I/O board 2.0
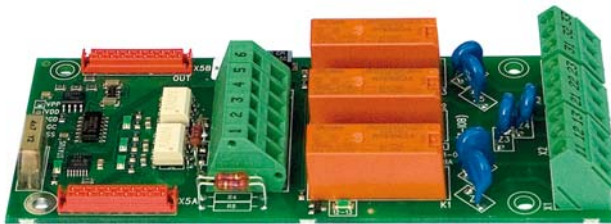# Option

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

Instruction manual
English

e m o t r o n

DEDICATED DRIVE

A **CG** Product

I/O board 2.0
Option

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

Instruction manual - English

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, dismounting, 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.

Contents

1.   Introduction

The I/O board is an option board for Emotron AC drives and Emotron TSA softstarters, which hereinafter on in this manual referred to as the "main product".

Type	Version	Note
Emotron FDU/VFX - AC drive	IP54/20 and IP20/21	Up to 3 option boards can be mounted
Emotron FlowDrive - type FLD		
Emotron VFXR/FDUL - AFE drive	IP54/20	
Emotron FDU/VFX - AC drive	IP2Y	Up to 2 option boards can be mounted
Emotron FlowDrive - type FLD		
Emotron TSA - softstarter	IP20	

The I/O board offers three additional galvanic isolated digital inputs and three additional programmable relay outputs.

The digital inputs and relay outputs are named as follows.

Bx DigInX or RelayZ, where B stands for option board and DigIn for digital input.
Bx can be 1, 2 or 3 (1 or 2 in AC drives version 2Y and Emotron TSA softstarter) X and Z can be 1, 2 or 3.
The board number is 1 if the option board is mounted on the first slot on the mounting plate.

Example

B2 DigIn3
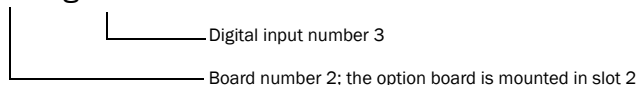
Digital input number 3

Board number 2; the option board is mounted in slot 2

After the I/O board is installed, the software automatically detects the presence of the board and the related menus will subsequently appear and become active in the setup menus of the main product.

Delivery and unpacking

Check the delivery. The shipment should contain:

• I/O board

• Mounting material as described in chapter on "Installation, AC drives" on page 21 or "Installation, TSA softstarters" on page 32.

• This manual

Check for visible signs of damage. Do not install if damage is found. If damage is found or something is missing from the package, please contact your supplier.

2. Connections and functions

2.1 Board layout and connections for Emotron FDU/VFX/VFXR/FDUL/FlowDrive versions IP54/IP20, IP20/21 and Emotron TSA softstarters

This chapter describes the board layout and connections.
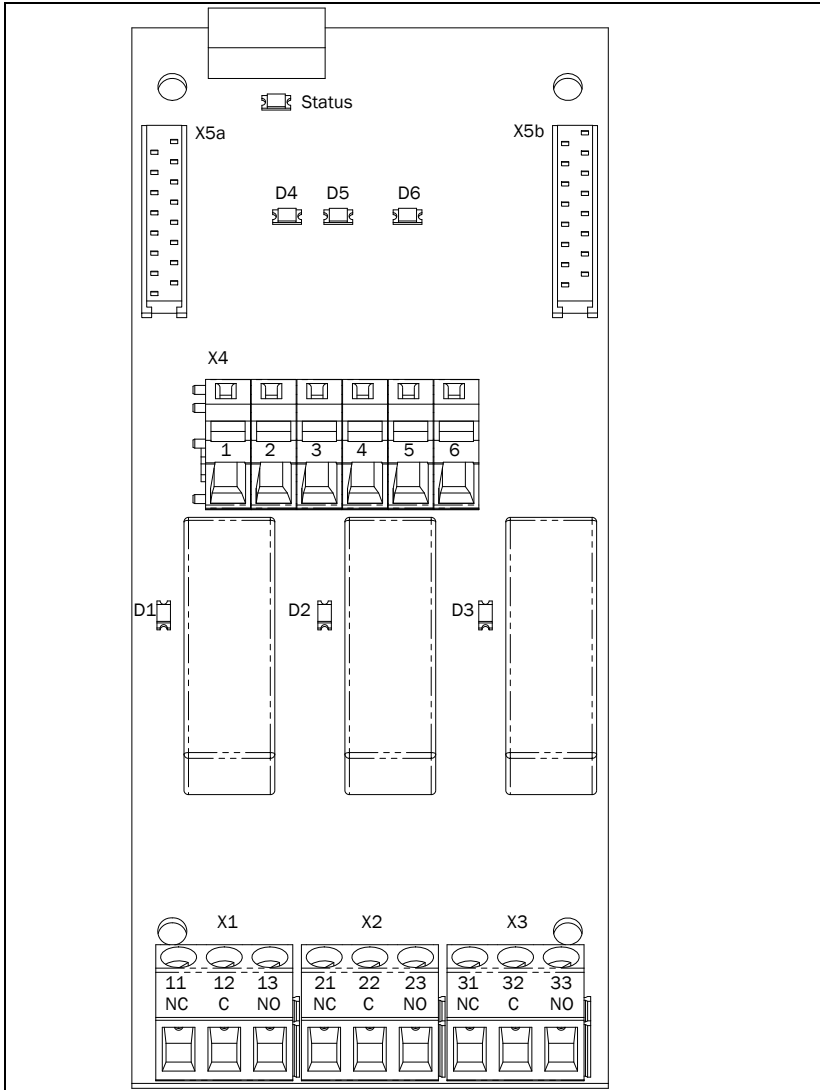
2.1.1 Board layout

Fig. 1   I/O board layout

2.1.2   User connections

Table 1   Function of terminal strip X1, X2 and X4.

X1	Name	Function (default)	Signal	Type
1	N/C	Relay B1 (2,3) R1 programmable output	Potential free change over 2 A/250 VAC/AC1	Relay output
2	COM			
3	N/O			
X2				
1	N/C	Relay B1 (2,3) R2 programmable output	Potential free change over 2 A/250 VAC/AC1	Relay output
2	COM			
3	N/O			
X3				
1	N/C	Relay B1 (2,3) R3 programmable output	Potential free change over 2 A/250 VAC/AC1	Relay output
2	COM			
3	N/O			
X4				
1	DigIn1 +	Board 1 (2,3) Digital input 1	0-24 VDC or 0-24 VAC,imp. 3.2 kΩ **See CAUTION below table.**	Differential digital input
2	DigIn1 -			
3	DigIn2 +	Board 1 (2,3) Digital input 2	0-24 VDC or 0-24 VAC, imp. 3.2 kΩ **See CAUTION below table.**	Differential digital input
4	DigIn2 -			
5	DigIn3 +	Board 1 (2,3) Digital input 3	0-24 VDC or 0-24 VAC, imp. 3.2 kΩ **See CAUTION below table.**	Differential digital input
6	DigIn3 -			

⚠️ **CAUTION!**
Galvanic isolation between digital inputs is limited. Maximum allowed voltage difference between digital inputs: 50 VDC or 50 VAC.

Note: Recommended minimum switching current at low voltages for the relays is 10 mA.

Table 2   Cable specification

Signal type	Maximum wire size	Tightening torque	Cable type
Digital	Solid wire: 0.14 to 2.5 mm^2	0.5 Nm	Screened
Relay	Flexible wire: 0.14 to 1.5 mm^2 Wire with ferrule: 0.25 to 1.5 mm^2		Not screened

2.1.3   LEDs

The LEDs on the I/O board indicate the following functions:

Table 3   LED description

LED	Description
Status	Flashing slowly (1 Hz) = OK Flashing fast = Communication Error Off = no power supply
D1	Relay 1 active when lit, X1:2 connected to X1:3
D2	Relay 2 active when lit, X2:2 connected to X2:3
D3	Relay 3 active when lit, X3:2 connected to X3:3
D4	DigIn 1 "ON" (high) when lit *
D5	DigIn 2 "ON" (high) when lit *
D6	DigIn 3 "ON" (high) when lit *

* See threshold limits for digital inputs in § 3.1, page 17.

2.1.4   Internal connectors

Table 4   Internal connectors

Connector	Description
X5a	First option slot: 16-pole flat cable connected to the control board option connector X5 on AC drives or X4 on Emotron TSA. Second or third option slot: 16-pole flat cable from the previous option board.
X5b	Connection to the next option board.

2.2 Board layout and connections for Emotron FDU/VFX/FlowDrive version IP2Y, frame sizes A3, B3 and C3

This chapter describes the board layout and connections.

Table 5   Emotron FDU/VFX/FLD-IP2Y frame size explanation

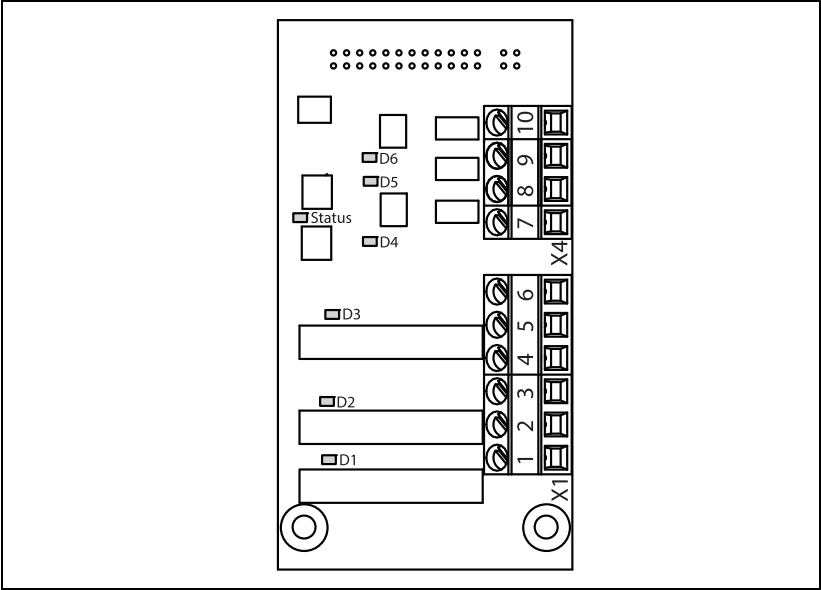| Model	Frame size
VFX/FDU/FLD48-2P5-2Y	A3
VFX/FDU/FLD48-3P4-2Y	
VFX/FDU/FLD48-4P1-2Y	
VFX/FDU/FLD48-5P6-2Y	
VFX/FDU/FLD48-7P2-2Y	
VFX/FDU/FLD48-9P5-2Y	
VFX/FDU/FLD48-012-2Y	
VFX/FDU/FLD48-016-2Y	B3
VFX/FDU/FLD48-023-2Y	
VFX/FDU/FLD48-032-2Y	C3
VFX/FDU/FLD48-038-2Y	

2.2.1 Board layout

Fig. 2   I/O board layout

2.2.2 User connections

Table 6   Function of terminal strip X3 and X4.

X1	Name	Function (default)	Signal	Type
1	N/0	Relay B1 (2,3) R1 programmable output	Potential free change over 2 A/250 VAC/AC1	Relay output
2	COM			
3	N/0	Relay B1 (2,3) R2 programmable output	Potential free change over 2 A/250 VAC/AC1	Relay output
4	COM			
5	N/0	Relay B1 (2,3) R3 programmable output	Potential free change over 2 A/250 VAC/AC1	Relay output
6	COM			
X4				
7	DigIn1 +	Board 1 (2,3) Digital input 1	0-24 VDC, imp. 3.2 kΩ **See CAUTION below table.**	Differential digital input
8	DigIn2 +	Board 1 (2,3) Digital input 2	0-24 VDC, imp. 3.2 kΩ **See CAUTION below table.**	Differential digital input
9	DigIn3 +	Board 1 (2,3) Digital input 3	0-24 VDC, imp. 3.2 kΩ **See CAUTION below table.**	Differential digital input
10	-	Common		

⚠️ **CAUTION!**
Galvanic isolation between digital inputs is limited. Maximum allowed voltage difference between digital inputs: 50 VDC.

Note: Recommended minimum switching current at low voltages for the relays is 10 mA.

Table 7   Cable specification

Signal type	Maximum wire size	Tightening torque	Cable type
Digital	Solid wire: 0.14 to 2.5 mm^2 Flexible wire: 0.14 to 1.5 mm^2 Wire with ferrule: 0.25 to 1.5 mm^2	0.5 Nm	Screened
Relay			Not screened

2.2.3   LEDs

The LEDs on the I/O board indicate the following functions:

Table 8   LED description

LED	Description
Status	Flashing slowly (1 Hz) = OK Flashing fast = Communication Error Off = no power supply
D1	Relay 1 active when lit, X1:1 connected to X1:2
D2	Relay 2 active when lit, X1:3 connected to X1:4
D3	Relay 3 active when lit, X1:5 connected to X1:6
D4	DigIn 1 "ON" (high) when lit *
D5	DigIn 2 "ON" (high) when lit *
D6	DigIn 3 "ON" (high) when lit *

* See threshold limits for digital inputs in § 3.1, page 17.

3.   Use of the inputs

All digital inputs are isolated differential inputs. Isolation means that the common of the signal is not connected to the common of the main product, nor with the common of any other input or output. One of the advantages of this is that control signals from different PLCs with a different common potential can be connected without any problem.

Another advantage of using differential inputs is that the input is less sensitive to external interference.

Sometimes it can be convenient to use the same source (0 V reference) for both the I/O and control board for signals. This is fully possible. The 24 V power supply capacity of the control board is limited, please see the note below.

NOTE: The maximum load of +24 V DC supply for the main product is limited. Please refer to the manual for the main product. The impedance of each digital input on the I/O board is 3.2 kOhm (7.5 mA).

3.1   Threshold limits for digital inputs

The input is considered high when the voltage difference exceeds 8 V DC/AC and the input is considered low when voltage difference is below 5 V DC/AC.

4. Functions

After the I/O board is installed, the software automatically detects the presence of the board and the related menus will subsequently appear and become active in the Setup Menu of the main product.

4.1 Menus and parameter settings

For a description of menus and parameter settings please refer to the manual for the main product.

5. Installation, AC drives

This chapter describes how to mount option boards in Emotron FDU/VFX/ VFXR/FDUL/FlowDrive AC drives.

5.1 Installation in versions IP54, IP20/21 and IP23

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.
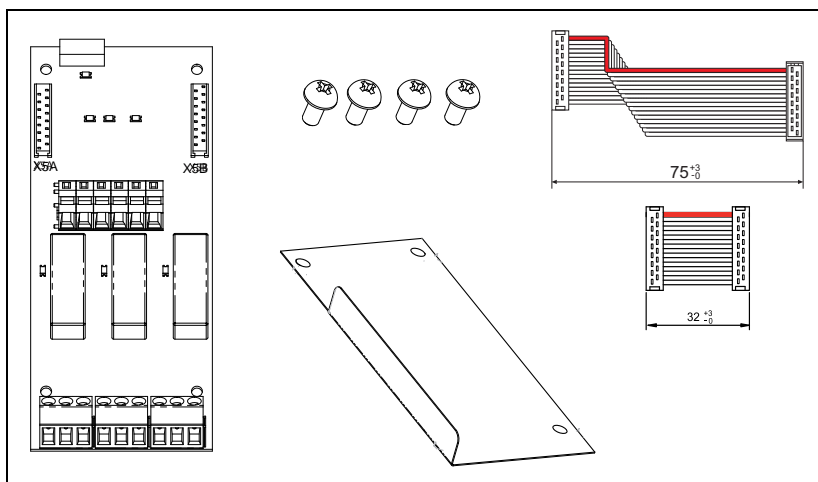
Fig. 3   Option kit contents

5.1.1 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.
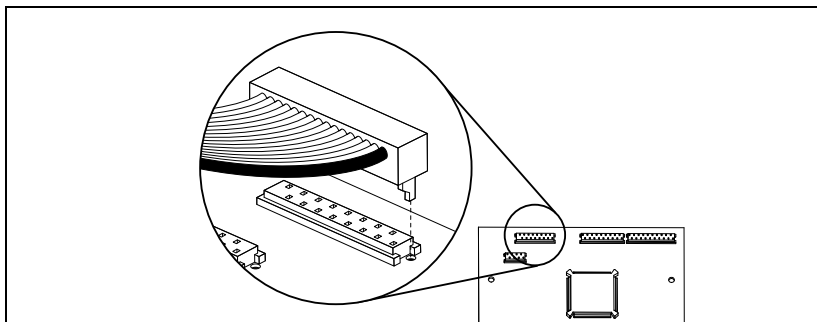
Fig. 4   Polarisation of flat cables.

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

5.1.2   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.

5.1.2.1 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. 5
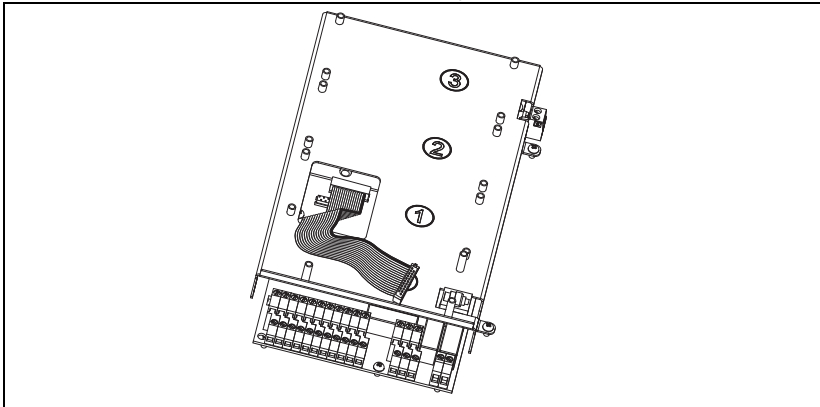
Fig. 5   Flat cable connected to the control board.

NOTE: For polarisation of the flat cable, see section 5.1.1 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.
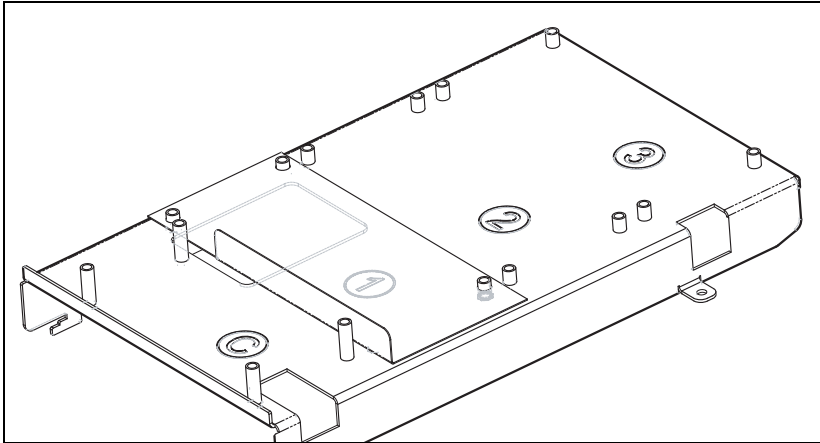

Fig. 6   Mounted insulating sheet

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 5.1.1 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.
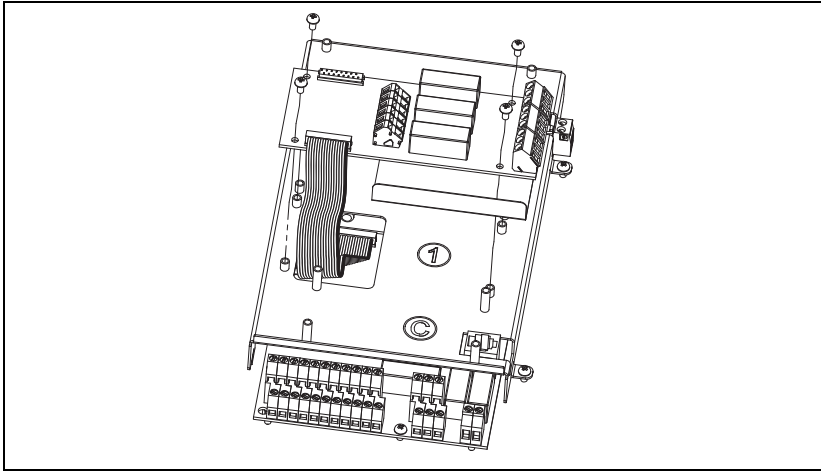
Fig. 7   Flat cable connected to the option board

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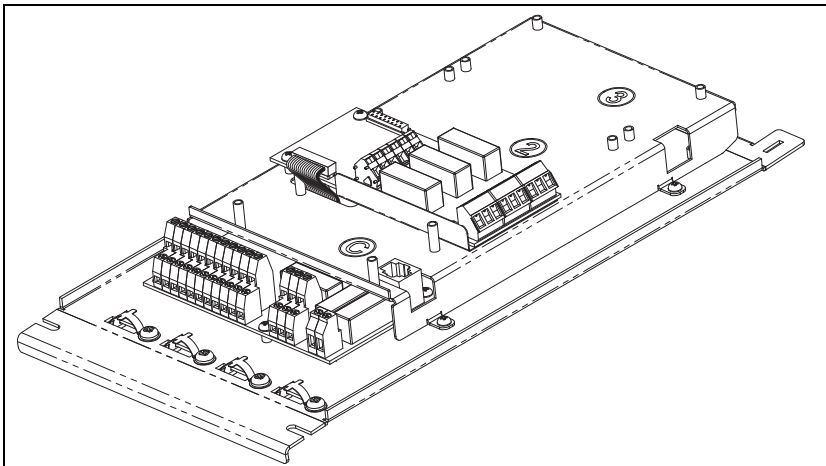5. Fasten the board using the four screws.

Fig. 8   Mounted option board

5.1.3 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.
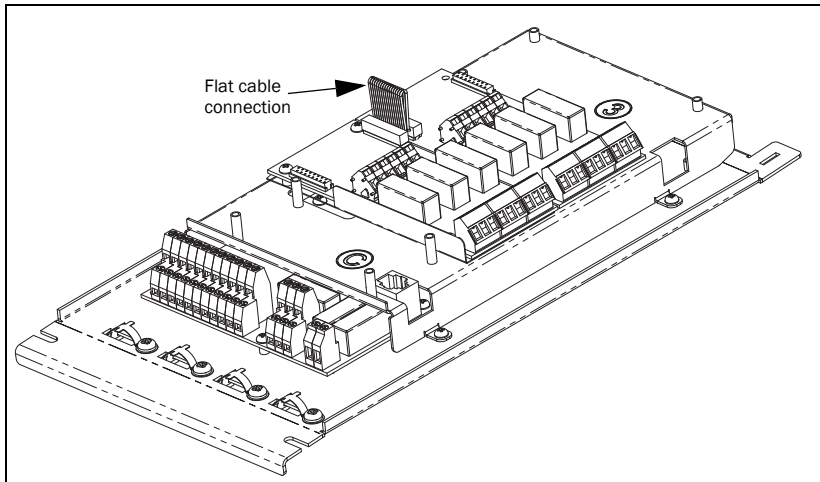

Flat cable connection

Fig. 9   Two option boards mounted on the mounting plate

5.2 Installation in version IP2Y frame sizes A3, B3 and C3

Two different option boards and one communication board can be mounted.

Table 9   Emotron FDU/VFX/FLD-IP2Y frame size explanation

Model	Frame size
VFX/FDU/FLD48-2P5-2Y	A3
VFX/FDU/FLD48-3P4-2Y	
VFX/FDU/FLD48-4P1-2Y	
VFX/FDU/FLD48-5P6-2Y	
VFX/FDU/FLD48-7P2-2Y	
VFX/FDU/FLD48-9P5-2Y	
VFX/FDU/FLD48-012-2Y	
VFX/FDU/FLD48-016-2Y	B3
VFX/FDU/FLD48-023-2Y	
VFX/FDU/FLD48-032-2Y	C3
VFX/FDU/FLD48-038-2Y	

5.2.1 Option boards type -2Y

The option kit includes

- option board.

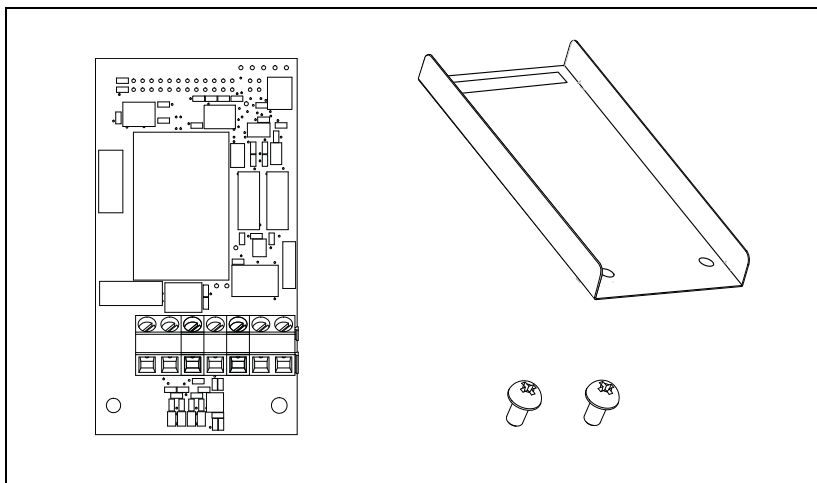- Two screws, M3 x 6.

- Insulating sheet.

Fig. 10   The IP2Y option kit includes.

> ⚠ **CAUTION!**
> **Incorrect connection might cause damage to both the option and to the control board/external equipment.**

5.2.2   Mounting the option board

Make sure that the AC drive has been switched off for at least ten 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.

It is possible to mount two option boards on the control board connectors X7A and X7B. It does not matter if you mount the option board on place X7A or X7B you are free to choose.

NOTE: The option board RS/485-2Y always needs to be mounted on connector X7B. Otherwise there is not enough room for the D-Sub connector.
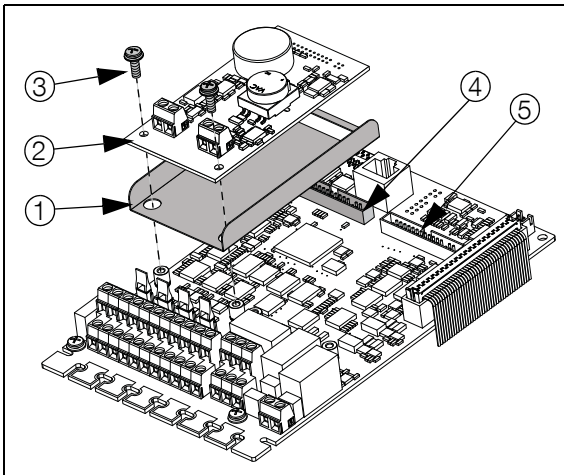

Fig. 11   How to mount the option board on connector X7A.

1. Place the insulating sheet over the short spacers and make sure the slot fits around the X7 connector on the control board. Make sure the flaps are bent upwards.

---

2. Put the option board into position by pressing the connector on the option board into connector X7 on the control board. Make sure it rests on the spacers.

3. Secure the option card with the two screws.

5.2.2.1 Mount another option board

A second option board is mounted in the same way as the first, see Fig. 12 where the second board in this case is mounted to connector X7B
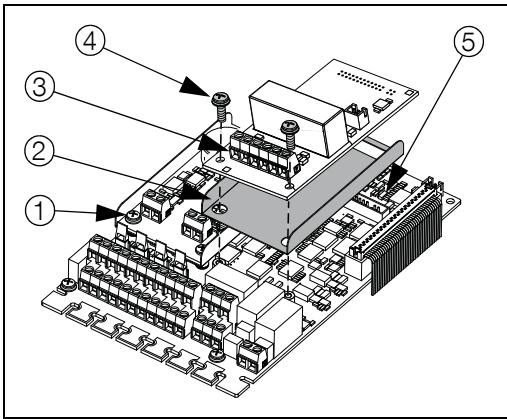
.

Fig. 12   Mount the second option board, in this case on to connector X7B.

6.   Installation, 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).

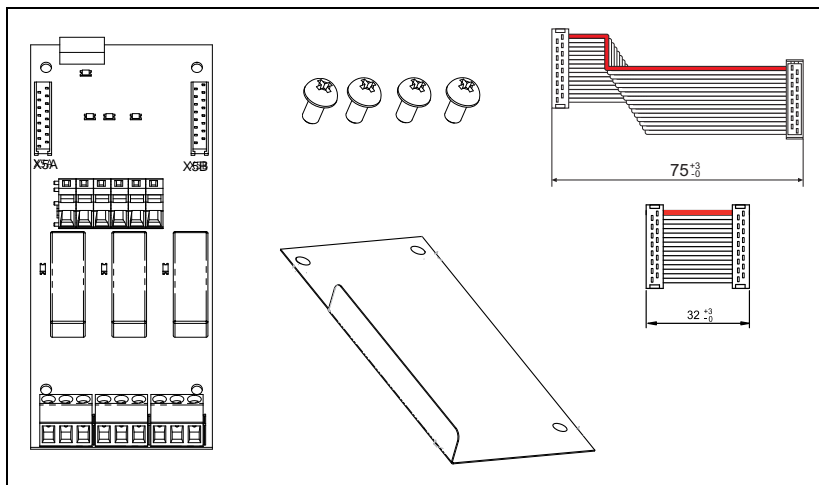*   Insulating sheet, not needed on Emotron TSA as it is integrated already.

Fig. 13   Option kit contents

6.1 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.

6.1.1 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.

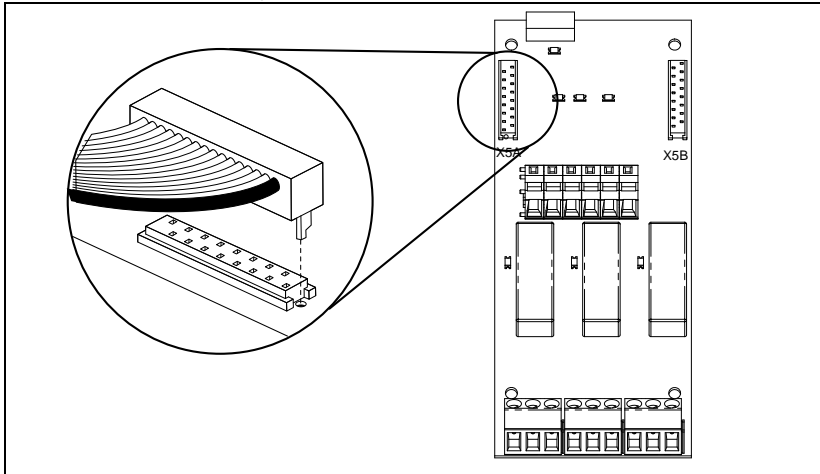1. Connect the short 16-pole flat cable (32 mm) to the X5A connector on the option board as in Fig. 14.

Fig. 14   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.

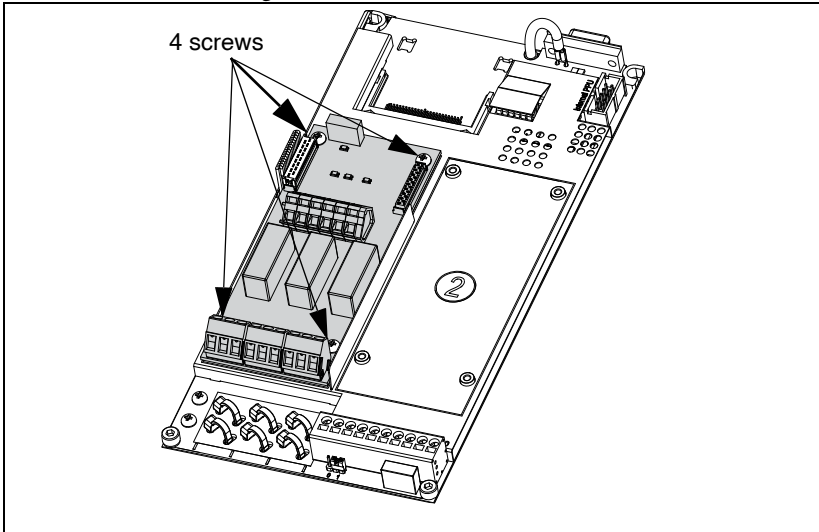3. Fasten the board using the four screws.

Fig. 15   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.

6.1.2 Mounting a second option board

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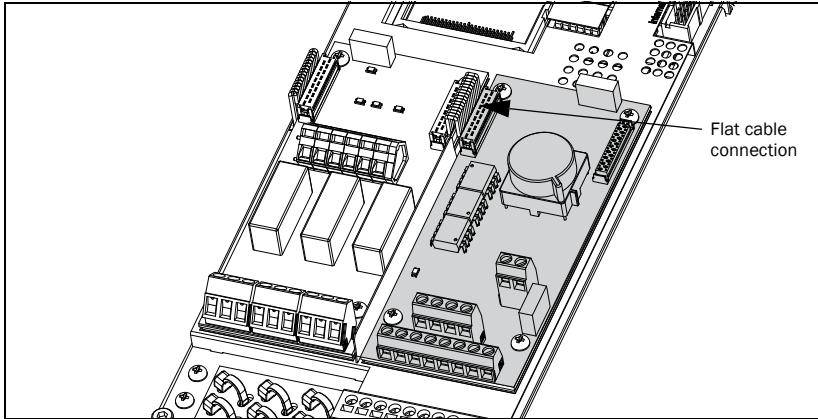
2. Fasten the option board using the four screws.

Fig. 16   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.