

TERMINAL BOX K7E WITH ELECTRONIC CONTROL



INSTALLATION AND OPERATING MANUAL

DEAR USER

This manual is intended to describe the installation and operation of the K7E terminal box.

Read the entire **manual carefully before connecting / installing.**

Do not hesitate to contact Lund & Sørensen A/S for any questions. **www.lselvarme.dk**

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.



SAFETY

- This manual should be read carefully before use.
- Installation of the electric cartridge and connection box must be carried out by a qualified electrician.
- Make sure all connections are properly made before the terminal box is switched on.
- Ensure that the connection box is connected to the neutral conductor and the protective earth (PE).
- At single-phase connection, neutral conductors are connected to both the control PCB and the heating element.



OPERATING CONDITIONS

- The electric immersion heater / terminal box is designed for operation in water and is manufactured according to the standards and regulations that apply when the following conditions are met:
- The electric terminal box is intended for stationary use in Class1 household applications, hot water/liquid heating.
- Industrial water / liquid heating in an environment where there are no Ex-requirements.
- Conditions for proper and safe operation requires that the entire heating element is always immersed in water/liquid.
- Otherwise, the electrical immersion heater will be damaged / destroyed.
- Limescale on the elements may damage the electrical immersion heater.
- Therefore, regular checks and any cleaning must be performed.
- When cleaning the outside of the terminal box, use a soft dry cloth.



ASSEMBLY INSTRUCTIONS

The product is intended for heating water, and is certified according to: 60335-2-73
(special requirements on stationary immersion heater, unpressurized system)

For applications not covered by the above, additional risk assessment and possible testing are required.

- The electrical immersion heater should be mounted in horizontal position.
- Ensure that temperature sensor and melt fuses are positioned at the bottom of the thermowell during installation. Otherwise, incorrect operation is likely.
- Avoid nearby cables/equipment with high currents or other electrical equipment that can cause transients or other disturbance.
- In case of electrical connection, the connection box must be preceded by a suitable fuse and a lockable safety switch. These should also be labeled "load disconnectors" or "safety switches".
- Do not cover the terminal box during normal operation.
- Consideration of tank/vessel temperature and other hot parts must be considered when selecting the connection cable.
- Ensure that the tank/vessel is fully filled with water/liquid before deployment.
- The manufacturer is not responsible for errors/damage caused by improper handling that is inconsistent with the contents of this manual.

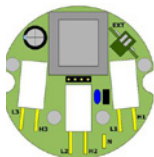
TECHNICAL DATA

Power range:	From 1000W to 9700W, 3x400V (14A), 1x230V (14A)
Supply voltage:	230V 1N ~, 400V 3N ~
IP rating:	IP54
Protection features:	
Temperature, overheat protection:	STB 106°C melt fuse. The fuse must be replaced by a qualified electrician Overheat protection melt fuse 106°C as spare part, part number: 1151550202
Temperature limiter:	82°C electronic/software (75°C is maximum operating setpoint temperature on the water/liquid)
Dry run:	Sensitivity at rise> 1°C/3s
Detection incorrect heater:	Sense after 60 minutes
Sensor:	NTC 10kΩ
Inputs:	
External control:	SPST potential-free contact
Measurement range:	-45°C - 195°C
Measurement accuracy:	0.1°C
Measurement time:	0.5s
Data reading:	7 segment LED display
Indication:	
• LED diodes:	Displays heating status and alarm
• LED display:	displays, process value/setpoint, settings
Ambient Temperature:	5 °C - 50 °C

K7E fits **Lund & Sørensen** immersion heaters with flange sizes between 1^{1/4} - 2^{1/2} inch

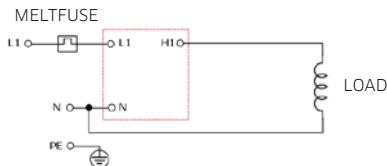
ELECTRICAL CONNECTIONS

The following illustration shows the PCB with electromechanical power relays.
The circuit diagram below is shown for both **single-phase** and **three-phase** installation.



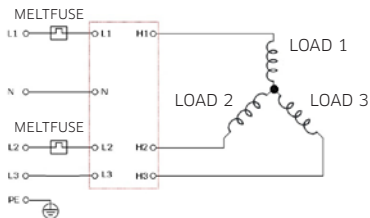
• SINGLE PHASE CONNECTION DIAGRAM

CONTROL PCB CONNECTIONS
230V VAC SUPPLY



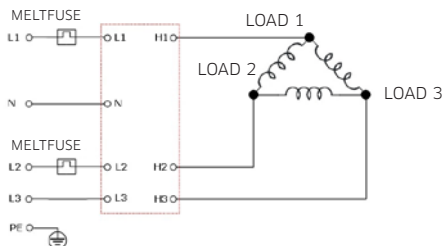
• THREE PHASE CONNECTION DIAGRAM (THREE-PHASE STAR)

CONTROL PCB CONNECTIONS
3X400VAC SUPPLY



• THREE PHASE CONNECTION DIAGRAM (THREE-PHASE DELTA)

CONTROL PCB CONNECTIONS
3X400VAC SUPPLY



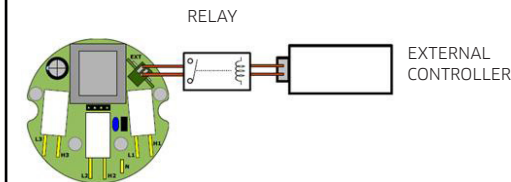
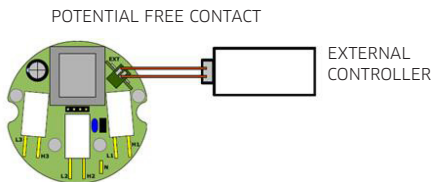
• EXTERNAL CONTROL

The control card (PCB) is also equipped with external input control of the unit. This feature enables control (on/off) based on an external control system signal. External control is connected to **(EXT)** as placed on the control board as shown below.

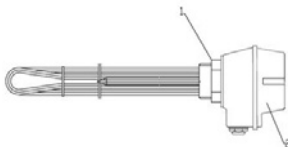
If the external control function is not to be used, the cross connector bracket over the EXT terminal must be fitted. Be careful not to install 230V over the EXT terminal! Incorrect connection may damage / destroy the control PCB! The external control input EXT should only be connected via potential-free contact / relay from external control system.

Example of connection / connection via
External control system is shown in the circuit diagram below:

If the external control system does not
have potential-free outputs, an intermediate relay must be used.



INSTALLATION IMMERSION HEATER AND TERMINAL BOX



Electric immersion heater together with the electronic control box **K7E** is intended for use in open vessels, for heating water/liquids.

1. Mount the immersion heater (1) in the intended flange together with the O-ring or the supplied gasket. Ensure that adequate tightening torque is applied to avoid leakage. Do not overtighten the flange, as this can cause irreversible damage.
2. Remove the upper part of the terminal control box (2).
3. Verify that the cable harness is properly connected between the elements (Star-connected or Delta-connected) with the attached links. Fit the bottom part of the control box (2) and connect the elements according to the connection diagram depending on which connection to be used, single-phase or three-phase.
(see connection diagram) Ensure that sensor and fuses are correctly mounted and placed in the thermowell on the electrical immersion heater.
4. Fit the upper part (2) with the bottom part.

STARTUP & OPERATION

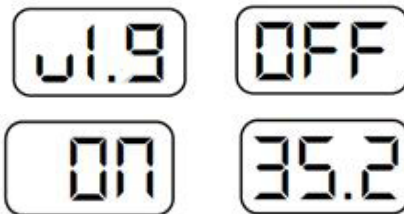
The K7E terminal box is a complete unit with microprocessor controlled temperature control. This regulates the heating process to the desired setpoint. The unit is equipped with an electronic temperature limiter and melting fuses as overheating protection.

See below for the control box and its layout and control buttons.



Number	Designation	Description
1	Alarm LED red	LED red flashes on activated alarm.
2	Heat LED green	LED green lit on active heater. At three-phase switching flashes the diode when 1°C remains to the setpoint.
3	-- Push button	Decreases Setpoint, or pressed for about 3 seconds changes control box status ON / OFF. (see connection diagram page 13 for detailed information)
4	+ Push button	Increases setpoint, or pressed for about 3 seconds access to the menu to change the setpoint on the hysteresis. (adjustable 1-10 °C) (see connection diagram page 13 for detailed information)
5	LED display	Displays current process value, setpoint, settings, alarm as well the status of the terminal control box.

Connecting of the terminal box to power supply 230V / 400V AC (depending on version) causes the display to show the current software version, and then the unit sets to OFF (OFF).



In this mode, the control is turned off - all the element(s) are voltage-free. Press the 1 button for about 3 seconds and the control box will switch to ON (ON) and will display current process value. In this mode the control is active and the element (s) will be engaged.

The display also shows alarm information and if EXT function is active. The table below describes how the information is displayed and its meaning

Information on display	Acoustic alarm	Alarm LED	Description
	Varying 	Flashing 	Absence or Temperature Sensor Error. Alarm automatically reset after correcting errors.
	Varying 	Flashing 	Max temperatur violation 82°C (factory setting) Alarms are reset manually by inserting the device OFF mode (OFF) and then restart.
	Single 	Flashing 	No water in the system (No Liquid). Alarm reset manually by inserting the device OFF mode (OFF) and then restart.
	Single 	Flashing 	Error on Heater (No Heating). Alarms are reset manually by setting the device in OFF mode (OFF) and then restart.
	-----	-----	Input for external control EXT open. The control box turns off the regulation.

The menu is divided into two sections: "Operation menu" (Terminal box set ON (ON) mode and "Service menu" (Terminal box set OFF (OFF) mode)

▶ OPERATION MENU (TERMINAL BOX SET (ON) MODE

Function designation	Parameter	Setpoint range Factory setting	Factory setting
OPERATING SETPOINT		5 - 75°C	50°C
ADJUSTING HYSTERESIS		1 - 10°C	2°C

▶ SERVICE MENU (TERMINAL BOX SET OFF (OFF) MODE

Function designation	Parameter	Setpoint range	Factory setting
OPERATION MONITORING SETUP		1 and 0	1

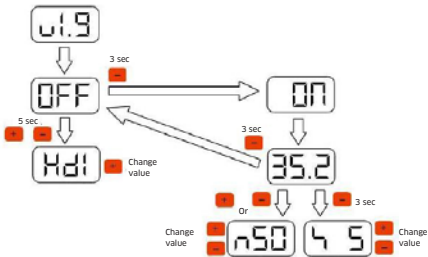
Lund & Sørensen A/S reserves the right to change the setting options in future versions.

MENU OVERVIEW

The illustration to the right shows the menu structure and how to navigate between the different functions in the operating menu and service menu. Make sure that there is no supply voltage on the device, and that the safety switch is set to "off".



IMPORTANT


Return to normal operating mode occurs automatically after 5 seconds after the last button press.



OPERATION MENU

The operating menu is available when the terminal control box is set **ON** (ON) mode.

To **CHANGE OPERATING SETPOINT** Press  or  when the actual process value appears on the display.

CHANGE HYSTERESIS. Done by holding down  for 3 seconds.

Return from menu to normal mode occurs automatically after 5 seconds after the last button press.

The description of the parameters is explained below:

1. CUSTOM SETUP



In this menu you set the desired Setpoint. If heater with three elements installed (three-phase operation) one of the elements will be switched off when the actual process value is 0.5°C below actual Setpoint.

Green LED indicating heat starts flashing.

2. HYSTERESIS SETUP




In this menu you set the desired temperature Hysteresis. (The value that indicates the difference between on/off on heater).



The setting of the Hysteresis can be done in the interval between 1 to 10 °C.

The following sections focus on installers and contains information which requires specialist knowledge and relevant education.


Changes from preset factory settings must be done in consultation with Lund & Sørensen A/S.

SERVICE MENY

For access to the service menu, the device must be set in "OFF" mode, then switch off the supply voltage. Then turn on the supply voltage for to boot the device. The first one shown on the display is the software version. Meanwhile, the software version is displayed, press and hold the button , the terminal box will now go to the OFF mode.

KEEP BUTTON  PRESSED . Now press the button  simultaneously.

Now you are in the service menu.

Press the button  as stepping between the functions / settings in the service menu, use the button  to change the values of the settings. Return from menu to OFF mode occurs automatically after 5 seconds from using the last button.

The description of the parameters is shown below:

1. SETTING UP HEATING MONITORING



In this menu, the user sets the function for heat monitoring. Set **Hd1** for heat monitoring or **Hd0** for no heat monitoring. Disabling this function turns off heat monitoring (**NoH**) and liquid level monitoring (**NoL**).

Disabling this feature also deactivates alarms as triggered by the above. If problems arise at heating (frequent false alarms from **NoH** and **NoL**) Should this option be set to **Hd0**.

3. SETTING OF MAXIMUM SETPOINT



This menu specifies the highest setpoint level that users can set.

2. SETTING UP HEATER CONFIGURATION



This menu sets the number of connected elements (heater Power).

hP1 Mode = A single element (Single phase 230V AC),

hP3 =Three elements (Three-phase 400V AC).

IMPORTANT!

Settings must match current element configuration. Incorrect setting may result overheating or too low heater output.

4. SETTING OF ELECTRONIC OVERHEATING LIMITER



This menu specifies which setpoint the electronic limiter should have. Any changes here must be done with care and is **NOT** for standard use. It's **ONLY** allowed to decrease the value from 82°C!