



Contactors and  
Motor Starters

Smoother running

Longer lasting



Electronic contactors  
and motor controllers



Cl-tronic™

Product  
overview and  
selection guide

# CI-tronic™ stands for high performance and long life

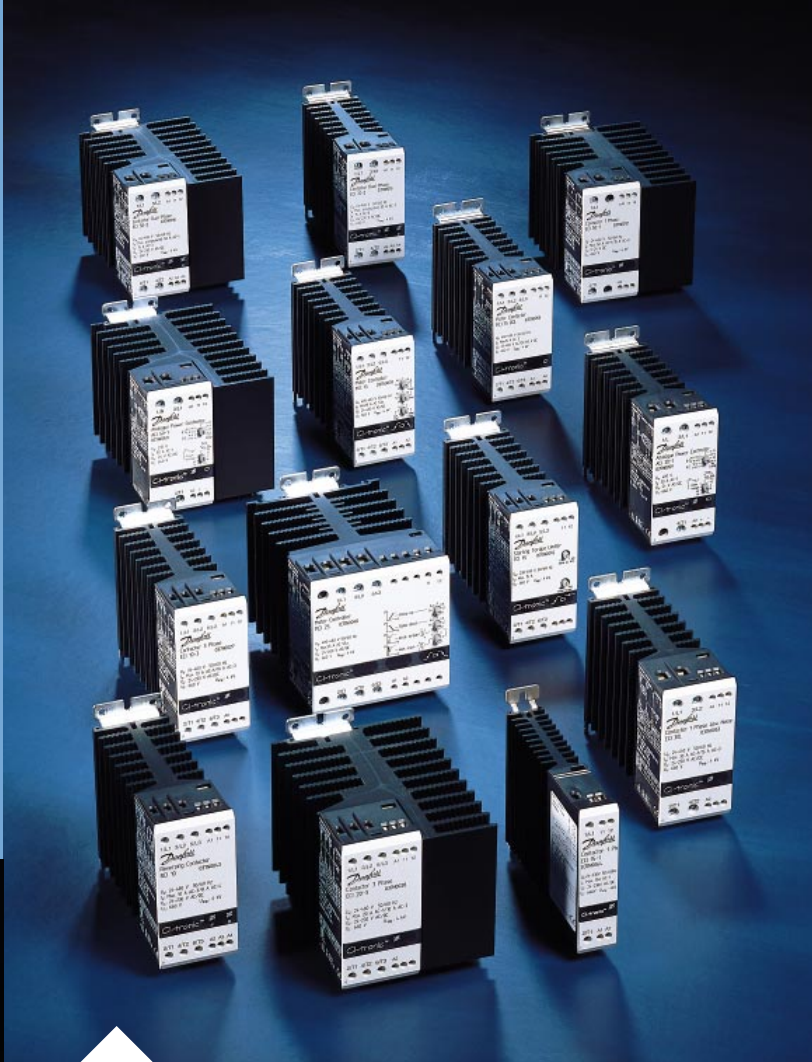
*There are many ways to control a heating process or a motor, but you'll have a hard time finding a better way than with Danfoss CI-tronic™ components.*

*The CI-tronic concept represents a breakthrough in contactor technology. In effect, we've revolutionized the solid state relay to create a range of electronic contactors and motor controllers that are as simple to use as they are advanced. On the one hand, CI-tronic contactors are as easy to specify and install as ordinary electro-mechanical components. On the other, they provide the switching speed of a solid state relay, yet thanks to their unique design outlast conventional SSRs by a factor of 10.*

*The secret? At the heart of every CI-tronic component is a new power chip that eliminates the thermal problems which cause early burnouts in traditional SSRs. We call the technology "LTE," for low thermal expansion, but bottom line for you is significantly greater reliability and operational life.*

*Danfoss CI-tronic contactors are ideal for just about any type of industrial heating application, while CI-tronic motor controllers can be used on everything from conveyors to cranes.*

*Just as important, like all Danfoss controls, CI-tronic components come with our usual assurance of global availability, fair prices, volume supply and fast delivery. And, of course, responsive service, if needed.*



## A new standard across a whole product range

*CI-tronic components set high standards for quality and reliability, but you'll also be impressed by the sheer scope of the product range. It includes both electronic contactors and analog power controllers as well as soft starters, torque limiters, reversing contactors and other types of motor controllers. Moreover, CI-tronic contactors already comply with IEC/EN 60947-4-3, the coming EU standard that will put tight new controls on ambient and operating temperatures and EMC immunity and emission.*

### Electronic contactors

ECI      Electronic contactors  
ACI      Analogue power controllers

### Motor controllers

MCI      Motor controllers (soft starters)  
TCI      Starting torque limiters  
MCI DOL   Motor contactors  
RCI      Reversing contactors

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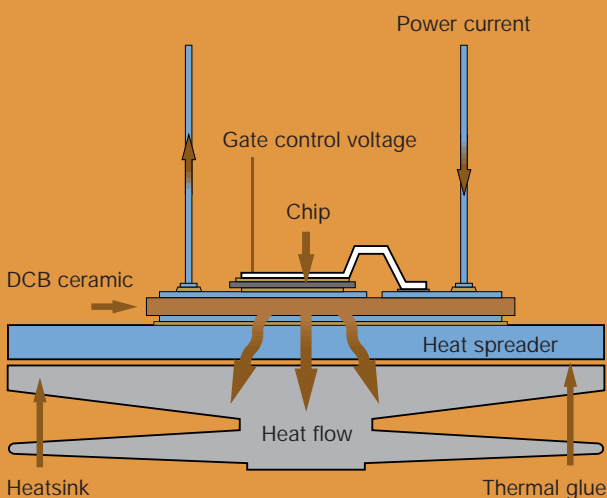
# LTE technology takes the heat off our power chip

*In conventional power relays, excessive heat generated by the power chip can lead to metal fatigue due to the different thermal expansion rates between the chip, the heat conductor and the current clip. In addition, air pockets in the soldering create hot spots on the chip, which can also impair performance and cause breakdowns. LTE technology solves the problem in a unique way to give you a high quality product with extremely long life:*

- *New materials virtually eliminate the effects of thermal expansion in the power chip*
- *New design with fewer soldering points increases heat dissipation*
- *New one-shot vacuum soldering process prevents the formation of air pockets and hot spots*



The CI-tronic power chip consists of a silicon device soldered in a sandwich construction between a current clip and a heat conductor assembly. The chip allows current to flow when a control voltage is applied to the gate.



## And they're as easy to specify and install as ordinary contactors

*Contactors and motor controllers play a relatively small if crucial role in most processes, so why should choosing the right component be so complicated. You'll find CI-tronic components refreshingly easy to work with — as simple to specify and install as standard electro-mechanical devices and vastly easier to deal with than conventional SSRs. It only takes a moment to configure them, and there's no need for heat sinks or varistors. CI-tronic components can be dimensioned to their full rated power and are delivered as a completely engineered product featuring:*

- *Compact modular construction*
- *DIN-rail mountable design*
- *Industry standard ratings*
- *Universal control voltages*
- *LED status indicators*
- *Logical control settings*



# CI-tronic means fewer burnouts, better process control, longer heater life

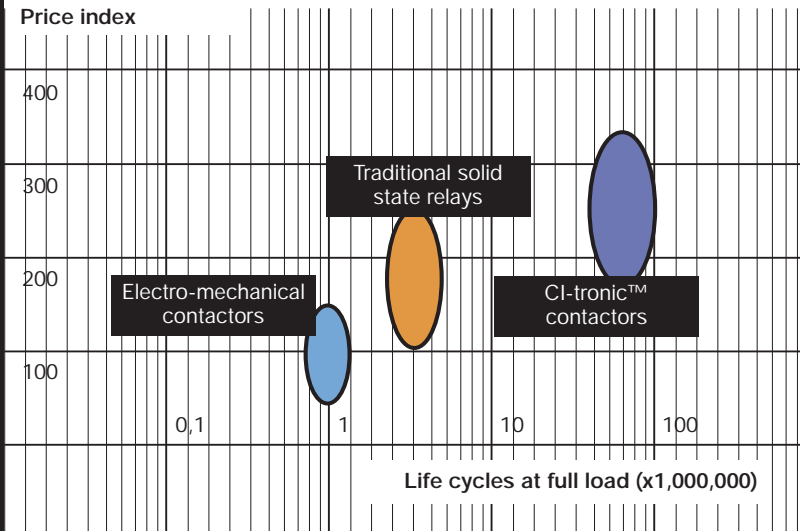
*It can happen to any OEM. You deliver a large and expensive system to a customer far from home. One day there's a breakdown and an urgent call for help. A service rep is dispatched to solve the problem only to find a burned out contactor in the heater system — a small fault but one that ends up costing you time, money, maybe even a little goodwill.*

*Whether you're producing equipment for injection molding, die casting, shrink wrapping or baking, constant operation eventually takes its toll on your heat control switch. Naturally, you can help avoid the unexpected by choosing contactors that are reliable. But you can also make contactor replacement an even rarer occurrence by equipping your system with CI-tronic components.*

*CI-tronic contactors are purpose-built for demanding industrial applications — or applications where you just don't want to risk that unexpected call in the night. With LTE technology, burnouts due to thermal stress become a very remote concern. CI-tronic contactors outlast solid state relays by a factor of 10 and outperform electro-mechanical contactors by an even wider margin. And they're price competitive, too.*

*CI-tronic products also give you better control of your heating process and longer heater life. Control is improved by the use of faster switching patterns which provide more stable process temperatures, which in turn reduces thermal stress and extends heater life.*

**CI-tronic contactors outlast solid state relays by a factor of 10**



CI-tronic™  
Electronic contactors

## CI-tronic also represents an affordable breakthrough in motor controls

*Soft starters are a tested way to keep torque surges in AC motors from damaging the equipment they're meant to control — nothing new about that. What is new, however, is that now there's an affordable line of these controls designed specifically for smaller motors — the CI-tronic range from Danfoss.*

*CI-tronic motor controllers cover the power range from 0.1 to 11 kW. They're ideal for applications that require smooth starting and stopping but that don't call for the expense of a conventional soft starter. Use them on pumps, fans, conveyors, gear or belt-driven machinery and countless other types of equipment. They provide precise control while reducing the shocks and vibrations that are a major cause of equipment failure and downtime. In addition, by reducing inrush currents during motor startup they eliminate power dropouts that can damage sensitive electronic equipment, saving you the expense of having to reinforce the line.*

*There are also a variety of CI-tronic controllers for more specialized tasks. For example, our motor contactors and reversing contactors are ideal for applications with frequent starts and stops. A zero cross-switching technique is used (the contactor always switches when the voltage is zero) to ensure speed and accuracy. These reliable products provide long service on everything from automatic doors to thread cutting machines and are an effective way to control difficult functions like "inching" on cranes.*

*Finally, for less demanding applications it's hard to beat our starting torque limiters, which offer the dependability of CI-tronic technology at highly attractive prices.*



## Motor controllers

CI-tronic™



CI-tronic motor controllers can be adjusted precisely for the needs of your application. Ramp-up and ramp-down times can be set from 0.5-10 seconds. Starting torque can be adjusted from 0-85% of nominal torque. And for applications with high breakaway torque the controller can provide a kickstart of full torque for 200 ms.





## Everyone benefits

*Regardless of the application, CI-tronic motor controllers provide smooth and precise starting and stopping while reducing wear and tear on your equipment. But they also benefit individual applications in specific ways.*

### Conveyors and packaging equipment

- *Smooth operation prevents tilting and spills*
- *Less stress on belts/chains prevents snapping/breakage*
- *Long life on indexing and reversing*
- *Unlimited start/stop*

### Automatic doors

- *Smooth opening and closing*
- *Faster operation*

### Cranes

- *No rough stops when clutch brake is engaged*
- *No gearbox damage due to operator inching*

### Fans

- *No belt squirreling or snapping*
- *Reduced number of belts*

### Pumps

- *No water hammering*
- *No damaged piping due to pressure peaks*

### Compressors

- *Reduced starting current eliminates line voltage drop*

### Tooling machines

- *Long life on indexing*
- *Fast reversing*

# Starting torque limiters Type TCI



## Features

- Adjustable ramp-up time, from 0.5-5 seconds
- Initial torque adjustable from 0-85%
- Single and three-phase operation
- LED status indicator
- Built-in varistor protection
- Unlimited start/stop operations per hour
- IP 20 protection
- Compact DIN-rail mountable design



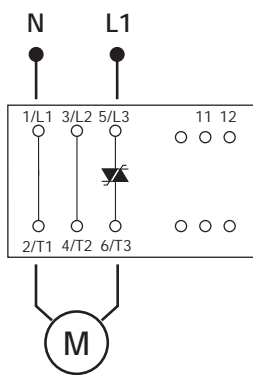
General Type	TCI 15	TCI 25
Product description	TCI starting torque limiters are designed for soft starting of 1 and 3-phase AC motors. The TCI unit is easy to install between the motor starter and the motor, and features adjustable ramp-up time and initial torque.	
Typical applications	AC motor application where a soft start is required, such as conveyors, fans, compressors and high inertia loads.	
Design standard	IEC/EN 60947-4-2	
Approvals	CE, CSA and NRTL/C (in compliance with UL 508)	
Output specifications		
Operational current AC-3, AC-53a and AC-58a (motor load)	15 A	25 A
Motor size at: 208 - 240 V a.c. 400 - 480 V a.c. 550 - 600 V a.c.	0.1 - 4.0 kW (0.18-5 HP) 0.1 - 7.5 kW (0.18-10 HP) 0.1 - 7.5 kW (0.18-10 HP)	0.1 - 7.5 kW (0.18-10 HP) 0.1 - 11 kW (0.18-15 HP) 0.1 - 18kW (0.18-25 HP)
Minimum operational current	50 mA	
Overload current profile	X-Tx: 8-3	
Overload relay trip class	Class 10	
Semiconductor protection fusing type 1 co-ordination type 2 co-ordination	50 A gL/gG 1800 A <sup>2</sup> S	50 A gL/gG 1800 A <sup>2</sup> S
Thermal specifications and environment		
Power dissipation, continuous duty	1 W/A	
Power dissipation, intermittent duty	1 W/A. x duty cycle	
Ambient temperature range	0 to 45° C	
Cooling method	Natural convection	
Mounting	Vertical (see also general mounting instructions)	
Max. ambient temperature with limited current	60° C, see derating for high temperatures in chart below	
Storage temperature range	-20 to 80° C	
Protection degree/pollution degree	IP 20/3	
Insulation specifications		
Rated insulation voltage, U <sub>i</sub>	660 V	
Rated impulse withstand voltage, U <sub>imp</sub>	4 KV	
Installation category	III	
Control specifications		
Ramp-up time	Adjustable from 0.5 - 5 seconds	
Initial torque	Adjustable from 0 - 85% of nominal torque	
EMC immunity	Meets requirements of EN50082-1 and EN 50082-2	

## Selection guide

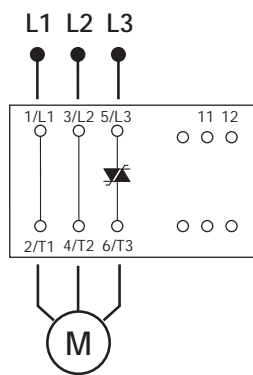
Operational voltage	Motor current max.	Motor power max.	Dimensions	Type	Code no.
208-480 V a.c.	15 A	4.0 kW/5.5 HP	45 mm module	TCI 15	037N0045
	25 A	7.5 kW/10 HP	45 mm module	TCI 25	037N0046
480-600 V a.c.	15 A	7.5 kW/10 HP	45 mm module	TCI 15	037N0047
	25 A	18.5 kW/25 HP	45 mm module	TCI 25	037N0048
690 V a.c.	25 A	18.5 kW/25 HP	45 mm module	TCI 25	037N0049

## Wiring and functional diagrams

Single phase operation



Three phase operation

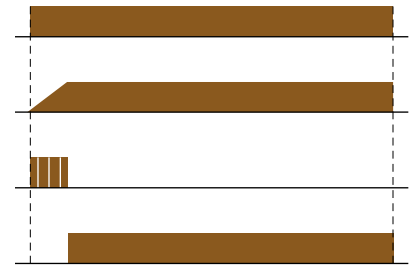


Mains voltage (L1, L2, L3)

Motor voltage

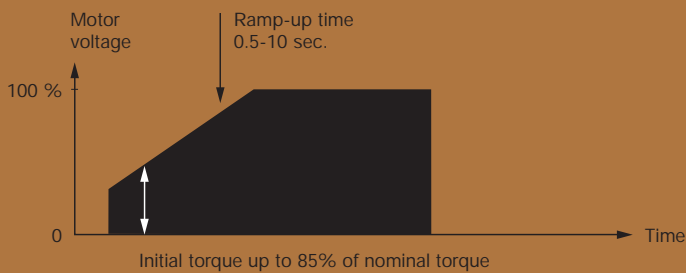
LED 1

LED 2



## Adjustments

Control of the motor is achieved by acting on the motor voltage. The motor speed will depend on the actual load on the motor shaft. A motor with little or no load will reach full speed before the voltage has reached its maximum value.



## Motor overload and short circuit protection

Overload and short circuit protection of the motor is easily achieved by installing a circuit breaker on the supply side of the motor controller.

Select the circuit breaker from the selection table according to the rated nominal operational current of the motor.

A CTI 25 circuit breaker will ensure a type 2 coordination protection and eliminate the need for separate thermal overload relay and semiconductor fuses.

Motor full load current A	Danfoss CTI 25 circuit breaker Code no.
0.1-0.16	047B3020
0.16-0.25	047B3021
0.25-0.4	047B3022
0.4-0.63	047B3023
0.63-1.0	047B3024
1.0-1.63	047B3025
1.6-2.5	047B3026
2.5-4.0	047B3027
4-6.3	047B3028
6-10	047B3029
10-16	047B3030
16-20	047B3031
20-25	047B3032

## Operating at high temperatures

If the motor controller is placed inside small cabinets, care must be taken to avoid exceeding the max. ambient temperature. Otherwise the current must be derated according to table.

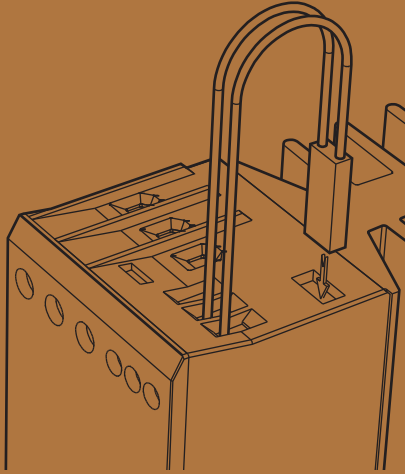
*For further information on dimensions, mounting and temperature overload protection see common information, page 24.*

Ambient temperature	TCI 15	TCI 25
40° C	15.0 A	25.0 A
50° C	15.0 A	25.0 A
60° C	15.0 A	20.0 A



# Temperature overload protection

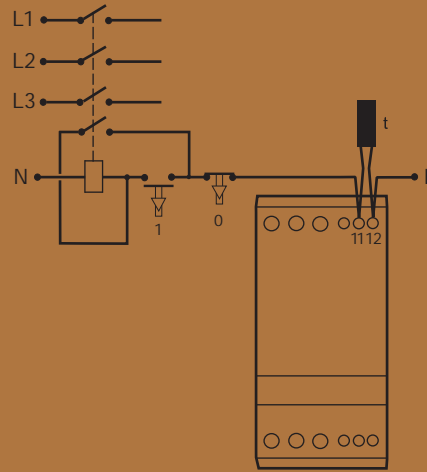
## Thermal overload protection of controller



Optional thermal overload protection is possible by inserting a thermostat in the slot on the right-hand side of the controller.

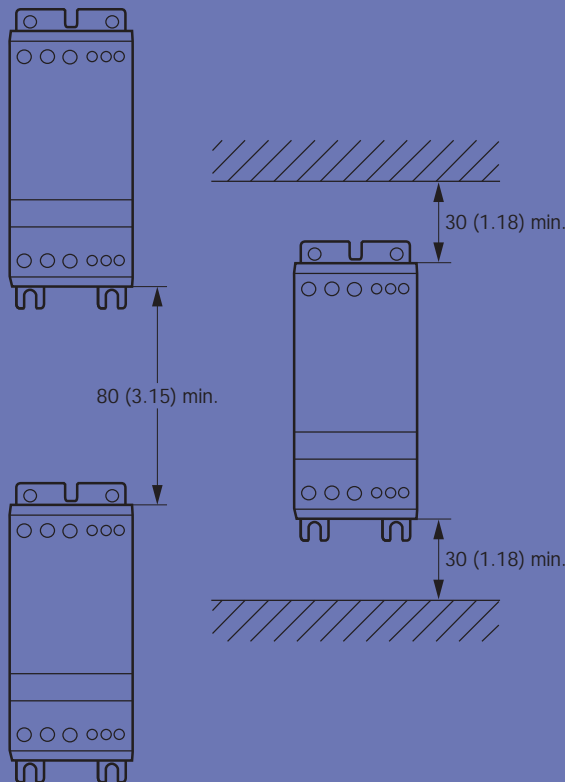
Order: UP62 thermostat 037N0050

## Wiring of overload protection

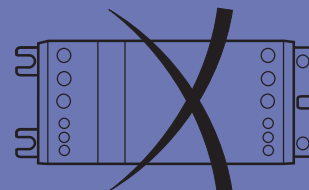
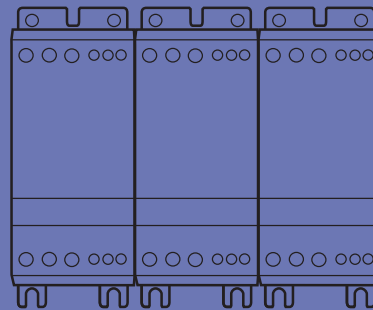


The thermostat is connected in series with the control circuit of the main contactor. When the temperature of the heat sink exceeds 100° C the main contactor will be switched OFF. A manual reset is necessary to restart this circuit.

## Mounting instruction in mm (inches)

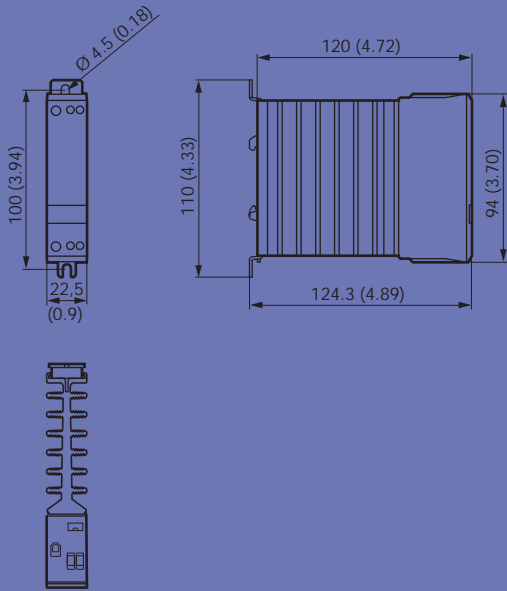


If unit is mounted horizontally, derate current by 50%. Keep heat sink clean. Airflow should not be blocked.

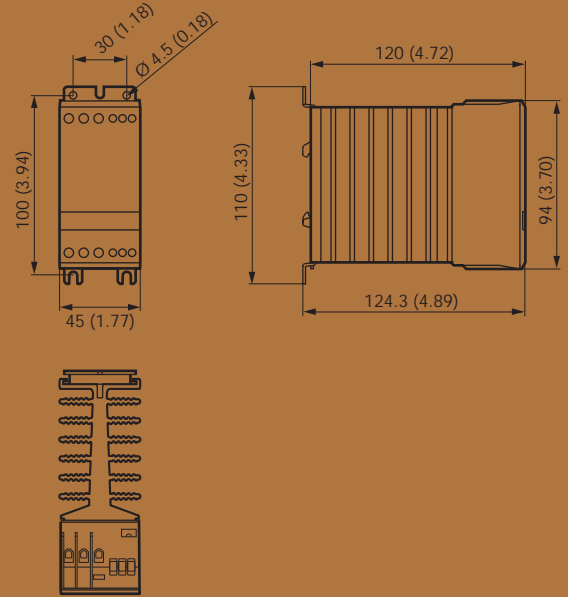


# Dimensions in mm (inches)

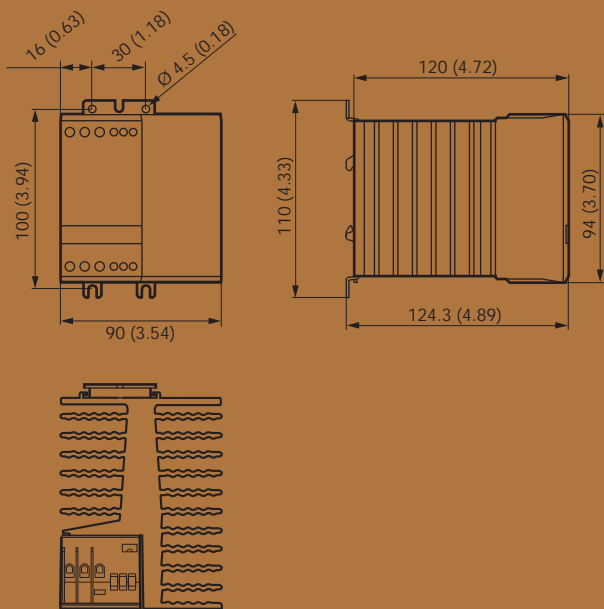
## Type ECI 15



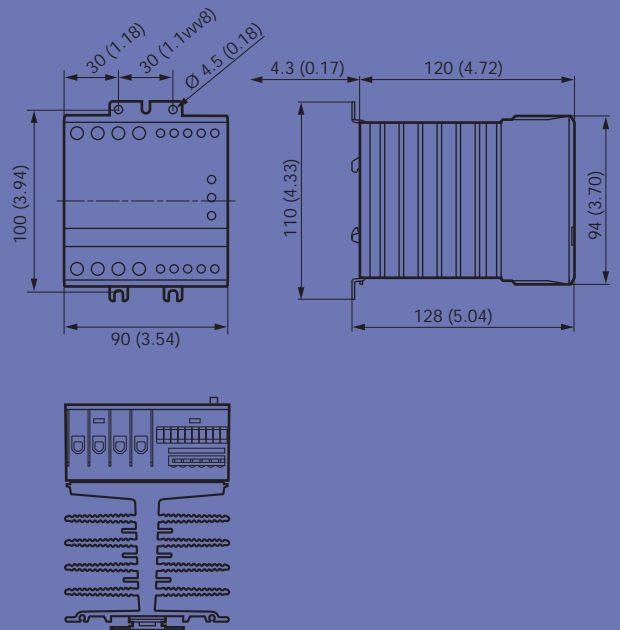
## Type ACI 15, ECI 30, MCI 15, TCI 15, TCI 25, RCI 10, and MCI 15DOL



## Type ACI 50, ECI 50



## Type MCI 25, MCI 25B





Contactors and motor starters

Pressure and temperature controls

Industrial valves

## One call and you're in control

*One call to Danfoss gives you access to an entire range of high-quality industrial controls. The Danfoss line encompasses components for industrial monitoring and control systems based on the principles of pressure and temperature measurement, electrical power, and fluid control, and includes:*

- Electro-mechanical contactors
- Electronic contactors and motor controllers
- Pressure and temperature switches
- Pressure transmitters
- Temperature sensors and transmitters
- Solenoid valves
- Externally operated valves
- Thermostatically operated valves

*Given their important monitoring and control functions, Danfoss components are designed for accuracy, reliability and long life. And our determination to guarantee a high-quality product is matched by an equally strong commitment to customer service. A specialist in the Danfoss industrial controls group can advise you on product selection and configuration, based on long experience in your industry. You'll find that with sales and service centers in over 100 countries, Danfoss is usually only a local call away.*

