Contents

1 Safety ................................................................................................................................................. 2
   1.1 Copyright, Limitation of Liability and Revision Rights ................................................................. 2
   1.4 Before Commencing Repair Work ............................................................................................... 3
   1.5 Special Conditions ....................................................................................................................... 4

2 Introduction ......................................................................................................................................... 5

3 How to Install ...................................................................................................................................... 7
   3.1 The BACnet Interface .................................................................................................................. 7
   3.4 Switches S201, S202, and S801 .................................................................................................. 9
   3.2 Bus Cabling .................................................................................................................................. 10

4 How to Configure the System ............................................................................................................. 11
   4.1 Configuring BACnet .................................................................................................................... 11
   4.2 Example of a simple setup of BACnet .......................................................................................... 12

5 BACnet Objects ..................................................................................................................................... 13
   5.1 Feedback to Network ................................................................................................................... 20
   5.2 BIBBs ......................................................................................................................................... 20

6 Parameters .......................................................................................................................................... 22
   6.1 Parameter Overview ..................................................................................................................... 22
   6.2 Parameter Description ................................................................................................................ 24

7 Troubleshooting ................................................................................................................................... 27
   7.1 Alarm, Warning and Extended Status Word ................................................................................ 27
   7.1.2 Alarm Words ........................................................................................................................... 28
   7.1.3 Warning Words ....................................................................................................................... 29
1 Safety

1.1.1 Copyright, Limitation of Liability and Revision Rights

This publication contains information proprietary to Armstrong. By accepting and using this manual the user agrees that the information contained herein will be used solely for operating equipment from Armstrong or equipment from other vendors provided that such equipment is intended for communication with Armstrong equipment over a serial communication link. This publication is protected under the Copyright laws of Denmark and most other countries.

Armstrong does not warrant that a software program produced according to the guidelines provided in this manual will function properly in every physical, hardware or software environment.

Although Armstrong has tested and reviewed the documentation within this manual, Armstrong makes no warranty or representation, neither expressed nor implied, with respect to this documentation, including its quality, performance, or fitness for a particular purpose.

In no event shall Armstrong be liable for direct, indirect, special, incidental, or consequential damages arising out of the use, or the inability to use information contained in this manual, even if advised of the possibility of such damages. In particular, Armstrong is not responsible for any costs, including but not limited to those incurred as a result of lost profits or revenue, loss or damage of equipment, loss of computer programs, loss of data, the costs to substitute these, or any claims by third parties.

Armstrong reserves the right to revise this publication at any time and to make changes to its contents without prior notice or any obligation to notify former or present users of such revisions or changes.

1.1.2 Safety Note

Safety Regulations

1. The frequency converter must be disconnected from mains if repair work is to be carried out. Check that the mains supply has been disconnected and that the necessary time has passed before removing motor and mains plugs.

2. The [STOP/RESET] key on the LCP of the frequency converter does not disconnect the equipment from mains and is thus not to be used as a safety switch.

3. Correct protective earthing of the equipment must be established, 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 currents are higher than 3.5mA.

5. Protection against motor overload is set by 1-90 Motor Thermal Protection. If this function is desired, set 1-90 Motor Thermal Protection to data value [ETR trip] (default value) or data value [ETR warning]. Note: The function is initialized at 1.16 x rated motor current and rated motor frequency.

For the North American market: The ETR functions provide class 20 motor overload protection in accordance with NEC.

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 passed before removing motor and mains plugs.

7. Please note that the frequency converter has more voltage inputs than L1, L2 and L3, when load sharing (linking of DC intermediate circuit) and external 24V DC have been installed. Check that all voltage inputs have been disconnected and that the necessary time has passed 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 make it necessary to ensure that no unintended start occurs, these stop functions are not sufficient.

2. While parameters are being changed, the motor may start. Consequently, the stop key [STOP/RESET] must always be activated; following which data can be modified.

3. A motor that has been stopped may start if faults occur in the electronics of the frequency converter, or if a temporary overload or a fault in the supply mains or the motor connection ceases.

1.1.3 Symbols

Symbols used in this manual

NOTE
Indicates something to be noted by the reader.

CAUTION
Indicates a general warning.

WARNING
Indicates a high-voltage warning.

Indicates default setting

1.1.4 Before Commencing Repair Work

1. Disconnect the frequency converter from mains
2. Disconnect DC bus terminals 88 and 89
3. Wait at least the time mentioned in section General Warning above
4. Remove motor cable
1.1.5 Special Conditions

**Electrical ratings:**
The rating indicated on the nameplate of the frequency converter is based on a typical 3-phase mains power supply, within the specified voltage, current and temperature range, which is expected to be used in most applications.

The frequency converters also support other special applications, which affect the electrical ratings of the frequency converter.

Special conditions which affect the electrical ratings might be:

- Single phase applications
- High temperature applications which require de-rating of the electrical ratings
- Marine applications with more severe environmental conditions.

Other applications might also affect the electrical ratings.

Consult the relevant sections in this manual and in the **IVS 102 Design Guide**, for information about the electrical ratings.

**Installation requirements:**
The overall electrical safety of the frequency converter requires special installation considerations regarding:

- Fuses and circuit breakers for over-current and short-circuit protection
- Selection of power cables (mains, motor, brake, loadsharing and relay)
- Grid configuration (grounded delta transformer leg, IT, TN, etc.)
- Safety of low-voltage ports (PELV conditions)

Consult the relevant clauses in these instructions and in the **IVS 102 Design Guide** for information about the installation requirements.

1.1.6 Installation at High Altitudes (PELV)

**WARNING**

**Hazardous Voltage!**

By altitudes above 2km, please contact Armstrong regarding PELV.

Avoid un-intended start

While the frequency converter is connected to mains, the motor can be started/stopped using digital commands, bus commands, references or via the LCP.

- Disconnect the frequency converter from mains whenever personal safety considerations make it necessary to avoid unintended start.
- To avoid unintended start, always activate the [OFF] key before changing parameters.
- Unless terminal 37 is turned off, an electronic fault, temporary overload, a fault in the mains supply, or lost motor connection may cause a stopped motor to start.

Failure to follow recommendations could result in death or serious injury.
2 Introduction

2.1.1 About this Manual

First time users can obtain the most essential information for quick installation and set-up in these chapters

Introduction
How to Install
How to Configure the System

For more detailed information including the full range of set-up options and diagnosis tools please refer to the chapters:

How to Control the Frequency Converter
Parameters
Troubleshooting

2.1.2 Technical Overview

BACnet (Building Automation and Control Network) is an open data communications protocol, American National Standard (ANSI/ASHRAE 135-1995). BACnet provides a means by which computer-based control equipment from different manufacturers can work together. BACnet is designed to handle many types of building controls, including HVAC, lighting, security, fire, access control, maintenance and waste management. BACnet permits flexibility for expansion and different equipment combinations.

Conformance Classes, Function Groups and the PICS:
Evaluating the capabilities of a BACnet device is potentially a formidable task, given the great choice of Objects, Properties and Services, which can be implemented, as well as the fact that it is not necessary for every BACnet device to have a full BACnet implementation in order to carry out its task. ASHRAE's BACnet Committee recognized this problem and responded with aids to evaluation in the form of "Conformance Classes," "Function Groups" and the "Protocol Implementation Conformance Statement" (PICS).

The BACNet protocol defines six levels of Conformance Classes, each of which specifies the minimum subset of Services implemented on the device. The lowest level, Conformance Class 1, requires only that the BACnet device contain a Device Object and that it be able to execute (respond to) a ReadProperty Service request. Each successive Conformance Class level adds Service Requests that must be executable by the device, as well as the Service Requests it must be able to initiate. Conformance Class 6 requires 21 types of Service Requests (of the 32 overall) to be implemented, of which 20 must be initiable and 17 executable. Conformance Class thus provides a measure of the device's ability to communicate.

Function Groups specify a combination of Objects and Services necessary to carry out certain building automation functions. They are specified independently of Conformance Class, though the implementation of some of the Function Groups automatically confers some Conformance Class higher than 1.

<table>
<thead>
<tr>
<th>Background information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol name:</td>
</tr>
<tr>
<td>Technology developer:</td>
</tr>
<tr>
<td>Year introduced:</td>
</tr>
<tr>
<td>Openness:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network topology:</td>
</tr>
<tr>
<td>Physical media:</td>
</tr>
<tr>
<td>Max. Distance at low speed:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transport mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication methods:</td>
</tr>
<tr>
<td>Baud Rates Supported:</td>
</tr>
<tr>
<td>Termination:</td>
</tr>
</tbody>
</table>

2.1.3 Assumptions

This manual assumes you are using the BACnet Protocol with a FC102 series frequency converter. It is also assumed that your system is equipped with a firmware supporting the BACnet communication services required by your application and that all requirements stipulated in the BACnet standard, as well as those pertaining to the IVS 102 Variable Speed Drive are strictly observed as well as all limitations therein fully respected.

2.1.4 Background Knowledge

The Armstrong BACNet Protocol is designed to communicate with any system complying with the BACnet MS/TP standard. Familiarity with the PC, BMS or PLC used as a master in the system is assumed. Issues regarding hardware or software produced by other manufacturers are beyond the scope of this manual and are not the responsibility of Armstrong.

If you have questions regarding set-up of master-to-master communication or communication to a non-Armstrong slave, please consult the appropriate manuals.
2.1.5 Available Literature for IVS 102

- Operating Instructions MG.11.Ax.yy provide the necessary information for getting the frequency converter up and running.
- Operating Instructions IVS 102 High Power, 94.888
- Design Guide 94.881 entails all technical information about the frequency converter and customer design and applications.
- Programming Guide MG.11.Cx.yy provides information on how to programme and includes complete parameter descriptions.
- Mounting Instruction, Analog I/O Option MCB 109, MI.38.Bx.yy
- PC-based Configuration Tool MCT 10, MG.10.Ax.yy
- Armstrong IVS 102 Energy Box software at www.danfoss.com/BusinessAreas/DrivesSolutions then choose PC Software Download
- IVS 102 Drive Applications, MG.11.Tx.yy
- Operating Instructions IVS 102 Profibus, MG.33.Cx.yy
- Operating Instructions IVS 102 Device Net, MG.33.Dx.yy
- Operating Instructions IVS 102 BACnet, 94.882
- Operating Instructions IVS 102 LonWorks, 94.884
- Operating Instructions IVS 102 Metasys, 94.885
- Operating Instructions IVS 102 FLN, 94.889
- Output Filter Design Guide, MG.90.Nx.yy
- Brake Resistor Design Guide, MG.90.Ox.yy

x = Revision number
yy = Language code

Armstrong technical literature is available in print from your local Armstrong Sales Office or online at:

2.1.6 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACI</td>
<td>Acyclical Control Interval</td>
</tr>
<tr>
<td>AOC</td>
<td>Application Orientated Controller</td>
</tr>
<tr>
<td>AV</td>
<td>Analog Variable</td>
</tr>
<tr>
<td>BMS</td>
<td>Building Management System</td>
</tr>
<tr>
<td>BV</td>
<td>Binary Variable</td>
</tr>
<tr>
<td>CTW</td>
<td>Control Word</td>
</tr>
<tr>
<td>EEPROM</td>
<td>Electrical Erasable Programmable Read Only Memory</td>
</tr>
<tr>
<td>EIA</td>
<td>Electronic Industries Association: Specifies of the EIA Standard RS 485-A</td>
</tr>
<tr>
<td>EMC</td>
<td>Electromagnetic Compatibility</td>
</tr>
<tr>
<td>I/O</td>
<td>Input/Output</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standards Organization</td>
</tr>
<tr>
<td>LCP</td>
<td>Local Control Panel</td>
</tr>
<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>MAV</td>
<td>Main Actual Value</td>
</tr>
<tr>
<td>MRV</td>
<td>Main Reference Value</td>
</tr>
<tr>
<td>PC</td>
<td>Personal Computer</td>
</tr>
<tr>
<td>PDU</td>
<td>Protocol Data Unit</td>
</tr>
<tr>
<td>PELV</td>
<td>Protected Extra Low Voltage</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable Logic Control</td>
</tr>
<tr>
<td>PNU</td>
<td>Parameter Number</td>
</tr>
<tr>
<td>STW</td>
<td>Status Word</td>
</tr>
</tbody>
</table>
3 How to Install

3.1 The BACnet Interface

3.1.1 Cabling

**Cable lengths and number of nodes**
For the correct function of a BACnet MS/TP system, it is mandatory to fulfill installation of the communication cables given in this manual. Under correct installation it is possible to have up to 250 nodes (125 masters and 125 slaves) on 1200 meter (4000 feet) cable.

The use of drop cable connection (i.e. T-connection) is not allowed in a BACnet MS/TP system. Drop cables will lead to reflection and malfunction of the system. In location where the cabling will demand a T-connection the use of repeaters is recommended.

Note that a repeater is a node in both of the two segments it connects. The number of frequency converters is based on a single master system. If there are two or more devices (e.g. PC tools, Routers), the number of frequency converters must be reduced correspondingly.

- Maximum length of an MS/TP segment: 1200 meters (4000 feet)
- Characteristic impedance: 100 to 130Ω
- Resistance: <110Ω/km
- Distributed capacitance: <100pF/m, between conductors
- Cross section: 0.82mm² conductor area, corresponding to AWG 18
- Cable type: twisted in pairs, 1 x 2, or 2 x 2 wires
- Screening: Copper-braided screen or braided screen and foil screen

Use of the same cable type throughout the entire segment is recommended to avoid impedance mismatch.
3.1.2 Network Connection

Connect the frequency converter to the RS-485 network as follows (see also diagram):

1. Connect signal wires to terminal 68 (P+) and terminal 69 (N-) on the main control board of the frequency converter.
2. Connect the cable screen as described under chapter Bus Cabling.

NOTE
Screened, twisted-pair cables are recommended to reduce noise between conductors.

3.1.3 Network Termination

Maximum Cable Lengths
Maximum total bus cable length: 4000 feet ~ 1200m
3.1.4 Switches S201, S202, and S801

Switches S201 (A53) and S202 (A54) are used to select a current (0-20mA) or a voltage (-10 to 10V) configuration of the analog input terminals 53 and 54 respectively.

Switch S801 (BUS TER.) can be used to enable termination on the RS-485 port (terminals 68 and 69).

See drawing Diagram showing all electrical terminals in section Electrical Installation.

Default setting:
- S201 (A53) = OFF (voltage input)
- S202 (A54) = OFF (voltage input)
- S801 (Bus termination) = OFF

NOTE
When changing the function of S201, S202 or S801 be careful not to use force for the switch over. It is recommended to remove the LCP fixture (cradle) when operating the switches. The switches must not be operated with power on the frequency converter.

3.1.5 Cable Routing

The BACnet communication cable must be kept away from motor and brake resistor cables to avoid coupling of high frequency noise from one cable to the other. Normally a distance of 200mm is sufficient, but maintaining the greatest possible distance between cables is generally recommended, especially where cables run in parallel over long distances.

When crossing is unavoidable, the BACnet cable must cross motor and brake resistor cables at an angle of 90°.
3.2 Bus Cabling

3.2.1 EMC Precautions

The following EMC precautions are recommended to achieve interference-free operation of the BACnet network. Additional EMC information is available in the IVS 102 Design Guide. Please also consult the BACnet master manual for further installation guidelines.

Ensure compliance with relevant national and local regulations, for example in protective earth connection.

3.2.2 Single Ground Shielding

For installing the bus cable on MS/TP, two different strategies can be followed, Single ground of shield and multiple ground of shield. Each strategy has both advantages and disadvantages. The following chapter explains the different between the two strategies. The single ground shield is specified in the ANSI/ASRAHE 135-2004 standard. The solution benefits by having only one ground connection of the shield, by doing so the possibility for ground loop of equalizing current is heavily reduced. In these systems the shield of the MS/TP cables has to be isolated from ground at all stations, except one. At each station the shield from the two cables has to be connected with each other, and isolated from ground. The best solution for this has been proven to be the use of shrink tubes. The single ground shielding is a good approach where the system uses long bus cables. If two buildings have to be connected over the same MS/TP bus cable, the use of fibre optic has to be considered. This will prevent that a lightning stroke will be carried from one building to another, and problem with difference in earth potential can be neglected.

3.2.3 Multiple Ground Shielding

If the distance between the individual drives is limited (e.g. inside a cabinet or in one control room) Armstrong recommends connecting the screen to ground at both ends of the bus cable. This ensures the maximum protection from EMC noise. Connecting the screen at each end will require that each BACnet device has the same earth potential or an equalizing current will flow in the screen of the cable and cause disturbance and poor performance of the system. Low impedance to ground connection of the screen can be achieved by connecting the surface of the screen to ground, by means of a cable clamp or a conductive cable gland. The FC 100 Series supplies various clamps and brackets to enable a proper ground connection of the BACnet cable screen.

Armstrong recommends to connect the screen to ground at both ends of the bus cable. This ensures the maximum protection from EMC noise. Connecting the screen at each end will require that each BACnet device has the same earth potential or else an equalizing current will flow in the screen of the cable and cause disturbance and poor performance of the system. Where this is not possible, the screen can be isolated from the chassis of the drive by use of shrink-tubing. It must be pointed out that the routing of the BACnet cable must be established with a maximum distance to other cables such as mains, motor cable, etc.
4 How to Configure the System

4.1 Configuring BACnet

4.1.1 Initialization Procedure

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default Value</th>
<th>Setting for BACnet</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-01 Control Site</td>
<td>Digital and control word</td>
<td>Digital and control word</td>
</tr>
<tr>
<td>8-02 Control Source</td>
<td>FC RS485</td>
<td>FC RS-485</td>
</tr>
<tr>
<td>8-03 Control Timeout Time</td>
<td>60 sec</td>
<td>1)</td>
</tr>
<tr>
<td>8-04 Control Timeout Function</td>
<td>Off</td>
<td>1)</td>
</tr>
<tr>
<td>8-05 End-of-Timeout Function</td>
<td>Resume setup</td>
<td>1)</td>
</tr>
<tr>
<td>8-06 Reset Control Timeout</td>
<td>Do not reset</td>
<td>1)</td>
</tr>
<tr>
<td>8-07 Diagnosis Trigger</td>
<td>Disable</td>
<td>n.a.</td>
</tr>
<tr>
<td>8-09 Communication Charset</td>
<td>ANSI X3.4</td>
<td></td>
</tr>
<tr>
<td>8-10 Control Profile</td>
<td>FC Profile</td>
<td>2)</td>
</tr>
</tbody>
</table>

Table 4.1 General Settings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default Value</th>
<th>Setting for BACnet</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-30 Protocol</td>
<td>FC</td>
<td>BACnet</td>
</tr>
<tr>
<td>8-31 Address</td>
<td>1</td>
<td>1)</td>
</tr>
<tr>
<td>8-32 Baud Rate</td>
<td>9600</td>
<td>9600 baud</td>
</tr>
<tr>
<td>8-35 Minimum Response Delay</td>
<td>10ms</td>
<td>10ms</td>
</tr>
<tr>
<td>8-36 Maximum Response Delay</td>
<td>5000ms</td>
<td>5000ms</td>
</tr>
</tbody>
</table>

Table 4.2 FC Port Settings

1) Depending on your application.
2) Depending on the BMS system
3) The address setting is depending on the system and each device connected to the BACnet MS/TP must have a unique address on this MS/TP network. Please also see section Parameter Overview > Parameter List.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default Value</th>
<th>Setting for BACnet</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-50 Coasting Select</td>
<td>Logic-or</td>
<td>Logic-or</td>
</tr>
<tr>
<td>8-52 DC Brake Select</td>
<td>Logic-or</td>
<td>Logic-or</td>
</tr>
<tr>
<td>8-53 Start Select</td>
<td>Logic-or</td>
<td>Logic-or</td>
</tr>
<tr>
<td>8-54 Reversing Select</td>
<td>Logic-or</td>
<td>Logic-or</td>
</tr>
<tr>
<td>8-55 Set-up Select</td>
<td>Logic-or</td>
<td>Logic-or</td>
</tr>
<tr>
<td>8-56 Preset Reference Select</td>
<td>Logic-or</td>
<td>Logic-or</td>
</tr>
</tbody>
</table>

Table 4.3 Digital/Bus Settings

<table>
<thead>
<tr>
<th>Name</th>
<th>Default Value</th>
<th>Setting for BACnet</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-70 BACnet Device Instance</td>
<td>1</td>
<td>1)</td>
</tr>
<tr>
<td>8-72 MS/TP Max Masters</td>
<td>127</td>
<td>Dependent on the Number of Masters in the system</td>
</tr>
<tr>
<td>8-74 &quot;I-Am&quot; Service</td>
<td>At power up</td>
<td>At power up</td>
</tr>
<tr>
<td>8-75 Initialisation Password</td>
<td>“admin”</td>
<td>“admin”</td>
</tr>
</tbody>
</table>

Table 4.4 BACnet Settings

1) The device instance setting is depending on the system, and each device connected to the BACnet MS/TP must have a unique device instance in the complete system.
4.1.2 Control Word Time-out Function

8-03 Control Timeout Time and 8-04 Control Timeout Function are not enabled in this version of the BACnet option.

4.2 Example of a simple setup of BACnet

This example shows the necessary steps to set up the FC102 BACnet interface with the following system requirements:

- MS/TP running at 38,400 Baud
- MAC address 20 for the FC102 on the MS/TP network
- Device Instance number 1025 for the FC102
- Highest number of a Master device is 35
- Start/stop of FC from BACnet only
- Reference from BACnet
- Read status of FC (Actual speed)

<table>
<thead>
<tr>
<th>Set the following parameters:</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-30 Protocol</td>
<td>BACnet [5]</td>
</tr>
<tr>
<td>8-31 Address</td>
<td>20</td>
</tr>
<tr>
<td>8-32 Baud Rate</td>
<td>38,400 Baud [4]</td>
</tr>
<tr>
<td>8-50 Coasting Select</td>
<td>Bus [1]</td>
</tr>
<tr>
<td>8-70 BACnet Device Instance</td>
<td>1025</td>
</tr>
<tr>
<td>8-72 MS/TP Max Masters</td>
<td>35</td>
</tr>
</tbody>
</table>

After the parameters have been set according the table above, the drive has to be unpowered and repowered before the changes take effect. When the frequency converter is detected by the BMS, the drive can be controlled by BV:1, which will start the motor if set to [1]. Setting AV:1 will set the speed reference of the drive. The actual speed can be monitored via AV:3. See also Analog Input- and Output Objects section.
5 BACnet Objects

5.1.1 Analog Input- and Output Objects

Control the frequency converter from the BACnet network using 'objects'. The various types of 'objects' and their descriptions are shown in the following tables. In the following tables all available objects are shown. The availability of objects depends on the mounting of the B and/or C options.

<table>
<thead>
<tr>
<th>ID</th>
<th>Object_Name</th>
<th>Present_Value</th>
<th>Default name</th>
<th>Parameter</th>
<th>Unit</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI0</td>
<td>Analog Input 53</td>
<td>1662 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI1</td>
<td>Analog Input 54</td>
<td>1664 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI2</td>
<td>Analog In X30/11</td>
<td>1675 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI3</td>
<td>Analog In X30/12</td>
<td>1676 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI4</td>
<td>Analog In X42/1</td>
<td>1830 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI5</td>
<td>Analog In X42/3</td>
<td>1831 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI6</td>
<td>Analog In X42/5</td>
<td>1832 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.1 Analog Inputs Object Map

<table>
<thead>
<tr>
<th>ID</th>
<th>Object_Name</th>
<th>Present_Value</th>
<th>Default name</th>
<th>Parameter</th>
<th>Unit</th>
<th>Writeable</th>
<th>Cmd.able</th>
<th>Timeout</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>AO0</td>
<td>Terminal 42 Output Bus Control</td>
<td>653 %</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>AO1</td>
<td>Pulse out #27 Bus Control</td>
<td>593 %</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>AO2</td>
<td>Pulse out #29 Bus Control</td>
<td>595 %</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>AO3</td>
<td>Terminal X30/8 Output Bus Control</td>
<td>663 %</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>MCB 101</td>
</tr>
<tr>
<td>AO4</td>
<td>Analog Output X42/7</td>
<td>2643 V</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>MCB 109</td>
</tr>
<tr>
<td>AO5</td>
<td>Analog Output X42/9</td>
<td>2653 V</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>MCB 109</td>
</tr>
<tr>
<td>AO6</td>
<td>Analog Output X42/11</td>
<td>2663 V</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>MCB 109</td>
</tr>
</tbody>
</table>

Table 5.2 Analog Outputs
<table>
<thead>
<tr>
<th>ID</th>
<th>Object_Name</th>
<th>Present_Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV:0</td>
<td>Reserved for VFD profile</td>
<td></td>
</tr>
<tr>
<td>AV:1</td>
<td>Input Reference 1</td>
<td>x x Note 1 % x x x</td>
</tr>
<tr>
<td>AV:2</td>
<td>Input Reference 2</td>
<td></td>
</tr>
<tr>
<td>AV:3</td>
<td>Output Speed</td>
<td>x x Note 2 % x x x</td>
</tr>
<tr>
<td>AV:4</td>
<td>PID Feedback</td>
<td></td>
</tr>
<tr>
<td>AV:5</td>
<td>Motor Current</td>
<td>x x 1614 Amps</td>
</tr>
<tr>
<td>AV:6</td>
<td>Power</td>
<td>x x 1610 kW</td>
</tr>
<tr>
<td>AV:7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:10</td>
<td></td>
<td>Reserved for VFD profile</td>
</tr>
<tr>
<td>AV:11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:15</td>
<td>Motor Thermal</td>
<td>1618 %</td>
</tr>
<tr>
<td>AV:16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:18</td>
<td></td>
<td>Reserved for VFD profile</td>
</tr>
<tr>
<td>AV:19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:21</td>
<td>Operating Hours</td>
<td>1500 Hours</td>
</tr>
<tr>
<td>AV:22</td>
<td>Running Hours</td>
<td>1501 Hours</td>
</tr>
<tr>
<td>AV:23</td>
<td>kWh Counter</td>
<td>1502 kWh</td>
</tr>
<tr>
<td>AV:24</td>
<td>Motor Voltage</td>
<td>1612 V</td>
</tr>
<tr>
<td>AV:25</td>
<td>Frequency</td>
<td>1613 Hz</td>
</tr>
<tr>
<td>AV:26</td>
<td>Torque</td>
<td>1622 %</td>
</tr>
<tr>
<td>AV:27</td>
<td>DC Link Voltage</td>
<td>1630 V</td>
</tr>
<tr>
<td>AV:28</td>
<td>Heatsink Temp.</td>
<td>1634 Deg</td>
</tr>
<tr>
<td>AV:29</td>
<td>Inverter Thermal</td>
<td>1635 %</td>
</tr>
<tr>
<td>AV:30</td>
<td>Setpoint 1</td>
<td>2021 % x</td>
</tr>
<tr>
<td>AV:31</td>
<td>Bus Feedback 1</td>
<td>894 % x</td>
</tr>
<tr>
<td>AV:32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:33</td>
<td></td>
<td>Reserved for P, I, D</td>
</tr>
<tr>
<td>AV:34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:35</td>
<td>Setpoint 2</td>
<td>2022 % x</td>
</tr>
<tr>
<td>AV:36</td>
<td>Bus Feedback 2</td>
<td>895 % x</td>
</tr>
<tr>
<td>ID</td>
<td>Object_Name</td>
<td>Present_Value</td>
</tr>
<tr>
<td>------</td>
<td>---------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>AV:37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:38</td>
<td></td>
<td>Reserved for P, I, D</td>
</tr>
<tr>
<td>AV:39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:40</td>
<td>Setpoint 3</td>
<td>2023 %</td>
</tr>
<tr>
<td>AV:41</td>
<td>Bus Feedback 3</td>
<td>896 %</td>
</tr>
<tr>
<td>AV:42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:43</td>
<td></td>
<td>Reserved for P, I, D</td>
</tr>
<tr>
<td>AV:44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:45</td>
<td>Running Bypass</td>
<td>3111 Hours</td>
</tr>
<tr>
<td>AV:46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV:50</td>
<td>Alarm Log: Error Code</td>
<td>1530 NONE</td>
</tr>
<tr>
<td>AV:51</td>
<td>Fault Code</td>
<td>Note 4 NONE</td>
</tr>
<tr>
<td>AV:52</td>
<td>PID Start Speed</td>
<td>2083 Hz</td>
</tr>
<tr>
<td>AV:53</td>
<td>On Reference Bandwidth</td>
<td>2084 %</td>
</tr>
<tr>
<td>AV:54</td>
<td>PID Proportional Gain</td>
<td>2093 NONE</td>
</tr>
<tr>
<td>AV:55</td>
<td>PID Integral Time</td>
<td>2094 Sec</td>
</tr>
<tr>
<td>AV:56</td>
<td>PID Differentiation Time</td>
<td>2095 Sec</td>
</tr>
<tr>
<td>AV:57</td>
<td>PID Diff. Gain Limit</td>
<td>2096 NONE</td>
</tr>
</tbody>
</table>

**Table 5.3 Analog Values**

1. Either AV:1 or AV:2 controls the drive reference. Only one of them can control the frequency converter at a time and BV:2 decides which one.

2. This value is not directly available in the frequency converter. The value must be calculated as follows:
   \[ AV:3 = \frac{Par. 16 - 17}{Par. 4 - 13} \times 100 \%
   \]

3. This value is not directly available in the frequency converter. The value must be calculated as follows:
   \[ AV:4 = \frac{Par. 16 - 52}{Par. 20 - 14} \times 100 \%
   \]

4. IVS 102 fault codes are transmitted as an analog value in AV:51. The Fault codes are mapped as shown in table on following page. The IVS 102 alarm codes are shown as well for comparison.
The following table shows the mapping of the FC102 alarm codes and their mapping to the BACnet's fault codes.

<table>
<thead>
<tr>
<th>Fault codes</th>
<th>Fault Code</th>
<th>IVS 102 Alarms</th>
<th>Fault Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Error</td>
<td>1</td>
<td>17, 34</td>
<td>Loss of communication with the network</td>
</tr>
<tr>
<td>Over Current</td>
<td>2</td>
<td>13, 40, 41, 42, 59</td>
<td>Instantaneous Output Current has exceeded inverter rated or programmed value</td>
</tr>
<tr>
<td>Over Temperature</td>
<td>3</td>
<td>11, 29, 65, 69, 74, 244, 245, 247</td>
<td>Heat sink Temperature Limit has been reached</td>
</tr>
<tr>
<td>Over Speed Deviation</td>
<td>4</td>
<td>49, 62</td>
<td>Inverter has exceeded maximum or programmed limit</td>
</tr>
<tr>
<td>Over Voltage</td>
<td>5</td>
<td>5, 7, 64</td>
<td>DC Bus Voltage has exceeded inverter limit</td>
</tr>
<tr>
<td>Under Voltage</td>
<td>6</td>
<td>1, 6, 8</td>
<td>DC Bus Voltage is lower than required inverter limit</td>
</tr>
<tr>
<td>Short Circuit</td>
<td>7</td>
<td>16</td>
<td>Inverter Output has shorted Phase to Phase</td>
</tr>
<tr>
<td>Ground Fault</td>
<td>8</td>
<td>14</td>
<td>Inverter Output Grounding Current has exceeded manufacturer</td>
</tr>
<tr>
<td>Motor Overload</td>
<td>9</td>
<td>10, 50-58, 222</td>
<td>Motor is overloaded</td>
</tr>
<tr>
<td>Inverter Overload</td>
<td>10</td>
<td>9</td>
<td>Timed over current fault</td>
</tr>
<tr>
<td>Over Torque Detection</td>
<td>11</td>
<td>12</td>
<td>Programmed limit for torque has been exceeded</td>
</tr>
<tr>
<td>External Fault</td>
<td>12</td>
<td>142</td>
<td>External fault has been activated in the inverter. This is a hard fault that must be reset</td>
</tr>
<tr>
<td>Operator Interface Error</td>
<td>13</td>
<td>-</td>
<td>Inverter programming or operational interface malfunction</td>
</tr>
<tr>
<td>Load Loss</td>
<td>14</td>
<td>3, 95, 229</td>
<td>Load on the Motor is less than programmed limit of system. An Example is a broken belt or coupling</td>
</tr>
<tr>
<td>Configuration Error</td>
<td>15</td>
<td>70, 76, 79, 81, 82, 91</td>
<td>Errors exist in the programmed or operational configuration of the inverter</td>
</tr>
<tr>
<td>Feedback Failure</td>
<td>16</td>
<td>60, 90, 192</td>
<td>Required system operational feedback (signal or sensor) is not responding as expected for correct system operation</td>
</tr>
<tr>
<td>Output Phase Loss</td>
<td>17</td>
<td>30, 31, 32</td>
<td>One or more of the output phases from the inverter to the motor are open</td>
</tr>
<tr>
<td>Motor Stall</td>
<td>18</td>
<td>99</td>
<td>Motor is operating in stall region and not able to accelerate</td>
</tr>
<tr>
<td>Power Unit Error</td>
<td>19</td>
<td>4, 33, 36, 37, 46, 228, 246</td>
<td>Error sensed on the power section of the inverter</td>
</tr>
<tr>
<td>Input Phase</td>
<td>20</td>
<td>-</td>
<td>Input single phase or low line voltage condition</td>
</tr>
<tr>
<td>Internal Drive Failure</td>
<td>21</td>
<td>25, 27, 38, 39, 47, 48, 73, 85, 86</td>
<td>FC102 specific fault.</td>
</tr>
</tbody>
</table>

Table 5.4 Mapping of Fault Codes
5.1.2 Binary Input- and Output Objects

<table>
<thead>
<tr>
<th>ID</th>
<th>Default name</th>
<th>Present_Value</th>
<th>Bit number</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>BI:0</td>
<td>Digital input Term 33</td>
<td>1660</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>BI:1</td>
<td>Digital input Term 32</td>
<td>1660</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>BI:2</td>
<td>Digital input Term 29</td>
<td>1660</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>BI:3</td>
<td>Digital input Term 27</td>
<td>1660</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>BI:4</td>
<td>Digital input Term 19</td>
<td>1660</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BI:5</td>
<td>Digital input Term 18</td>
<td>1660</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>BI:6</td>
<td>Digital input Term 37</td>
<td>1660</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>BI:7</td>
<td>Digital input GPIO Term X30/2</td>
<td>1660</td>
<td>9</td>
<td>MCB 101</td>
</tr>
<tr>
<td>BI:8</td>
<td>Digital input GPIO Term X30/3</td>
<td>1660</td>
<td>8</td>
<td>MCB 101</td>
</tr>
<tr>
<td>BI:9</td>
<td>Digital input GPIO Term X30/4</td>
<td>1660</td>
<td>7</td>
<td>MCB 101</td>
</tr>
</tbody>
</table>

BI:10..BI:15 are reserved for P1660/x (MCB 115)

### Table 5.5 Binary Inputs

<table>
<thead>
<tr>
<th>ID</th>
<th>Default name</th>
<th>Present_Value</th>
<th>Bit number</th>
<th>Writeable</th>
<th>Cmd.able</th>
<th>Timeout</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>BO:0</td>
<td>Digital Output Term 27</td>
<td>590</td>
<td>0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>BO:1</td>
<td>Digital Output Term 29</td>
<td>590</td>
<td>1</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>BO:2</td>
<td>GPIO Output Term X30/6</td>
<td>590</td>
<td>2</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>MCB 101</td>
</tr>
<tr>
<td>BO:3</td>
<td>GPIO Output Term X30/7</td>
<td>590</td>
<td>3</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>MCB 101</td>
</tr>
<tr>
<td>BO:4</td>
<td>Relay 1</td>
<td>590</td>
<td>4</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>BO:5</td>
<td>Relay 2</td>
<td>590</td>
<td>5</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>BO:6</td>
<td>Option B Relay 1 Output</td>
<td>590</td>
<td>6</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>MCB 105</td>
</tr>
<tr>
<td>BO:7</td>
<td>Option B Relay 2 Output</td>
<td>590</td>
<td>7</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>MCB 105</td>
</tr>
<tr>
<td>BO:8</td>
<td>Option B Relay 3 Output</td>
<td>590</td>
<td>8</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>MCB 105</td>
</tr>
</tbody>
</table>

BO:9..BO:39 are reserved for Output P590/x (MCB 115)

### Table 5.6 Binary Outputs
<table>
<thead>
<tr>
<th>ID</th>
<th>Object_Name</th>
<th>Present_Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BV:0</td>
<td>Reserved for VFD profile</td>
<td></td>
</tr>
<tr>
<td>BV:1</td>
<td>RUN/STOP Command x x</td>
<td>CTW:047c Reversing bit 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 reverse x x</td>
</tr>
<tr>
<td>BV:2</td>
<td>REF 1 / REF 2 Select x x</td>
<td>Note 1 n/a x x x x</td>
</tr>
<tr>
<td>BV:3</td>
<td>Fault Reset Command x x</td>
<td>CTW 7 x</td>
</tr>
<tr>
<td>BV:4</td>
<td>RUN / STOP Monitor x x</td>
<td>STW 1</td>
</tr>
<tr>
<td>BV:5</td>
<td>OK / FAULT Monitor x x</td>
<td>STW 3, 6, 7</td>
</tr>
<tr>
<td>BV:6</td>
<td>HAND / AUTO Reference x x</td>
<td>16-95 1</td>
</tr>
<tr>
<td>BV:7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:13</td>
<td>Reserved for VFD profile</td>
<td></td>
</tr>
<tr>
<td>BV:14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:21</td>
<td>Warning x x STW 7</td>
<td></td>
</tr>
<tr>
<td>BV:22</td>
<td>Trip x x STW 3</td>
<td></td>
</tr>
<tr>
<td>BV:23</td>
<td>Triplock STW 6</td>
<td></td>
</tr>
<tr>
<td>BV:24</td>
<td>Coasting CTW 3 x x x x</td>
<td></td>
</tr>
<tr>
<td>BV:25</td>
<td>CW/CCW CTW 15 x x x x</td>
<td></td>
</tr>
<tr>
<td>BV:26</td>
<td>Jog CTW 8 x x x x</td>
<td></td>
</tr>
<tr>
<td>BV:27</td>
<td>Reset CTW 7 x x x x</td>
<td></td>
</tr>
<tr>
<td>BV:28</td>
<td>Reset KWh Counter 1506 n/a x</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:29</td>
<td>Reset Running Hours Counter 1507 n/a x</td>
<td></td>
</tr>
<tr>
<td>BV:30</td>
<td>Reverse STW 1</td>
<td></td>
</tr>
<tr>
<td>BV:31</td>
<td>Speed = reference STW 8</td>
<td></td>
</tr>
<tr>
<td>BV:32</td>
<td>Bus control STW 9</td>
<td></td>
</tr>
<tr>
<td>BV:33</td>
<td>Running x x STW 11</td>
<td></td>
</tr>
<tr>
<td>BV:34</td>
<td>Ramp 1/ Ramp 2 CTW 9 x x x</td>
<td></td>
</tr>
<tr>
<td>BV:35</td>
<td>ECB Test Mode 3110 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td>Object_Name</td>
<td>Present_Value</td>
</tr>
<tr>
<td>------</td>
<td>------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>BV:36</td>
<td>ECB Drive Mode</td>
<td>3110 1</td>
</tr>
<tr>
<td>BV:37</td>
<td>ECB auto. Bypass Enable</td>
<td>3110 2</td>
</tr>
<tr>
<td>BV:38</td>
<td>ECB Bypass Mode</td>
<td>3110 3</td>
</tr>
<tr>
<td>BV:39</td>
<td>Reserved for ECB (MCO 104) - 3110 bit 4..10</td>
<td></td>
</tr>
<tr>
<td>BV:40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BV:45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.1.3 Multi-state Value Objects

<table>
<thead>
<tr>
<th>ID</th>
<th>Object_Name</th>
<th>Present_Value</th>
<th>Timeout</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSV:0</td>
<td>Smart Logic Controller State</td>
<td>1638 n/a</td>
<td></td>
</tr>
<tr>
<td>MSV:1</td>
<td>Active Setup</td>
<td>CTW 13 and 14 x x x</td>
<td></td>
</tr>
</tbody>
</table>
5.1.4 Real Time Clock Variable

The frequency converter has a built-in real-time clock. The standard real-time clock has no battery backup function, which will lead to a loss of time if the drive is un-powered. Some BACnet Master's can be programmed to send out the date and time as a Broadcast Telegram on a regular basis. The BACnet Interface will update the real-time clock of the drive if it receives the time synchronization telegram.

5.1 Feedback to Network

The BACnet option provides several output variables (nvo’s) objects to the network, containing important motor- and I/O feedback data. The BACnet option transmits bound network variables only and sends feedback data when there is a change in value.

Influence of the digital input terminals upon the Control Mode, 8-50 Coasting Select to 8-56 Preset Reference Select

The influence of the digital input terminals upon control of the frequency converter can be programmed in 8-50 Coasting Select to 8-56 Preset Reference Select.

8-01 Control Site overrules the settings in parameters 8-50 to 8-56 and Terminal 37, Safe Stop overrules any parameter.

Each of the digital input signals can be programmed to logic AND, logic OR, or to have no relation to the corresponding bit in the control word. In this way a specific control command i.e. stop / coast, can be initiated by the fieldbus only, fieldbus AND Digital Input, or Fieldbus OR Digital input terminal.

In order to control the frequency converter via BACnet, 8-50 Coasting Select must be set to either Bus [1], or to Logic AND [2] and 8-01 Control Site must be set to Digital and ctrl. word [0] or Controlword only [2].

5.2 BIBBs

<table>
<thead>
<tr>
<th>BIBB</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ReadProperty</td>
<td>Execute</td>
</tr>
<tr>
<td>WriteProperty</td>
<td>Execute</td>
</tr>
<tr>
<td>DeviceCommunicationControl</td>
<td>Execute</td>
</tr>
<tr>
<td>ReinitializeDevice</td>
<td>Execute</td>
</tr>
<tr>
<td>I-Am</td>
<td>Initiate</td>
</tr>
<tr>
<td>I-Have</td>
<td>Initiate</td>
</tr>
<tr>
<td>TimeSynchronization</td>
<td>Execute</td>
</tr>
<tr>
<td>Who-Has</td>
<td>Execute</td>
</tr>
<tr>
<td>Who-Is</td>
<td>Execute</td>
</tr>
</tbody>
</table>
### 5.3.1 Object/Property Support Matrix

The following table summarises the Object Types and Properties supported:

<table>
<thead>
<tr>
<th>Property</th>
<th>Device</th>
<th>Binary Input</th>
<th>Binary Output</th>
<th>Binary Value</th>
<th>Analog Input</th>
<th>Analog Output</th>
<th>Analog Value</th>
<th>Multistage Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object identifier</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Object Name</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Object Type</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>System Status</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor Name</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor Identifier</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model Name</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firmware Revision</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appl. Software Revision</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protocol Version</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protocol Revision</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Services Supported</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Object List</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. APDU Length</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Segmentation Support</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Time</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Date</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APDU Timeout</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number APDU Retries</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Master</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max Info Frames</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device Address Binding</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Database Revision</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present Value</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Status Flags</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Event State</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Reliability</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Out-of-Service</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Number of States</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Text</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Units</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priority Array</td>
<td>X</td>
<td>X*</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td></td>
</tr>
<tr>
<td>Relinquish Default</td>
<td>X</td>
<td>X*</td>
<td>X</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td>X*</td>
<td></td>
</tr>
<tr>
<td>Polarity</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active Text</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inactive Text</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For commandable values only*
6 Parameters

6.1 Parameter Overview

6.1.1 Parameter List

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default value</th>
<th>Range</th>
<th>Conversion index</th>
<th>Data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-01 Control Site</td>
<td>Dig. and ctrl. word [0]</td>
<td>[0 - 2]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-02 Control Source</td>
<td>Option A</td>
<td>[0 - 4]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-03 Control Timeout Time</td>
<td>1 s</td>
<td>0.1 - 18000</td>
<td>- 1</td>
<td>7</td>
</tr>
<tr>
<td>8-04 Control Timeout Function</td>
<td>Off [0]</td>
<td>[0 - 10]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-05 End-of-Timeout Function</td>
<td>Hold set-up [0]</td>
<td>[0 - 1]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-06 Reset Control Timeout</td>
<td>Do not reset [0]</td>
<td>[0 - 1]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-07 Diagnosis Trigger</td>
<td>Disable [0]</td>
<td>[0 - 3]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-10 Control Profile</td>
<td>FC [0]</td>
<td>[0 - x]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-30 Protocol</td>
<td>FC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-31 Address</td>
<td>1</td>
<td>[0 – 255]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-32 Baud Rate</td>
<td>9600</td>
<td>[0 – 7]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-33 Parity / Stop Bits</td>
<td>No Parity, 1 Stop Bit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-35 Minimum Response Delay</td>
<td>10mS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-36 Maximum Response Delay</td>
<td>5000mS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-37 Maximum Inter-Char Delay</td>
<td>25.00mS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-50 Coasting Select</td>
<td>Logic OR [3]</td>
<td>[0 - 3]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-52 DC Brake Select</td>
<td>Logic OR [3]</td>
<td>[0 - 3]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-53 Start Select</td>
<td>Logic OR [3]</td>
<td>[0 - 3]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-54 Reversing Select</td>
<td>Logic OR [3]</td>
<td>[0 - 3]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-55 Set-up Select</td>
<td>Logic OR [3]</td>
<td>[0 - 3]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-56 Preset Reference Select</td>
<td>Logic OR [3]</td>
<td>[0 - 3]</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>8-70 BACnet Device Instance</td>
<td>1</td>
<td>[1-4194304]</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>8-72 MS/TP Max Masters</td>
<td>127</td>
<td>[1-127]</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>8-73 MS/TP Max Info Frames</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-74 &quot;I-Am&quot; Service</td>
<td>Once at powerup [0]</td>
<td>[0-1]</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>8-75 Initialisation Password</td>
<td>“admin”</td>
<td>String[19]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.1 BACnet Specific Parameter List

Please refer to the IVS 102 Operating Instructions, MG.11.Ax.yy for a comprehensive parameter list or to the IVS 102 Programming Guide, MG.11.Cx.yy for detailed descriptions of parameters.

Conversion index

This number refers to a conversion figure used when writing or reading to and from the frequency converter.

<table>
<thead>
<tr>
<th>Conv. Index</th>
<th>100</th>
<th>67</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
<th>-4</th>
<th>-5</th>
<th>-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conv. factor</td>
<td>1/60</td>
<td>1000000</td>
<td>100000</td>
<td>10000</td>
<td>1000</td>
<td>100</td>
<td>10</td>
<td>1</td>
<td>0.1</td>
<td>0.01</td>
<td>0.001</td>
<td>0.0001</td>
<td>0.00001</td>
<td>0.000001</td>
<td></td>
</tr>
<tr>
<td>Data type</td>
<td>Description</td>
<td>Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------</td>
<td>------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Integer 8</td>
<td>Int8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Integer 16</td>
<td>int16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Integer 32</td>
<td>int32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Unsigned 8</td>
<td>Uint8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Unsigned 16</td>
<td>Uint16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Unsigned 32</td>
<td>Uint32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Visible String</td>
<td>VisStr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Normalized value 2 bytes</td>
<td>N2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Bit sequence of 16 boolean variables</td>
<td>V2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Time difference w/o date</td>
<td>TimD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See the frequency converter *Design Guide* for further information about data types 33, 35 and 54.
6.2 Parameter Description

6.2.1 8-** Comm. and Options

8-01 Control Site

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Digital and ctrl.word</td>
</tr>
<tr>
<td>1</td>
<td>Digital only</td>
</tr>
<tr>
<td>2</td>
<td>Controlword only</td>
</tr>
</tbody>
</table>

The setting in this parameter overrides the settings in 8-50 Coasting Select to 8-56 Preset Reference Select.

8-02 Control Source

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
</tr>
<tr>
<td>1</td>
<td>FC Port</td>
</tr>
<tr>
<td>2</td>
<td>USB Port</td>
</tr>
<tr>
<td>3</td>
<td>Option A</td>
</tr>
<tr>
<td>4</td>
<td>Option B</td>
</tr>
</tbody>
</table>

Select the source of the control word: one of two serial interfaces or four installed options. During initial power-up, the frequency converter automatically sets this parameter to Option A [3] if it detects a valid fieldbus option installed in slot A. If the option is removed, the frequency converter detects a change in the configuration, sets 8-02 Control Source back to default setting FC Port, and the frequency converter then trips. If an option is installed after initial power-up, the setting of 8-02 Control Source will not change but the frequency converter will trip and display: Alarm 67 Option Changed.

This parameter cannot be adjusted while the motor is running.

8-03 Control Timeout Time

<table>
<thead>
<tr>
<th>Range</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 s*</td>
<td>[0.1 - 18000 s]</td>
</tr>
</tbody>
</table>

Enter the maximum time expected to pass between the reception of two consecutive telegrams. If this time is exceeded, it indicates that the serial communication has stopped. The function selected in 8-04 Control Timeout Function will then be carried out.

In BACnet the following variables will trigger the Control Word Time parameter:

- Analog Outputs
- Binary Outputs
- AV0
- AV1
- AV2
- AV4
- BV1
- BV2
- BV3
- BV4
- BV5
- Multistate Outputs

8-04 Control Timeout Function

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Off</td>
</tr>
<tr>
<td>1</td>
<td>Freeze output</td>
</tr>
<tr>
<td>2</td>
<td>Stop</td>
</tr>
<tr>
<td>3</td>
<td>Jogging</td>
</tr>
<tr>
<td>4</td>
<td>Max. speed</td>
</tr>
<tr>
<td>5</td>
<td>Stop and trip</td>
</tr>
<tr>
<td>7</td>
<td>Select setup 1</td>
</tr>
<tr>
<td>8</td>
<td>Select setup 2</td>
</tr>
<tr>
<td>9</td>
<td>Select setup 3</td>
</tr>
<tr>
<td>10</td>
<td>Select setup 4</td>
</tr>
<tr>
<td>20</td>
<td>N2 Override Release</td>
</tr>
</tbody>
</table>

Select the time-out function. The time-out function is activated when the control word fails to be updated within the time period specified in 8-03 Control Timeout Time. Choice [20] only appears after setting the Metasys N2 protocol.

8-05 End-of-Timeout Function

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Hold set-up</td>
</tr>
<tr>
<td>1</td>
<td>Resume set-up</td>
</tr>
</tbody>
</table>

Select the action after receiving a valid control word following a time-out. This parameter is active only when 8-04 Control Timeout Function is set to [Set-up 1-4].

In 8-06 Reset Control Timeout

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Do not reset</td>
</tr>
</tbody>
</table>

Retains the set-up specified in 8-04 Control Timeout Function, [Select setup 1-4] following a control time-out.
8-06  Reset Control Timeout

Option:  Function:
[1] Do reset  Returns the frequency converter to the original set-up following a control word time-out. When the value is set to Do reset [1], the frequency converter performs the reset and then immediately reverts to the Do not reset [0] setting.

8-07 Diagnosis Trigger

Option:  Function:
[0] * Disable
[1] Trigger on alarms

This parameter has no function for BACnet.

8-09 Communication Charset

Option:  Function:
[0] * ISO 8859-1
[1] ANSI X3.4

8-30 Protocol

Option:  Function:
[5] BACnet  Communication according to the BACnet protocol as described in FC 100 Native BACnet Operating Instructions.

8-31 Address

Range:  Function:
1. * [1. - 127.] Sets the drives MAC ID on the MS/TP network.

8-32 Baud Rate

Option:  Function:
[2] 9600 Baud
[3] 19200 Baud
[4] * 38400 Baud
[6] 76800 Baud


Default refers to the FC Protocol.

8-33 Parity / Stop Bits

Option:  Function:
[0] * Even Parity, 1 Stop Bit
[1] Odd Parity, 1 Stop Bit
[2] No Parity, 1 Stop Bit
[3] No Parity, 2 Stop Bits

Parity and Stop Bits for the protocol 8-30 Protocol using the FC Port. For some of the protocols, not all options will be visible. Default depends on the protocol selected.

8-35 Minimum Response Delay

Range:  Function:
Size related* [5. - 10000. ms] Specify the minimum delay time between receiving a request and transmitting a response. This is used for overcoming modem turnaround delays.

8-36 Maximum Response Delay

Range:  Function:
Size related* [11. - 10001. ms] Specify the maximum permissible delay time between transmitting a request and receiving a response. Exceeding this delay time will cause control word time-out.

8-37 Maximum Inter-Char Delay

Range:  Function:
Size related* [0.00 - 35.00 ms] Specify the maximum permissible time interval between receipt of two bytes. This parameter activates time-out if transmission is interrupted.

8-50 Coasting Select

Option:  Function:
[0] Digital input  Activates Start command via a digital input.
[1] Bus  Activates Start command via the serial communication port or fieldbus option.
[2] Logic AND Activates Start command via the fieldbus/serial communication port, AND additionally via one of the digital inputs.
[3] * Logic OR Activates Start command via the fieldbus/serial communication port OR via one of the digital inputs.

8-52 DC Brake Select

Option:  Function:
[0] Digital input  Activates Start command via a digital input.
[1] Bus  Activates Start command via the serial communication port or fieldbus option.
[2] Logic AND Activates Start command via the fieldbus/serial communication port, AND additionally via one of the digital inputs.
[3] * Logic OR Activates Start command via the fieldbus/serial communication port OR via one of the digital inputs.
### 8-53 Start Select

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] Digital input</td>
<td>Activates Start command via a digital input.</td>
</tr>
<tr>
<td>[1] Bus</td>
<td>Activates Start command via the serial communication port or fieldbus option.</td>
</tr>
<tr>
<td>[2] Logic AND</td>
<td>Activates Start command via the fieldbus/serial communication port, AND additionally via one of the digital inputs.</td>
</tr>
<tr>
<td>[3] Logic OR</td>
<td>Activates Start command via the fieldbus/serial communication port OR via one of the digital inputs.</td>
</tr>
</tbody>
</table>

### 8-54 Reversing Select

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] Digital input</td>
<td>Activates Reverse command via a digital input.</td>
</tr>
<tr>
<td>[1] Bus</td>
<td>Activates Reverse command via the serial communication port or fieldbus option.</td>
</tr>
<tr>
<td>[2] Logic AND</td>
<td>Activates Reverse command via the fieldbus/serial communication port, AND additionally via one of the digital inputs.</td>
</tr>
<tr>
<td>[3] Logic OR</td>
<td>Activates Reverse command via the fieldbus/serial communication port OR via one of the digital inputs.</td>
</tr>
</tbody>
</table>

**NOTE**

This parameter is active only when 8-01 Control Site is set to [0] Digital and control word.

### 8-55 Set-up Select

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] Digital input</td>
<td>Activates the set-up selection via a digital input.</td>
</tr>
<tr>
<td>[1] Bus</td>
<td>Activates the set-up selection via the serial communication port or fieldbus option.</td>
</tr>
<tr>
<td>[2] Logic AND</td>
<td>Activates the set-up selection via the fieldbus/serial communication port, AND additionally via one of the digital inputs.</td>
</tr>
<tr>
<td>[3] Logic OR</td>
<td>Activates the set-up selection via the fieldbus/serial communication port OR via one of the digital inputs.</td>
</tr>
</tbody>
</table>

### 8-56 Preset Reference Select

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] Digital input</td>
<td>Activates Preset Reference selection via a digital input.</td>
</tr>
<tr>
<td>[1] Bus</td>
<td>Activates Preset Reference selection via the serial communication port or fieldbus option.</td>
</tr>
<tr>
<td>[2] Logic AND</td>
<td>Activates Preset Reference selection via the fieldbus/serial communication port, AND additionally via one of the digital inputs.</td>
</tr>
<tr>
<td>[3] Logic OR</td>
<td>Activates the Preset Reference selection via the fieldbus/serial communication port OR via one of the digital inputs.</td>
</tr>
</tbody>
</table>

### 8-70 BACnet Device Instance

<table>
<thead>
<tr>
<th>Range</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 4194302</td>
<td>The Device Instance number must be unique for the complete BACnet, not only for this MS/TP Branch.</td>
</tr>
<tr>
<td>1 - [0 - 4194302]</td>
<td>Enter a unique ID number for the BACnet device.</td>
</tr>
</tbody>
</table>

### 8-72 MS/TP Max Masters

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 127</td>
<td>Define the address of the master which holds the highest address in this network. Decreasing this value optimises polling for the token.</td>
</tr>
</tbody>
</table>

### 8-73 MS/TP Max Info Frames

<table>
<thead>
<tr>
<th>Range</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 65534</td>
<td>Define how many info/data frames the device is allowed to send while holding the token.</td>
</tr>
<tr>
<td>1*</td>
<td>[1 - 65534 ]</td>
</tr>
</tbody>
</table>

### 8-74 "I-Am" Service

<table>
<thead>
<tr>
<th>Option</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0] *</td>
<td>Send at power-up</td>
</tr>
<tr>
<td>[1] Continuously</td>
<td>Choose whether the device should send the &quot;I-Am&quot; service message only at power-up or continuously with an interval of approx. 1 min.</td>
</tr>
</tbody>
</table>

### 8-75 Initialisation Password

<table>
<thead>
<tr>
<th>Range</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Size related] 0 - 0</td>
<td>Enter the password needed for execution of Drive Re-initialisation from BACnet.</td>
</tr>
<tr>
<td>0 *</td>
<td>[0 - 0]</td>
</tr>
</tbody>
</table>
7 Troubleshooting

7.1 Alarm, Warning and Extended Status Word

7.1.1 Alarm and Warning Messages

General
There is a clear distinction between alarms and warnings. In the event of an alarm, the frequency converter will enter a fault condition. After the cause for the alarm has been cleared, the master must acknowledge the alarm message in order to start operation of the frequency converter again. A warning, on the other hand, may appear when a warning condition arises, then disappear when conditions return to normal without interfering with the process.

Alarm Word and Warning Word are shown on the display in Hex format. If there is more than one warning or alarm, a sum of all warnings or alarms will be shown. Warning Word and Alarm Word are displayed in par. 16-90 to 16-95. For more information on the individual alarms and warnings, please refer to: IVS 102 Design Guide.

Warnings
All warnings within the frequency converter are represented by a single bit within a Warning Word. A Warning Word is always an action parameter. Bit status FALSE [0] means no warning, while bit status TRUE [1] means warning. Each bit status has a corresponding text string message. In addition to the Warning Word message the master will also be notified via a change to bit 7 in the status word.

Alarms
Following an alarm message the frequency converter will enter a fault condition. Only after the fault has been rectified and the master has acknowledged the alarm message by setting bit 3 in the Control Word, can the FC resume operation. All alarms within the FC are represented by a single bit within an Alarm Word. An Alarm Word is always an action parameter. Bit status FALSE [0] means no alarm, while bit status TRUE [1] means alarm.
### 7.1.2 Alarm Words

#### 16-90 Alarm Word

<table>
<thead>
<tr>
<th>Bit  (Hex)</th>
<th>Alarm Word (16-90 Alarm Word)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000001</td>
<td>Brake check</td>
</tr>
<tr>
<td>00000002</td>
<td>Power card over temperature</td>
</tr>
<tr>
<td>00000004</td>
<td>Earth fault</td>
</tr>
<tr>
<td>00000008</td>
<td>Ctrl. card over temperature</td>
</tr>
<tr>
<td>00000010</td>
<td>Control word timeout</td>
</tr>
<tr>
<td>00000020</td>
<td>Over current</td>
</tr>
<tr>
<td>00000080</td>
<td>Motor thermistor over temp.</td>
</tr>
<tr>
<td>00000100</td>
<td>Motor ETR over temperature</td>
</tr>
<tr>
<td>00000200</td>
<td>Inverter overloaded</td>
</tr>
<tr>
<td>00000400</td>
<td>DC link under voltage</td>
</tr>
<tr>
<td>00000800</td>
<td>DC link over voltage</td>
</tr>
<tr>
<td>00001000</td>
<td>Short circuit</td>
</tr>
<tr>
<td>00002000</td>
<td>Inrush fault</td>
</tr>
<tr>
<td>00004000</td>
<td>Mains phase loss</td>
</tr>
<tr>
<td>00008000</td>
<td>AMA not OK</td>
</tr>
<tr>
<td>00010000</td>
<td>Live zero error</td>
</tr>
<tr>
<td>00020000</td>
<td>Internal fault</td>
</tr>
<tr>
<td>00040000</td>
<td>Brake overload</td>
</tr>
<tr>
<td>00080000</td>
<td>Motor phase U is missing</td>
</tr>
<tr>
<td>00100000</td>
<td>Motor phase V is missing</td>
</tr>
<tr>
<td>00200000</td>
<td>Motor phase W is missing</td>
</tr>
<tr>
<td>00400000</td>
<td>Fieldbus fault</td>
</tr>
<tr>
<td>00800000</td>
<td>24V supply fault</td>
</tr>
<tr>
<td>01000000</td>
<td>Mains failure</td>
</tr>
<tr>
<td>02000000</td>
<td>1.8V supply fault</td>
</tr>
<tr>
<td>04000000</td>
<td>Brake resistor short circuit</td>
</tr>
<tr>
<td>08000000</td>
<td>Brake chopper fault</td>
</tr>
<tr>
<td>10000000</td>
<td>Option change</td>
</tr>
<tr>
<td>20000000</td>
<td>Drive initialised</td>
</tr>
<tr>
<td>40000000</td>
<td>Safe Stop</td>
</tr>
<tr>
<td>80000000</td>
<td>Not used</td>
</tr>
</tbody>
</table>

#### 16-91 Alarm Word 2

<table>
<thead>
<tr>
<th>Bit  (Hex)</th>
<th>Alarm Word 2 (16-91 Alarm Word 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000001</td>
<td>Service Trip, read / Write</td>
</tr>
<tr>
<td>00000002</td>
<td>Reserved</td>
</tr>
<tr>
<td>00000004</td>
<td>Service Trip, Typecode / Sparepart</td>
</tr>
<tr>
<td>00000008</td>
<td>Reserved</td>
</tr>
<tr>
<td>00000100</td>
<td>Reserved</td>
</tr>
<tr>
<td>00000200</td>
<td>No Flow</td>
</tr>
<tr>
<td>00000400</td>
<td>Dry Pump</td>
</tr>
<tr>
<td>00000800</td>
<td>End of Curve</td>
</tr>
<tr>
<td>00001000</td>
<td>Broken Belt</td>
</tr>
<tr>
<td>00002000</td>
<td>Not used</td>
</tr>
<tr>
<td>00004000</td>
<td>Not used</td>
</tr>
<tr>
<td>00008000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00010000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00020000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00040000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00080000</td>
<td>Fans error</td>
</tr>
<tr>
<td>00100000</td>
<td>ECB error</td>
</tr>
<tr>
<td>00200000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00400000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00800000</td>
<td>Reserved</td>
</tr>
<tr>
<td>01000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>02000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>04000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>08000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>10000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>20000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>40000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>80000000</td>
<td>Reserved</td>
</tr>
</tbody>
</table>
### 7.1.3 Warning Words

<table>
<thead>
<tr>
<th>Bit (Hex)</th>
<th>Warning Word (16-92 Warning Word)</th>
<th>Bit (Hex)</th>
<th>Warning Word 2 (16-93 Warning Word 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000001</td>
<td>Brake check</td>
<td>00000001</td>
<td>Start Delayed</td>
</tr>
<tr>
<td>00000002</td>
<td>Power card over temperature</td>
<td>00000002</td>
<td>Stop Delayed</td>
</tr>
<tr>
<td>00000004</td>
<td>Earth fault</td>
<td>00000004</td>
<td>Clock Failure</td>
</tr>
<tr>
<td>00000008</td>
<td>Ctrl. card over temperature</td>
<td>00000008</td>
<td>Reserved</td>
</tr>
<tr>
<td>00000010</td>
<td>Control word timeout</td>
<td>00000010</td>
<td>Reserved</td>
</tr>
<tr>
<td>00000020</td>
<td>Over current</td>
<td>00000020</td>
<td>No Flow</td>
</tr>
<tr>
<td>00000040</td>
<td>Torque limit</td>
<td>00000040</td>
<td>Reserved</td>
</tr>
<tr>
<td>00000080</td>
<td>Motor thermistor over temp.</td>
<td>00000080</td>
<td>End of Curve</td>
</tr>
<tr>
<td>00000100</td>
<td>Motor ETR over temperature</td>
<td>00000100</td>
<td>Broken Belt</td>
</tr>
<tr>
<td>00000200</td>
<td>Inverter overloaded</td>
<td>00000200</td>
<td>Not used</td>
</tr>
<tr>
<td>00000400</td>
<td>DC link under voltage</td>
<td>00000400</td>
<td>Reserved</td>
</tr>
<tr>
<td>00000800</td>
<td>DC link over voltage</td>
<td>00000800</td>
<td>Reserved</td>
</tr>
<tr>
<td>00001000</td>
<td>DC link voltage low</td>
<td>00001000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00002000</td>
<td>DC link voltage high</td>
<td>00002000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00004000</td>
<td>Mains phase loss</td>
<td>00004000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00008000</td>
<td>No motor</td>
<td>00008000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00010000</td>
<td>Live zero error</td>
<td>00010000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00020000</td>
<td>10V low</td>
<td>00020000</td>
<td>Not used</td>
</tr>
<tr>
<td>00040000</td>
<td>Brake resistor power limit</td>
<td>00040000</td>
<td>Fans warning</td>
</tr>
<tr>
<td>00080000</td>
<td>Brake resistor short circuit</td>
<td>00080000</td>
<td>ECB warning</td>
</tr>
<tr>
<td>00100000</td>
<td>Brake chopper fault</td>
<td>00100000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00200000</td>
<td>Speed limit</td>
<td>00200000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00400000</td>
<td>Fieldbus comm. fault</td>
<td>00400000</td>
<td>Reserved</td>
</tr>
<tr>
<td>00800000</td>
<td>24V supply fault</td>
<td>00800000</td>
<td>Reserved</td>
</tr>
<tr>
<td>01000000</td>
<td>Mains failure</td>
<td>01000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>02000000</td>
<td>Current limit</td>
<td>02000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>04000000</td>
<td>Low temperature</td>
<td>04000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>08000000</td>
<td>Voltage limit</td>
<td>08000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>10000000</td>
<td>Encoder loss</td>
<td>10000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>20000000</td>
<td>Output frequency limit</td>
<td>20000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>40000000</td>
<td>Not used</td>
<td>40000000</td>
<td>Reserved</td>
</tr>
<tr>
<td>80000000</td>
<td>Not used</td>
<td>80000000</td>
<td>Reserved</td>
</tr>
</tbody>
</table>
TORONTO
23 BERTRAND AVENUE
TORONTO, ONTARIO
CANADA
M1L 2P3
+1 416 755 2291

BUFFALO
93 EAST AVENUE
NORTH TONAWANDA, NEW YORK
U.S.A.
14120-6594
+1 716 693 8813

BIRMINGHAM
HEYWOOD WHARF, MUCKLOW HILL
HALESOWEN, WEST MIDLANDS
UNITED KINGDOM
B62 8QJ
+44 (0) 8444 145 145

MANCHESTER
WOLVERTON STREET
MANCHESTER
UNITED KINGDOM
M11 2ET
+44 (0) 8444 145 145

BANGALORE
#59, FIRST FLOOR, 3RD MAIN
MARGOSA ROAD, MALLESWARAM
BANGALORE, INDIA
560 003
+91 (0) 80 4906 3555

SHANGHAI
NO. 1619 HU HANG ROAD, XI DU TOWNSHIP
FENG XIAN DISTRICT, SHANGHAI
P.R.C.
201401
+86 21 3756 6696

ARMSTRONG FLUID TECHNOLOGY
ESTABLISHED 1934
ARMSTRONGFLUIDTECHNOLOGY.COM

MAKING ENERGY MAKE SENSE™