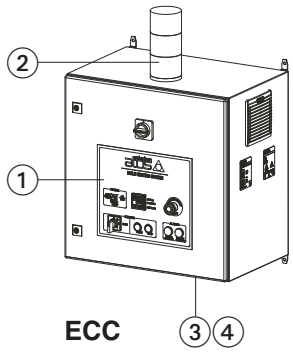
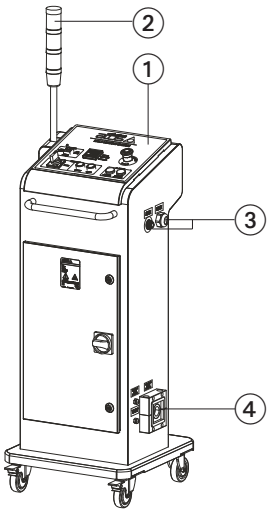
Electrical control systems ECT and ECC

for heating control of molds using planar inductors



ECC



ECT

① Control panel
② Signalling stoplight
③ Power supply cable entry and compressed air inlet
④ gateway for quick connector of inductor

ECT, ECC

Electrical control systems designed to power and control **MHB** and **MHP** planar inductors. The control systems are available in two versions: mobile (ECT) and fixed (ECC). These systems are used for preheating or heating of planar metal elements, such as molds for metals and rubber. They allow for faster, more precise, and efficient temperature control of the molds compared to traditional free flame burners, significantly reducing heating times and eliminating risks associated with the use of combustible gases in production facilities.

Each system contains an EPG power generator for inductor power supply.

Heating cycles can be performed according to the following integrated control logic:

- Timed control for rapid heating based on a predefined time interval
- Temperature-regulated control for precise closed-loop temperature regulation.

1 MODEL CODE

ECT	-	H	-	TR	-	T400VAC	-	T	*

Electrical command:
ECC = Cabinet
ECT = Trolley

Dimension

Temperature control logic
TM = Timed control
TR = Temperature regulated control

Power supply (1)
T400VAC for 380-400VAC - 50/60Hz 3-phase
T460VAC for 440-460VAC - 50/60Hz 3-phase

Series number

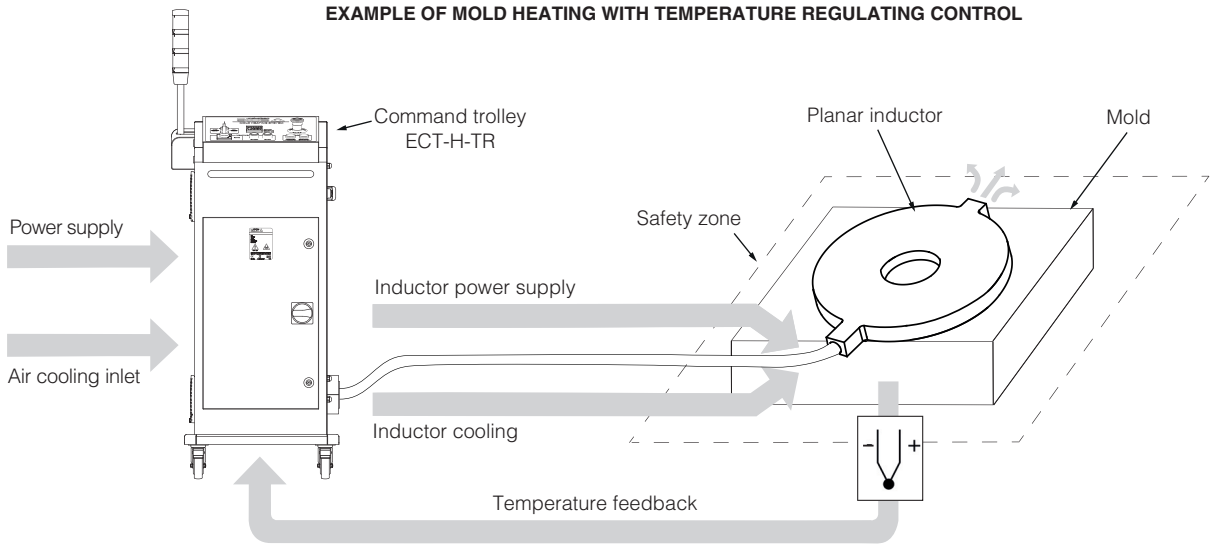
Transmitter
T = Transmitter installed

(1) For other voltage code, please contact Atos Induction technical office

Note: To transmit data to a PC, the Radio/USB Converter ECD-RV and ECD-SW software are required, which are not included in control system; see AI110 technical table.

2 FUNCTIONAL EXAMPLE

EXAMPLE OF MOLD HEATING WITH TEMPERATURE REGULATING CONTROL



3 FUNCTIONAL DESCRIPTION

Through the integrated EPG generator, the electric control systems power the planar inductor with amplitude and frequency-modulated currents, generating magnetic fields capable of heating the ferromagnetic materials of the molds to be heated. The generator automatically adapts the current modulation to optimize the magnetic coupling between the heating element and the material to be heated. This maximizes the transmitted thermal power and reduces process times.
The electric control systems integrate the following temperature control logics:

Timed control

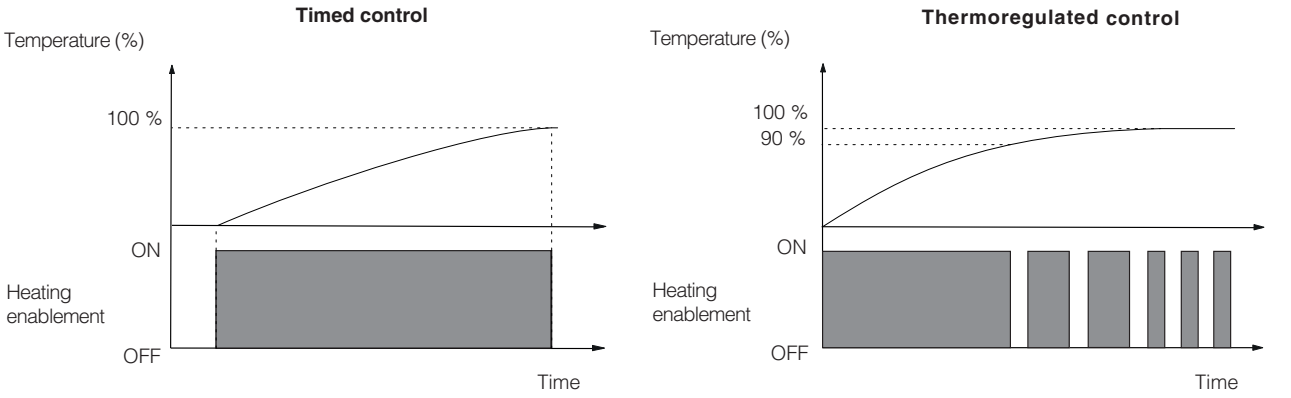
The timer enables the EPG generator for a predetermined time required to reach the desired temperature.
In this condition, the generator supply a constant power for the entire set time interval, at the end of which the heating process is automatically interrupted. The heating time is defined by the user according to the application's needs.

⚠ To use the timed control is necessary to verify that, with the set timing, the mold does not exceed the maximum allowable temperature of 350°C for planar inductors.

Thermoregulated control

The temperature is precisely regulated in closed loop by the temperature controller through ON/OFF modulation of the Enable signal sent to the EPG generator integrated in the control system. This control logic requires the installation of a sensor (type K thermocouple) to measure the actual temperature of the mold. The sensor output signal is sent to the temperature controller, which compares the value with the set reference temperature. At the beginning of the heating cycle, the Enable command is kept active until reaching about 90% of the desired temperature. Then, the temperature controller will modulate the Enable command appropriately to reach and maintain the set temperature. This control logic allows for high precision in reaching and maintaining the set temperature, cancelling out possible thermal drifts.

The following diagrams show the timed and temperature-controlled control logics.



4 GENERAL CHARACTERISTICS

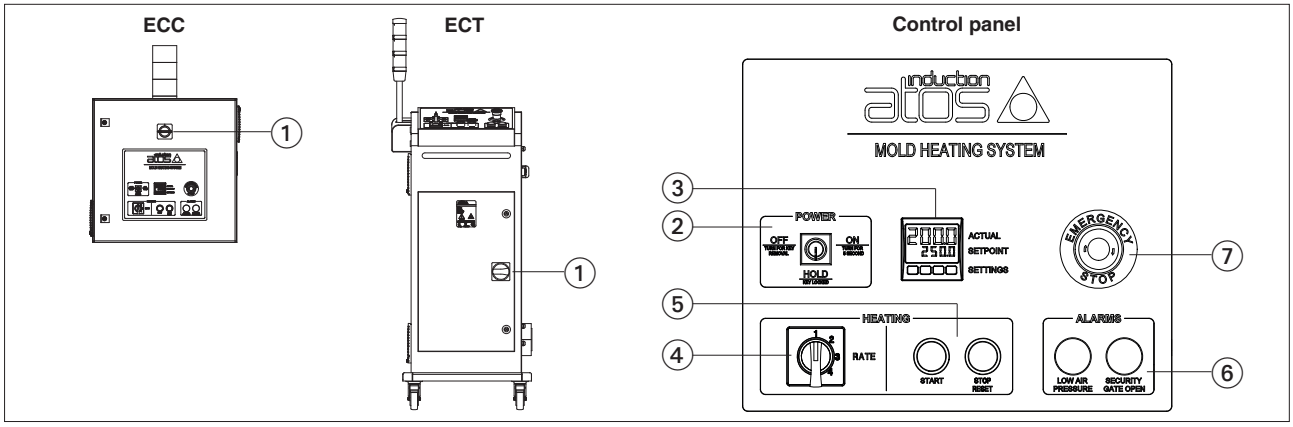
Positioning	During the heating process, the control system must be located in a safe position, outside the buffer zone, see section 8
Ambient temperature	0°C ÷ +40°C
Max mold temperature	350°C
Relative humidity	30% ÷ 60%
Inlet air pipe diameter	External diameter 12 mm - not supplied
Inlet air pressure	2 ÷ 6 bar
Protection degree [CEI EN 605229]	IP 54
Compliance	CE conformity, according to: EMC 2014/30/UE (EN 61000-6-2; EN 61000-6-4); Low voltage directive 2014/35/UE (EN 60519-1; EN 60519-3); RoHS 2011/65/UE; REACH (CE n° 1907/2006)

5 ELECTRICAL CHARACTERISTICS

Max power		[kW]	15
Power supply			3x400 ±10% VAC o 3x460 ±10% VAC
Max power consumption (±5%)	T400VAC	[A]	22,8
	T460VAC	[A]	19,8
Frequency		[Hz]	50 ÷ 60
Power factor (cos φ)			0,95
Output	Peak voltage	[V]	1200
	Peak current	[A]	100
	Frequency	[kHz]	4 ÷ 15
Circuit control voltage			24 VDC
Power cable			FG16OR16 4X10 mm^2 (three-phase + GND) - not included

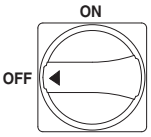
6 CONTROL PANEL AND STOPLIGHT SIGNAL

The control panel is equipped with buttons and indicator lights to control the heating process. The presence of a stoplight signals the operational status of the system.



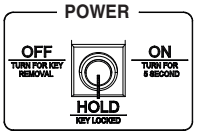
General switch (1)

The main switch allows the control system to be connected to the power supply.
Turn the switch ON to connect the system to the power supply.
Turn the switch OFF to disconnect the system from the power supply.
To open the front door of the trolley/cabinet, the main switch must be in the OFF position.



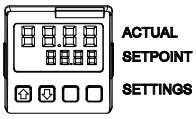
Key switch (2)

Turn On: turn the key to the right to **ON** for five seconds, for enable the power supply of the EPG generator and the temperature controller. The key automatically returns to the **HOLD** position and cannot be removed. The orange light illuminates on the traffic light.
If the heating element is not properly connected or coupled with the mold to be heated, the control panel cannot be activated, and the red light illuminates on the traffic light.
Turn Off: turn the key to the left to **OFF** for turn off the control panel. In this position, it is also possible to remove the key to prevent the trolley from being activated.



Timer (for EC*-TM) (3)

The timer allows setting the heating time of the molds without the need for a dedicated thermocouple. The time is displayed on the digital display. The factory pre-set value is 25 minutes.
Press the SET button to enter the time adjustment menu (time1), then press the buttons ⇧⇩ to modify the heating cycle time. The heating process will automatically stop at the end of the set time.

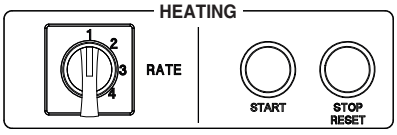


At the end of the set time, the heating process will automatically stop. In order to avoid exceeding the maximum allowable temperature of 350°C, it is recommended to perform the first heating cycles with limited time periods, gradually increasing until reaching the desired temperature. During these phases, it is necessary to monitor the temperature of the metal at the points in direct contact with the inductor.

Thermostat (for EC*-TR) (3)

The thermostat controls the mold temperature in a closed loop according to the logic described in section 3.
The set temperature is displayed on the digital display. Press the buttons ⇧⇩ to modify the temperature up to a maximum of 350°C.
The temperature change must be made when the generator is in START mode, otherwise the command will not be received.
The user must place a type K thermocouple on the surface of the mold, at a point in direct contact with the inductor, and connect it to the EC* trolley thermostat, as shown in section 9.
In this way, the thermocouple will measure one of the hottest points on the mold. It is important to consider that the system will initially heat the surface in contact with the heating blanket, and then uniformly propagate throughout the entire mold volume.
The use of an armored thermocouple is recommended.

Heating (4) (5)

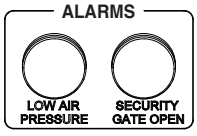


Power selector (4)

The selector allows you to set 4 different power levels, programmable via software (see section 7 for setting), factory preset with these powers:
1 = 6kW **2** = 9kW **3** = 12kW **4** = 15kW

START - STOP/RESET (5)

Using the START-STOP/RESET buttons, it is possible to control the heating process.
START: after setting the power using selector (4), the time (EC*-TM) or temperature (EC*-TR) (3), press the button to start the heating process. The green light illuminates on the stoplight.
STOP/RESET: press the button to manually interrupt the heating cycle (both in timed and temperature-controlled mode), or only in timed mode, to rearm the system before a new start. The orange light illuminates on the stoplight.



Alarm (6)

Two alarm lights, located on the control panel, indicate the failure to start or the forced interruption of heating due to the following anomalies:

- LOW AIR PRESSURE: air pressure in the cooling circuit inlet less than 2 bar.
- SECURITY GATE OPEN: safety barrier open.

Both alarms are accompanied by the red light illuminating on the traffic light.

⚠ If the traffic light is red and both alarm lights are off, this indicates an internal anomaly. Check that all connections are properly made and verify the correct positioning of the cover on the mold; if the problem persists, contact Atos Induction technical support.

⚠ If the thermocouple breaks (only for EC*-TR), the power supply to the inductor is automatically interrupted. The red light on the stoplight illuminates, and an error message appears on the temperature controller screen. Heating can be restarted only after the thermocouple is repaired.

Emergency stop (7)

In case of an emergency, press the EMERGENCY STOP mushroom button to completely turn off the heater.

7 CONNECTION TO PC

The transceiver allows the transmission of diagnostic information about the generator (operational status and alarms) to a computer, as well as the setting of parameters. It is necessary to provide for the use of the radio/USB converter ECD-RV and the related software ECD-SW to enable communication with the PC.
The radio/USB converter can communicate with multiple trolleys/panels equipped with a transceiver, but not simultaneously; see technical table AI110.

8 INSTALLATION REQUIREMENTS

To move the control trolley, use the handle located on the front part of the trolley. Once positioned, lock the wheels using the appropriate brakes.

Note: to prevent possible damage during shipping, the electric command is delivered with the stoplight disassembled. Mount it before using the system.

ECC and ECT control systems must be positioned outside the safety zone, see technical table AI300 section. 6. The safety zone must be delimited by a physical barrier equipped with a safety switch.

The safety switch ensures the segregation of the inductor during the heating phases.

⚠ Is forbidden enter in the safety zone when the heating is active; in case the barrier is opened, the process is automatically interrupted.

8.1 Electrical Connections

To wire the control system, open the front door, insert the cables through the dedicated cable glands (located on the right side of the trolley or on the bottom of the panel) and connect the terminals to the corresponding terminals. See section 9 for connection specifications.

Connection to the power supply

The control system must be connected to the power supply in compliance with the electrical safety regulations in force in the installation country.

Thermocouple connection (only for EC*-H-TR)

Ensure that the thermocouple is securely positioned between the inductor and the surface of the mold so that it can measure the temperature in the contact zone between the inductor and the mold. Use a type K thermocouple, and the use of armored type ensures greater wear resistance.

⚠ An incorrect positioning of the thermocouple would cause errors in the temperature control process, with possible damage of the inductor.

Connection of safety switch in the safety zone

The safety switch must be installed to prevent any accidental openings of the barrier, which delimits the safety zone, during the inductor power supply phases.

8.2 Compressed air connection

The ECT carriage and ECC cabinet are equipped with an inlet for compressed air, necessary for the cooling of the planar inductor.
Connect the air hose to the quick connector on the right side of the carriage or on the bottom of the panel.
Ensure the air pressure and feeding tube specifications, as indicated in section 4.

⚠ At the end of the heating cycle, the air flow continues to be supplied to the heating element to protect the inductor inside. In any case, always remove the heating plate from the hot mold at the end of the heating process

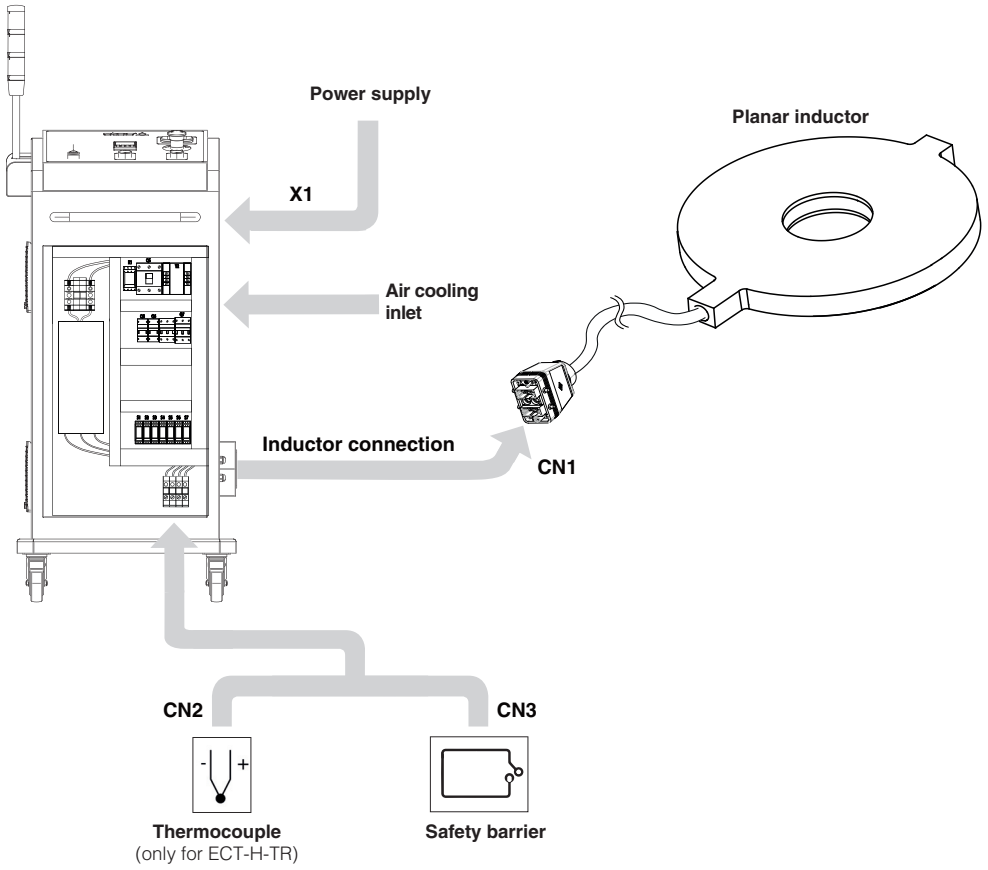
8.3 Connection of the MHB or MHP heating plate

To connect the heating plate, open the front door, remove the wall pass-through cover (on the right side of the carriage or on the bottom of the panel), insert the blanket cable through the wall pass-through and connect the quick connector to the corresponding interface inside the carriage; finally, reassemble the wall pass-through cover. The connector contains the electrical connections and the cooling air duct of the inductor.

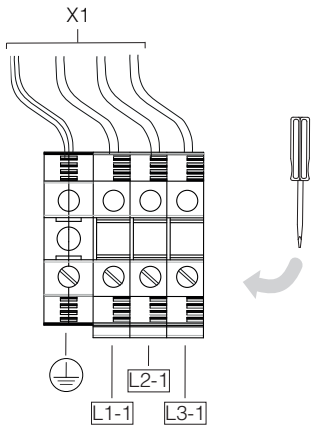
⚠ The control system can only power one heating element at a time, therefore it is not possible to connect multiple heating elements

⚠ All connections must be made exclusively by expert and qualified personnel.

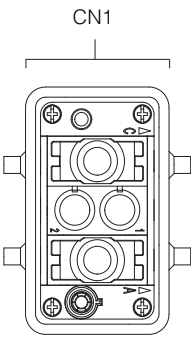
9 ECT TROLLEY CONNECTIONS



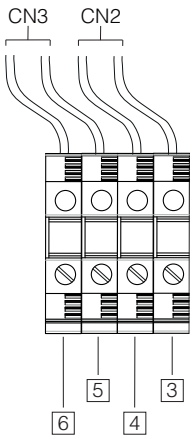
Power supply connection



Inductor connection



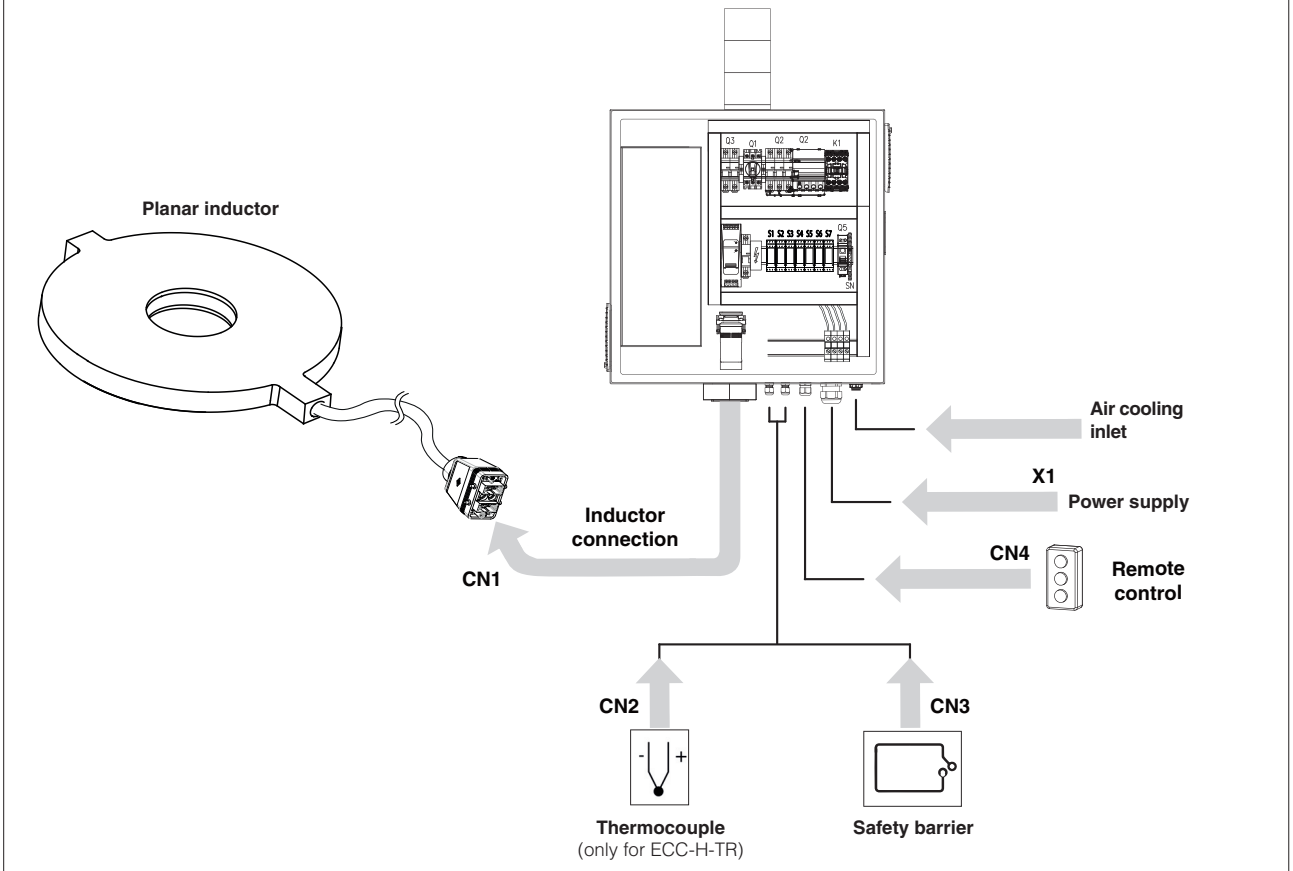
Safety switch and thermocouple connection

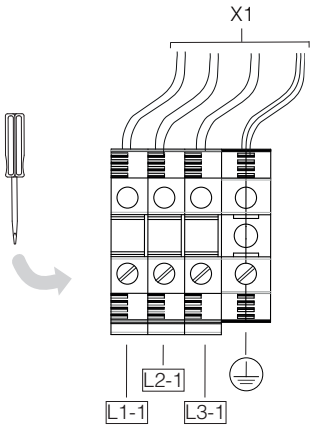


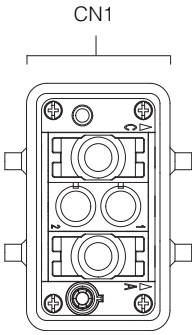
TERMINAL BLOCK	PIN	TECHNICAL SPECIFICATIONS	NOTES
X1 **(1)**	L1-1	3x400 VAC or 3x460 VAC	Power supply
	L2-1		
	L3-1		
	Yellow/green		GND connection
CN1	Planar inductor connection		
CN2 **(2)**	3	Terminal Ni-Cr (- white)	Input - Thermocouple K (only for ECT-H-TR)
	4	Terminal Ni-Al (+ green)	
CN3 **(2)**	5	24VDC (5 A max)	Input - Safety switch
	6		

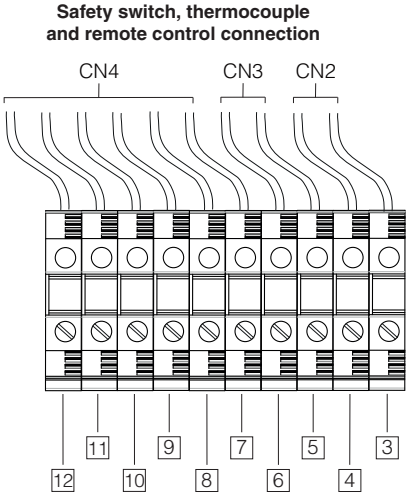
(1) Cable section: min.10 mm^2; max.16 mm^2; **(2)** Cable section max = 2,5 mm^2

10 ECC CABINET CONNECTIONS





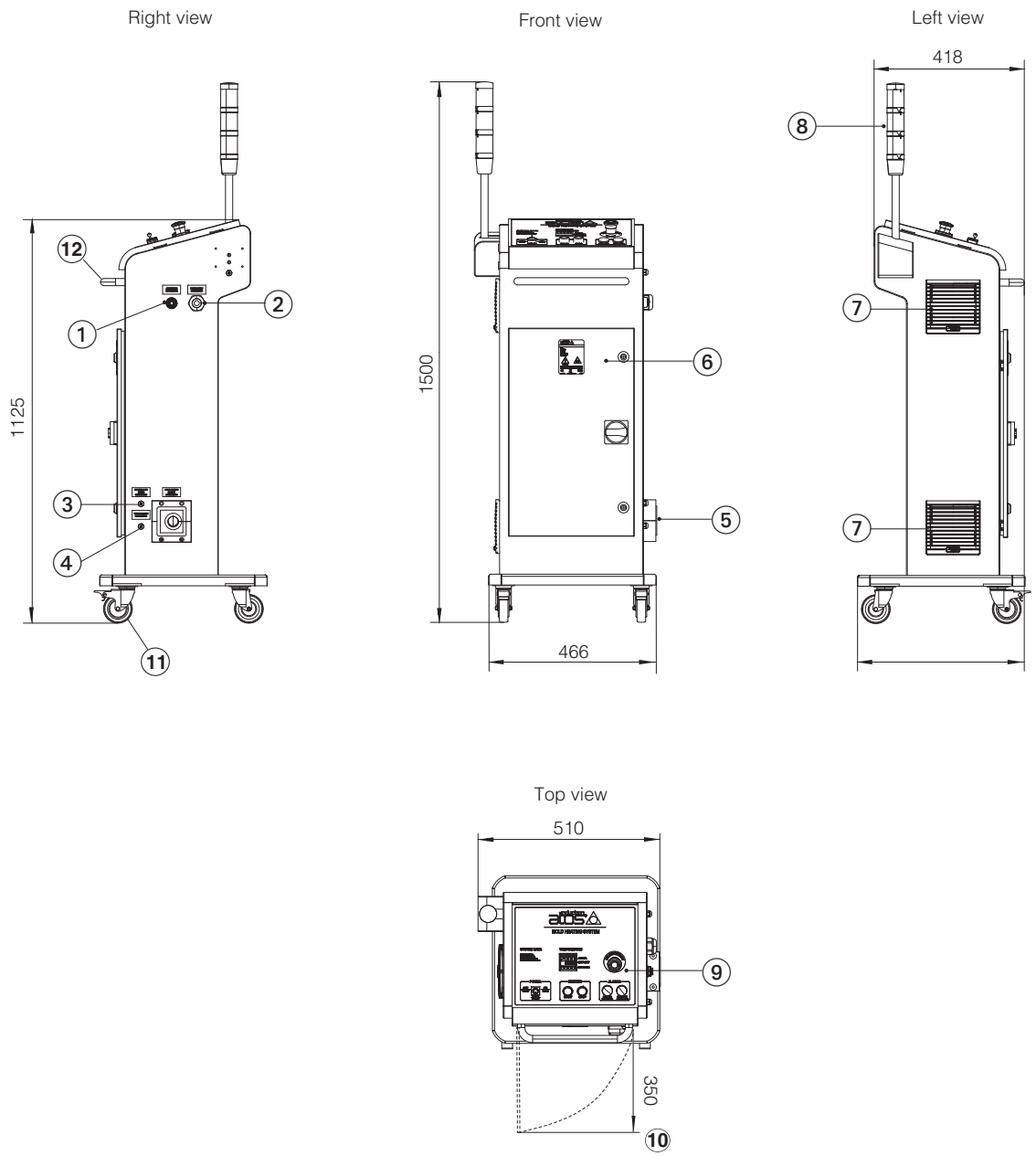




TERMINAL BLOCK	PIN	TECHNICAL SPECIFICATIONS	NOTES
X1 **(1)**	L1-1	3x400 VAC or 3x460 VAC	Power supply
	L2-1		
	L3-1		
	Yellow/green		GND connection
CN1	Planar inductor connection		
CN2 **(2)**	3	Terminal Ni-Cr	Input - Thermocouple (only for ECC-H-TR)
	4	Terminal Ni-Al	
CN3 **(2)**	5	24VDC (5 A max)	Input - Safety switch
	6		
CN4 **(2)**	7		Emergency button remote -jumper if not used-
	8		
	9		Start button remote -jumper if not used-
	10		
	11		Stop/reset button remote -jumper if not used-
	12		

(1) Cable section: min.10 mm^2; max.16 mm^2; **(2)** Cable section max = 2,5 mm^2

11 ECT DIMENSIONS [mm]



(1) Air pipe connection: Ø12

(2) Power supply cable entry - PG29

(3) Safety gate cable entry - M12

(4) Thermocouple cable entry - M12

(5) Fairlead for planar inductor cable entry

(6) Front door

(7) Cooling grids

(8) Light signalling device (stoplight)

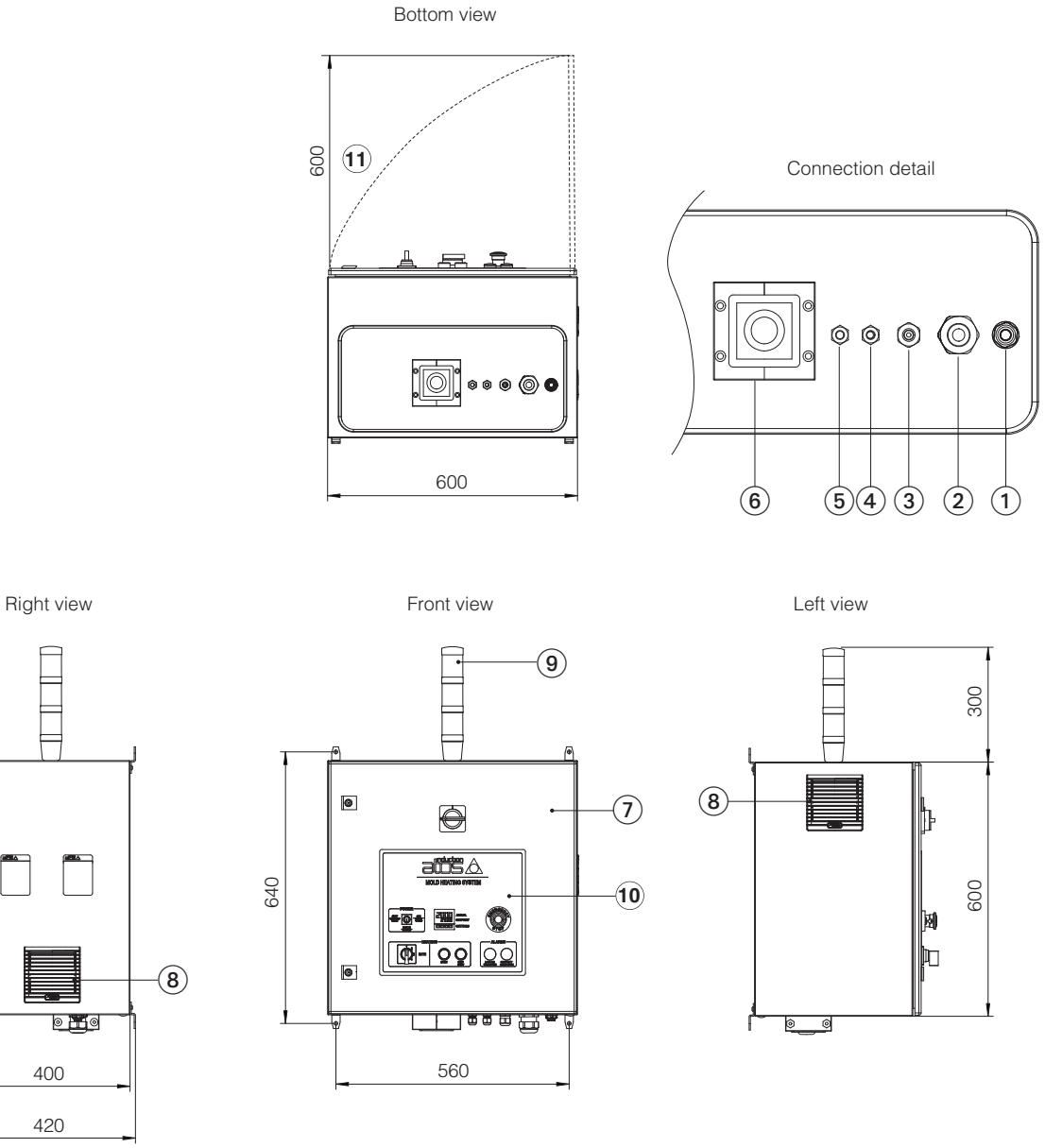
(9) Control panel

(10) Minimum space required for proper door opening

(11) Swivel wheels with brakes

(12) Handling handle

12 ECC DIMENSIONS [mm]



1. Air pipe connection: Ø12
2. Power supply cable entry - PG29
3. Remote push-button panel cable entry
4. Safety gate cable entry - M12
5. Thermocouple cable entry - M12
6. Fairlead for planar inductor cable entry
7. Front door
8. Cooling grids
9. Light signalling device (stoplight)
10. Control panel
11. Minimum space required for proper door opening

13 RELATED DOCUMENTATION

AI100	Electronic power generator	**AI300**	Inductive heating blankets
AI110	Electronic communication devices	**AI310**	Inductive heating plates