



# Operating Guide

FC Series Add-On Instruction for VLT<sup>®</sup> EtherNet/IP MCA 121

VLT<sup>®</sup> HVAC Drive FC 102 • VLT<sup>®</sup> AQUA Drive FC 202

VLT<sup>®</sup> AutomationDrive FC 301/302 • VLT<sup>®</sup> Decentral Drive FCD 302





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# 1 Introduction

## 1.1 Purpose of the Manual

This manual explains how to use the Add-On Instruction (AOI) software to integrate a frequency converter and the VLT® EtherNet/IP MCA 121 into the Logix5000 control systems (ControlLogix, CompactLogix, and FlexLogix).

This operating guide is intended for use by qualified personnel. Users are assumed to be familiar with:

- VLT® frequency converter.
- EtherNet/IP technology.
- PC or PLC that is used in the master system.

### NOTICE

This version of the AOI supports version 20.0 or later of the programming tool RSLogix 5000. Earlier versions of RSLogix do not support the Danfoss EDS file and require additional set-up of the module configuration.

VLT® is a registered Danfoss trademark. EtherNet/IP™ is a trademark of ODVA, Inc.

## 1.2 Additional Resources

Resources available for the frequency converters and optional equipment:

- The relevant frequency converter *operating guide* provides the necessary information for getting the frequency converter up and running.
- The relevant frequency converter *design guide* provides detailed information about capabilities and functionality to design motor control systems.
- The relevant frequency converter *programming guide* provides greater detail on working with parameters and many application examples.
- The *VLT® EtherNet/IP MCA 121 Installation Guide* provides information about installing the EtherNet/IP and about troubleshooting.
- The *VLT® EtherNet/IP MCA 121 Programming Guide* provides information about configuring the system, controlling the frequency converter, parameter access, programming, troubleshooting, and some typical application examples.

Supplementary publications and manuals are available from Danfoss. See [drives.danfoss.com/knowledge-center/technical-documentation/](http://drives.danfoss.com/knowledge-center/technical-documentation/) for listings.

## 1.3 Product Overview

### 1.3.1 Intended Use

This operating guide relates to the FC Series Add-On Instructions for VLT® EtherNet/IP MCA 121.

The AOI for VLT® EtherNet/IP MCA 121 is intended for use with:

- VLT® HVAC Drive FC 102.
- VLT® AQUA Drive FC 202.
- VLT® AutomationDrive FC 301/FC 302.
- VLT®Decentral Drive FCD 302.

### 1.3.2 Add-On Instruction Features

- Easy handling of FC series frequency converters.
- Start the motor with a single bit.
- Speed reference as real value in percentage.
- Actual speed of the motor in percentage.
- Direct information when a warning or an alarm is present.
- Motor current as readout in Amps.
- When the frequency converter prohibits the start of the motor, it is shown.

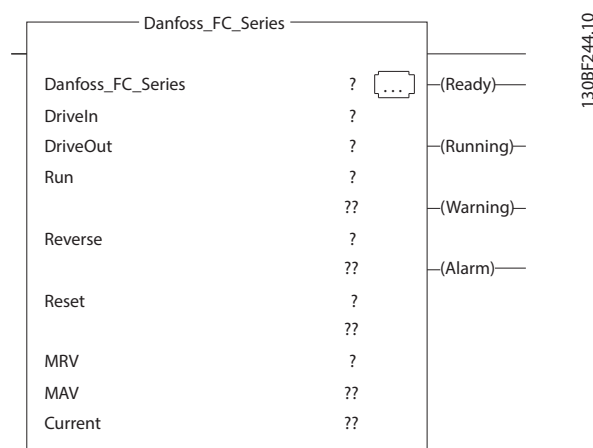



Illustration 1.1 AOI Features

### 1.4 Disposal



Do not dispose of equipment containing electrical components together with domestic waste. Collect it separately in accordance with local and currently valid legislation.

### 1.5 Symbols, Abbreviations, and Conventions

Abbreviation	Definition
AOI	Add-On Instruction
BOOTP	Bootstrap protocol
DHCP	Dynamic host configuration protocol
EDS	Electronic data sheet
IP	Internet protocol
LCP	Local control panel
MAV	Main actual value
MRV	Main reference value
PC	Personal computer
PLC	Programmable logic controller
SINT	Short integer

Table 1.1 Symbols and Abbreviations

#### Conventions

Numbered lists indicate procedures.  
 Bullet lists indicate other information and description of illustrations.  
 Italicized text indicates:

- Cross-reference.
- Link.
- Parameter name.
- Parameter group name.
- Parameter option.

### 1.6 Safety

The following symbols are used in this guide:

#### **▲WARNING**

Indicates a potentially hazardous situation that could result in death or serious injury.

#### **▲CAUTION**

Indicates a potentially hazardous situation that could result in minor or moderate injury. It can also be used to alert against unsafe practices.

#### **NOTICE**

Indicates important information, including situations that can result in damage to equipment or property.

#### 1.6.1 Qualified Personnel

Correct and reliable transport, storage, installation, operation, and maintenance are required for the trouble-free and safe operation of the frequency converter. Only qualified personnel are allowed to install or operate this equipment.

Qualified personnel are defined as trained staff, who are authorized to install, commission, and maintain equipment, systems, and circuits in accordance with pertinent laws and regulations. Also, the qualified personnel must be familiar with the instructions and safety measures described in this installation guide.

#### **▲WARNING**

##### UNINTENDED START

When the frequency converter is connected to AC mains, DC supply, or load sharing, the motor can start at any time. Unintended start during programming, service, or repair work can result in death, serious injury, or property damage. The motor can start with an external switch, a fieldbus command, an input reference signal from the LCP or LOP, via remote operation using MCT 10 Set-up Software, or after a cleared fault condition.

To prevent unintended motor start:

- Press [Off/Reset] on the LCP before programming parameters.
- Disconnect the frequency converter from the mains.
- Completely wire and assemble the frequency converter, motor, and any driven equipment before connecting the frequency converter to AC mains, DC supply, or load sharing.

## 2 General Configuration of the Frequency Converter

### 2

The parameters listed in *Table 2.1* are required for enabling the frequency converter to communicate with the VLT® EtherNet/IP MCA 121. When setting the parameters, use the settings listed in *Table 2.1*.

Parameter	Setting
Parameter 0-03 Regional Settings	[0] International
Parameter 8-01 Control Site	[0] Digital and ctrl. word or [2] Control word only
Parameter 8-02 Control Word Source	[3] Option A
Parameter 8-04 Control Word Timeout Function	[0] Off, [1] Freeze output, [2] Stop, [3] Jogging, [4] Max speed, or [5] Stop and trip
Parameter 8-10 Control Word Profile	[0] FC profile
Parameter 12-00 IP Address Assignment	[0] Manual
Parameter 12-01 IP Address	For example 192.168.1.10
Parameter 12-02 Subnet Mask	For example 255.255.255.000
Parameter 12-21 Process Data Config Write [0]	[1680] Fieldbus CTW 1
Parameter 12-21 Process Data Config Write [1]	[1682] Fieldbus REF 1
Parameter 12-22 Process Data Config Read [0]	[1603] Status word
Parameter 12-22 Process Data Config Read [1]	[1605] Main actual value [%]
Parameter 12-22 Process Data Config Read [2]	[1614] Motor current
Parameter 12-22 Process Data Config Read [3]	[1614] Motor current
Parameter 12-22 Process Data Config Read [4]	[1690] Alarm word
Parameter 12-22 Process Data Config Read [5]	[1690] Alarm word
Parameter 12-22 Process Data Config Read [6]	[1692] Warning word
Parameter 12-22 Process Data Config Read [7]	[1692] Warning word

**Table 2.1 Settings for Required Parameters**

1. When the frequency converter is commissioned, set *parameter 0-03 Regional Settings* before any other changes are made to the frequency converter via the Main Menu.
2. Press [Quick Menu] and select *Q2 Quick set-up* to enter the motor data into the frequency converter. The quick set-up can be done now or at a later time. To ensure proper operation, it must be done before running the motor.
3. Verify the settings of *parameter 8-01 Control Site* and *parameter 8-02 Control Word Source* to ensure that the PLC can control the frequency converter.

When *parameter 8-01 Control Site* is set to [0] *Digital and ctrl. word*, a connection between terminal 12/13 and terminal 27 is required to control the motor.

4. The default setting of the frequency converter allows the frequency converter to continue operation if the communication is lost to the PLC. If this operation is not wanted, change *parameter 8-04 Control Word Timeout Function* via the Main Menu.
5. The Add-On Instruction requires that *parameter 8-10 Control Word Profile* is set to [0] *FC Profile*. If *parameter 8-10 Control Word Profile* is set to [5] *ODVA*, it leads to malfunction of the AOI. Verify that *parameter 8-10 Control Word Profile* is set correctly via the Main Menu. See *VLT® EtherNet/IP MCA 121 Programming Guide* for more information.
6. Configure the IP settings of the frequency converter by setting:
  - 6a *Parameter 12-00 IP Address Assignment.*
  - 6b *Parameter 12-01 IP Address.*
  - 6c *Parameter 12-02 Subnet Mask.*

If the IP settings are set via a DIP switch, BOOTP, or DHCP server, see the *VLT® EtherNet/IP MCA 121 Programming Guide* for more information.

7. For module connection instances 103/153, configure the associated additional process data (PCD) words by setting the following parameters according to *Table 2.1*:

7a *Parameter 12-21 Process Data Config Write [0].*

7b *Parameter 12-21 Process Data Config Write [1].*

7c *Parameter 12-22 Process Data Config Read [0].*

7d *Parameter 12-22 Process Data Config Read [1].*

7e *Parameter 12-22 Process Data Config Read [2].*

7f *Parameter 12-22 Process Data Config Read [3].*

7g *Parameter 12-22 Process Data Config Read [4].*

7h *Parameter 12-22 Process Data Config Read [5].*

7i *Parameter 12-22 Process Data Config Read [6].*

7j *Parameter 12-22 Process Data Config Read [7].*

### 3 Importing the Add-On Instruction

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1. Download the Add-On Instruction file *Danfoss\_FC\_Series.L5X* from [drives.danfoss.com/downloads/software/](http://drives.danfoss.com/downloads/software/). The file is included in the zip-file *VLT EtherNet IP Add-On Instructions and User Tags*.
2. Save the Add-On Instruction file *Danfoss\_FC\_Series.L5X* on a PC.
3. Right-click *Add-On Instruction* in the navigation tree.
4. Select *Import Add-On Instruction*.

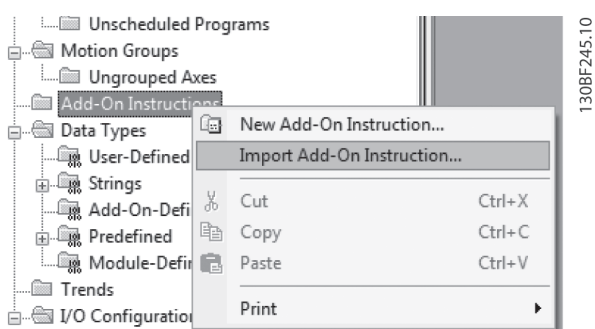


Illustration 3.1 Import Add-On Instruction

5. Select the Add-On Instruction file *Danfoss\_FC\_Series.L5X*.

The *File selection* window is shown in *Illustration 3.1*.

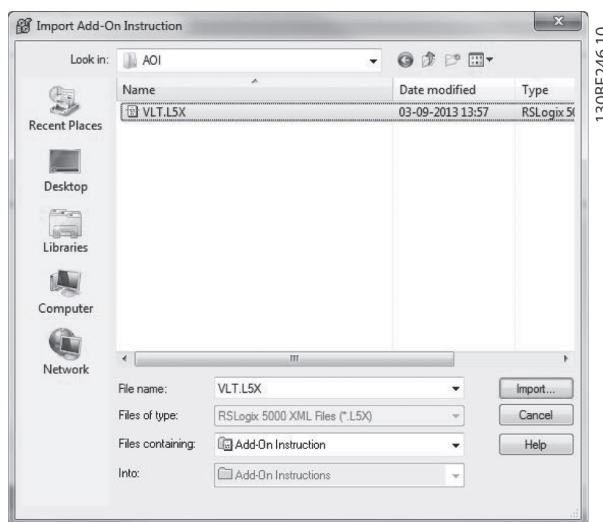
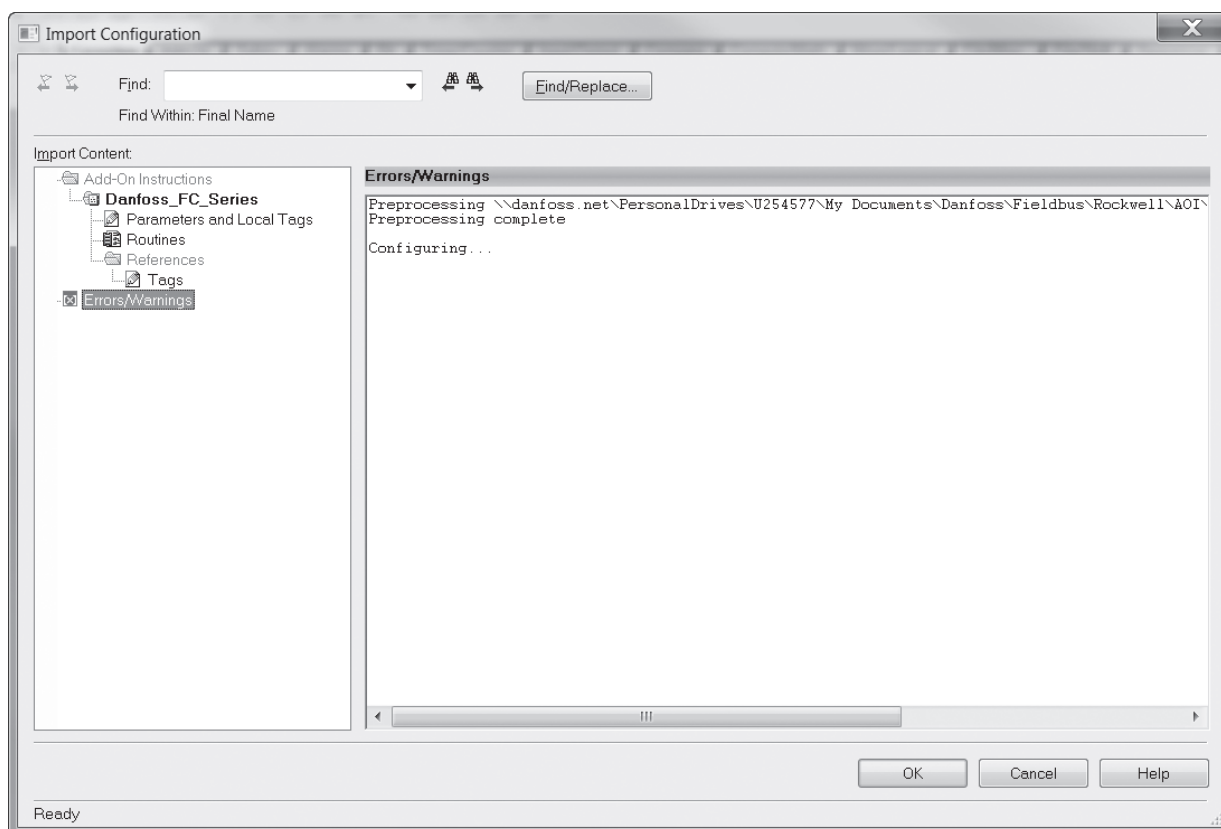


Illustration 3.2 Select Add-On Instruction File

6. Click *Import...* to import the AOI to the RXLogix 5000 tool.
7. Select the *Error/warnings* icon in the *Import configuration* window to verify that there are no warnings or errors. *Illustration 3.3* shown an example without errors.





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Illustration 3.3 Check for Errors/Warnings

If warnings and/or errors exist, the AOI does not work properly. If no errors/warnings are present, press *OK* to import the AOI. No further settings are required in this menu.

8. Verify that the AOI is available in the *Add-On Instruction* menu and that it looks as in *Illustration 3.4*. Also, verify that the name is the same.



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Illustration 3.4 Add-On Instruction Available in Menu

## 4 Configuring the I/O of the PLC

Before continuing, install the EDS file for the frequency converter on the PLC. Download the file from [drives.danfoss.com/downloads/software/](http://drives.danfoss.com/downloads/software/). See the *VLT® EtherNet/IP MCA 121 Programming Guide* for detailed information.

Add the frequency converters to the EtherNet/IP scanner module. When the module is added, the following module dialog appears as in *Illustration 4.1*:

4

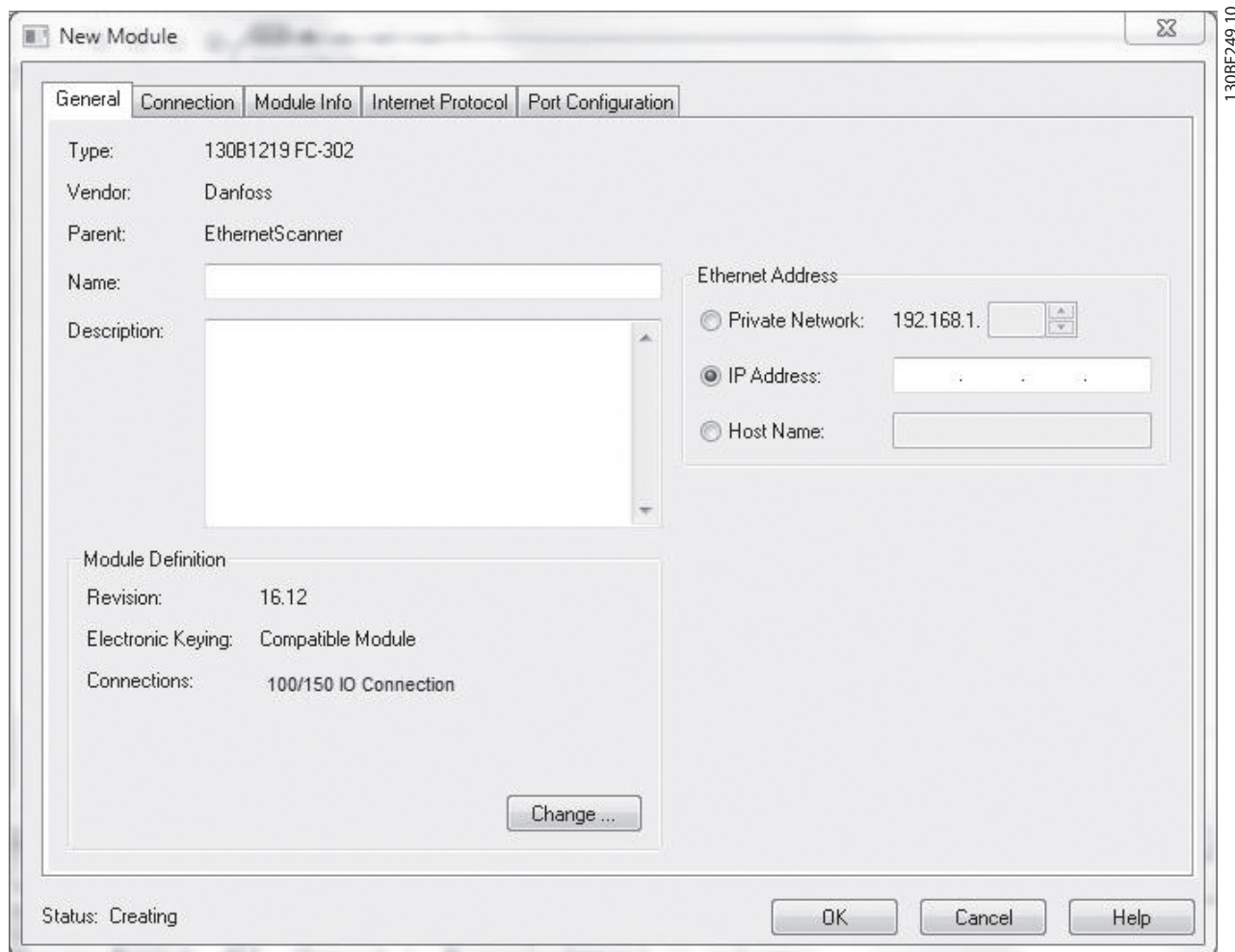


Illustration 4.1 New Module Window

1. Enter the IP address used in *parameter 12-01 IP Address*, for example 192.168.1.10. All IP addresses must be unique for each device connected to the network.
2. Set the *Name* field to, for example, FC302. This is the tag used for the actual communication
3. Change the module connection instance from 100/150 to 103/153 by clicking *Change...*. The *Module Definition* dialog appears as shown in *Illustration 4.2*.

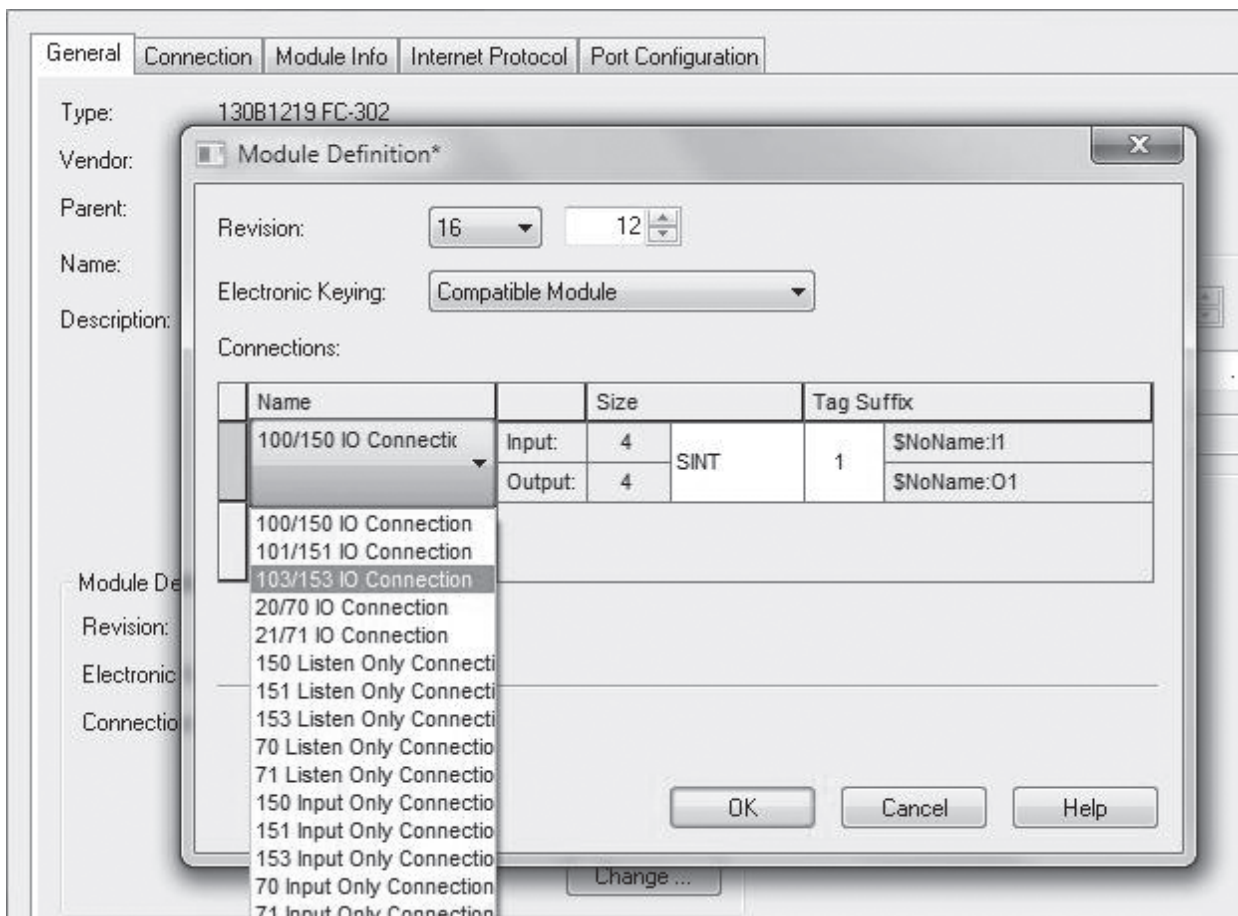


Illustration 4.2 Module Definition Window

4. Select the 103/153 IO connection and click OK to accept the new setting. The Size field is SINT to match the EDS-AOP definition in RSLogix 5000.
5. Click Yes to accept the warning message that follows.
6. Click OK to confirm the setting.

## 5 Setting up the Add-On Instruction

The Danfoss Add-On Instruction can be copied to the PLC's rung.

1. Open the Add-On Instruction folder.
2. Drag and drop the VLT AOI into a rung in the programming window.

When the AOI has been placed, the GUI looks as in *Illustration 5.1*.

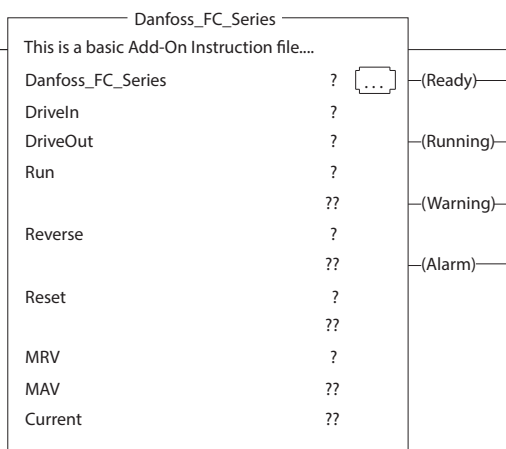


Illustration 5.1 VLT Add-On Instruction

3. Select the field *Danfoss\_FC\_Series* in AOI, right-click, and select *New Tag...*

The *New Tag* window appears, see *Illustration 5.2*.

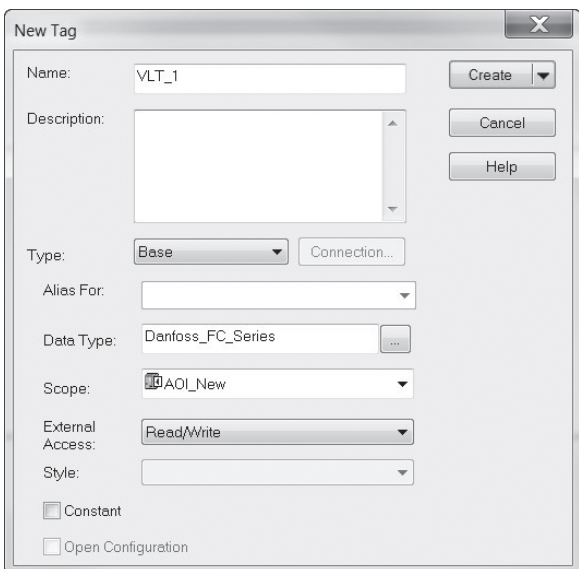


Illustration 5.2 New Tag Window

Keep the new tag in the controller scope of the PLC to have the status of the frequency converter available in the entire project.

4. Insert a name for the frequency converter to be controlled (for example VLT\_1) in the *Name* field.
5. Click *Create*.

This generates a list of tags for this AOI. The tags generated look as in *Illustration 5.3*.

Illustration 5.3 Tag List

Name	Type	Description
EnableIn	Boolean	Activates the AOI if set to true (1).
Run	Boolean	Set to true (1): Starts the motor.
Reverse	Boolean	Set to false (0): Sets the motor direction to clockwise (CW). Set to true (1): Reverses the motor direction to counterclockwise (CCW). If the motor has to run in CCW, set <i>parameter 4-10 Motor Speed Direction to [2] Both directions</i> .
Reset	Boolean	In transition from 0 to 1, a fault trip can be reset.
MRV	Real	Main reference value: Speed setpoint in % of nominal motor speed.

Table 5.1 Function of Input Tags

Name	Type	Description
Ready	Boolean	If true (1): The motor can be started. If false (0): The frequency converter has a local stop signal activated (for example LCP stop, terminal 27=0), or an alarm that prevents the frequency converter from being ready.
Running	Boolean	If true (1): The motor is energized.
Warning	Boolean	If true (1): The frequency converter has an active warning.
Alarm	Boolean	If true (1): The frequency converter has an active alarm.
MAV	Real	Main actual value: Actual motor speed in % of nominal motor speed.
Current	Real	Motor current in Amps.

Table 5.2 Functions of Output Tags

By double-clicking the field *DriveIn* of the VLT AOI in the PLC's rung, the corresponding input tags (in the controller scope of the PLC) appear as in *Illustration 5.4*. From the drop-down list, select the input tag that corresponds to the actual frequency converter (for example FC302:I1.Data).

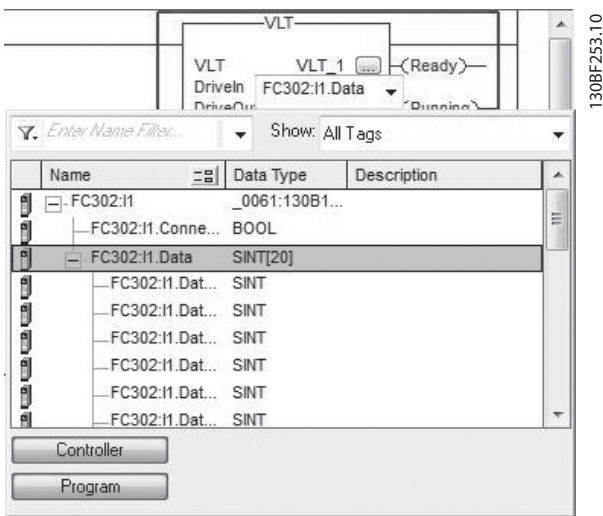


Illustration 5.4 Selecting an Input Tag

New tags can be created by right-clicking in any field and selecting *New Tag*. The same procedure must be done with the *DriveOut* field to control the frequency converter (for example FC302:O1.Data).

The frequency converter can now be controlled by just calling the AOI, setting the RUN bit to true, and setting the MRV to a value between 0.0 and 100.0%. If MRV is set to a negative value, the motor runs in CCW (if *parameter 4-10 Motor Speed Direction* is set to [2] *Both directions*).



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