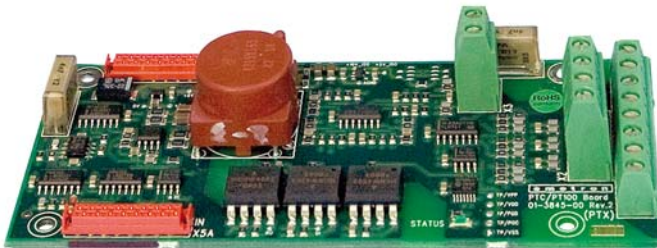




PTC/PT100 board 2.0

Option

For Emotron VFX/FDU 2.0 AC drive
Emotron VFXR/FDUL
Emotron FlowDrive
Emotron TSA softstarter



Instruction Manual
English

PTC/PT100 board 2.0

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Instruction Manual - English

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Safety

Instruction manual

Read this instruction manual first!

This option is a supplementary part of the “main product” and the user must be acquainted with the original instruction manual of the main product. All safety instructions, warnings, etc. as mentioned in this instruction manual must be known to the user.

Safety instructions

Read the safety instructions in the instruction manual for the main product.

Installation

Installation, commissioning, dismantling, making measurements, etc. on the main product may only be carried out by personnel who are technically qualified for the task. Installation must also be carried out in accordance with the local standards. Ensure that all necessary safety measures are taken.



WARNING!

Take all necessary safety precautions during installation and commissioning to prevent personal injuries, e.g. by an uncontrolled load.

Opening the main product



WARNING!

Always switch off the mains supply before opening the main product.
For AC drives, wait at least 7 minutes to allow the buffer capacitors to discharge.

Always take adequate precautions before opening the main product, even though the connections for the control signals and jumpers are isolated from the mains voltage.

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1. Introduction

This board is used to connect motor thermistors (PTC) acc. to DIN44081/44082 and/or PT100 sensors acc. to IEC 60 751 to the main product. Note that both the PTC and the PT100 sensors need to be isolated from live voltage, see § 2.2.4, page 12 for further details.

There are three terminals on the option board, X1 - X3. X1 and X2 are for PT100 input and X3 for PTC input. It is possible to mount two PTC/PT100 boards and thereby receiving up to 6 PT100 inputs on Emotron FDU and VFX -IP54, -IP2X AC drives and Emotron TSA softstarters.

Both PTC and PT100 functions can be used for thermal motor protection. When the monitored temperature e.g. motor temperature becomes too high, the main product will trip.

The PT100 function can be used as a process temperature feedback to optimise the control. The PT100 function can also be used for monitoring measured temperatures by the analogue comparators and the programmable levels.

2. Connections and functions

2.1 Board layout

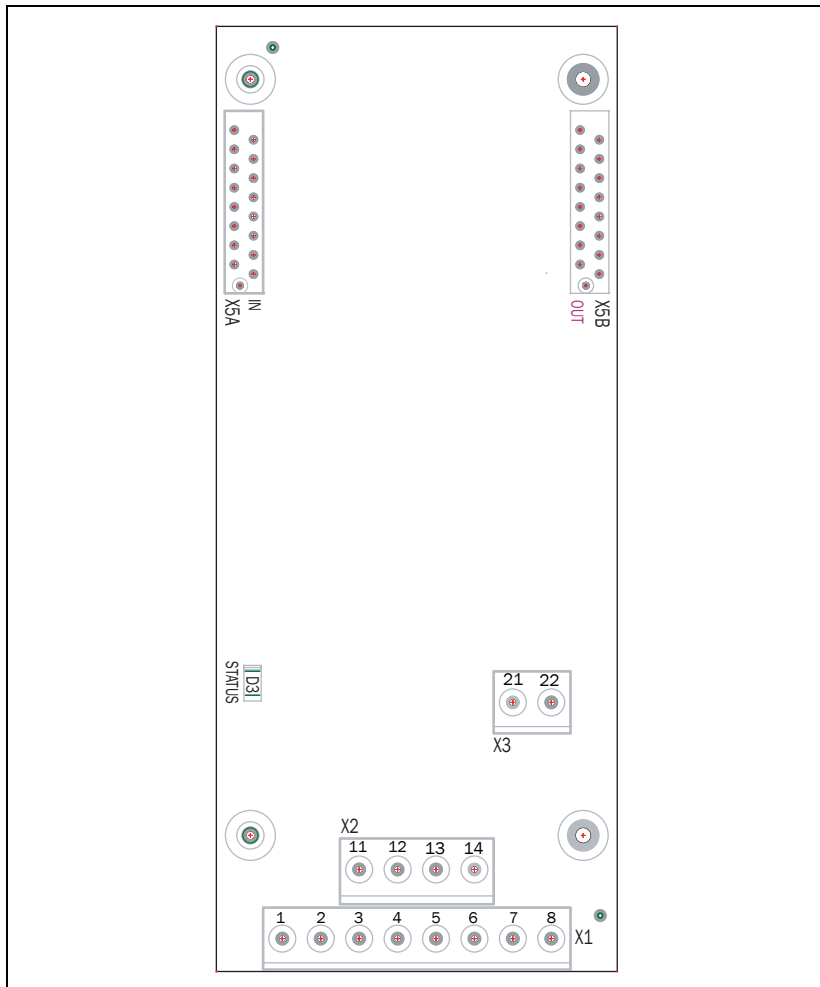


Fig. 1 PTC/PT100 option board layout

2.2 General information

2.2.1 Menus

The following menus are available when the PTC/PT100 option board is installed in the main product.

All menus are described in the manual for the main product.

Menus for Emotron FDU/ VFX AC drives

Table 1 Menus for AC-drives available with the PTC/PT100 option board

Menu	Function	Default	Range/Selection
234	Thermal protection	Off	Off = No thermal protection PTC = PTC protection enabled PT100 = PT100 protection enabled PTC+PT100 = Both protections enabled
235	Motor Class	F140	A 100°C, E 115°C, B 120°C, F 140°C, F Nema 145°C, H 165°C
71B	PT100 1, 2, 3	-	Shows the measured temperatures with a resolution of 1 degree, for all three PT100 inputs.
71C	PT100 4, 5, 6	-	Shows the measured temperatures with a resolution of 1 degree, for all three PT100 inputs on the second option board if installed.

Menus for Emotron TSA softstarter

Table 2 *Menus for Emotron TSA available with the PTC/PT100 option board*

Menu	Function	Default	Range/Selection
21C	Units	SI	SI/US
71B	PT100B1 123	-	Shows the measured temperatures with a resolution of 1 degree, on the first PTC/PT100 option board.
71C	PT100B2 123	-	Shows the measured temperatures with a resolution of 1 degree, on the second PTC/PT100 option board.
232	PT100 Alarm		
2321	PT100 Alarm action	No Action	No action, Hard trip, Soft trip, Warning
2322	Motor Class	F140	A 100°C, E 115°C, B 120°C, F 140°C, F Nema 145°C, H 165°C
2323	PT100 inputs	PT100 1-3	Select active inputs: PT100 1, PT100 1-2, PT100 1-3, PT100 1-4, PT100 1-5, PT100 1-6 (1 - 3 = Board 1, 4 - 6 = Board 2)
233	PTC Alarm		
2331	PTC Alarm action	No Action	No action, Hard trip, Soft trip, Warning
2332	PTC Inputs	PB-PTC	PB-PTC = Power board PTC input is enabled. Note! not available on this option board, see main product instruction manual. PB-PTC & Opt1 = both the PTC input on the power board and on the first option board are enabled. PB-PTC & Opt1-2 = both the PTC input on the power board and on both option boards are enabled.

NOTE: Always use the on board (main product) PTC input (PB-PTC) first. Additional PTC's can be connected to first and second option board.

2.2.2 Status LED

For location of status LED, see Fig. 1.

Table 3 Specification of status LED

LED	Specification
D3	Flashing slowly (1 Hz) = OK Flashing fast = communication error Off = no power supply

2.2.3 Cable recommendations and shielding

Shielded twisted pair cables are recommended. Connect the cable shield firmly (low ohmic connection) to the mounting plate (PE) according to Fig. 2 on AC drives or Fig. 3 on Emotron TSA.

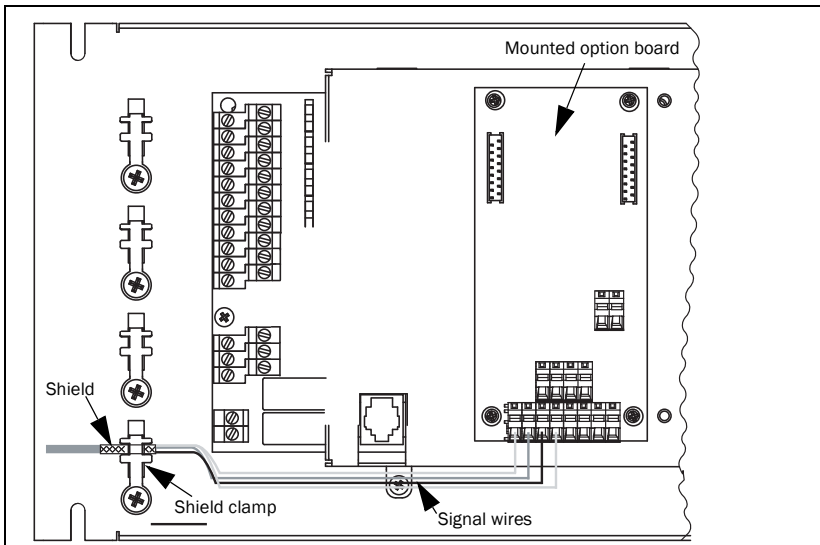


Fig. 2 General shielding principle on AC drives

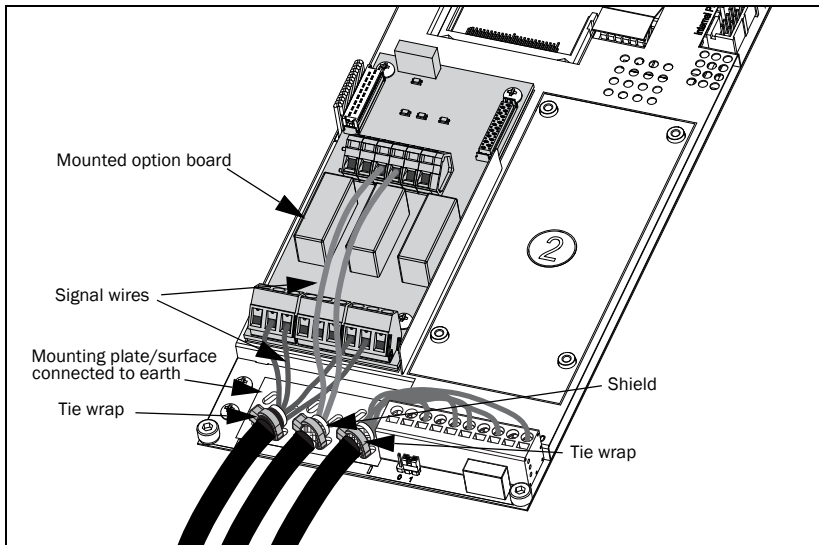


Fig. 3 General shielding principle on Emotron TSA softstarter (example with I/O board)

The shield must end at the Clamp/tie wrap. Only the signal wires should continue to the terminals of the PTC/PT100 option board.

In most cases it is recommended that both ends of the shield are connected to PE. This will give a good attenuation of high frequency interference. Shield connections should be made using the largest possible surface.

Make sure that you select a cable of material appropriate for your environment. Consider ambient temperature, humidity and occurrence of chemical substances such as oil. Standard copper wire with cross-sectional area of approximately $0.14 - 1.5 \text{ mm}^2$ will be sufficient in most cases.

2.2.4 Isolation

The control board in the main product is a Separated Extra Low Voltage (SELV) circuit. This means that this board is safely separated from other circuits that carry higher voltages and is isolated from earth and protective earth conductors of other circuits. The PTC/PT100 circuit on this option board is separated from the control board SELV circuit with separation rated for:

1. Double insulation when used in main product rated up to 480 VAC.
2. Basic insulation when used in main product rated up to 690 VAC.

It is recommended that the PTC/PT100 sensors are always separated from live parts with at least basic insulation for the relevant voltage.



WARNING!

For main products rated higher than 480 VAC it is mandatory to have at least basic insulation between the temperature sensor and live voltage.

2.3 PTC input

This PTC input is for safety reasons isolated from internal supplies and electronics, see § 2.2.4, page 13 for detailed information. The PTC sensor should be connected to terminal X3. No polarisation is needed. Up to six PTCs may be connected in series according to DIN44081/44082.

Table 4 Terminal configuration for PTC connection

X3	Name	Function
21	T1	PTC input
22	T2	PTC input

2.3.1 Electrical specification

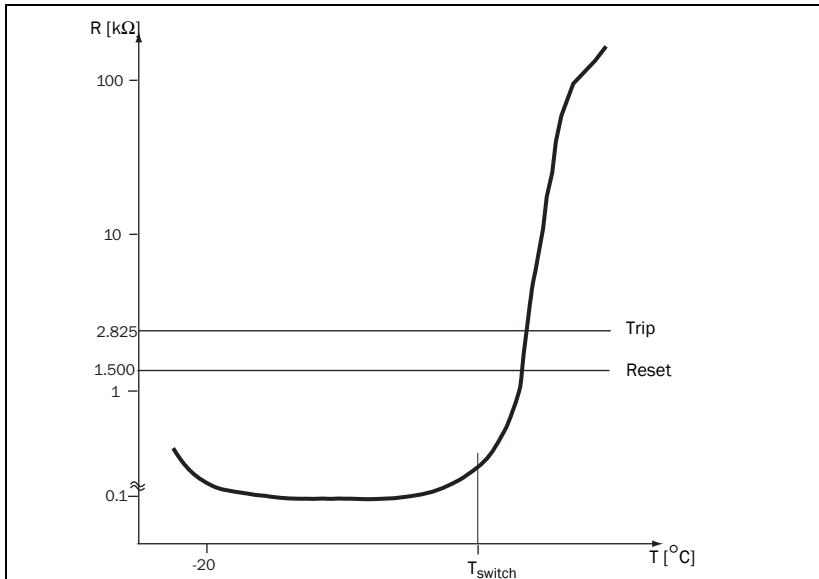


Fig. 4 Typical PTC-curve

The figure above shows a typical PTC-curve. The resistance increases drastically with the temperature after a certain switch temperature, T_{switch} , which is typically 60 - 120 °C (depending on PTC type).

Table 5 Electrical specifications for the PTC input

Number of PTCs	1 to 6 in series acc. to DIN44081/44082
Trip at	2,825 $\Omega \pm 10\%$
Reset at	1,500 $\Omega \pm 10\%$
Measurement voltage U_{T1-T2} at $\leq T_{\text{switch}}$	<1 VDC

2.3.2 PTC connection example

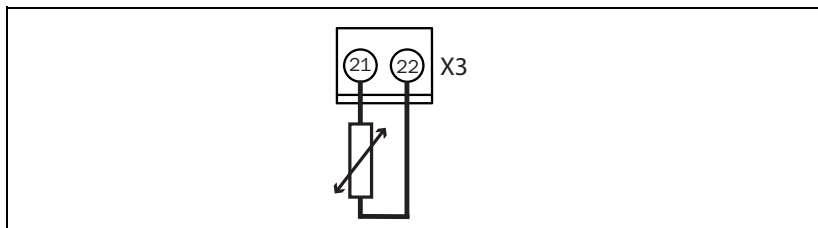


Fig. 5 Connecting a PTC

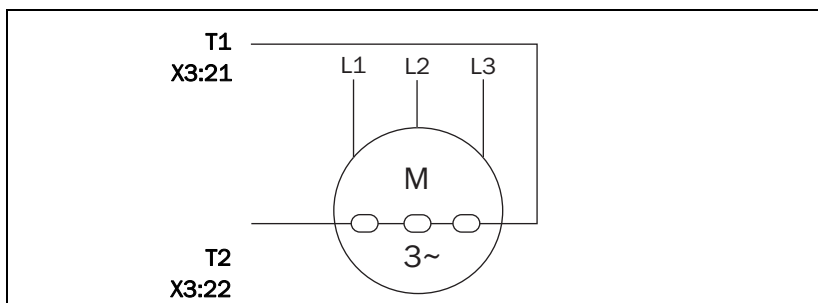


Fig. 6 Example of an application with three PTCs in series.

2.4 PT100 input

The PT100 input is according to EN60751. Connector X1 and X2 on the PTC/PT100 option board have the following terminal configuration:

Table 6 Terminal configuration for PT100 input

X1	Name	Function
1	Feed_1+	Constant current feed channel 1
2	PT100_1+	Positive input for PT100 channel 1
3	PT100_1-	Negative input for PT100 channel 1
4	Feed_1-	Constant current feed channel 1
5	Feed_2+	Constant current feed channel 2
6	PT100_2+	Positive input for PT100 channel 2
7	PT100_2-	Negative input for PT100 channel 2
8	Feed_2-	Constant current feed channel 2

X2	Name	Function
11	Feed_3+	Constant current feed channel 3
12	PT100_3+	Positive input for PT100 channel 3
13	PT100_3-	Negative input for PT100 channel 3
14	Feed_3-	Constant current feed channel 3

NOTE: PT100 inputs which are left unconnected will indicate a temperature of approximately -99 degrees.

2.4.1 Electrical specifications

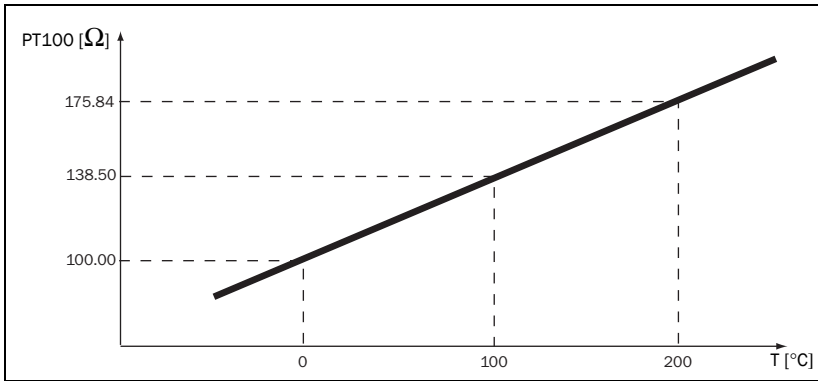


Fig. 7 Graph of the PT100 resistance/Temperature relationship.

Table 7 Electrical specifications for PT100 input

Standard	EN60751
Temperature range	-100°C to +300°C
Accuracy	≤1% off full scale

Menu [71B] in the main product shows the temperatures measured for the PT100 element, with a resolution of 1 degree, for each PT100 inputs.

Menu [71C] in the main product shows the element measured temperatures, with a resolution of 1 degree, for all three PT100 inputs on the second installed PTC/PT100 option board.

2.4.2 PT100 connection examples

Three PT100 channels are available for temperature measurement. All three PT 100 channels (X1, pins 1-8 and X2, pins 11-14) can be used as a 4-wire input which can be used for precision measurement to avoid measurement errors due to resistance in connecting wires.

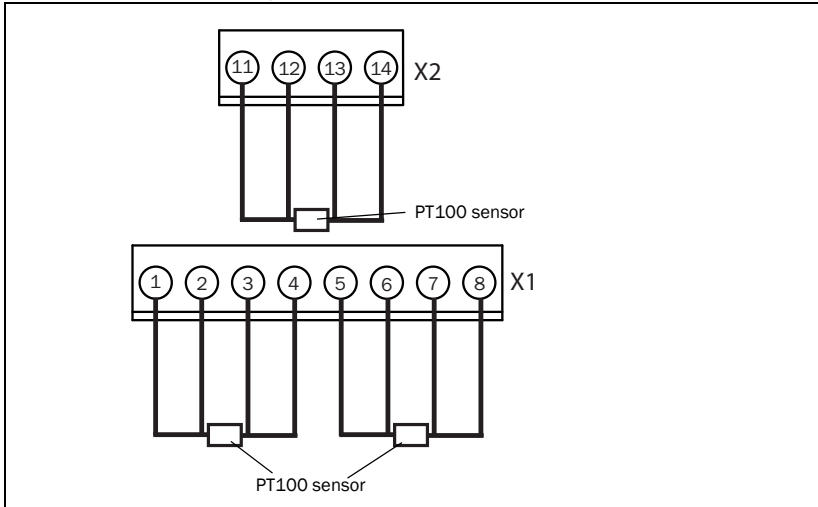


Fig. 8 Connecting PT100 sensors for 4-wire temperature measurement

NOTE: To achieve proper 4-wire temperature measurement it is important that Feed_x+ is connected to PT100_x+ and Feed_x- is connected to PT100_x-. Make sure that the terminal screws are tightened to achieve a low ohmic connection.

It is also possible to use these 4-wire inputs as a 2-wire input by putting a jumper between Feed_x+ and PT100_x+ and one between Feed_x- and PT100_x-. See figure below.

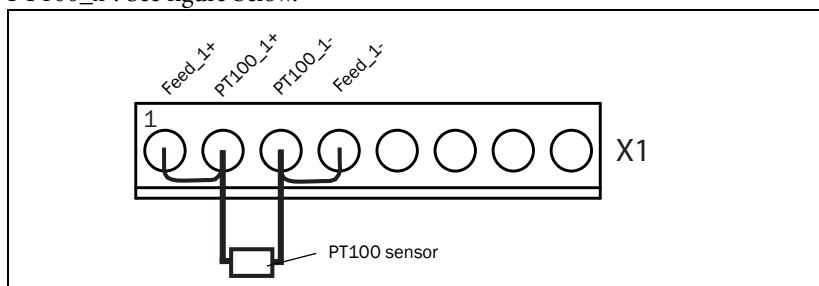


Fig. 9 Using 4-wire input as 2-wire input.

Motor thermal protection

Emotron AC Drives. When the PT100 function is enabled by selecting function PT100 or PTC+PT100 in menu [234] and the correct motor class is selected in menu [235] this PT100 function will automatically protect the connected motor against overheating.

Emotron TSA. When the PT100 function is enabled by selecting function PT100 or PTC+PT100 in menu [232] with submenus and the correct motor class is selected in menu [2322] this PT100 function will automatically protect the connected motor against overheating.

For PT100 supervision and alarm, setup menus:

[2321] "PT100 Alarm action",

[2322] "Motor class",

[2323] "PT100 inputs" accordingly.

For PTC supervision and alarm, setup menus:

[2331] "PTC Alarm action"

[2332] "PTC inputs" accordingly

Process value

When PT 100 is selected in menu [321], the PT100 element is used for feedback of e.g. the actual process temperature.

In Emotron AC drives this can be used with the process PID regulator. to establish an optimised temperature control.

In Emotron TSA softstarters the PT100 temperature signals can be used for temperature start/stop control.

Monitoring

Example:

PT100_1, PT100_2 or PT100_3 is selected as a Comparator Value in one of menus [6111] to [6114]. The measured temperature for the concerning PT100 can be used to monitor the temperature level. This analogue comparator output can activate a (alarm) signal via Digital Output or Relay. It can also be used to start an action (e.g. start/stop) in combination with the comparator and the Virtual Connections. See the main product instruction manual for more information.

3. Installation, AC drives

3.1 Installation in type IP54, IP20/21 and IP23



This chapter describes how to mount option boards in the AC drive.

On these AC drives up to three different option boards and one communication board can be mounted.

The option kit includes

- option board.
- Four screws, M3 x 6.
- One 16-pole flat cable, approx. 75 mm long. This cable is used to connect the first option board.
- One 16-pole flat cable approx. 32 mm long, for connection between two option boards.
- Insulating sheet.

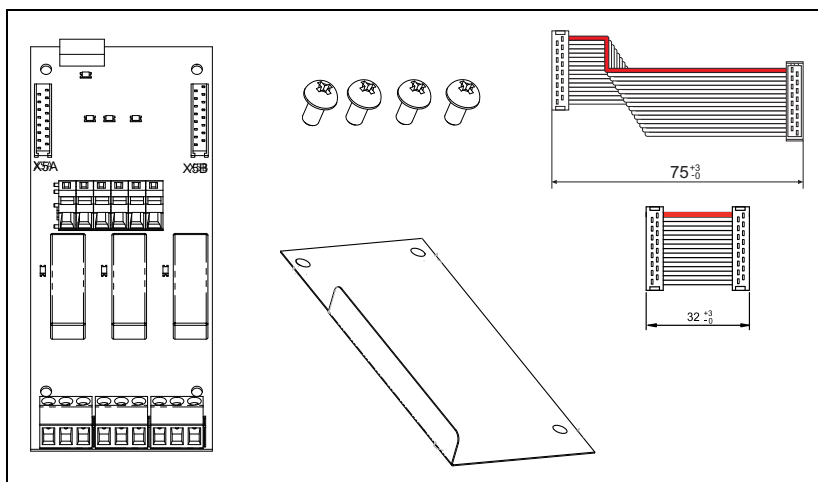


Fig. 10 Option kit contents

3.1.1 Polarisation of flat cables

The flat cable is marked with a colour on one side and has a pin on the micromatch male contact. This side must be matched to the female micromatch contact on the control board and option board respectively, where a small hole in the board is located.

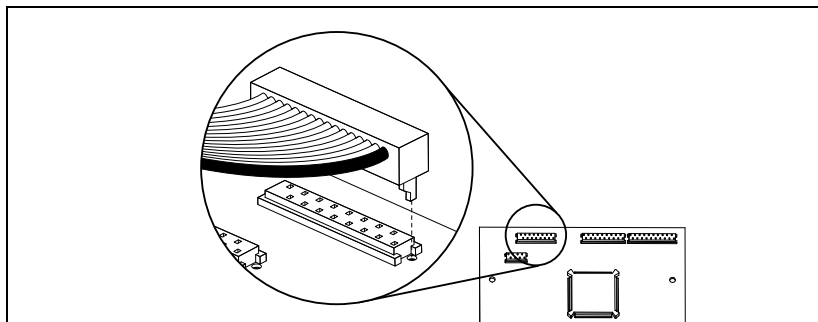


Fig. 11 Polarisation of flat cables.



CAUTION!

Incorrect connection might cause damage to both the option and to the control board/external equipment.

3.1.2 Mechanical mounting

Make sure that the AC drive has been switched off for at least seven minutes to ensure that the capacitor bank is discharged before continuing with installation! Also make sure that no external equipment connected to the drive's interface is powered on.

NOTE: Correct installation is essential for fulfilling the EMC requirements and for proper operation of the module.

3.1.2.1 Mounting the first option board

The first option board is always mounted on the slot marked 1 on the mounting plate. In this example we assume that no other option board is installed.

1. Connect the 16-pole flat cable (75 mm) to the X5 connector on the control board with the cable downwards as in Fig. 12

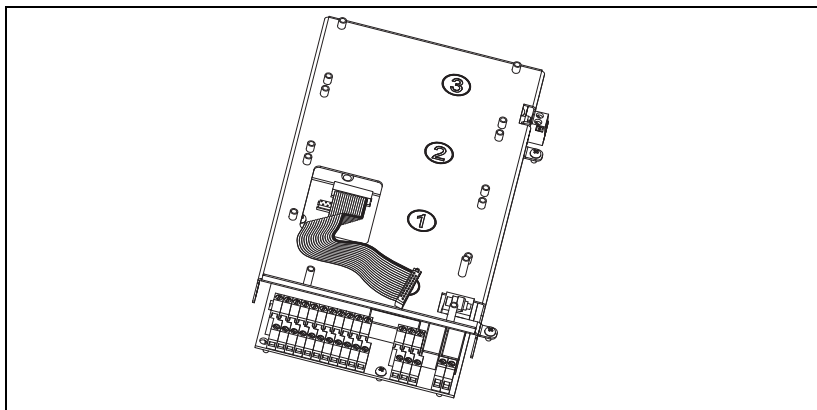


Fig. 12 Flat cable connected to the control board.

NOTE: For polarisation of the flat cable, see section 3.1.1 on page 23.

2. Place the insulating sheet over the short spacers on the slot marked 1 on the mounting plate. Make sure the flap bent upwards is mounted towards the control board interface as in the figure below.

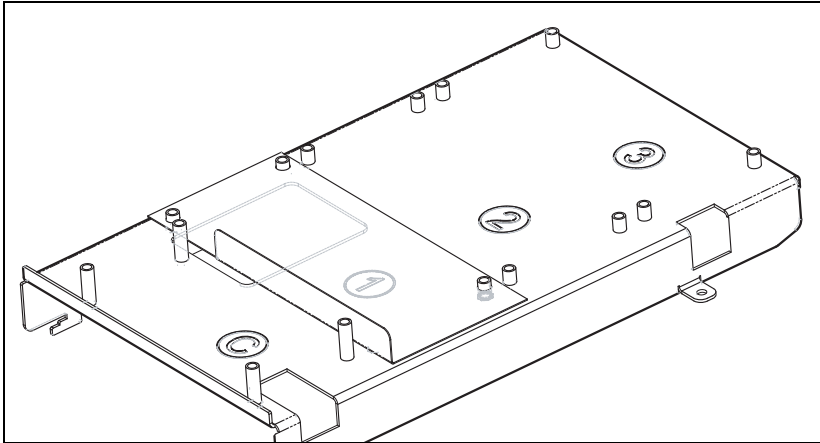


Fig. 13 Mounted insulating sheet

3. Connect the other end of the 16-pole flat cable to the X5A connector on the option board. Make sure that the polarisation is correct as in section 3.1.1 on page 23.

NOTE: Connect the micro match male contact to the option in the same manner as on the control board, i.e. the pin on the micro match contact must be fitted into the hole in the PCB.

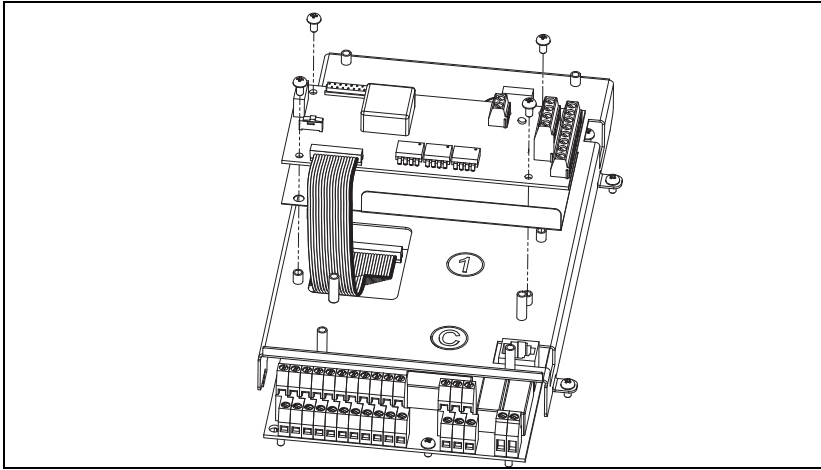


Fig. 14 Flat cable connected to the option board

4. Put the option board on the spacers.
5. Fasten the board using the four screws.

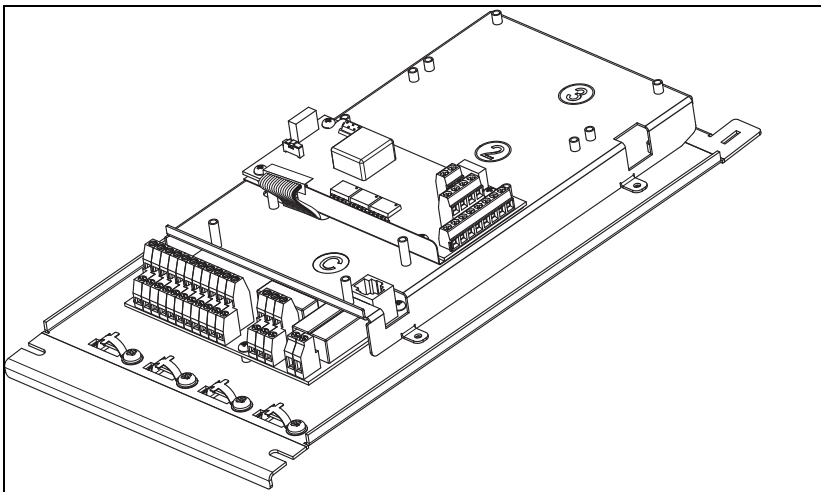


Fig. 15 Mounted option board

3.1.3 Mounting another option board

1. Place the insulating sheet on the spacers on the option board slot marked 2 or 3. It is necessary to select the slot closest to the already mounted option board.

NOTE: Place the insulating sheet with the turned up flap facing the interface of the control board to achieve proper insulation between the option boards.

2. Put the option board on the spacers.
3. Fasten the option board on the spacers using the four screws.
4. Connect the short flat cable between the X5B connector on the first option board and the X5A connector on the option board you have just mounted.

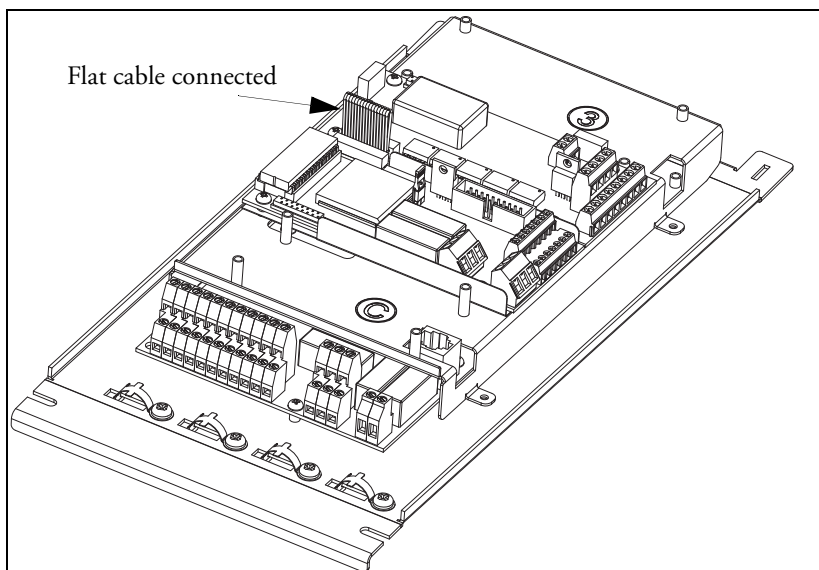


Fig. 16 Two option boards mounted on the mounting plate

4. Installation, TSA softstarters

Installation in Emotron TSA softstarters

This chapter describes how to mount the option board in the main product.

On Emotron TSA softstarters up to two option boards and one fieldbus/communication module can be mounted.

The option kit includes

- Option board.
- Four screws, M3 x 6.
- One 16-pole flat cable approx. 32 mm long. This cable is used to connect the first option board to the control board. This cable is also used for connection between two option boards.
- One 16-pole flat cable, approx. 75 mm long. This cable is not needed on Emotron TSA (only to be used on AC drives).
- Insulating sheet, not needed on Emotron TSA as it is integrated already.

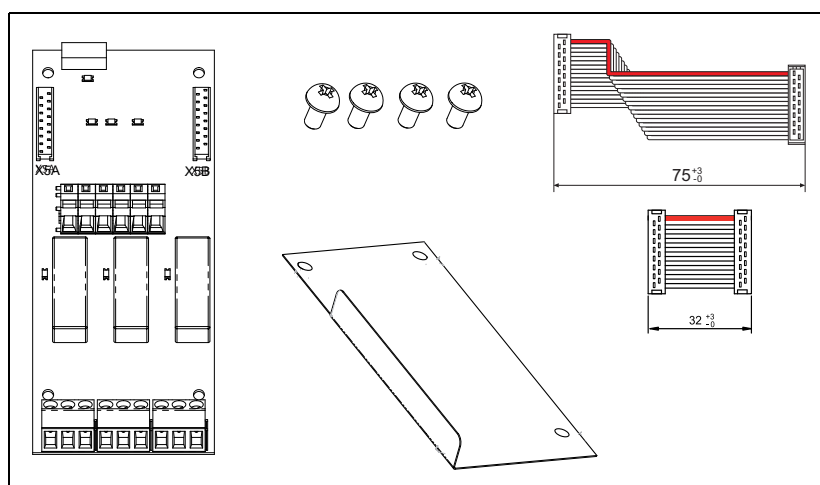


Fig. 17 Option kit contents

4.1 Mechanical mounting

Make sure that all power supplies (i.e. both Main and control supply) is switched off before continuing the installation! Also make sure that no external equipment connected to the softstarters interface is switched on

NOTE: Correct installation is essential for fulfilling the EMC requirements and for proper operation of the module.

4.1.1 Mounting the first option board

The first option board is always mounted on the slot marked 1 on the insulating sheet. In this example we assume that no other option board is installed.

1. Connect the short 16-pole flat cable (32 mm) to the X5A connector on the option board as in Fig. 18.

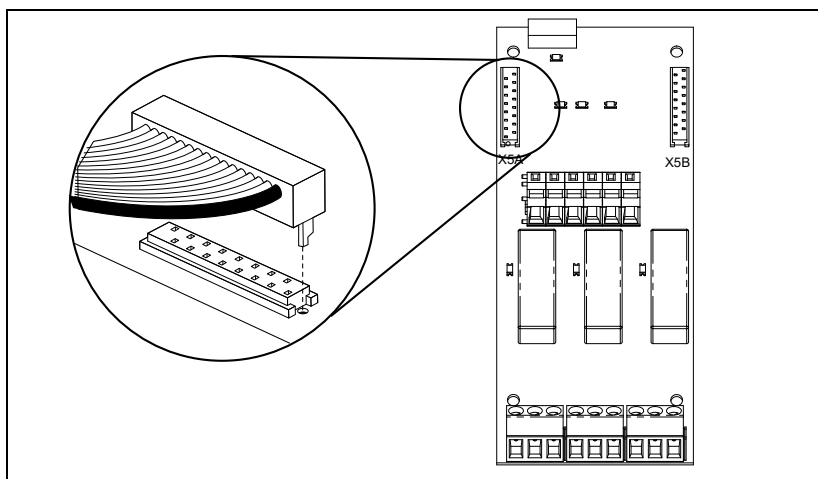


Fig. 18 Connect the flat cable to X5A connector on the option board.

2. Place the option board on the spacers at the option board slot marked 1.
3. Fasten the board using the four screws.

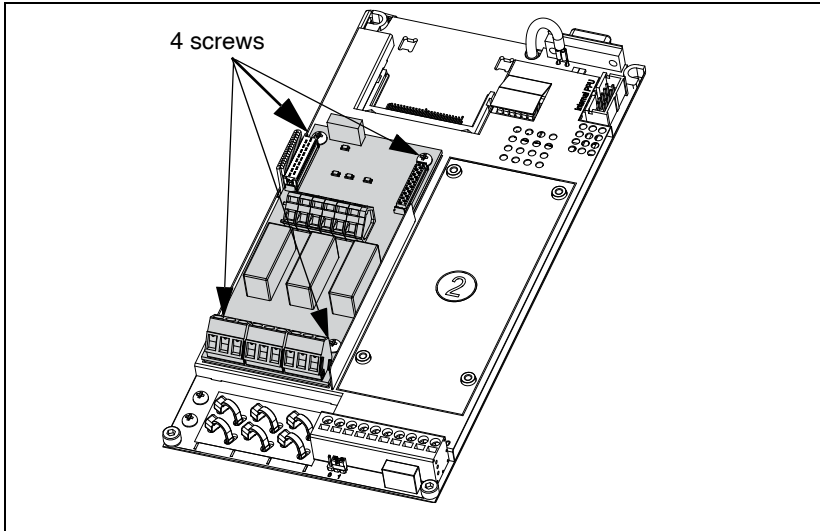


Fig. 19 Place the option board on the spacers and fasten it with the four screws.

4. Connect the other end of the 16-pole flat cable to the X4 connector on the control board.

4.1.2 Mounting a second option board

1. Place the option board on the spacers at the option board slot marked 2.
2. Fasten the option board using the four screws.

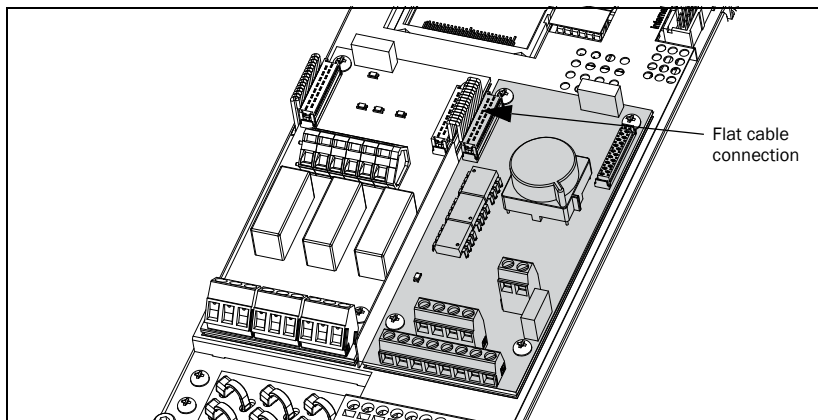


Fig. 20 Two option boards mounted and interconnected with a flat cable.

3. Connect the short flat cable between the X5B connector on the first option board and the X5A connector on the option board just mounted.

CG Drives & Automation Sweden AB
Mörsaregatan 12
Box 222 25
SE-250 24 Helsingborg
Sweden
T +46 42 16 99 00
F +46 42 16 99 49
www.cgglobal.com / www.emotron.com