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# 1 How to Read these Operating Instructions

## 1

### 1.1.1 How to Read these Operating Instructions

These Instructions will help you get started and mount your MCF 106 A/B in C Option Adaptor. Please read these instructions in full and, in order to be able to work with the system safely and professionally, particularly observe the hints and cautionary remarks.

Chapter 1, **How to Read these Operating Instructions**, introduces the manual and informs you about the approvals, symbols, and abbreviations used in this literature.

Chapter 2, **Safety and Conformity**, contains safety instructions and certificates for the MCF 106 A/B in C Option Adaptor option and the VLT AutomationDrive FC 302.

Chapter 3, **Introduction to the MCB 112 VLT PTC Thermistor Card**, informs you about the general aspects of the option and its functions. It also contains the technical data about the MCF 106 A/B in C Option Adaptor.

Chapter 4, **How to Install**, guides you through mechanical and technical installation.

### 1.1.2 Available Literature for VLT AutomationDrive FC 300

- The VLT® AutomationDrive FC 300 Operating Instructions provide the necessary information for getting the drive up and running.
- The VLT® AutomationDrive FC 300 Design Guide entails all technical information about the drive design and applications including encoder, resolver and relay options.
- The VLT® AutomationDrive FC 300 Programming Guide contains information on how to programme the VLT AutomationDrive. Furthermore, you will find descriptions of the parameters and parameter lists, which give an overview of the parameters in each group.
- The VLT® AutomationDrive FC 300 Profibus Operating Instructions provide the information required for controlling, monitoring and programming the drive via a Profibus fieldbus.
- The VLT® AutomationDrive FC 300 DeviceNet Operating Instructions provide the information required for controlling, monitoring and programming the drive via a DeviceNet fieldbus.
- The VLT® AutomationDrive FC 300 MCT 10 Operating Instructions provide information for installation and use of the software on a PC.
- The VLT® AutomationDrive FC 300 IP21 / Type 1 Instruction provides information for installing the IP21 / Type 1 option.
- The VLT® AutomationDrive FC 300 24 V DC Backup Instruction provides information for installing the 24 V DC Backup option.

Danfoss Drives technical literature is also available online at [www.danfoss.com/drives](http://www.danfoss.com/drives).


1.1.3 Approvals

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1.1.4 Symbols


Symbols used in this Operating Instructions.



**NB!**  
Indicates something to be noted by the reader.



Indicates a general warning.



Indicates a high-voltage warning.

\*

Indicates default setting

1.1.5 Abbreviations

Electro Magnetic Compatibility	EMC
Drive	FC
Local Control Panel	LCP
Parameter	par.

## 2 Safety and Conformity

### 2.1.1 Important notes

Proper, safe operation of a device requires that it be properly transported and stored, professionally installed and commissioned, and used as intended. Only those personnel may work on the device who are familiar with its installation, commissioning, and operation and have appropriate qualifications for their activities. They must observe the contents of the operating instructions, the notes attached to the device, and all applicable safety regulations for the setup and operation of electrical installations. These devices are built and tested in compliance with EN 60947-8 and leave our plant in perfect condition from a safety standpoint. To keep them in this state, you must observe the safety guidelines marked "Warning" in the operating instructions. Failure to observe safety guidelines can result in death, bodily injury, or damage to the device itself and to other devices and systems. If the information contained in the operating instructions is insufficient for a particular case, please contact us directly or the representative responsible for you. Instead of the industry standards and regulations named in these operating instructions and valid in Europe, when operating the device outside their area of applicability, you must follow the regulations applicable to the country of use.



Warning! EN60204-1 safety circuits. The devices may not be used alone for functions where an automatic restart must be prevented.

### 2.1.2 Safety Precautions



The voltage of the frequency converter is dangerous whenever connected to mains. Incorrect installation of the motor, frequency converter or fieldbus may cause damage to the equipment, serious personal injury or death. Consequently, the instructions in this manual, as well as national and local rules and safety regulations, must be complied with.

#### Safety Regulations

1. The mains supply to the frequency converter must be disconnected whenever repair work is to be carried out. Check that the mains supply has been disconnected and that the necessary time has elapsed before removing motor and mains supply plugs.
2. The [OFF] button on the control panel of the frequency converter does not disconnect the mains supply and consequently it must not be used as a safety switch.
3. The equipment must be properly earthed, the user must be protected against supply voltage and the motor must be protected against overload in accordance with applicable national and local regulations.
4. The earth leakage current exceeds 3.5 mA.
5. Protection against motor overload is not included in the factory setting. If this function is desired, set par. 1-90 *Motor Thermal Protection* to data value ETR trip 1 [4] or data value ETR warning 1 [3].
6. Do not remove the plugs for the motor and mains supply while the frequency converter is connected to mains. Check that the mains supply has been disconnected and that the necessary time has elapsed before removing motor and mains plugs.
7. Please note that the frequency converter has more voltage sources than L1, L2 and L3, when load sharing (linking of DC intermediate circuit) or external 24 V DC are installed. Check that all voltage sources have been disconnected and that the necessary time has elapsed before commencing repair work.

#### Warning against unintended start

1. The motor can be brought to a stop by means of digital commands, bus commands, references or a local stop, while the frequency converter is connected to mains. If personal safety considerations (e.g. risk of personal injury caused by contact with moving machine parts following an unintentional start) make it necessary to ensure that no unintended start occurs, these stop functions are not sufficient. In such cases the mains supply must be disconnected or the *Safe Stop* function must be activated.
2. The motor may start while setting the parameters. If this means that personal safety may be compromised (e.g. personal injury caused by contact with moving machine parts), motor starting must be prevented, for instance by use of the *Safe Stop* function or secure disconnection of the motor connection.

3. A motor that has been stopped with the mains supply connected, may start if faults occur in the electronics of the frequency converter, through temporary overload or if a fault in the power supply grid or motor connection is remedied. If unintended start must be prevented for personal safety reasons (e.g. risk of injury caused by contact with moving machine parts), the normal stop functions of the frequency converter are not sufficient. In such cases the mains supply must be disconnected or the *Safe Stop* function must be activated.

**NB!**

When using the *Safe Stop* function, always follow the instructions in the *Safe Stop* section of the Design Guide.

4. Control signals from, or internally within, the frequency converter may in rare cases be activated in error, be delayed or fail to occur entirely. When used in situations where safety is critical, e.g. when controlling the electromagnetic brake function of a hoist application, these control signals must not be relied on exclusively.



Touching the electrical parts may be fatal - even after the equipment has been disconnected from mains.

Also make sure that other voltage inputs have been disconnected, such as external 24 V DC, load sharing (linkage of DC intermediate circuit), as well as the motor connection for kinetic back up.

Systems where frequency converters are installed must, if necessary, be equipped with additional monitoring and protective devices according to the valid safety regulations, e.g. law on mechanical tools, regulations for the prevention of accidents etc. Modifications on the frequency converters by means of the operating software are allowed.

Hoisting applications:

The frequency converter functions for controlling mechanical brakes cannot be considered as a primary safety circuit. There must always be a redundancy for controlling external brakes.

### Protection Mode

Once a hardware limit on motor current or dc-link voltage is exceeded the drive will enter "Protection mode". "Protection mode" means a change of the PWM modulation strategy and a low switching frequency to minimize losses. This continues 10 sec after the last fault and increases the reliability and the robustness of the drive while re-establishing full control of the motor.

In hoist applications "Protection mode" is not usable because the drive will usually not be able to leave this mode again and therefore it will extend the time before activating the brake – which is not recommendable.

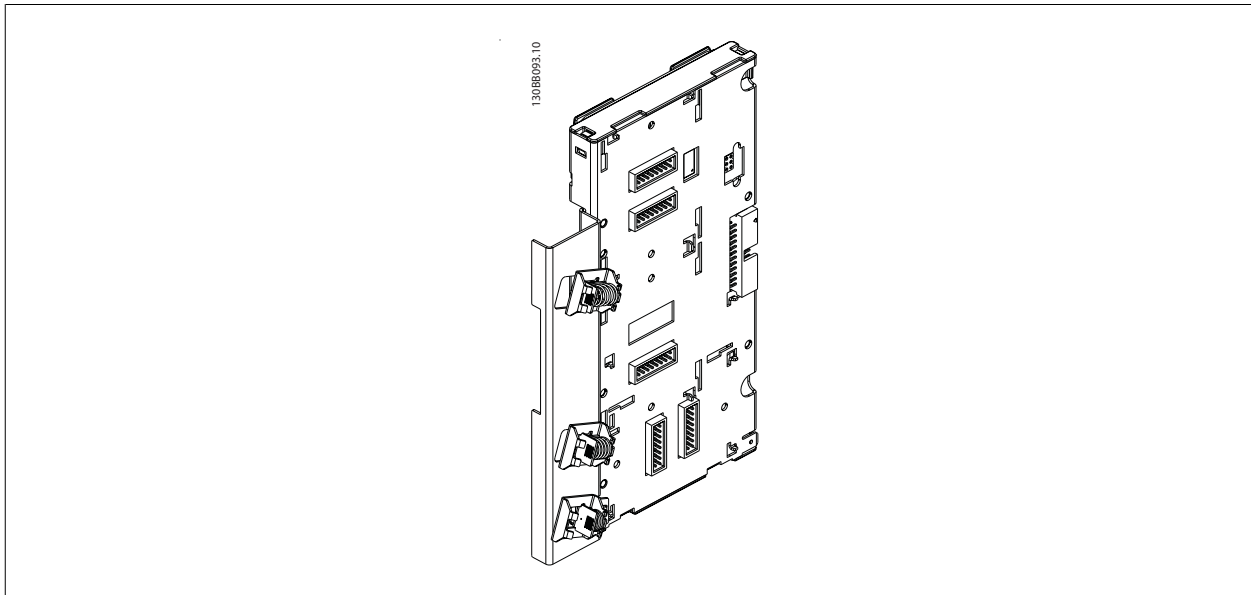
The "Protection mode" can be disabled by setting par. 14-26 *Trip Delay at Inverter Fault* to zero which means that the drive will trip immediately if one of the hardware limits is exceeded.

**NB!**

It is recommended to disable protection mode in hoisting applications (par. 14-26 *Trip Delay at Inverter Fault* = 0)

### 3 Introduction to MCF 106 A/ B in C Option Adaptor

The A/ B in C Option Adaptor makes it possible to combine a number of different options.



3

Illustration 3.1: Drawing of MCF 106 A/B in C Option Adaptor. Two options can be installed in the MCF 106 at the same time. The upper slot is called E0 and the lower is called E1.

One A and one B option can be installed in the standard A and B slots of the Control Card – behind the LCP/ Blind cover. With the addition of the MCF 106 the possibilities are increased.

- Up to three different B options – one in the standard B slot and two in the Adaptor
- One Fieldbus (A option) at any time – in the standard A slot or in the E0 slot of the adaptor.
- The MCB 121 Ethernet takes up both slot A and slot B when installed in the standard slot A of the Control Card. The only way to install a B option at the same time: Use the standard B slot of the Control Card and move the MCA 121 in the E1 slot of the Adaptor.
- MCA 121 EthernetIP has bottom entry when installed in the Adaptor
- Two identical options can not be installed at the same time
- MCB 105 Relay Card and MCB 112 PTC Thermistor Card are not supported by the Adaptor and must thus only be installed in the standard slot B of the Control Card. That also means that these two options can not be combined.

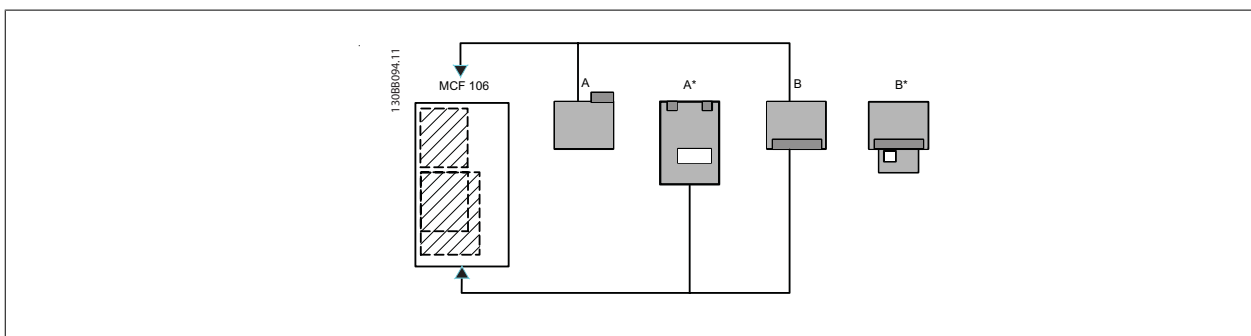


Illustration 3.2: Generally, A- and B options can be installed in the MCF 106. The exceptions are the special B options (B\*) MCB 105 Relay Card and MCB 112 PTC Thermistor Card that both have an extra large plastic part and are not supported by the MCF 106. Also the special A option (A\*) MCA 121 EthernetIP that takes up the size of almost two standard options is an exception as it can only be installed in the lower slot of MCF 106 and with bottom entry.

### 3.1.1 Combinations

The following table shows which combinations can be realized.

Option	Mounting in the MCF 106	ID	Name	Possible combinations	
				with MCF 106	without MCF 106
<b>A</b>	Yes <sup>6)</sup>	MCA 101	Profibus DP V1	+ 3B + D	+ B + C + D
	Yes <sup>6)</sup>	MCA 104	DeviceNet	+ 3B + D	+ B + C + D
	Yes <sup>6)</sup>	MCA 105	CanOpen	+ 3B + D	+ B + C + D
	Yes <sup>6)</sup>	MCA 108	LonWorks	+ 3B + D	+ B + C + D
	Yes <sup>6)</sup>	MCA 113	Profibus Conv. (VLT® 3000)	+ 3B + D	+ B + C + D
	Yes <sup>7)</sup>	MCA 121	EtherNetIP	+ 2B + D	+ C + D
<b>B</b>	Yes	MCB 102	Encoder option	+ A + 2B <sup>1)</sup> + D	+ A <sup>2)</sup> + C + D
	No	MCB 105	Relay option <sup>3)</sup>	+ A + 2B <sup>1)</sup> + D	+ A <sup>2)</sup> + C + D
	Yes	MCB 101	General Purpose I/O	+ A + 2B <sup>1)</sup> + D	+ A <sup>2)</sup> + C + D
	Yes	MCB 103	Resolver option	+ A + 2B <sup>1)</sup> + D	+ A <sup>2)</sup> + C + D
	Yes	MCB 108	PLC Safe Interfece	+ A + 2B <sup>1)</sup> + D	+ A <sup>2)</sup> + C + D
	No	MCB 112	PTC Thermistor Card <sup>3)</sup>	+ A + 2B <sup>1)</sup> + D	+ A <sup>2)</sup> + C + D
<b>C0</b>	No	MCO 305	Programmable Motion Control	None	+ A + B <sup>4)</sup> + C <sup>5)</sup> + D
	No	MCO 350	Synchronizing Control	None	+ A + B <sup>4)</sup> + D
	No	MCO 351	Positioning Sontrol	None	+ A + B <sup>4)</sup> + D
	No	MCO 352	Center Winder	None	+ A + B <sup>4)</sup> + D
<b>C1</b>	No	MCA 103	ProfiSafe-Safe Stop	None	+ A + B <sup>4)</sup> + D
	No	MCB 113	Stt. Relay Card	None	+ A + B <sup>4)</sup> + D
<b>D</b>	No	MCB 107	24V External Supply	+ A + 3B <sup>1)</sup>	+ A + B <sup>4)</sup> + C

Table 3.1: Overview of different possibilities for combinations. Look up one of the options in question and see which additional options this can be combined with, if MCF 106 is used and if only the standard drive is used. A list of limitations and exceptions can be found to the right of the table.

- 1) One B less if MCA 121 EthernetIP is used
- 2) Does not incl. MCA 121 EthernetIP
- 3) MCB 105 and MCB 112 must always be installed in the standard B slot of the Control Card and can thus never be combined
- 4) Can only incl B if A is not MCA 121 EtherNetIP
- 5) One C1 option can be added on top of the MCO 305 in the bookstyle enclosures (A2, A3 and B3)
- 6) Only in E0slot
- 7) Only in E1 slot



**NB!**

Two identical options can not be installed at the same time

The table is elaborated in the following drawings.



### 3.1.2 Elaboration of Combinations

The basics of Figure 3 is used to illustrate the combinations in a simple way.

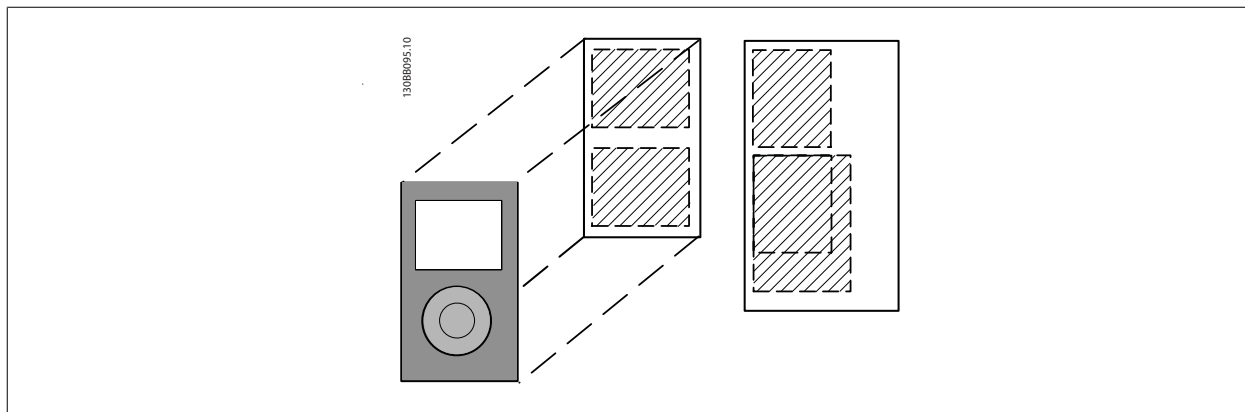


Illustration 3.3: Rough illustration of the standard A- and B slot in the Control Card - behind the LCP/ blind cover (Left) and the MCF 106 (Right)

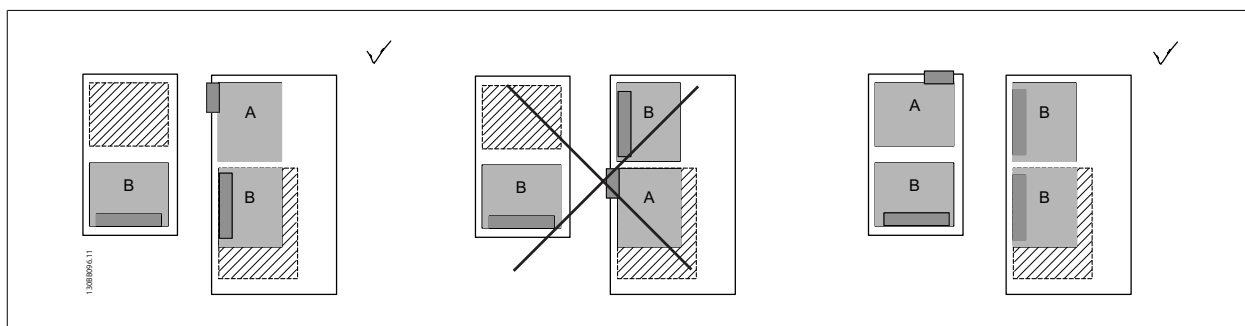


Illustration 3.4: A FieldBus option can be installed in the MCF 106 but only in the E0 slot (left), Normally, the FieldBus will be installed in the standard A-slot of the Control Card which makes it possible to install a total of three B options (right).

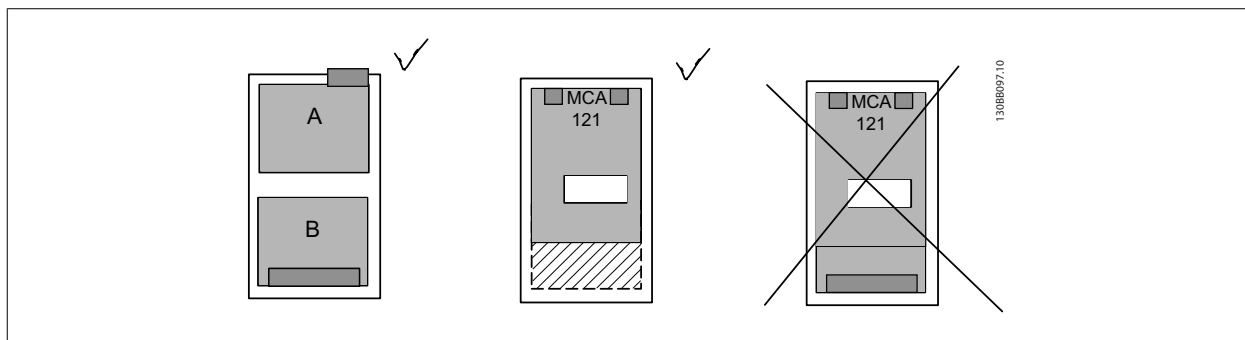


Illustration 3.5: The Control Card has an A- and a B slot which makes it possible to install an A option at the same time as a B option (left). The MCA 121 Ethernet A option takes up more space than the other FieldBusses but can still be installed in the A slot as long as the B slot is left empty (middle). It is not possible to install both MCA 121 and a B option on the Control Card (right).

- (1) One B less if MCA 121 EthernetIP is used
- (2) Does not incl. MCA 121 EthernetIP
- (4) Can only incl. B if A is not MCA 121 Ethernet

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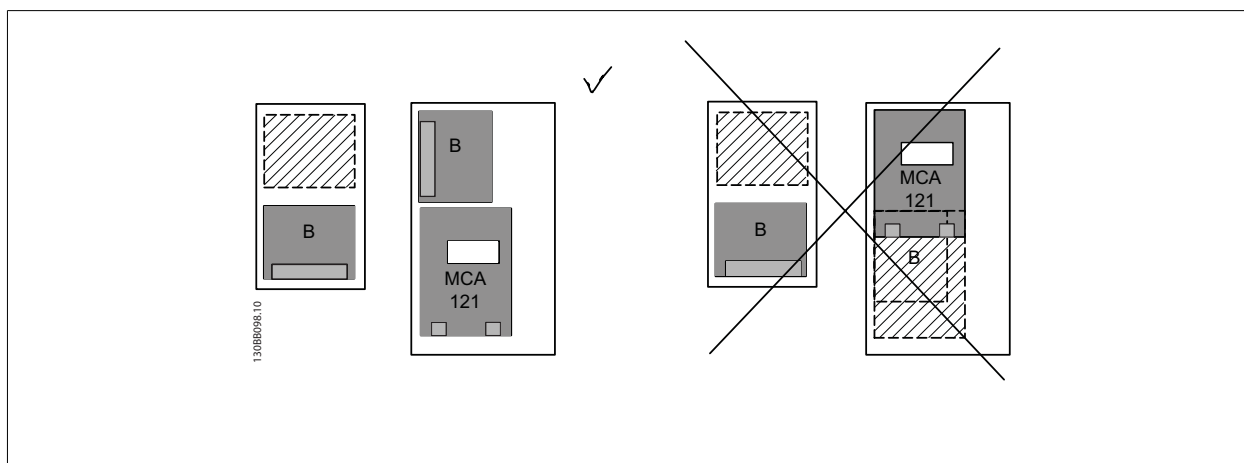


Illustration 3.6: 121 EthernetIP can be installed with bottom entry in the lower slot of the MCF 106.

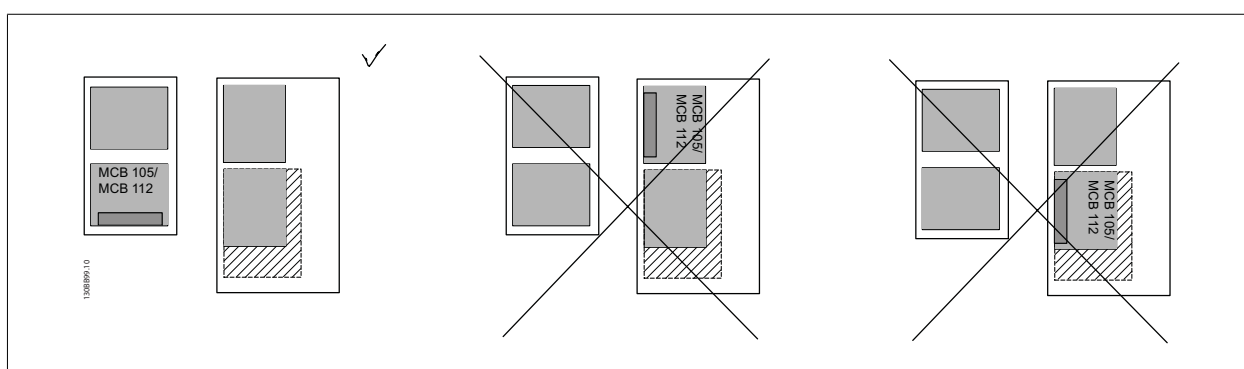


Illustration 3.7: MCB 105 and MCB 112 are different from the other B options as these two have an extended plastic cover for protection. They can be installed in the standard B slot of the Control Card but never in the MCF 106.

(3) MCB 105 and MCB 112 must always be installed in the standard B slot of the Control Card and can thus never be combined

## 4 How to Install

The MCF 106 is installed in the C slot. Please refer to the *FC 300 Design Guide*, chapter *Options and Accessories*, section *Mounting of Options in Slot C* for more information.

### 4.1.1 Mounting of A and B options in the MCF 106

The A and B options are mounted in the MCF 106 via the standard option connector and two plastic holders per option.

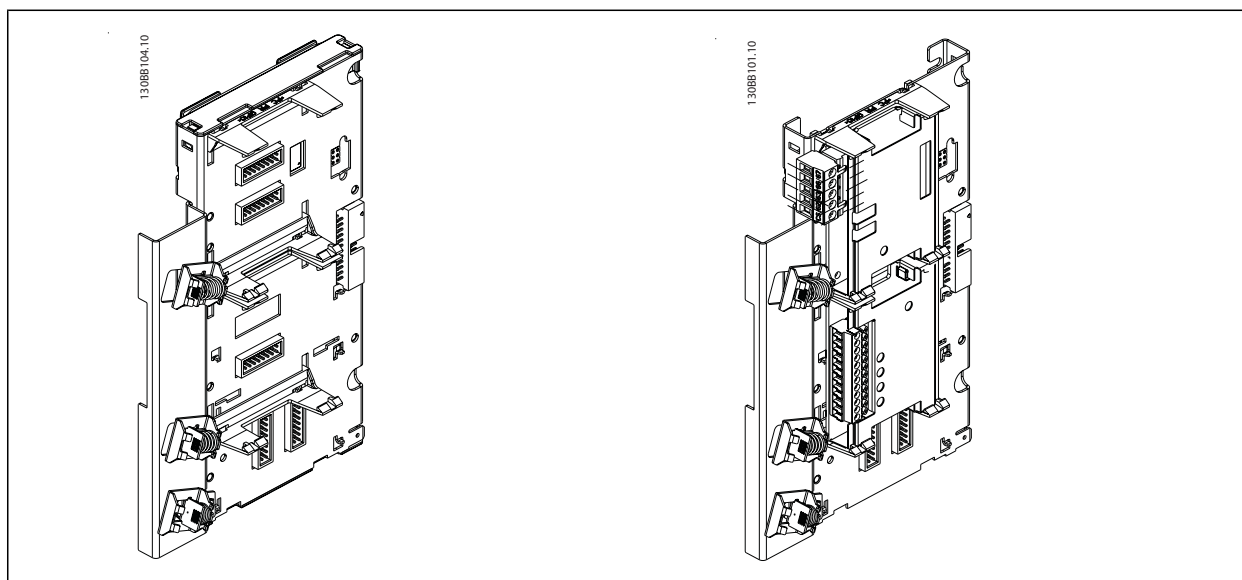


Illustration 4.1: Mounting of A and B options in the MCF 106. Plastic holders placed for side entry (left) and installed options (right).

The connectors are facing the left side where the support plate for the cable connections is placed.

All options that are mounted in the MCF 106 are installed with side entry except the MCA 121 EthernetIP option that can only be installed in slot E1 with bottom entry. The plastic holders are moved to another position when installing the MCA 121 which is illustrated in the following figures

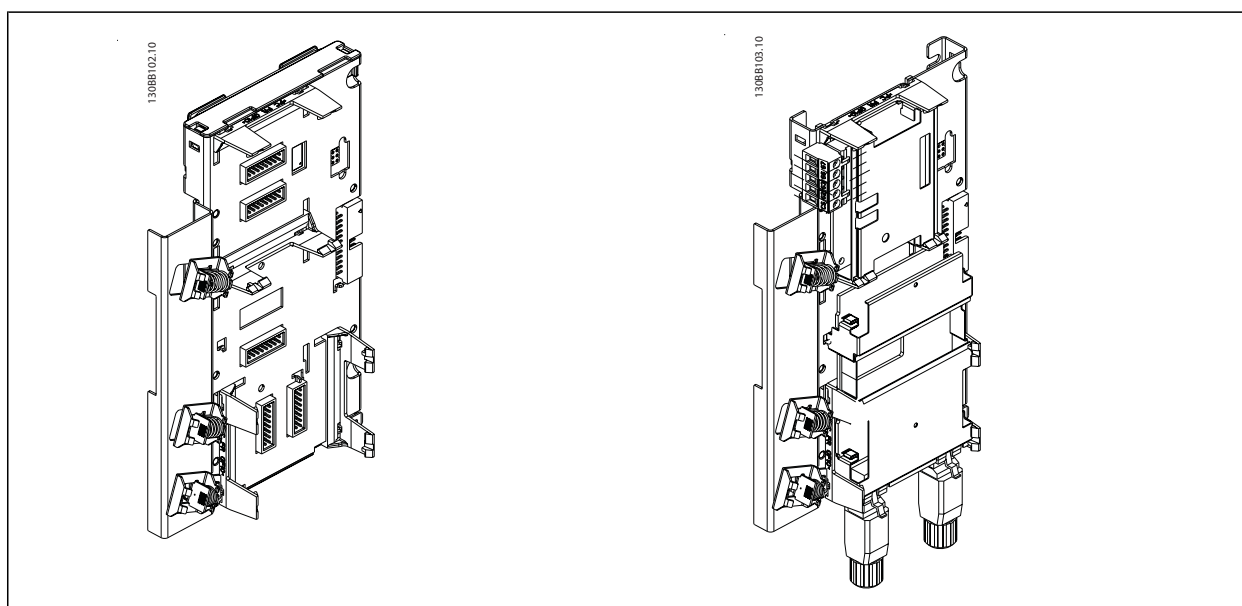


Illustration 4.2: 9 Mounting of A and B options in the MCF 106. Plastic holders placed for MCA 121 EthernetIP (left) and installed options (right).

## 4.2 Mounting of the MCF 106 in the Frequency Converter

### 4.2.1 Bookstyle (A2, A3 and B3)


**NB!**

For installation in the bookstyle frames, the manual describes how to use guides to install the MCF 106 to the backplate of the option box.

The existing backplate does not have these guides yet. Therefore, the MCF 106 must be installed as a standard C0 option on the backplate.

**4**

A special mounting system is used for the bookstyle enclosures. The MCF 106 is mounted in the 60 mm extended option box on the side of the frequency converter via a guide. This makes it possible to do commissioning on the mounted options in an easy way even if a series of frequency converters are mounted side-by-side. When the MCF 106 is in place it is fixed to the extended option box with a hook and two screws. The following figures illustrate the principle.

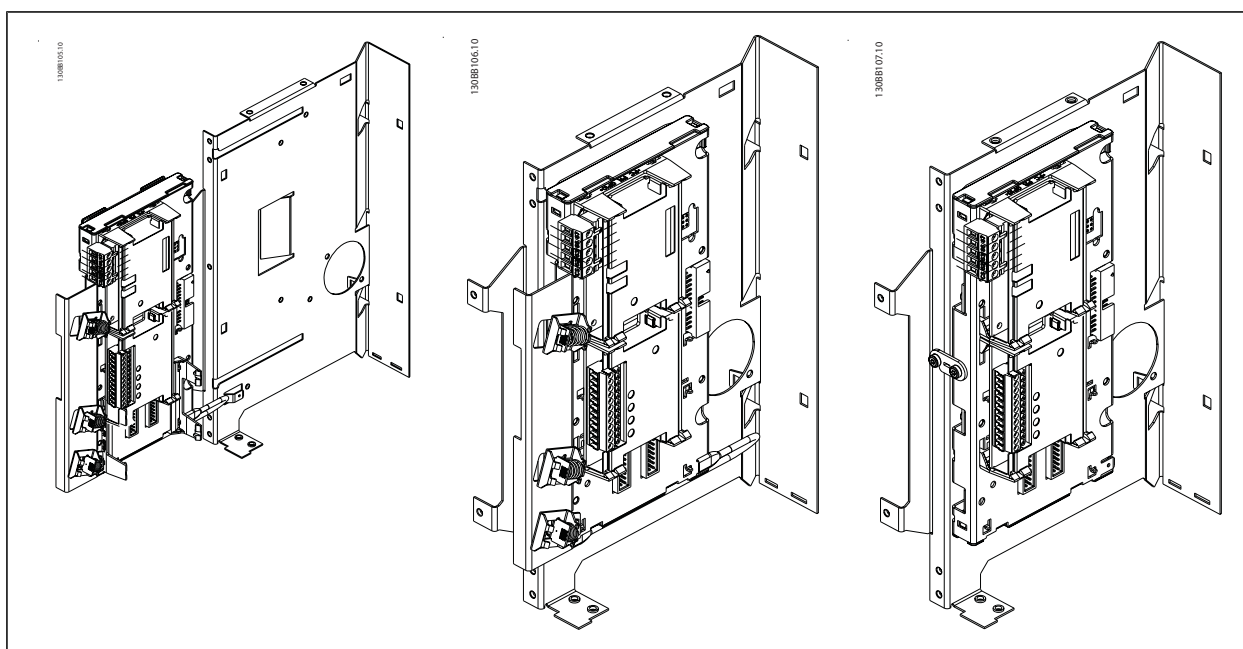


Illustration 4.3: Installation of MCF 106 in the extended option box on the side of the bookstyle frames. The MCF 106 and the extended option box where the guide principle can be seen (left) and the MCF 106 installed in the extended option box via the guide (center). The support plate for the cable connections has been removed from the last drawing (right) to give view to the hook system that fixes the MCF 106 to the extended option box.


**NB!**

Connect the earth wire from the MCF 106 to the metal plate of the option box (only relevant for the bookstyle).

The bottom plate can be mounted before or after sliding in the MCF 106. When the MCA 121 is installed (bottom entry) either the bottom plate or the the fieldbus cables must be disconnected during commissioning in order to make it possible to use the guide. This is illustrated in the following figure.

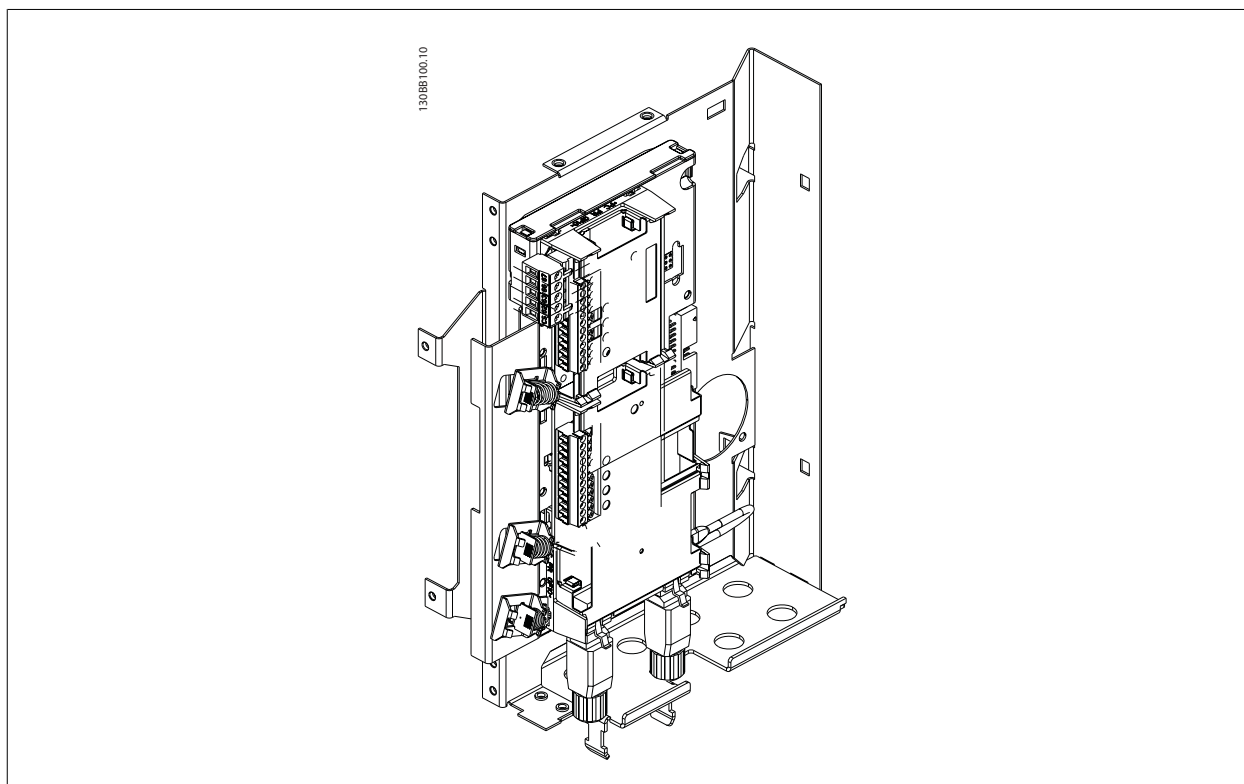


Illustration 4.4: Installation with MCA 121 EthernetIP. When the EthernetIP cables are disconnected the guide can be used to slide the MCF 106 into place or out for commissioning. Another possibility is to remove the bottom plate during commissioning.

### 4.2.2 Compact (A5 – F)

For the compact frequency converters the installation is similar to that of a C option where screws are used. Please refer to the Design Guide section 10.1.3 Mounting of Options in Slot C for an elaboration.

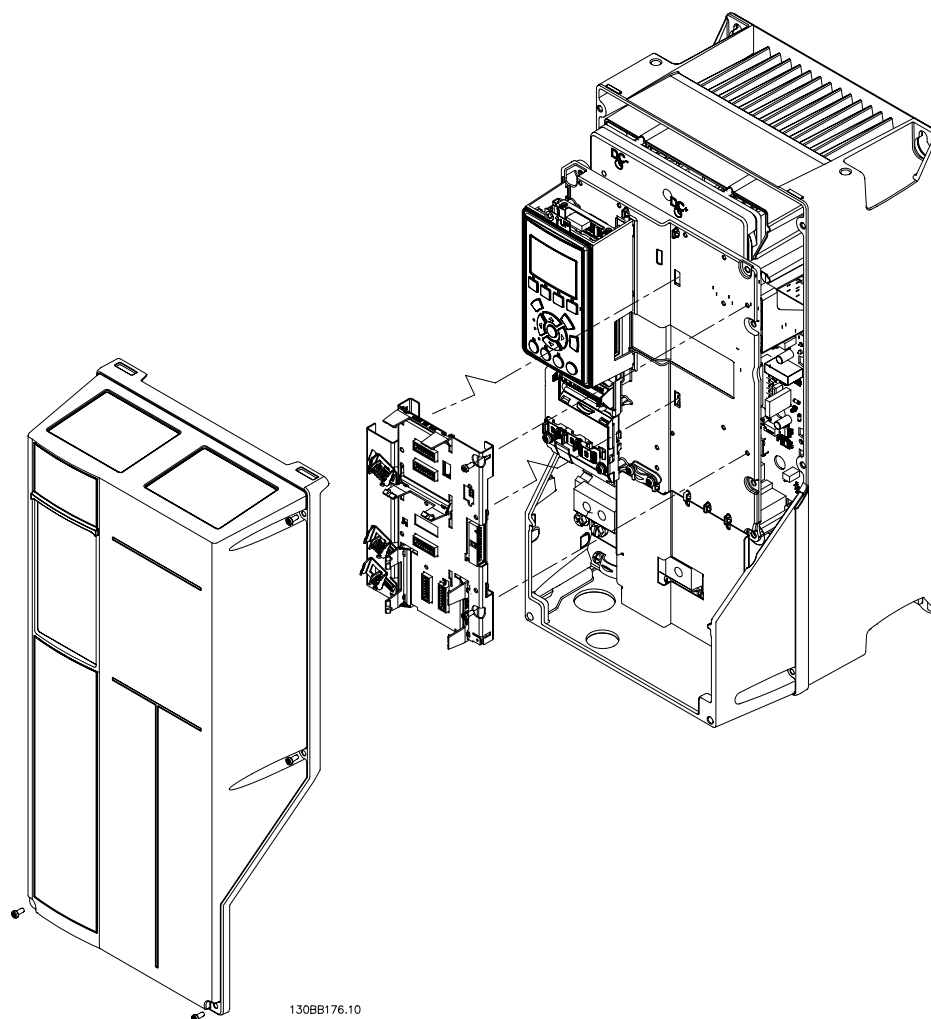
**4**

Illustration 4.5: Frame sizes: A5. B1. B2. B4. C1. C2. C3 and C4



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