program to be run. See “Heating Programs” below.
When a button is pressed the program will start.
Releasing the button will NOT stop the program!
Pressing the button for a second time will stop the program.

Control panel full version



1	ON/OFF	
2	Power potentiometer	X
3	Switch Panel/Handle/External	X
4	Test (power on)	
5	Panel contact ON/OFF	X
6	Not currently used	
7	Connection temperature sensor IR-pyrometer	X
8	External Control	X
9	External Emergency Stop circuit	X
10	Arrow down	
11	Arrow right	
12	Emergency stop	
13	Set/Confirm/Acknowledge	
14	Arrow up	
15	Arrow left	
16	Green = Heating Red = Current limit Orange = On	
17	Green = OK Red = Error	
18	Display window	

X = Option

Menu structure of the control panel

The menu consist of seven main pages where messages and measurements are presented, settings can be reviewed and changed.

- Operation
  Start mode that shows the most important measurements during normal operation
- Settings
  View current settings and make changes.
- Heating Programs
  View and change programs to be run. Not part of Limited (L) variant.
- Temperatures
  Displays the monitored temperatures in the system
- Diagnostic
  Shows values not presented in operations menu
- Alarms
  Shows currently active alarms. Alarms are acknowledged with the "OK" button, and can be acknowledged regardless which menu is currently active.
- Product Information
  Versions of the installed parts of the system. Not presented in further details.

Operation	Settings	Heating Programs	Temperatures	Diagnostic
Power	Panel Locked	**Program1**	IGBT	Mains current
Desired Power	Max Power	Preheating	Max IGBT	Mains voltage
Work Object*	Program Select*	Heating	Water in*	Mains voltage S*
Frequency	Max. Temp Work Obj.*	Cooling	Rectifier*	Mains voltage T*
Resonant current	Temp.sens. WorkObj.*	Program2	Water out	Phase Order*
Program select*	Max. Resonan Curr.	Program3	Work object	Flow monitor
Mains current	Pyro. Emissivity	Program4	Temperature Scale	Flow monitor Ext.
Progress	Time Cooling Water	Program5		Heat switch
Operation time	Time	Program6		Temp sensor work object*
	Språk/Language	Program7		IrToImain
	PLC Voltage Range*	Program8		Ip address*
	Fan*	Program9		
	High Temp Alarm*	Program10		
	No Heat temperature*			
	No Heat Time*			
	Temp Regulate P*			
	Temp Regulate D*			
	PowerLimitOkTemp*			
	Network*			

* : Depending on the current configuration.

Menu Operation

No settings can be made in the Operation Menu

Menu selection Operation	Comments
Power	Displays IS-value VA (VoltAmpere)
Desired Power	Displays Should-value in VA
Work Object	Temperature from connected Pyrometer. Displays "-" if not connected. Not part of Limited version
Frequency	Shows the operating frequency in use. Direct after the start of heating shows resonant frequency.
Resonant current	Shows the primary current. May be limited at high power output to avoid high resonant current peaks
Program Select	Select and display heating program to use 0= no program. 1-10= heating program
Mains current	Shows line current in A (Ampere)
Progress	Shows time for current heating in manual operation, shows current program step time in program mode
Operation time	Displays the time the machine has been in operation (heating time) hhhh:mm:ss

Menu Settings

Menu Settings	Comment
Panel Locked	Lock the panel from unintended changes. See below.
Max power	Limit the power used
Program selected	Set the currently selected program. 0 for manual operation
Max. Temp.Work Object	Temperature at which point the machine will disable heating for manual operation
Temp. Sens. Workobj	Use external Pyrometer to monitor the temperature of the work object.
Max Resonant current	Limit the resonant current, to remove this limit set 0. The machine still has factory limitations that cannot be disabled.
Pyro.emissivity	Set the emissivity for the pyrometer. Dependent on the material used.
Time cooling water	After heating cooling water will still be active for this time. Set 0 for continuous cooling applied
Time	Set the current time and date
Språk/Language	Select language
PLC Voltage Range	Set the voltage range of the power control in the external control port. 0-10V or 0-20V
Fan	Set Fan mode operation. Only IH5 model Off = Always off Normal = Controlled by water temperature Low = Always on low speed. High = Always on high speed.
High Temp Alarm	Set a temperature that the heater should set an external signal to indicate high temperature. Not on all models.
No heat temperature & No heat time	When using a predefined program with temperature, it is possible to set a temperature that the object that is heated should reach within a specified amount of time. To disable set the time to 0 sec.
Temp Regulate P & D	PID regulator settings used when running temperature control programs.
PowerLimitOkTemp	It is possible to limit the output power of the machine when running programs and the desired temperature has been reached.
Network	Select Static or DHCP network configuration Network settings, not available on all models, Contact distributor if unclear.

Panel Locked

The data changeable in the Settings and Heating Programs panels can be locked to avoid changes by accident. A four digit pin code is used to unlock the panel. Setting the pin code to 0000 will allow the machine to start in unlocked mode, basically a disabled lock. However the panel can still be locked from this state and 0000 will have to be entered to unlock the machine, or rebooting the machine.

To Lock the system from unlocked state:

Navigate to the Panel Locked setting and press the Down key.
Five rows of settings are now available Lock/Unlock and the four digits in the pin code.
Change the first line to Lock and press Ok.
The panel is now locked. If you change the pin code in the settings now the pin is NOT changed.
To change the pin see below.

To Unlock the system from locked state:

Navigate to the Panel Locked setting and press the Down key.
Five rows of settings are now available Lock/Unlock and the four digits in the pin code.
The first line can be ignored. The pin code will show only X's.
Using the Down/Up arrow to select each digit and Left/Right arrow to change the values, set the correct pin code values and then press the OK key.
The system should now be unlocked and Unlock should be displayed as the value.

To Change the pin code:

This needs to be done from an unlocked system. (Hmm, how odd?)
Navigate to the Panel Locked setting and press the Down key.
Five rows of settings are now available Lock/Unlock and the four digits in the pin code.
The first line must be left as Unlocked value.
Change the pin code digits as desired.
Press the OK key to store the new pin.
The system is still unlocked and Unlock should be displayed as the value.

Make changes to a setting

- Navigate to the settings menu using the left/right arrow buttons.
- Press Arrow Down to select the parameters
- Now using the left/right arrow buttons select desired parameter to change.
- Press Arrow Down to enter Change mode.
- Using Left/right arrow the value is changed.
  Press and hold to activate acceleration.
  Release and wait for deacceleration if needed.
  Some values have more than one level. Time for instance can have one level for hour, one for minute and so on.
- Levels are navigated by Up/Down arrows.
- If you press Up to return to the parameter row the change is cancelled.
- Pressing "OK" button will confirm the new value and return to the parameter level again.

Making and running of programs

1. Start the machine
2. Press left Arrow twice to select Heating Programs menu
3. Press Arrow Down to select Program.
4. Using Left and right arrow select which program to be changed (1-10)
5. Press Arrow Down to select program
6. Now using Left/right arrow to select which Step. (Preheating/heating/cooling)
7. Arrow down to select step.
8. Now select parameter to change (Time/Type/Power/Temp change/Temperature). Change a value in the same way as done for settings. See Menu Settings.
9. Repeat step 6-8 for all three steps.
10. Return to the menu settings.
11. Change to Parameter "Program Select" to the program to run.
12. Start heating to run the program.

Note on programs: Some pyrometers used to measure the temperature are not able to measure below a certain temperature (usually somewhere between 100-200). Is this the case for programs requiring Temperature (All but Time type) then the heater will use the set Power to start the heating and allow to get a valid temperature from the Pyrometer. Differ from Temp: Low and – as displayed Temp. "Low" is too low to get a good measurement but "-" indicates a missing Pyrometer connection.

Program Types	Description of type	Parameters used
Time	Run with set power for set amount of time	Time, Power
Temperature	Run to and maintain set Temperature for set amount of time	Time, Temperature and Power
Run To Temp	Run to set temperature. When set temperature is reached the next step is started. Time must be set as a maximum time limit. NOTE: No error is generated if set temperature is not reached	Time, Temperature and Power
Temp Change	Run to set temperature with set temperature change (degrees/hour). Negative values indicate a decrease in temperature. Starting temp is defined as the current temp. If no valid temp is available the first valid temperature received once heating has started is used. Time must be set for a maximum time limit.	Time, Temperature, Power and Temp Change

Menu Temperatures

Menu Temperatures	Comment
IGBT	Current temperature of IGBT
Max IGBT	Maximum temperature of IGBT ever reached.
Water in	Temperature on Water into heater, dependent on configuration
Rectifier	Temperature on rectifier, dependent on configuration
Water out	Temperature on Water out of heater
Work object	Temperature on work object if pyrometer present. Not part of Limited
Celsius/Fahrenheit	Set temperature to be displayed in Celsius (default) or Fahrenheit.

Menu Diagnostic

Menu Diagnostic	Comment
Mains Current	Measured Mains Current
Mains Voltage	Measured Mains Voltage
Mains Voltage S	Additional two phases when present
Mains Voltage T	
Phase Order	Shows the Phase order of Input Mains RST or RTS. If a cooler is supplied by Incoil and its power supply is connected thru the IH machine the phase order should be RST. The cooler needs a correct phase order for the fan and pump to operate in the correct direction. Not all machines.
Flow Monitor	Shows if monitor detects water flow or not.
Flow Monitor Ext.	Shows if second monitor detects water flow or not.
Heating Switch	Is Switch open or closed.
Temp.sens. WorkObj.	OK, Not connected or Communication error
IrToImain	Not all machines. During operation shows the relationship between resonance current and mains current. Can in some systems be used to detect that the coil is running without object to heat.
IpAddress	Shows the machines Ip-address, not on all machines.

Menu Alarms

In this menu active alarms are presented. If more alarms are active than can be displayed then Arrow Up/Down can be used to navigate the list of active alarms.
In order to be able to acknowledge an alarm the conditions that raised the alarms need to go away.
Example: Phase error: then all three phases need to be restored to be able to acknowledge the alarm.
More than one alarm may be active at any time but only one will be flashing and is also displayed in the bottom row in all other menus.
Pressing OK button will acknowledge the current alarm. But if the conditions for the alarms still apply then the alarm will still be active. Acknowledged alarms will disappear from the list and if more than one active alarm then the next one will become flashing and can be acknowledged.

Message in the display

Display text	Comments	Solution
Reboot!	Internal error requiring reboot	Restart the machine
EEPROM format err.	Cannot read parameter memory	Contact dealer.
EEPROM incomplete	Cannot read parameter memory	Contact dealer.
EEPROM write error	Error when storing parameters	Contact dealer.
Regulator config.	Internal error	Contact dealer.
3V3 low voltage	Internal monitoring of externally supplied voltages. Check connected equipment	Check connected equipment for short circuit. If error persist contact dealer.
24V low voltage		
5V low voltage		
Regulator error 1	Internal error	Contact dealer.
Regulator error 2	Internal error	Contact dealer.
Regulator error 3	Internal error	Contact dealer.
Regulator error 14	Internal error	Contact dealer.
Regulator error 16	Internal error	Contact dealer.
Regulator error 17	Heating stopped as phase error discovered	Check phases and fuses.
Regulator error 18	Internal error	Contact dealer.
Regulator error 29	Internal error	Contact dealer.
Phase error	Error on one or more phases.	Check phases and fuses.
Load error	Heater cannot detect working coil	Check coil and its connections
Mains current rush	Heating stopped because of large mains current detected	Can occur if the unit comes too close to the resonance frequency. Contact dealer.
High mains current	Normally the heater can regulate the current to within limits but for some	Should not occur under normal operating. Contact dealer.

	reason has now failed and finally cancelled heating	
Contactor released	Contactor released during heating. Occurs together with other errors. Need to set the unit in standby to be able to acknowledge.	Check other errors.
Resonanscurrent high	Heating stopped as possible short circuit was detected.	Contact dealer.
Resonanscurrent low		Contact dealer.
Resonanscurrent rush		Contact dealer.
Low mains voltage	One or more phases missing or voltage too low	Check phases and fuses. Contact dealer.
No Current flow	No current flows in the resonance circuit.	Check coil and its connections. Contact dealer.
Temp. sensor IGBT	Unable to measure the temperature of internal temperature sensors.	Contact dealer.
Temp.sensor w.in		Contact dealer.
Temp.sensor w.out		Contact dealer.
Temp.sens.WorkObj.	Heater set to operate with external pyrometer but the heater cannot establish connetion	Check pyrometer and cables.
Emergency stop	Emergency stop was pressed	Release when **safe** and acknowledge.
Contactor	Contactor is in the wrong position.	Contact dealer. Internal cable error?
Heating switch	If button to start heating is pressed when unit is in standby	Release switch and acknowledge. Check cables if error persist
No Water flow	No Water flow detected when in On.	Check waterflow.
No Water flow ext		
Unexp. Water flow	Water flow detected in standby on machines with internal water valve.	Water valve may be damaged or water flow sensor damaged. Contact dealer.
Unexp. W. flow ext		
Temperature IGBT	Temperature too high on IGBT	Internal electronics have become very hot should not occur unless some error. Contact dealer
Water temp in	Temperature too high on water into the machine. Difficult to cool with hot water	Check incoming watersupply.
Water temp out	Temperature too high on water going out of the machine. Something may generate too much heat.	Check incoming water temperature if this may be the cause. Contact dealer
Temp.sensor rectif	Temperature too high on internal rectifier	Internal electronics have become very hot should not occur unless some error. Contact dealer
Empty coil	IrToImain setting has detected that the coil is running empty.	Check that the coil is not empty. Contact dealer for assistance if problem persist.
No heat detected	The temperature detected has not reached the correct temperature within the defined amount of time	Make sure that the IR-Pyrometer is correctly positioned. Check if the object is inserted correctly into the coil. Adjust the setting in Settings menu to reflect the correct temperature and or time.
Prog Interrupt	When configured that programs should not be interrupted but allowed to run thru.	Something stopped a running program when not allowed
PC Connection	Trying to start heating program without connection to PC when configured to demand connection	Check PC-connection, program running…
Cannot reach Temp	Heating program Run To Temp or Temp Change programs was unable to reach the desired temperature within the specified time limit	

Technical specifications

	IH5	IH10	IH18	IH25
Continuous Output power / kVa	3,5	10	22	22
Frequency Range kHz	4-50	4-50	4-50	4-50
Supply voltage/current range	230/16	400/16	400/32	400/32
Power Frequency Hz	50/60	50/60	50/60	50/60
Cooling	Intern	Extern	Extern	Extern
Water consumption L/min		4,5	4,5	4,5
Water pressure bar min/max		3-8	3-8	3-8
Max temperature electronic	50˚C	50˚C	50˚C	50˚C
Max temperature water	40˚C	40˚C	40˚C	40˚C
Chassis height	400mm	630mm	271mm	630mm
Chassis width	310mm	310mm	300mm	310mm
Chassis depth	480mm	600mm	596mm	600mm
Total weight approx.	28kg	43kg	25kg	43kg
Transformer length - standard 3 m	1/2/3	3/5/7/10	7	3/5/7/10

	IH30	IH50	IH80
Continuous Output power / kVa	30	44	80
Frequency Range kHz	4-50	1-50	1-50
Supply voltage/current range	400/50	400/63	400/125
Power Frequency Hz	50/60	50/60	50/60
Cooling	Extern	Extern	Extern
Water consumption L/min	9,5	9,5	9,5
Water pressure bar min/max	3-8	3-8	3-8
Max temperature electronic	50˚C	50˚C	50˚C
Max temperature water	40˚C	40˚C	40˚C
Chassis height	630mm	630mm	890mm
Chassis width	310mm	310mm	400mm
Chassis depth	600mm	600mm	900mm
Total weight approx.	45kg	45kg	70kg
Transformer length - standard 3 m	3/5/7/10	3/5/7/10	3/5/7/10

Security Class: Standard
EN 61000-6-4
EN 61000-6-2
EN 60335-1

Warranty

1 year guarantee from date of sale.

- Damage caused by carelessness during handling and transport, is not covered by the guarantee
- The use of induction coils which are not made for the unit and therefore causing damage is not covered by guarantee. Always contact the dealer / manufacturer for the design of induction coils.
- Damage caused by faulty electrical connection or cooling problems / dirty cooling water is not covered under guarantee.
- Squeeze injuries of the hose assembly and transformer are not covered by warranty.
- Induction coils are excluded from the guarantee.

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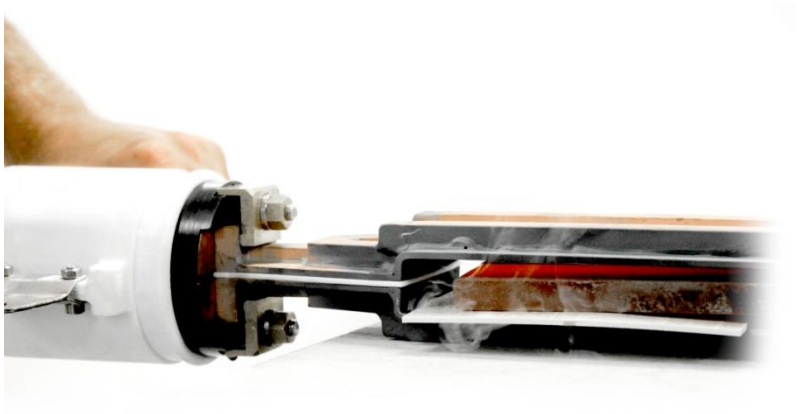

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