

SMV DeviceNet™ Communications Module

Communications Interface Reference Guide

About These Instructions

This documentation applies to the optional DeviceNet™ communications module for the SMVector inverter and should be used in conjunction with the SMVector Operating Instructions (Document SV01) that shipped with the drive. These documents should be read in their entirety as they contain important technical data and describe the installation and operation of the drive.

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1 Safety Information

1.1 Warnings, Cautions and Notes

1.1.1 General

Some parts of Lenze controllers (frequency inverters, servo inverters, DC controllers) can be live, moving and rotating. Some surfaces can be hot. Non-authorized removal of the required cover, inappropriate use, and incorrect installation or operation creates the risk of severe injury to personnel or damage to equipment.

All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE0110 and national regulations for the prevention of accidents must be observed).

According to this basic safety information, qualified skilled personnel are persons who are familiar with the installation, assembly, commissioning, and operation of the product and who have the qualifications necessary for their occupation.

1.1.2 Application

Drive controllers are components designed for installation in electrical systems or machinery. They are not to be used as appliances. They are intended exclusively for professional and commercial purposes according to EN 61000-3-2. The documentation includes information on compliance with the EN 61000-3-2.

When installing the drive controllers in machines, commissioning (i.e. the starting of operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 2006/42/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting drive as directed) is only allowed when there is compliance to the EMC Directive (2004/108/EC). The drive controllers meet the requirements of the Low Voltage Directive 2006/95/EC. The harmonised standards of the series EN 50178/DIN VDE 0160 apply to the controllers.

The availability of controllers is restricted according to EN 61800-3. These products can cause radio interference in residential areas. In the case of radio interference, special measures may be necessary for drive controllers.

1.1.3 Installation

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

Controllers contain electrostatically sensitive components, which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

1.1.4 Electrical Connection

When working on live drive controllers, applicable national regulations for the prevention of accidents (e.g. VBG 4) must be observed. The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the regulatory documentation.

The regulatory documentation contains information about installation in compliance with EMC (shielding, grounding, filters and cables). These notes must also be observed for CE-marked controllers.

The manufacturer of the system or machine is responsible for compliance with the required limit values demanded by EMC legislation.



1.1.5 Operation

Systems including controllers must be equipped with additional monitoring and protection devices according to the corresponding standards (e.g. technical equipment, regulations for prevention of accidents, etc.). The user is allowed to adapt the controller to his application as described in the regulatory documentation.



DANGER!

- After the controller has been disconnected from the supply voltage, do not touch the live components and power connection until the capacitors have discharged. Please observe the corresponding notes on the controller.
- Do not continuously cycle input power to the controller more than once every three minutes.
- Please close all protective covers and doors during operation.



WARNING!

Network control permits automatic starting and stopping of the inverter drive. The system design must incorporate adequate protection to prevent personnel from accessing moving equipment while power is applied to the drive system.

Table 1: Pictographs used in these instructions

| Pictograph | Signal Word | Meaning | Consequences if ignored |
|------------|-----------------|--|--|
| | DANGER! | Warning of Hazardous Electrical Voltage. | Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken. |
| | WARNING! | Impending or possible danger for persons | Death or injury |
| | STOP! | Possible damage to equipment | Damage to drive system or its surroundings |
| | NOTE | Useful tip: If observed, it will make using the drive easier | |

1.2 Reference Documentation

- SV01, SMV Operating Instructions: Technical Library: <http://www.lenzeamericas.com>
- AN0023, Getting Started with DeviceNet (PS & SMV Drives): Technical Library: <http://www.lenzeamericas.com>
- DeviceNet™ Information, ODVA (Open DeviceNet Vendor's Association): <http://www.odva.org>



2 Introduction

The following information is provided to allow the SMV Series drive to operate on a DeviceNet network; it is not intended to explain how DeviceNet™ itself works. Therefore, a working knowledge of DeviceNet is assumed, as well as familiarity with the operation of the SMV Series drive.

2.1 Fieldbus Overview

The DeviceNet fieldbus is an internationally accepted communications protocol designed for commercial and industrial installations of factory automation and motion control applications. High data transfer rates combined with its efficient data formatting, permit the coordination and control of multi-node applications.

2.2 Module Specification

- Group 2 Server Device
- Supported Baudrates: 125 kbps, 250 kbps, 500 kbps
- Supported input/output data words: Polled, Bit Strobe, Changed of state, Cyclic
- Explicit communication for parameter access

NOTE: The SMV does not support the Explicit Unconnected Message Manager!

To simplify setup and operation, implemented classes and behavior conform to the AC DRIVE profile as specified in the ODVA DeviceNet standard.

To assist in recovery from Communication Faulted condition, Offline Connection Set messages are supported. The SMV supports the following Group 4 message types:

Group 4 Message ID 2C - Communication Faulted Response Message

Group 4 Message ID 2D - Communication Faulted Request Message

Using these messages, the user will be able to identify a faulted drive and when possible, re-establish communication without disconnecting the network or resetting the drive. After receiving “Identify Request Message” while in Communication Faulted state, the value in parameter P419 will flash “1000/1777”.

The SMV drive supports these object classes:

- Identity Object - Class 0x01
- Message Router Object - Class 0x02
- DeviceNet Object - Class 0x03
- Assembly Object - Class 0x04
- DeviceNet Connection Object - Class 0x05
- Parameter Object - Class 0x0F
- Parameter Group Object - Class 0x10
- Motor Data Object - Class 0x28
- Control Supervisor Object - Class 0x29
- AC/DC Drive Object - Class 0x2A
- Acknowledge Handler Object - Class 0x2B

2.3 Module Identification Label

Figure 1 illustrates the labels on the DeviceNet communications module. The SMV DeviceNet module is identifiable by:

- Two labels affixed to either side of the module.
- The color-coded identifier label in the center of the module

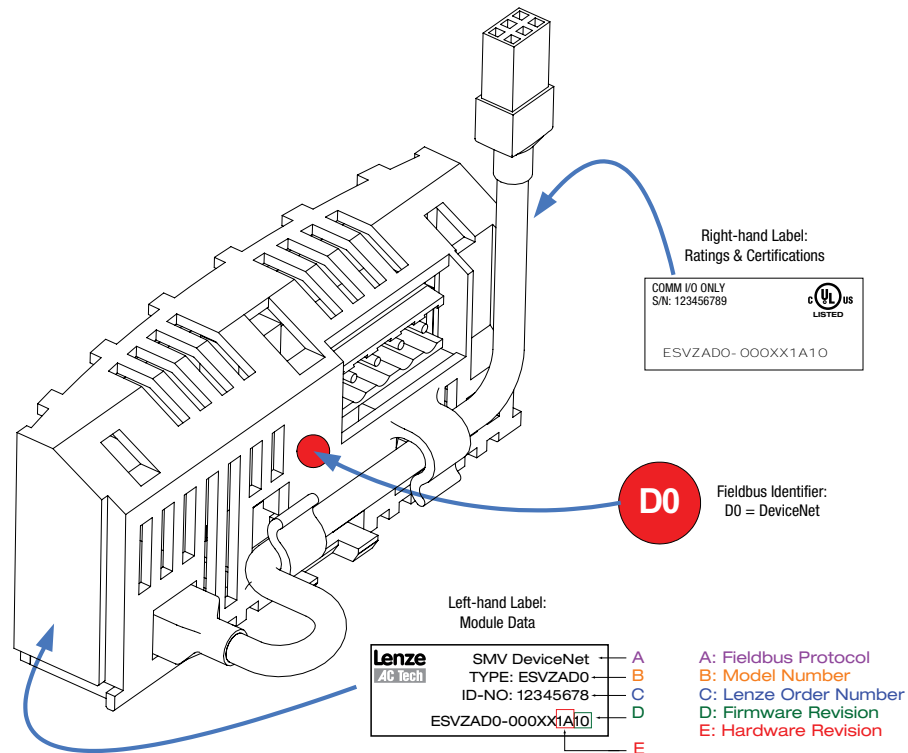


Figure 1: SMV DeviceNet Module Label



Installation

3 Installation

3.1 Mechanical Installation

1. Ensure that for safety reasons, the AC supply has been disconnected before opening the terminal cover.
2. Insert the DeviceNet option module in the terminal cover and securely "click" into position as illustrated in Figure 2.
3. Wire the network cables as detailed in paragraph 3.3, Electrical Installation, to the connector provided and plug the connector into the option module.
4. Align terminal cover for refitting, connect the module umbilical cord to the drive then close the cover and secure as shown in Figure 3.

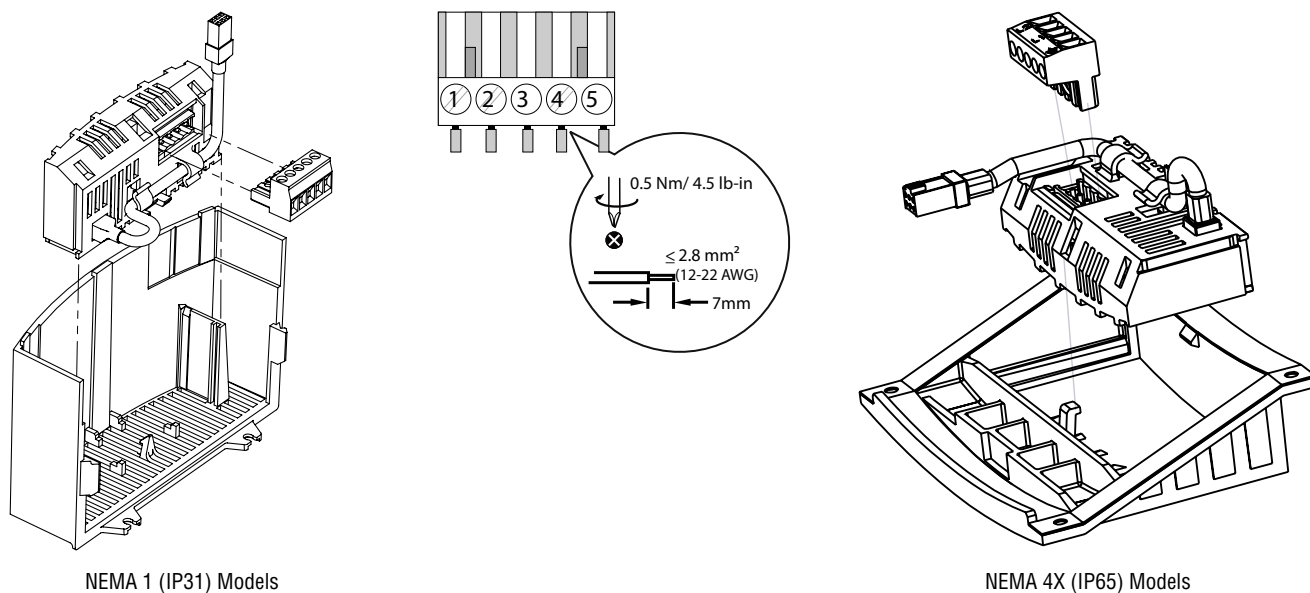


Figure 2: Installing the DeviceNet Communications Module

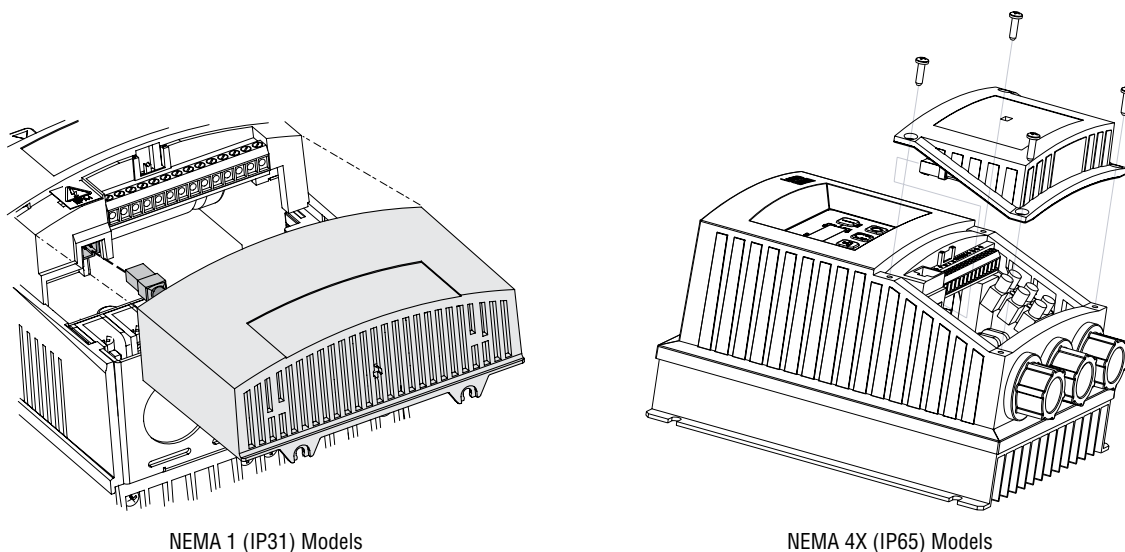


Figure 3: Re-Installing the SMV Terminal Cover



3.2 DeviceNet Terminal Block

Table 2: DeviceNet Pin Assignments

| Terminal | Name | Wire Color | Description | Terminal Block |
|----------|--------|------------|---|----------------|
| 1 | V- | Black | 0V | |
| 2 | CAN_L | Blue | CAN Bus Low (negative data line) | |
| 3 | Shield | Bare | | |
| 4 | CAN_H | White | CAN Bus High (positive data line) | |
| 5 | V+ | Red | 11 - 25 VDC power supply; current consumption (100mA @ 11VDC max) | |

3.3 Electrical Installation

3.3.1 Cable Types

Due to the high data rates used on DeviceNet networks, it is paramount that correctly specified cable is used. The use of low quality cable will result in excess signal attenuation and data loss. Several types of cable are available for DeviceNet networks: flat cable, thicknet, mid cable and thinnet. Installation is typically done with thicknet for trunk cable and thinnet for drop cable. Thicknet has a 3" minimum bend radius. Thinnet is more flexible, with a 2" minimum bend radius, and as such is easier to install. Thinnet can be used for the entire installation. The type of cable used, the lengths of the overall network and the drop cables all affect the maximum baud rate.

Cable specifications and approved manufacturers are available from the official DeviceNet website at: <http://www.ovda.org>.

3.3.2 Network Limitations

There are several factors that must be taken into consideration when designing a DeviceNet network. For full details refer to the official "DeviceNet™ Planning and Installation Manual" available on the <http://www.ovda.org> website. However, here is an abbreviated checklist:

- DeviceNet networks are limited to a maximum of 64 nodes. Devices default to node 63 so leave node 63 open to avoid duplicate node addresses when adding devices.
- Maximum total network length is governed by the data rate and cable type used. Refer to Table 3.

Table 3: Network Length, Drop Cable Length and Baud Rate

| Data Rate | MAXIMUM Network Length | | | | Sum of all Drop Cable Lengths |
|-----------|------------------------|----------|-----------|---------|-------------------------------|
| | Flat Cable | Thicknet | Mid Cable | Thinnet | |
| 125 kbps | 420m | 500m | 300m | 100m | 156m |
| 250 kbps | 200m | 250m | 250m | 100m | 78m |
| 500 kbps | 75m | 100m | 100m | 100m | 39m |

- Cumulative drop line does not exceed the network specified limit.
- Network drops/spurs must not exceed 6 meters (19' 8.2").



Installation

- Use fiber optic segments to:
 - Extend networks beyond normal cable limitations
 - Overcome different ground potential problems
 - Overcome very high electromagnetic interference
- Ground at only one location, preferably in the center of the network.

3.3.3 Connections and Shielding

- ODVA specifies to ground the DeviceNet network at one location only.
- The ground location should be done on the node that is closest to the physical center of the network to maximize the performance and minimize the effect of outside noise.
- The grounding connection method with regards to the network “V-” connections depends upon the cable type used (refer to cable data sheet or ODVA “DeviceNet™ Planning and Installation Manual” for further details).

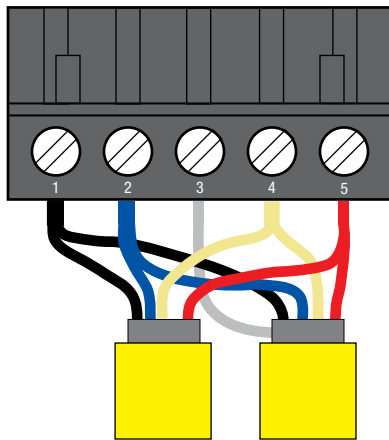


Figure 4: Network Daisy Chain Connection

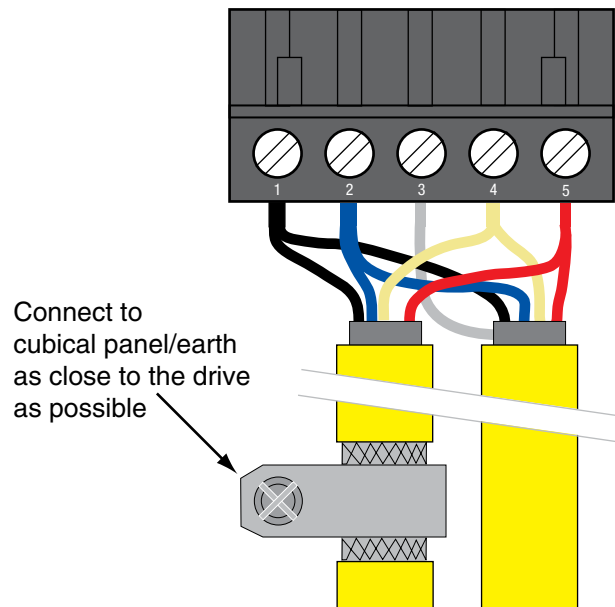


Figure 5: Ground Connection of Center Network Node



NOTE

If the bare screen is too long there is some risk that it may come into contact with the drive power terminals. Therefore it is strongly recommended that an insulating sleeve be fitted.



3.3.4 Network Termination

In high speed fieldbus networks such as DeviceNet, it is essential to install the specified termination resistors, i.e. one at both ends of a network segment. Failure to do so will result in signals being reflected back along the cable which will cause data corruption. The method of termination varies with the type of network cable available. If terminating using an open-style resistor on the drive connection, use a 121Ω 1/4W 1% resistor and fit as illustrated in Figure 6.

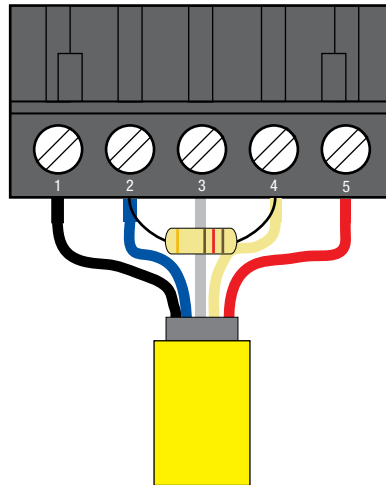


Figure 6: Network Termination on Drive Connector

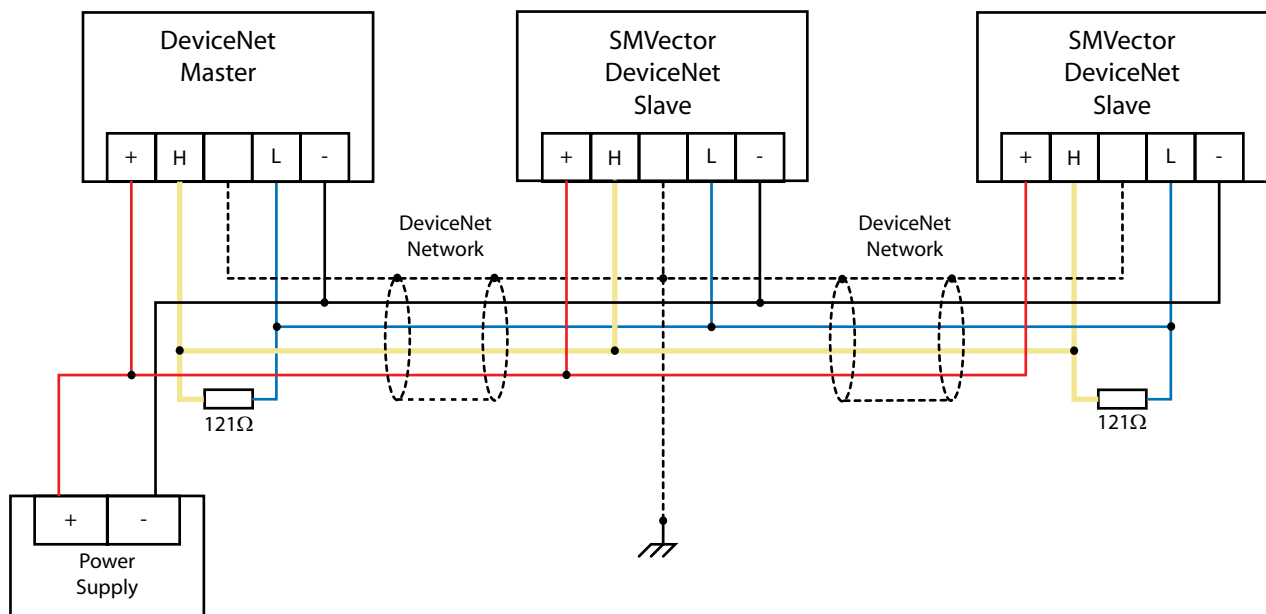


Figure 7: DeviceNet Network Wiring



4 Commissioning DeviceNet Communication

4.1 Overview

It is assumed that the user has familiarised themselves with how to navigate through the drive parameters using the keypad. Refer to the drive user manual for details.

The details that follow provide a step-by-step guide to quickly and easily set-up an SMV drive to communicate on a DeviceNet fieldbus network, in a basic format. There are many more features and settings available for the DeviceNet option module, for details on these refer to the fuller description in the sections that follow.

4.2 Configuring the Network Master

4.2.1 Master Support Files

The EDS (Electronic Data Sheet) file is basically a lookup table. It tells the DeviceNet master (scanner) what the slave is and how its memory is mapped. The EDS file needs to be read into the DeviceNet master. The utility used for this purpose is RSNetworkx for DeviceNet from Rockwell Automation.

To simplify setup, the EDS file supporting the SMV Series drive is available from Lenze-AC Tech. To obtain a copy of the appropriate EDS file, please contact Lenze-AC Tech or visit www.lenzeamericas.com. The EDS file is also included on the CD that shipped with the drive.

Use RSNetworkx for DeviceNet to configure the data exchange between the AC Tech drive and the DeviceNet master. First use the “EDS Hardware Installation tool” to register the EDS file of the drive. Once the EDS file is registered, change to ONLINE mode and browse the network. Locate an icon for the AC Tech drive at its configured network address. Add the drive to the scan list for the DeviceNet master and define the I/O connection. By default, “Polled” is used for most applications. Double click on the icon for the drive to allow the drive parameters to be read and edited.

4.2.2 DeviceNet Master Setup Procedure

Details for configuring a specific network master are NOT provided herein. The method for configuring master devices differs greatly between manufacturers. Provided herein is a very basic, generic guide to setting up a network master.

1. Launch the Master configuration software.
2. Install/Import the required ESD support file(s) using the wizard tool if provided.
3. Setup master DeviceNet port with required criteria such as node address and baudrate etc.
4. Add or “drag and drop” the required slave devices from the ESD library to the DeviceNet network which is typically depicted on screen.
5. Configure the slave node address, ensuring that each node has a unique and individual address.
6. Configure each slave's I/O data size. (This is typically done by dragging and dropping the required amount of modules from the ESD file library or picking the modules from a list).
7. Save the configuration and download to the Master.



4.3 Configuring the SMV DeviceNet Module

4.3.1 Connecting

With the drive power disconnected install the DeviceNet module and connect the network cable as instructed in the preceding section 3.1. Ensure the drive Run/Enable terminal is disabled then apply the correct voltage to the drive (refer to the drive's user manual for voltage supply details).

4.3.2 Setting the Network Protocol

| P400 - Network Protocol | | | |
|-------------------------|----|--------|---------|
| Default: | 0 | Range: | 0 or 6 |
| Access: | RW | Type: | Integer |

Set P400 = 4 (DEVICENET)

Some SMV option modules are capable of supporting multiple protocols; therefore it is necessary to set the required protocol. The option module is only initialised after a protocol has been selected.

After the module is initialised with DeviceNet™ protocol it will enter Online Mode (P402 = 3).

4.3.3 Node Address (MAC-ID)

| P410 - Node ID | | | |
|----------------|----|--------|---------|
| Default: | 63 | Range: | 0 - 63 |
| Access: | RW | Type: | Integer |

Set P410 to the required value.

The default address is 63. The permissible address range is: 0 - 63

On a DeviceNet network, each node must be assigned a unique address (MAC-ID). Valid node addresses range from 0-63. In most cases, MAC-ID 0 is assigned to the DeviceNet master controller, to ensure that messages from the master controller have a higher priority on the CAN network. By default most DeviceNet devices will power up at address 63. It is important to leave address 63 available on the network so that the replacement of a node does not cause a conflict. If two or more nodes are assigned the same MAC-ID, the network will recognize only one node and permit that node to communicate with the master controller. All other nodes with the same MAC-ID will be left undiscovered by and invisible to the network.

If P410 (NODE ID) is changed, the drive must be reset by recycling power or by issuing a RESET command using Parameter P418 via the DeviceNet network before the new values take effect.

If an invalid node address is set, the SMV DeviceNet module will over-write the value in P410 to 63. When the SMV DeviceNet module is reset, this default value will be used as the DeviceNet node address.



Commissioning

4.3.4 Baud / Data Rate

| P411 - Baud Rate | | | |
|------------------|----|--------|---------|
| Default: | 0 | Range: | 0 - 2 |
| Access: | RW | Type: | Integer |

Set P411 to match the DeviceNet network baud rate.

Table 4: DeviceNet Baud Rates

| P411 Value | Baud Rate |
|------------|-----------|
| 0 | 125 kbps |
| 1 | 250 kbps |
| 2 | 500 kbps |

NOTE: If P411 (BAUD RATE) has been changed, the drive must be reset by recycling power or by issuing a RESET command using Parameter P418 via the DeviceNet network before the new value takes effect.

Once these parameters are set, cycle power to the drive. This will make the address and baud rate parameters take effect. During power-up (and resets), the SMV drive performs the following functions:

1. Power up initializations; sets all variables and states.
2. Sets the MAC address and baud rate base on values programmed in EPM (P410, P411).
3. Checks for duplicate node address to verify that its own address is unique on the network.

If the power-up or reset sequence fails, the SMV drive will enter DeviceNet failure mode. In this case, the drive will not be accessible to the network, but can still be operated in terminal mode. This failure state is indicated in parameter P419 (Diagnostic) by number "1093".

4.3.5 Module Timeout Action

| P404 - Module Timeout Action | | | |
|------------------------------|----|--------|---------|
| Default: | 3 | Range: | 0 - 3 |
| Access: | RW | Type: | Integer |

Table 5: Module Timeout Action

| P404 Setting | Action upon Timeout |
|--------------|----------------------|
| 0 | Ignore |
| 1 | STOP (refer to P111) |
| 2 | Quick Stop |
| 3 | Fault (F_{net}) |

To prevent runaway conditions, the default is set to 3, so that in the case of module timeout, the drive will display " F_{net} " (Module to drive communication fault).



4.3.6 Data Mapping

- The SMV DeviceNet module has support for 1 cyclic data channel in both directions.
- Cyclic data configuration is described in detail in section 5.
- The default mapping for SMV DeviceNet is 2 Data IN words and 2 Data OUT words, the configuration is shown in Table 6.

Table 6: Default Mapped Cyclic Data

| Data OUT Channel | Mapped Function | Data IN Channel | Mapped Function |
|------------------|--------------------|-----------------|-------------------------|
| 0 | Drive Control Word | 0 | Drive Status Word |
| 1 | Frequency Setpoint | 1 | Actual Output Frequency |



NOTE

The terms “OUT data” and “IN data” describe the direction of data transfer as seen by the DeviceNet network master controller.

4.3.7 Re-initialising

| P418 - Re-initialise | | | |
|----------------------|----|--------|---------|
| Default: | 0 | Range: | 0 - 1 |
| Access: | RW | Type: | Integer |

Set P418 = 1 to activate any changes made to the module settings i.e. changing any parameters in the 400 range means the module has to be re-initialised. This can also be done by cycling power to the drive.



NOTE

The module is only re-initialised following a transition from 0 to 1 in P418



WARNING

DeviceNet re-initialisation may activate the new Dout configuration, which can result in changes to the present controller state, including starting.



Commissioning

4.3.8 Check Node Status

| P419 - DeviceNet Status | | | |
|-------------------------|-----|--------|---------|
| Default: | N/A | Range: | 0 - 4 |
| Access: | RO | Type: | Integer |

P419 is a 4-digit integer. Digit 1 represents the Power Status, Digit 2 the Control Status, Digit 3 the Network Status and Digit 4 the I/O Status. Refer to Table 7 for the DeviceNet Status description.

Table 7: DeviceNet Module Status

| P419 Digit | Digit Represents | Selection |
|------------|------------------|--|
| 1 | Power Status | 1 = External power supply ON |
| 2 | Control Status | 0 = Local Control and Reference 1 = Network Control, Local Reference 2 = Local Control, Network Reference 3 = Network Control, Network Reference |
| 3 | Network Status | 0 = Network not connected 1 = Network not connected 2 = Network connection time out 3 = Communication faulted 5 = Network connected 8 = Duplicate MAC-ID failure 9 = Network critical link failure |
| 4 | I/O Status | 0 = I/O connection off 1 = I/O connection idle state 3 = I/O faulted 5 = I/O active 9 = I/O critical error |

4.3.9 Non-Module Parameter Settings

In addition to configuring the DeviceNet module there are several drive based parameters that may need to be set

- P100 - Start Control Source; network control is possible in any mode except mode 2 (“Remote Keypad Only”).
- P112 - Rotation; Used to enable either uni or bi direction rotation of the motor.
- P121, 122 or 123 = 9. One of the digital inputs must be assigned to mode 9 - “Network Control” and have the corresponding input closed to enable write access to the drive parameters.

4.3.10 Sample Setup and Wiring for DeviceNet Control

This example uses Explicit or I/O Polled messaging for Run Forward/Reverse and speed control. NOTE: If P100>0, then Terminal 1 must be closed to Terminal 4 in order to start the drive through the DeviceNet interface. Parameters can be setup using the drive keypad, EPM Programmer, or DeviceNet configuration tool (for example RSNetWorx™) that uses the EDS file provided by Lenze - AC Tech.

As a minimum, the following parameters should be set:

P121, P122, P123 - One of these parameters must be set to 09 (Network Enable)

P112 ROTATION DIRECTION - Set this parameter to FORWARD & REVERSE (01) if operation in both directions is required.

P305 MOTOR NOMINAL SPEED AT RATED FREQUENCY (RPM)

P304 MOTOR RATED FREQUENCY (Hz)



- P400 DEVICENET NODE ADDRESS (0 - 63)
- P401 DEVICENET BAUD RATE (125, 250, 500 kbps)
- P430 DEVICENET OUTPUT ASSEMBLY SELECTION - Set this parameter to select output assembly for Polled connection. The following selections are available:
- 0 = 20 Basic Speed Control
 - 1 = 21 Extended Speed Control RPM
 - 2 = 100 Extended Speed Control Hz + Digital and Analog Output 1
 - 3 = 102 PID Setpoint + Digital + Analog Output 1
 - 4 = 104 Torque Setpoint + Digital + Analog Output 1

The most versatile assemblies are #21 (selection 1) and #100 (selection 2). They allow RUN FORWARD and RUN REVERSE control as well as speed control. Refer to Section 5.2 for more assembly details.

- P440 DEVICENET INPUT ASSEMBLY SELECTION - Set this parameter for Polled, COS or Cyclic I/O connection. Refer to Section 5.2 for more assembly details.

NOTE: If Parameter P400 (NETWORK ADDRESS) or P401 (BAUD RATE) have been changed, the drive must be reset by recycling power or by issuing a RESET command using Parameter P418 via the DeviceNet network before the new values take effect.

4.3.11 Sample of Setup and Test Runs using Rsnetworx for DeviceNet

1. Make all necessary DeviceNet network connections.
2. Using "EDS Hardware Installation Tool" register the EDS file for SMV family of drives.
3. Switch mode to ONLINE. After browsing through all available addresses on the network, "AC Tech SMV Drive" should appear at the programmed address.
4. To access the drive parameters double click on the drive icon.
5. After uploading parameters from the SMV drive, they can be edited and downloaded back to the drive. SMV drive parameters accessed through the drive keypad correspond to the same Network ID, to simplify programming they have a drive parameter number in front of their name.

For example:

Parameter ID P160 corresponds to drive parameter "P160 Carrier Select"

Parameter ID P110 corresponds to drive parameter "P110 Start Method"

DeviceNet parameter IDs #1 to #99 are only accessible through the network connection. Refer to the Parameter Class section for parameter descriptions.

To assist in Network Controlled test runs, the EDS file consists of parameters that permit triggering RUN commands by changing the bits setable in ID#65 (Network Control Word).

NOTE: RUN and STOP commands must be triggered according to the table in Section 5.3.6

ID#61 - Network Reference Frequency: Controls the drive speed reference parameter if bit 6 (Network Reference) is set to Network Control.



WARNING!

Make sure it is safe to operate the driven equipment prior to starting the SMV Series drive from the network. Damage to equipment and/or injury to personnel can result!



5 Cyclic Data Access

5.1 What is Cyclic Data?

- Cyclic/Process/Polled data is the name given to the method used to transfer routine process data between the network master and slave nodes.
- Cyclic data transfer must be configured during network setup.
- The terms “OUT data” and “IN data” describe the direction of data transfer as seen by the DeviceNet network master controller.
- Cyclic data source & destination is configured & controlled by the SMV DeviceNet module's mapping capabilities.

5.2 Mapping Cyclic Data

5.2.1 Data OUT

| P430 - Dout Assembly Selections | | | |
|---------------------------------|----|--------|---------|
| Default: | 1 | Range: | 0 - 4 |
| Access: | RW | Type: | Integer |

- The SMV DeviceNet module has 1 cyclic OUT channel which utilises up to 8 bytes of data.
- Table 8 lists the assembly selections for OUT going data being sent from the network master.

Table 8 – Data OUT

| Parameter | Function | Default | Selection | Output Assembly | Length |
|-----------|------------------------|---------|---|-----------------|---------|
| P430 | Dout Channel 1 mapping | 1 | 0 – Basic Speed Control | 20 | 4 bytes |
| | | | 1 – Extended Speed Control | 21 | 4 bytes |
| | | | 2 – Extended Speed Hz + Digital & Analog Output 1 | 100 | 8 bytes |
| | | | 3 – PID Setpoint + Digital & Analog Output 1 | 102 | 8 bytes |
| | | | 4 – Torque Setpoint + Digital & Analog Output 1 | 104 | 8 bytes |



WARNING

Modification to the Dout configuration may result in changes to present controller state, including starting.

5.2.2 Data IN

| P440 - Din Assembly Selections | | | |
|--------------------------------|----|--------|---------|
| Default: | 1 | Range: | 0 - 5 |
| Access: | RW | Type: | Integer |

- The SMV DeviceNet module has 1 cyclic IN channel which utilises up to 8 bytes of data.
- Table 9 lists the assembly selections for IN coming data being sent to the network master.

Table 9 – Data IN

| Parameter | Function | Default | Selection | Input Assembly | Length |
|-----------|-----------------------|---------|--|----------------|---------|
| P440 | Din Channel 1 mapping | 1 | 0 – Basic Speed Control | 70 | 4 bytes |
| | | | 1 – Extended Speed Control | 71 | 4 bytes |
| | | | 2 – Extended Speed Hz + Digital & Analog Input 1 | 101 | 8 bytes |
| | | | 3 – PID Setpoint , Feedback | 103 | 8 bytes |
| | | | 4 – Speed, Actual Torque, Analog input | 105 | 8 bytes |
| | | | 5 - Data Words selectable with P441 - P444 | 106 | Custom* |

* Custom length selectable via P441 - P444 (0, 2, 4, 6 or 8 bytes)



5.3 Input/Output Assembly Configuration Mappings

5.3.1 Output Assembly Details

P430 = 0: Output Assembly 20 Basic Speed Control

P430 = 1: Output Assembly 21 Extended Speed Control

| | Bit | P430 = 0 | | Bit | P430 = 1 |
|-------|--|--|-------|--|--|
| | | | | | |
| WORD0 | 0 | 0 = NOT Run Forward 1 = Run Forward | WORD0 | 0 | 0 = NOT Run Forward 1 = Run Forward |
| | 1 | Reserved | | 1 | 0 = NOT Run Reverse 1 = Run Reverse |
| | 2 | Fault reset on transition from 0 to 1 | | 2 | Fault reset on transition from 0 to 1 |
| | 3 | Reserved | | 3 | Reserved |
| | 4 | Reserved | | 4 | Reserved |
| | 5 | Reserved | | 5 | 0 = Local Control 1 = Network Control |
| | 6 | Reserved | | 6 | 0 = Local Speed Ref 1 = Network Speed Ref |
| | 7 | Reserved | | 7 | Reserved |
| | 8 | Reserved | | 8 | Reserved |
| | 9 | Reserved | | 9 | Reserved |
| | 10 | Reserved | | 10 | Reserved |
| | 11 | Reserved | | 11 | Reserved |
| | 12 | Reserved | | 12 | Reserved |
| | 13 | Reserved | | 13 | Reserved |
| | 14 | Reserved | | 14 | Reserved |
| | 15 | Reserved | | 15 | Reserved |
| WORD1 | Speed in RPMs (max 32767) • RPM calculation based on P304 and P305 • Example 1: P304 = 60Hz; P305 = 1750 RPM request setpoint forward (CW) at 25.0 HZ = $25.0 \times 1750 / 60 = 729 = 0x02D9$ | | WORD1 | Speed in RPMs (max 32767) • RPM calculation based on P304 and P305 • Example 1: P304 = 60Hz; P305 = 1750 RPM request setpoint forward (CW) at 25.0 HZ = $25.0 \times 1750 / 60 = 729 = 0x02D9$ | |

Attention: To use this Output Assembly 20, Network Control and Network Reference must be set using explicit communication by writing into the control word at NetID65. The bit configuration of this word matches the WORD0 of Output Assembly 100.



Cyclic Data Access

P430 = 2: Output Assembly 100 Speed in Hz + Digital and Analog Output

P430 = 3: Output Assembly 102 PID Setpoint + Digital and Analog Output

| | Bit | P430 = 2 | | Bit | P430 = 3 |
|-------|-----|---|-------|-----|---|
| | | | | | |
| WORD0 | 0 | 0 = NOT Run Forward 1 = Run Forward | WORD0 | 0 | 0 = NOT Run Forward 1 = Run Forward |
| | 1 | 0 = NOT Run Reverse 1 = Run Reverse | | 1 | 0 = NOT Run Reverse 1 = Run Reverse |
| | 2 | Fault reset on transition from 0 to 1 | | 2 | Fault reset on transition from 0 to 1 |
| | 3 | Reserved | | 3 | Reserved |
| | 4 | Reserved | | 4 | Reserved |
| | 5 | 0 = Local Control 1 = Network Control | | 5 | 0 = Local Control 1 = Network Control |
| | 6 | 0 = Local Speed Ref 1 = Network Speed Ref | | 6 | 0 = Local Speed Ref 1 = Network Speed Ref |
| | 7 | Reserved | | 7 | Reserved |
| | 8 | Network Speed Reference (valid if bit 6 is set) 0 = Network 6 = Preset #3 | | 8 | Network Speed Reference (valid if bit 6 is set) 0 = Network 6 = Preset #3 |
| | 9 | 1 = Keypad 7 = Preset #4 ⁽¹⁾ | | 9 | 1 = Keypad 7 = Preset #4 ⁽¹⁾ |
| | 10 | 2 = 0 - 10VDC 8 = Preset #5 ⁽¹⁾ | | 10 | 2 = 0 - 10VDC 8 = Preset #5 ⁽¹⁾ |
| | 11 | 3 = 4 - 20 mA 9 = Preset #6 ⁽¹⁾ | | 11 | 3 = 4 - 20 mA 9 = Preset #6 ⁽¹⁾ |
| | | 4 = Preset #1 10 = Preset #7 ⁽¹⁾ | | | 4 = Preset #1 10 = Preset #7 ⁽¹⁾ |
| | | 5 = Preset #2 11 = MOP | | | 5 = Preset #2 11 = MOP |
| | 12 | 0 = No Action 1 = Inhibit (Coast to Stop) | | 12 | 0 = No Action 1 = Inhibit (Coast to Stop) |
| | 13 | 0 = No Action 1 = Activate (Quick Stop) | | 13 | 0 = No Action 1 = Activate (Quick Stop) |
| | 14 | 0 = No Action 1 = Force Manual Mode (active only in Network Control, PID mode will force open loop) | | 14 | 0 = No Action 1 = Force Manual Mode (active only in Network Control, PID mode will force open loop) |
| | 15 | 0 = DC brake active 1 = DC brake not active | | 15 | 0 = DC brake active 1 = DC brake not active |
| WORD1 | | Unsigned speed 0.1 Hz resolution Received value = 0x01F0 = 49.6Hz | WORD1 | | Network PID setpoint Signed value -999 to 31000 |
| WORD2 | | Digital Output + Relay - Active when parameter P140, P142 = 25 Network Control Bit 9 - Open Collector Bit 10 - Relay Others - Reserved for future use | WORD2 | | Digital Output + Relay - Active when parameter P140, P142 = 25 Network Control Bit 9 - Open Collector Bit 10 - Relay Others - Reserved for future use |
| WORD3 | | Analog Output [0.1 VDC] - Active when parameter P150 = 9 Network Control Received value = 0x024B = 5.87 [VDC] | WORD3 | | Analog Output [0.1 VDC] - Active when parameter P150 = 9 Network Control Received value = 0x024B = 5.87 [VDC] |

(1) Presets #4, #5, #6 and #7 are ignored when the drive is operating in either PID mode or Torque mode.



P430 = 4: Output Assembly 104 Torque Setpoint + Digital and Analog Output

| | Bit | P430 = 4 |
|-------|-----|---|
| | | |
| WORD0 | 0 | 0 = NOT Run Forward 1 = Run Forward |
| | 1 | 0 = NOT Run Reverse 1 = Run Reverse |
| | 2 | Fault reset on transition from 0 to 1 |
| | 3 | Reserved |
| | 4 | Reserved |
| | 5 | 0 = Local Control 1 = Network Control |
| | 6 | 0 = Local Speed Ref 1 = Network Speed Ref |
| | 7 | Reserved |
| | 8 | Network Speed Reference (valid if bit 6 is set) 0 = Network 6 = Preset #3 |
| | 9 | 1 = Keypad 7 = Preset #4 ⁽¹⁾ |
| | 10 | 2 = 0 - 10VDC 8 = Preset #5 ⁽¹⁾ |
| | 11 | 3 = 4 - 20 mA 9 = Preset #6 ⁽¹⁾ |
| | 12 | 4 = Preset #1 10 = Preset #7 ⁽¹⁾ |
| | 13 | 5 = Preset #2 11 = MOP |
| | 14 | 0 = No Action 1 = Inhibit (Coast to Stop) |
| WORD1 | 15 | 0 = No Action 1 = Activate Quick Stop) |
| | 16 | 0 = No Action 1 = Force Manual Mode (active only in Network Control, PID mode will force open loop |
| WORD2 | 17 | 0 = DC brake active 1 = DC brake not active |
| WORD3 | 18 | Unsigned torque setpoint 0 - 400% limited by parameter P330 Torque Limit |
| WORD4 | 19 | Digital Output + Relay - Active when parameter P140, P142 = 25 Network Control Bit 9 - Open Collector Bit 10 - Relay Others - Reserved for future use |
| WORD5 | 20 | Analog Output [0.1 VDC] - Active when parameter P150 = 9 Network Control Received value = 0x024B = 5.87 [VDC] |

(1) Presets #4, #5, #6 and #7 are ignored when the drive is operating in either PID mode or Torque mode.



Cyclic Data Access

5.3.2 Input Assembly Details

P440 = 0: Input Assembly 70 Basic Speed Control

P440 = 1: Input Assembly 71 Extended Speed Control

| WORD0 | Bit | P440 = 0 |
|-------|--|---------------------|
| | 0 | 1 = Faulted |
| | 1 | Reserved |
| | 2 | 1 = Running Forward |
| | 3 | Reserved |
| | 4 | Reserved |
| | 5 | Reserved |
| | 6 | Reserved |
| | 7 | Reserved |
| | 8 | Reserved |
| | 9 | Reserved |
| | 10 | Reserved |
| | 11 | Reserved |
| | 12 | Reserved |
| | 13 | Reserved |
| | 14 | Reserved |
| | 15 | Reserved |
| WORD1 | Speed in RPMs (max 32767) <ul style="list-style-type: none"> RPM calculation based on P304 and P305 Example 1: P304 = 60Hz; P305 = 1750 RPM request setpoint forward (CW) at 25.0 HZ = $25.0 \times 1750/60 = 729 = 0x02D9$ | |

| WORD0 | Bit | P440 = 1 |
|-------|---|--|
| | 0 | 1 = Faulted |
| | 1 | Reserved |
| | 2 | 1 = Running Forward |
| | 3 | 1 = Running Reverse |
| | 4 | 1 = Ready |
| | 5 | 0 = Local Control 1 = Network Control |
| | 6 | 0 = Local Speed Ref 1 = Network Speed Ref |
| | 7 | 1 = At Reference |
| | 8 | Reserved |
| | 9 | Reserved |
| | 10 | Reserved |
| | 11 | Reserved |
| | 12 | Reserved |
| | 13 | Reserved |
| | 14 | Reserved |
| | 15 | Reserved |
| WORD1 | Speed in RPMs (max 32767) <ul style="list-style-type: none"> RPM calculation based on P304 and P305 Example 1: P304 = 60Hz; P305 = 1750 RPM request setpoint forward (CW) at 40.0 HZ = $40.0 \times 1750/60 = 1166 = 0x048E$ | |

Cyclic Data Access



P440 = 2: Input Assembly 101 Speed in Hz + Digital and Analog Input

P440 = 3: Input Assembly 103 Speed in Hz + Actual PID Setpoint and Feedback

| | Bit | P440 = 2 |
|-------|-----|---|
| | 0 | 1 = Faulted |
| | 1 | Reserved |
| | 2 | 1 = Running Forward |
| | 3 | 1 = Running Reverse |
| | 4 | 1 = Ready |
| | 5 | 0 = Local Control 1 = Network Control |
| | 6 | 0 = Local Speed Ref 1 = Network Speed Ref |
| | 7 | 1 = At Reference |
| | 8 | Actual Setpoint Source |
| | 9 | 0 = Keypad 6 = Preset #4 1 = 0 - 10VDC 7 = Preset #5 2 = 4 - 20 mA 8 = Preset #6 |
| | 10 | 3 = Preset #1 9 = Preset #7 4 = Preset #2 10 = MOP |
| | 11 | 5 = Preset #3 11 = Network |
| | 12 | 1 = PID Active (closed loop) |
| | 13 | 1 = Torque Mode Active |
| | 14 | 1 = Current Limit |
| | 15 | 1 = DC Braking |
| WORD0 | | |
| WORD1 | | Unsigned actual frequency 0.1 Hz resolution |
| WORD2 | | Digital Input/Output State (See Note 1 for details) |
| WORD3 | | Analog Input 0 - 10 V TB [0.1VDC] Received value = 0x3A = 5.8 [VDC] |

| | Bit | P440 = 3 |
|-------|-----|---|
| | 0 | 1 = Faulted |
| | 1 | Reserved |
| | 2 | 1 = Running Forward |
| | 3 | 1 = Running Reverse |
| | 4 | 1 = Ready |
| | 5 | 0 = Local Control 1 = Network Control |
| | 6 | 0 = Local Speed Ref 1 = Network Speed Ref |
| | 7 | 1 = At Reference |
| | 8 | Actual Setpoint Source |
| | 9 | 0 = Keypad 6 = Preset #4 1 = 0 - 10VDC 7 = Preset #5 2 = 4 - 20 mA 8 = Preset #6 |
| | 10 | 3 = Preset #1 9 = Preset #7 4 = Preset #2 10 = MOP |
| | 11 | 5 = Preset #3 11 = Network |
| | 12 | 1 = PID Active (closed loop) |
| | 13 | 1 = Torque Mode Active |
| | 14 | 1 = Current Limit |
| | 15 | 1 = DC Braking |
| WORD0 | | |
| WORD1 | | Unsigned actual frequency 0.1 Hz resolution |
| WORD2 | | Actual PID Setpoint Signed value -999 to 31000 |
| WORD3 | | Actual PID Feedback Signed value -999 to 31000 |

Note 1: Digital I/O State

| | | | | |
|-----------------------------------|-------|--------------------------|--------|-----------------|
| WORD - Digital Input/Output State | Bit 0 | | Bit 8 | TBC13C |
| | Bit 1 | | Bit 9 | TB14 OutState |
| | Bit 2 | Output Fault | Bit 10 | Relay State |
| | Bit 3 | Fast Current Limit State | Bit 11 | Charge Relay |
| | Bit 4 | TB1 ON | Bit 12 | Assertion Level |
| | Bit 5 | | Bit 13 | |
| | Bit 6 | TB13A | Bit 14 | |
| | Bit 7 | TB13B | Bit 15 | |



P440 = 5: Input Assembly 106 Custom Selectable

| | |
|-------|--|
| Bit | P440 = 5 |
| WORD0 | Data from Parameter/ID specified in Parameter P441 For Example: Setting P441 to 508 will place the value of parameter P508 Motor Current into the Word0 of Input Assembly 106 |
| WORD1 | Data from Parameter/ID specified in Parameter P442 For Example: Setting P442 to 527 will place the value of parameter P527 Actual Frequency into the Word1 of Input Assembly 106 |
| WORD2 | Data from Parameter/ID specified in Parameter P443 For Example: Setting P443 to 520 will place the value of parameter P527 0 - 10VDC Analog Input into the Word2 of Input Assembly 106 |
| WORD3 | Data from Parameter/ID specified in Parameter P444 For Example: Setting P444 to 506 will place the value of parameter P506 Motor Voltage into the Word3 of Input Assembly 106 |

Note: Value of Zero in Parameter P441 to P444 defines the end of Assembly 106.



6 Troubleshooting and Fault Elimination

6.1 Faults

Table 10 lists the faults common to the DeviceNet Communications Module.

Table 10: Faults

| STATUS | POSSIBLE CAUSE | REMEDY |
|-----------|---------------------------------------|---|
| F_{nEF} | Module to Drive communication timeout | Connection between drive and module is not made. |
| F_{nE1} | DeviceNet Lost | Established connection has timed out. |
| F_{nE2} | Message Monitoring timeout | Trigger via Supervisor Object 0x29 - 1-17 Force Fault Trip. |

6.2 Troubleshooting

Table 11 lists some common DeviceNet Communications problems and possible corrective action.

Table 11: Troubleshooting

| NETWORK TROUBLESHOOTING | | |
|--|--|---|
| SYMPTOM | POSSIBLE CAUSE | REMEDY |
| No communication from the drive. | Module is not initialized properly | - Verify the module connection - Check P400 and P402 |
| | Incorrect DeviceNet settings | - Use P403 to reset DeviceNet parameters - Verify P410 and P411 |
| | Improper wiring | - Check wiring between DeviceNet Network and Communications Module. - Ensure the terminal block is properly seated. - Check connection between module and drive. |
| DeviceNet write commands are ignored or return exceptions | Network enabled terminal is either open or not configured | Configure one of the input terminals (P121, P122 or P123) to "Network Enabled" function and close the corresponding contact. |
| SMV Drive cannot be accessed from network; P419 = "00" | Communication section is not receiving power | Check DeviceNet connections and power. |
| SMV Drive cannot be accessed from network; P419 code is "1093". | Bus Failure | - Check DeviceNet connections and power. - Ensure SMV drive address is unique. - Check the baud rate. - Ensure bias resistors were placed correctly. - Reset SMV drive by cycling power. - Contact AC Tech Service Dept. |
| SMV drive cannot be accessed from network; P419 code is different than 1090 or "1093". | - Communication section is not receiving power. - Connection problem; shorted signal wires for example. - Scanner device failure. | - Check DeviceNet connections and power. - Check the scanner device. |
| SMV drive cannot be accessed from the network; P419 Code is "083" | Duplicate DeviceNet address | - Ensure SMV drive address is unique. - Reset SMV drive by cycling power. - Use Faulted Node Recovery utility. |
| SMV drive stops and "F.nF1" fault is displayed; P419 code is "1x3x" or "1xx3" (x = any number except 9). | - SMV communication has been lost and the Watchdog Timer shut down the drive. - Communication was lost after the Master established communication. - Scanner device failure. | - Check the Master device. - Change expected packet rate if Master cannot handle the update rate. - Re-establish communication and clear the fault. |
| SMV drive stops without a fault; P419 code is "1111". | Master device closed established connection when SMV drive was in Network Control Mode, and Parameter P419 DeviceNet Idle Mode is set to 0 ("Stop the Drive"). | - Switch Off Network Control before established connection is closed. - Set the DeviceNet Parameter P419 DeviceNet Idle Mode to 1 ("Hold Last State"). - Reestablish connection and restart the SMV drive. |
| SMV drive stops and "F.nF2" fault is displayed; P419 code is "1xxx" (x = any number). | Master device forced Network fault; Control Supervisor Object 0x29-1-17 "Force Fault Trip". | Check Master device control logic. |




7 Reference

Refer to the Installation and Operation manual (SV01) for drive-specific parameters. The 400 Series parameters exclusive to the DeviceNet™ communications module are accessible once the DeviceNet module is installed.

7.1 P400 Parameter Menu

| Code | | Possible Settings | | IMPORTANT |
|--------------------------------------|------------------------|-------------------|---|--|
| No. | Name | Default | Selection | |
| CANopen Module Specific Parameters | | | | |
| P400 | Network Protocol | | 0 Not Active 4 DeviceNet | |
| P401 | Module Revision | | Display reads 04.x.x where: 04 = DeviceNet Module x.x = Module Revision | Read only |
| P402 | Module Status | 0 | 0 Not Initialized 1 Initialization: Module to EPM 2 Initialization: EPM to Module 3 Online 4 Failed Initialization Error 5 Time-out Error 6 Initialization Failed 7 Initialization Error | Read only Module type mismatch (P401) Protocol Selection mismatch (P400) |
| P403 | Module Reset | 0 | 0 No Action 1 Reset Module parameter values to default. | Returns module parameters 401...499 to the default values shown in this manual. |
| P404 | Module Time-out Action | 3 | 0 Ignore 1 STOP (see P111) 2 Quick Stop 3 Fault (F_{net}) | <ul style="list-style-type: none">Action to be taken in the event of a Module/ Drive Time-out.Time-out is fixed at 200ms.Selection 1 (STOP) is by the method selected in P111. |
| P405 | Network Fault | 0 | 0 No Fault 1 F_{nF1} - DeviceNet Lost 2 F_{nF2} - Fault Triggered by DeviceNet | Read only |
| P406 | Proprietary | | Manufacturer specific | Read only |
| DeviceNet / Configuration Parameters | | | | |
| P410 ⁽¹⁾ | DeviceNet address | 63 | 0 ... 63 | (Node ID) |
| P411 ⁽¹⁾ | DeviceNet baud rate | 0 | 0 125 kbps (max distance = 500m) 1 250 kbps (max distance = 250m) 2 500 kbps (max distance = 100m) | |
| P414 | DeviceNet Idle Mode | 0 | 0 Stop the drive 1 Hold the last state | |



| Code | | Possible Settings | | IMPORTANT |
|--------------------------|-----------------------------|--|--|--|
| No. | Name | Default | Selection | |
| P415 | Action on Loss of DeviceNet | 0 | 0 Trigger fault 'F_nt1' 1 Ignore 2 AC Tech specific - Switch off network controlled bits (STOP is not triggered) | Only active in Network Control (n.xxx) |
| P416 | Bus Off | 0 | 0 Hold in Error 1 Reset CAN | |
| P417 | Bus Off Counter | 0 | Number of Bus Off Conditions 0.....255 | Read-only Does not overflow |
| P418 | Reset DeviceNet node | 0 | 0 No action 1 Reset DeviceNet communication | On transition from 0 to 1, re-initializes DeviceNet controller and activates changes made to parameters marked with ⁽¹⁾ |
| | |  | WARNING! DeviceNet re-initialization may activate new assemblies configurations, which can result in changes to present controller state, including starting. | |
| | | P419 | DeviceNet Status | |
| Digit 1 - Power Status | | | 1 External power supply On | |
| Digit 2 - Control Status | | | 0 Local control and reference 1 Network control, local reference 2 Local control, network reference 3 Network control, network reference | |
| | | | | |
| | | | | |
| | | | | |
| Digit 3 - Network Status | | | 0 Network not connected 1 Network not connected 2 Network connection time out 3 Communication faulted 5 Network connected 8 Duplicate MAC ID failure 9 Network critical link failure | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Digit 4 - I/O Status | | 0 I/O connection off 1 I/O connection idle state 3 I/O faulted 5 I/O active 9 I/O critical error | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| P429 | CAN Peripheral Status | | Bits: 0 Error passive mode 1 Bus off mode 2 CAN Enabled 3 Receiver busy 4 Transmitter busy 5 Transmit error count > 128 6 Overload frame 7 Receive error count > 128 | <ul style="list-style-type: none">• Read-only• CAN warnings and errors |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |



Reference

| Code | | Possible Settings | | IMPORTANT |
|-----------------------------------|--|-------------------|--|---|
| No. | Name | Default | Selection | |
| Assembly Configuration Parameters | | | | |
| P430 ⁽¹⁾ | DeviceNet Output Assembly Selection (See Assembly Details) | 1 | 0 Output assembly 20 - basic speed control | Length = 4 bytes |
| | | | 1 Output assembly 21 - extended speed control | Length = 4 bytes |
| | | | 2 Output assembly 100 - extended speed Hz + digital and analog output 1 | Length = 8 bytes |
| | | | 3 Output assembly 102 - PID setpoint + digital and analog output 1 | Length = 8 bytes |
| | | | 4 Output assembly 104 - torque setpoint + digital and analog output 1 | Length = 8 bytes |
| | | | WARNING! DeviceNet re-initialization may activate new assemblies configurations, which can result in changes to present controller state, including starting.. | |
| P439 | Received Output Assembly Counter | | Overflow above 255 | Diagnostics-only |
| P440 ⁽¹⁾ | DeviceNet Input Assembly Selection (See Assembly Details) | 1 | 0 Input assembly 70 - basic speed control | Length = 4 bytes |
| | | | 1 Input assembly 71 - extended speed control | Length = 4 bytes |
| | | | 2 Input assembly 101 - extended speed Hz + digital and analog input | Length = 8 bytes |
| | | | 3 Input assembly 103 - PID setpoint, feedback | Length = 8 bytes |
| | | | 4 Input assembly 105 - speed, actual torque, analog input | Length = 8 bytes |
| | | | 5 Input assembly 106 - data words selectable with parameters P441 - P444 | Custom: Length selectable via P441...P444 (0, 2, 4, 6 or 8 bytes) |
| ⁽¹⁾ | These parameters take effect only after power up when P418 is reset or DeviceNet is reset. | | | |
| P441 | Parameter ID of word 0 | 0 | Value is placed in Word 0 of assembly 106 | A value of 0 in Parameter P441 - P444 defines end of assembly 106 |
| P442 | Parameter ID of word 1 | 0 | Value is placed in Word 1 of assembly 106 | A value of 0 in Parameter P441 - P444 defines end of assembly 106 |
| P443 | Parameter ID of word 2 | 0 | Value is placed in Word 2 of assembly 106 | A value of 0 in Parameter P441 - P444 defines end of assembly 106 |
| P444 | Parameter ID of word 3 | 0 | Value is placed in Word 3 of assembly 106 | A value of 0 in Parameter P441 - P444 defines end of assembly 106 |
| P449 | Transmitted Assembly Counter | 0 | Overflow above 255 | Diagnostic-only |



| Code | | Possible Settings | | IMPORTANT |
|------------------------------------|--|-------------------|---|-----------|
| No. | Name | Default | Selection | |
| DeviceNet Configuration Parameters | | | | |
| P450 | Explicit Message Instance State | 0 | 0 Nonexistent | Read-only |
| | | | 1 Configuring | |
| | | | 2 Wait for connection ID | |
| | | | 3 Established | |
| | | | 4 Timed out | |
| | | | 5 Deferred delete | |
| P452 | Explicit Message Expected Packet Rate | 0 | 0 ... 65535 {ms} | Read-only |
| P453 | Explicit Message Status Bits Info Bit 0,1: | | 1 Auto delete - goes into non-existing state | Read-only |
| | | | 3 Deferred delete | |
| | Explicit Message Timeout Info Bit 2: | | 1 Check timeout | |
| | Explicit Message Connection Info Bit 3: | | 1 Connection exists | |
| P460 | Polled I/O Message Connection State | 0 | 0 Nonexistent | Read-only |
| | | | 1 Configuring | |
| | | | 2 Wait for connection ID | |
| | | | 3 Established | |
| | | | 4 Timed Out | |
| P462 | Polled I/O Expected Packet Rate | 0 | 0 ... 65535 {ms} | Read-only |
| P463 | Polled I/O Status Bits Bit 0,1: | | 0 Transition to timed out - stays in timeout | Read-only |
| | | | 1 Auto delete - goes into nonexistent state | |
| | | | 2 Auto reset - reset the connection timeout timer | |
| | Polled I/O Timeout Info Bit 2: | | 1 Check timeout | |
| | Polled I/O Connection Info Bit 3: | | 1 Connection exists | |
| P470 | Bit Strobe Message Connection State | 0 | 0 Nonexistent | Read-only |
| | | | 1 Configuring | |
| | | | 2 Wait for connection ID | |
| | | | 3 Established | |
| | | | 4 Timed Out | |



Reference

| Code | | Possible Settings | | IMPORTANT |
|------|---|-------------------|---|------------|
| No. | Name | Default | Selection | |
| P472 | Bit Strobe Expected Packet Rate | 0 | 0 ... 65535 {ms} | Read-only |
| P473 | Bit Strobe Status Bit Info Bit 0,1: | | 0 Transition to timed out - stays in timeout | Read-only |
| | | | 1 Auto delete - goes into nonexistent state | |
| | | | 2 Auto reset - reset the connection timeout timer | |
| | Bit Strobe Timeout Info Bit 2: | | 1 Check timeout | |
| | Bit Strobe Connection Info Bit 3: | | 1 Connection exists | |
| P480 | Change of State/ Cyclic Message Connection State | 0 | 0 Nonexistent | Read-only |
| | | | 1 Configuring | |
| | | | 2 Wait for connection ID | |
| | | | 3 Established | |
| | | | 4 Timed Out | |
| P482 | Change of State/ Cyclic Expected Packet Rate | 0 | 0 ... 65535 {ms} | Read-only |
| P483 | Change of State/ Cyclic Status Bits Bit 0,1: | | 0 Transition to timed out - stays in timeout | Read-only |
| | | | 1 Auto delete - goes into nonexistent state | |
| | | | 2 Auto reset - reset the connection timeout timer | |
| | Change of State/ Cyclic Timeout Action Bit 2: | | 1 Check timeout | |
| | Change of State/ Cyclic Connection Info Bit 3: | | 1 Connection exists | |
| P485 | Change of State Trigger WORD selector | 0 | 0 Word 0 of selected input assembly is used for COS trigger | Read/write |
| | | | 1 Word 1 of selected input assembly is used for COS trigger | |
| | | | 2 Word 2 of selected input assembly is used for COS trigger | |
| | | | 3 Word 3 of selected input assembly is used for COS trigger | |



| Code | | Possible Settings | | IMPORTANT |
|------------------------------------|---------------------------------------|-------------------|---------------------------|--|
| No. | Name | Default | Selection | |
| P486 | Change of State Status (16-bits) | 0 | 0 ... 65535 | Value from WORD selected in P485 Read-only |
| P487 | Change of State Bit Mask (16-bits) | 65535 | 0 ... 65535 | Read/write Note: State change of bits in P486 masked with "1" in P487 trigger the COS I/O message if COS I/O connection is open |
| P490 | Motor Type | 7 | 0 Non-standard motor | |
| | | | 1 PM DC motor | |
| | | | 2 FC DC motor | |
| | | | 3 PM synchronous motor | |
| | | | 4 FC synchronous motor | |
| | | | 5 Switched reluctance | |
| | | | 6 Wound rotor induction | |
| | | | 7 Squirrel cage induction | |
| CANopen Module Specific Parameters | | | | |
| P494 | Communication Module Software Version | | | <ul style="list-style-type: none">• Read only• Format: x.yz |
| P495 | Internal Code | | | <ul style="list-style-type: none">• Read only• Alternating Display: xxx-; -yy |
| P498 | Missed Messages Drive to Module | | | <ul style="list-style-type: none">• Read only |
| P499 | Missed Messages Module to Drive | | | <ul style="list-style-type: none">• Read only |



Reference

7.2 Class Implementation Details

7.2.1 Identity Object - Class 0x01

| IDENTITY CLASS ATTRIBUTES | | | | |
|---------------------------|-------------|--------------------------|----------------|--|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 1 |
| INSTANCE 1 | | | | |
| 1 | GET | VENDOR ID | UINT | 587 |
| 2 | GET | DEVICE TYPE | UINT | 2 (AC drive) |
| 3 | GET | PRODUCT CODE | UINT | 2 (SMV DeviceNet Module) |
| 4 | GET | MAJOR REV. MINOR REV. | USINT USINT | 1 1 |
| 5 | GET | STATUS | USINT | 4 = Configured 5 = Owned |
| 6 | GET | SERIAL NUMBER | UDINT | Unique 32-bit number |
| 7 | GET | PRODUCT NAME | ASCII String | "AC Tech SMV Communication Module Drive" |

| IDENTITY CLASS SERVICES | | | |
|-------------------------|-----------------|----------|----------------------|
| SERVICE CODE | IMPLEMENTED FOR | | SERVICE NAME |
| | CLASS | INSTANCE | |
| 0x0E | YES | YES | Get_Attribute_Single |
| 0x05 | NO | YES | RESET |

7.2.2 Message Router Object - Class 0x02

| MESSAGE ROUTER CLASS ATTRIBUTES | | | | |
|---------------------------------|-------------|-------------------------------|---------------|-----------------------------|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 1 |
| INSTANCE 1 | | | | |
| 1 | GET | CLASS LIST | ARRAY | List of Implemented Classes |
| 2 | GET | MAXIMUM NUMBER OF CONNECTIONS | UINT | 1 |
| 3 | GET | CURRENTLY USED CONNECTIONS | UINT | 1 |
| 4 | GET | CURRENTLY USED ID's | Array of UINT | List of Connection ID |

| MESSAGE ROUTER CLASS SERVICES | | | |
|-------------------------------|-----------------|----------|----------------------|
| SERVICE CODE | IMPLEMENTED FOR | | SERVICE NAME |
| | CLASS | INSTANCE | |
| 0x0E | YES | YES | Get_Attribute_Single |



7.2.3 DeviceNet Object - Class 0x03

| DEVICENET CLASS ATTRIBUTES | | | | |
|----------------------------|-------------|-----------------|-----------|------------------------------------|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 2 |
| INSTANCE 1 | | | | |
| 1 | GET/SET | NODE ADDRESS | USINT | 0 to 63 |
| 2 | GET/SET | DATA RATE | USINT | 0 to 2 |
| 3 | GET/SET | BOI | BOOL | 0 = Hold in Error 1 = Reset CAN |
| 4 | GET/SET | BUS-OFF COUNTER | USINT | 0 to 255 |
| 5 | GET | ALLOCATION INFO | | |
| | | ALLOC. CHOICE | BYTE | Allocation Byte |
| | | MASTER ADDRESS | USINT | 0 to 63 Address |

| DEVICENET CLASS SERVICES | | | |
|--------------------------|-----------------|----------|--------------------------------------|
| SERVICE CODE | IMPLEMENTED FOR | | SERVICE NAME |
| | CLASS | INSTANCE | |
| 0x0E | YES | YES | Get_Attribute_Single |
| 0x10 | NO | YES | Set_Attribute_Single |
| 0x4B | NO | YES | Allocate_Master/Slave_Connection_Set |
| 0x4C | NO | YES | Release_Master/Slave_Connection_Set |



Reference

7.2.4 Assembly Object - Class 0x04

| ASSEMBLY CLASS ATTRIBUTES | | | | |
|---------------------------|-------------|-----------------------------|-----------|-------|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 2 |
| 2 | GET | MAXIMUM NUMBER OF INSTANCES | USINT | 11 |
| INSTANCES (See Below) | | | | |
| 1 | GET | NUMBER OF MEMBER | USINT | 1 |
| 3 | GET/SET | DATA | INSTANCE | |

| INSTANCE NUMBER AND NAME | | | ACCESS RULE FOR ATTRIBUTE #3 DATA |
|--|----------------|----------|-----------------------------------|
| INSTANCE 20 = BASIC SPEED CONTROL | | | GET / SET |
| INSTANCE 21 = EXTENDED SPEED CONTROL | | | GET / SET |
| INSTANCE 100 = EXTENDED SPEED HZ + DIGITAL AND ANALOG OUTPUT | | | GET / SET |
| INSTANCE 102 = PID SETPOINT + DIGITAL AND ANALOG OUTPUT | | | GET / SET |
| INSTANCE 104 = TORQUE SETPOINT + DIGITAL AND ANALOG OUTPUT | | | GET / SET |
| INSTANCE 70 = BASIC SPEED CONTROL | | | GET |
| INSTANCE 71 = EXTENDED SPEED CONTROL | | | GET |
| INSTANCE 101 = EXTENDED SPEED HZ + ANALOG AND DIGITAL I/O | | | GET |
| INSTANCE 103 = CUSTOM: SPEED, PID SETPOINT, FEEDBACK | | | GET |
| INSTANCE 105 = CUSTOM: SPEED, ACTUAL TORQUE, ANALOG INPUT | | | GET |
| INSTANCE 106 = CUSTOM: DATA WORDS SELECTABLE WITH PARAMETERS P441 - P444 | | | GET |
| ASSEMBLY CLASS SERVICES | | | |
| SERVICE CODE | IMPLEMETED FOR | | SERVICE NAME |
| | CLASS | INSTANCE | |
| 0x0E | YES | YES | Get_Attribute_Single |
| 0x05 | NO | YES | RESET |



7.2.5 DeviceNet Connection Object - Class 0x05

| DEVICENET CONNECTION CLASS ATTRIBUTES | | | | |
|--|-------------|-------------------------------|-----------|---|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 1 |
| INSTANCE 1 - EXPLICIT MESSAGE INSTANCE | | | | |
| 1 | GET | STATE | USINT | 0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out 5 = Deferred Delete |
| 2 | GET | INSTANCE TYPE | USINT | 0 = Explicit |
| 3 | GET | TRANSPORT CLASS TRIGGER | USINT | 0x83 |
| 4 | GET | PRODUCED CONNECTION ID | UINT | |
| 5 | GET | CONSUMED CONNECTION ID | UINT | |
| 6 | GET | INITIAL COMM. CHARACTERISTICS | USINT | 0x22 |
| 7 | GET | PRODUCED CONNECTION SIZE | UINT | 80 (max) |
| 8 | GET | CONSUMED CONNECTION SIZE | UINT | 80 (max) |
| 9 | GET / SET | EXPECTED PACKET RATE | UINT | Timer Resolution of 2 ms |
| 12 | GET / SET | WATCHDOG ACTION | UINT | 1 = Auto Delete 3 = Deferred Delete |
| 13 | GET | PRODUCED CONN. PATH LENGTH | UINT | 0 |
| 14 | GET | PRODUCED CONNECTION PATH | | Null (No Data) |
| 15 | GET | CONSUMED CONN. PATH LENGTH | UINT | 0 |
| 16 | GET | CONSUMED CONNECTION PATH | | Null (No Data) |
| 17 | GET | INHIBIT TIME | USINT | 0 |



Reference

| DEVICENET CONNECTION CLASS ATTRIBUTES | | | | |
|--|-------------|-------------------------------|-----------|--|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 2 - POLLED I/O MESSAGE CONNECTION | | | | |
| 1 | GET | STATE | USINT | 0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out |
| 2 | GET | INSTANCE TYPE | USINT | 1 = I/O Connection |
| 3 | GET | TRANSPORT CLASS TRIGGER | USINT | 0x82 |
| 4 | GET | PRODUCED CONNECTION ID | UINT | |
| 5 | GET | CONSUMED CONNECTION ID | UINT | |
| 6 | GET | INITIAL COMM. CHARACTERISTICS | USINT | 0x01 |
| 7 | GET | PRODUCED CONNECTION SIZE | UINT | 0 to 8 |
| 8 | GET | CONSUMED CONNECTION SIZE | UINT | 0 to 4 |
| 9 | GET / SET | EXPECTED PACKET RATE | UINT | Timer Resolution of 2 ms |
| 12 | GET / SET | WATCHDOG ACTION | UINT | 0 = Time Out 1 = Auto Delete 2 = Auto Reset |
| 13 | GET | PRODUCED CONN. PATH LENGTH | UINT | 3 |
| 14 | GET | PRODUCED CONNECTION PATH | | 0x63 (Hex String) Hex String - Assembly # |
| 15 | GET | CONSUMED CONN. PATH LENGTH | UINT | 3 |
| 16 | GET | CONSUMED CONNECTION PATH | | 0x63 (Hex String) Hex String - Assembly # |
| 17 | GET | INHIBIT TIME | USINT | 0 |



| DEVICENET CONNECTION CLASS ATTRIBUTES | | | | |
|---------------------------------------|-------------|-------------------------------|-----------|--|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 3 - BIT STROBE | | | | |
| 1 | GET | STATE | USINT | 0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out |
| 2 | GET | INSTANCE TYPE | USINT | 1 = I/O Connection |
| 3 | GET | TRANSPORT CLASS TRIGGER | USINT | 0x82 |
| 4 | GET | PRODUCED CONNECTION ID | UINT | |
| 5 | GET | CONSUMED CONNECTION ID | UINT | |
| 6 | GET | INITIAL COMM. CHARACTERISTICS | USINT | 0x02 |
| 7 | GET | PRODUCED CONNECTION SIZE | UINT | 0 to 8 |
| 8 | GET | CONSUMED CONNECTION SIZE | UINT | 8 |
| 9 | GET / SET | EXPECTED PACKET RATE | UINT | Timer Resolution of 2 ms |
| 12 | GET / SET | WATCHDOG ACTION | UINT | 0 = Time Out 1 = Auto Delete 2 = Auto Reset |
| 13 | GET | PRODUCED CONN. PATH LENGTH | UINT | 3 |
| 14 | GET | PRODUCED CONNECTION PATH | | 0x63 (Hex String) Hex String - Assembly # |
| 15 | GET | CONSUMED CONN. PATH LENGTH | UINT | 3 |
| 16 | GET | CONSUMED CONNECTION PATH | | 0x63 (Hex String) Hex String - Assembly # |
| 17 | GET | INHIBIT TIME | USINT | 0 |



Reference

| DEVICENET CONNECTION CLASS ATTRIBUTES | | | | |
|--|-------------|-------------------------------|-----------|--|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 4 - CHANGE OF STATE / CYCLIC INSTANCE | | | | |
| 1 | GET | STATE | USINT | 0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out |
| 2 | GET | INSTANCE TYPE | USINT | 1 = I/O Connection |
| 3 | GET | TRANSPORT CLASS TRIGGER | USINT | 0x82 |
| 4 | GET | PRODUCED CONNECTION ID | UINT | |
| 5 | GET | CONSUMED CONNECTION ID | UINT | |
| 6 | GET | INITIAL COMM. CHARACTERISTICS | USINT | 0x01 or 0x0F |
| 7 | GET | PRODUCED CONNECTION SIZE | UINT | 0 to 8 |
| 8 | GET | CONSUMED CONNECTION SIZE | UINT | 0 |
| 9 | GET / SET | EXPECTED PACKET RATE | UINT | Timer Resolution of 2 ms |
| 12 | GET / SET | WATCHDOG ACTION | UINT | 0 = Time Out 1 = Auto Delete 2 = Auto Reset |
| 13 | GET | PRODUCED CONN. PATH LENGTH | UINT | 3 |
| 14 | GET | PRODUCED CONNECTION PATH | | 0x63 (Hex String) Hex String - Assembly # |
| 15 | GET | CONSUMED CONN. PATH LENGTH | UINT | 3 |
| 16 | GET | CONSUMED CONNECTION PATH | | 0x63 (Hex String) Hex String - Assembly # |
| 17 | GET / SET | INHIBIT TIME | USINT | 0 |

| DEVICENET CONNECTION CLASS SERVICES | | | |
|-------------------------------------|-----------------|----------|----------------------|
| SERVICE CODE | IMPLEMENTED FOR | | SERVICE NAME |
| | CLASS | INSTANCE | |
| 0x0E | YES | YES | Get_Attribute_Single |
| 0x10 | NO | YES | Set_Attribute_Single |



7.2.6 Parameter Object - Class 0x0F

| PARAMETER CLASS ATTRIBUTES NUMBER OF INSTANCES (PARAMETERS): 550 | | | | |
|---|-------------|---------------------|-----------|-------------|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 2 |
| 2 | GET | NUMBER OF INSTANCES | UINT | 150 |
| 8 | GET | PARAMETER CLASS | WORD | 0x03 |
| | | DESCRIPTOR | | |
| 9 | GET | CONFIGURATION | UINT | 0 |
| | | ASSEMBLY # | | |
| 10 | GET | NATIVE LANGUAGE | UINT | 0 = English |
| INSTANCE 1 - 550 | | | | |
| 1 | GET / SET | PARAMETER VALUE | | |
| 2 | GET | LINK PATH SIZE | USINT | 0 to 2 |
| 3 | GET | LINK PATH | DNET PATH | |
| 4 | GET | DESCRIPTOR | WORD | |
| 5 | GET | DATA TYPE | USINT | |
| 6 | GET | DATA SIZE | USINT | |

NOTE: Refer to Parameter List in the Parameter Object Instance table.

| PARAMETER CLASS SERVICES | | | |
|--------------------------|-----------------|----------|----------------------|
| SERVICE CODE | IMPLEMENTED FOR | | SERVICE NAME |
| | CLASS | INSTANCE | |
| 0x0E | YES | YES | Get_Attribute_Single |
| 0x10 | NO | YES | Set_Attribute_Single |



Reference

Parameter Object Instance (Parameter List)

NOTE: These same parameters are present in the EDS File

| ID NO | PARAMETER | OBJECT MAPPING |
|---------|-----------------------------------|----------------|
| 1-49 | RESERVED | |
| 50 | DIGITAL OUTPUT BITS | 0x0F-50-1 |
| 51-54 | RESERVED | |
| 55 | TB30 ANALOG OUTPUT | 0x0F-55-1 |
| 56-59 | RESERVED | |
| 60 | KEYPAD COMMAND FREQUENCY | 0x0F-60-1 |
| 61 | NETWORK COMMAND FREQUENCY | 0x0F-61-1 |
| 62 | ACTUAL COMMAND FREQUENCY | 0x0F-62-1 |
| 63 | ACTUAL OUTPUT FREQUENCY | 0x0F-63-1 |
| 64 | RESERVED | |
| 65 | CONTROL WORD | 0x0F-65-1 |
| 66 | DEVICENET STATUS WORD | 0x0F-66-1 |
| 67 | DRIVE STATUS WORD | 0x0F-67-1 |
| 68 | DRIVE OPERATION STATE | 0x0F-68-1 |
| 69 | PRESENT FAULT | 0x0F-69-1 |
| 70 | KEYPAD PID SETPOINT COMMAND | 0x0F-70-1 |
| 71 | NETWORK PID SETPOINT COMMAND | 0x0F-71-1 |
| 72 | ACTUAL PID SETPOINT | 0x0F-72-1 |
| 73 | ACTUAL PID SETPOINT | 0x0F-73-1 |
| 74 | ACTUAL PID FEEDBACK | 0x0F-74-1 |
| 75-79 | RESERVED | |
| 80 | KEYPAD TORQUE SETPOINT (%) | 0x0F-80-1 |
| 81 | NETWORK TORQUE SETPOINT (%) | 0x0F-81-1 |
| 82-90 | RESERVED | |
| 91 | INTERNAL STATE FGD | 0x0F-91-1 |
| 92 | INTERNAL STATE PWM | 0x0F-92-1 |
| 93-98 | RESERVED | |
| 99 | DRIVE PARAMETER REVISION | 0x0F-99-1 |
| 100-541 | MATCH SMV PARAMETERS P100 TO P541 | |
| 542-550 | RESERVED | |



| PARAMETER ATTRIBUTES | | | |
|---------------------------------|-------------|-------|---|
| ATTRIBUTE ID | ACCESS RULE | BIT # | ATTRIBUTE |
| 50 Digital Output Bits | GET/SET | 1 | |
| | | 2 | |
| | | 3 | |
| | | 4 | |
| | | 5 | |
| | | 6 | TB14 Out State (1 - ON; 0 - OFF) |
| | | 7 | Relay State (1 - ON; 0 - OFF) |
| | | 8 | |
| | | 9 | |
| | | 10 | |
| | | 11 | |
| | | 12 | |
| | | 13 | |
| | | 14 | |
| | | 15 | |
| 55 TB30 Analog Output | GET/SET | | Min/Max (0/1000) corresponds to 0.00 to 10.00VDC |
| 60 Keypad Command Frequency | GET/SET | | Min/Max (0.0/500.0) Hz Default: 20 Hz Precision = 1 (1 place after decimal point) |
| 61 Network Command Frequency | GET/SET | | Min/Max (0.0/500.0) Hz Default: 20 Hz Precision = 1 (1 place after decimal point) |
| 62 Actual Command Frequency | GET/SET | | Min/Max (0.0/500.0) Hz Default: 20 Hz Precision = 1 (1 place after decimal point) |
| 63 Actual Output Frequency | GET/SET | | Min/Max (0.0/500.0) Hz Default: 20 Hz Precision = 1 (1 place after decimal point) |



Reference

| PARAMETER ATTRIBUTES | | | |
|----------------------|-------------|-------|---|
| ATTRIBUTE ID | ACCESS RULE | BIT # | ATTRIBUTE |
| 65 Control Word | GET/SET | 0 | 0 = NOT Run Forward 1 = Run Forward |
| | | 1 | 0 = NOT Run Reverse 1 = Run Reverse |
| | | 2 | Fault reset on transition from 0 to 1 |
| | | 3 | Reserved |
| | | 4 | Reserved |
| | | 5 | 0 = Local Control 1 = Network Control |
| | | 6 | 0 = Local Speed Ref 1 = Network Speed Ref |
| | | 7 | Reserved |
| | | 8 | Network Speed Reference (valid if bit 6 is set) 0 = Network 6 = Preset #3 |
| | | 9 | 1 = Keypad 7 = Preset #4 ⁽¹⁾ 2 = 0 - 10VDC 8 = Preset #5 ⁽¹⁾ |
| | | 10 | 3 = 4 - 20 mA 9 = Preset #6 ⁽¹⁾ 4 = Preset #1 10 = Preset #7 ⁽¹⁾ |
| | | 11 | 5 = Preset #2 11 = MOP |
| | | 12 | 0 = No Action 1 = Inhibit (Coast to Stop) |
| | | 13 | 0 = No Action 1 = Activate Quick Stop |
| | | 14 | 0 = No Action 1 = Force Manual Stop |
| | | 15 | 0 = DC Brake Active 1 = DC Brake NOT Active |

(1) Presets #4, #5, #6 and #7 are ignored when the drive is operating in either PID mode or Torque mode.



| PARAMETER ATTRIBUTES | | | |
|-----------------------------|----------------|-------|---|
| ATTRIBUTE ID | ACCESS RULE | BIT # | ATTRIBUTE |
| 66 DeviceNet Status Word | Read Only | 0 | 1 = Faulted |
| | | 1 | Reserved |
| | | 2 | 1 = Running Forward |
| | | 3 | 1 = Running Reverse |
| | | 4 | 1 = Ready |
| | | 5 | 0 = Local Control 1 = Network Control |
| | | 6 | 0 = Local Speed Ref 1 = Network Speed Ref |
| | | 7 | 1 = At Reference |
| | | 8 | Network Speed Reference (valid if bit 6 is set) 0 = Keypad 6 = Preset #4 ⁽¹⁾ |
| | | 9 | 1 = 0 - 10 VDC 7 = Preset #5 ⁽¹⁾ 2 = 4 - 20 mA 8 = Preset #6 ⁽¹⁾ |
| | | 10 | 3 = Preset #1 9 = Preset #7 ⁽¹⁾ 4 = Preset #2 10 = MOP |
| | | 11 | 5 = Preset #3 11 = Network |
| | | 12 | 1 = PID Active (closed loop) |
| | | 13 | 1 = Torque Mode Active |
| | | 14 | 1 = Current Limit |
| 15 | 1 = DC Braking | | |

(1) Presets #4, #5, #6 and #7 are ignored when the drive is operating in either PID mode or Torque mode.



Reference

| PARAMETER ATTRIBUTES | | | |
|-----------------------------|--------------------------|-------|--|
| ATTRIBUTE ID | ACCESS RULE | BIT # | ATTRIBUTE |
| 67 Drive Status Word | Read Only | 0 | 0 = Stop 1 = Run |
| | | 1 | 1 = Quick Stop (ramp to stop) Active |
| | | 2 | 0 = Direction Forward (commanded) 1 = Direction Reverse |
| | | 3 | 0 = Direction Forward (actual) 1 = Direction Reverse |
| | | 4 | 0 = NET REF not active 1 = NET REF sets the active source |
| | | 5 | 0 = Speed Mode 1 = Torque Mode |
| | | 6 | 0 = Open Loop (PID Off) 1 = Closed Loop (PID On) |
| | | 7 | 0 = Manual Mode; 1 = AUTO mode |
| | | 8 | Actual Setpoint Source 0 = Keypad 6 = Preset #4 1 = 0 - 10 VDC 7 = Preset #5 2 = 4 - 20 mA 8 = Preset #6 3 = Preset #1 9 = Preset #7 4 = Preset #2 10 = MOP 5 = Preset #3 11 = Network |
| | | 9 | |
| | | 10 | |
| | | 11 | |
| | | 12 | |
| | | 13 | Control 0 = Keypad 2 = Remote Keypad 1 = Terminal 3 = Network |
| | | 14 | 0 = Network Control Disabled 1 = Network Control Enabled |
| | | 15 | 1 = DC Braking |
| 68 Drive Operation State | AC Tech Diagnostics Only | | |



| PARAMETER ATTRIBUTES | | | |
|----------------------|-------------|-------|---|
| ATTRIBUTE ID | ACCESS RULE | BIT # | ATTRIBUTE |
| 69 Present Fault | Read Only | 1 | Temperature Output Fault |
| | | 2 | Overcurrent Fault |
| | | 3 | Ground (Short to Earth) Fault |
| | | 4 | Excessive Drive Temperature Fault |
| | | 5 | Fly Start Fault |
| | | 6 | High Bus Voltage (Over Voltage) Fault |
| | | 7 | Low Bus Voltage Fault |
| | | 8 | Motor Overload Fault |
| | | 9 | OEM Defaults Corrupted |
| | | 10 | Illegal Setup Fault |
| | | 11 | Dynamic Brake Overheated Fault |
| | | 12 | Single Phase, Voltage Ripple to High |
| | | 13 | External Fault |
| | | 14 | Control EEPROM fault |
| | | 15 | Start Power Loss Fault |
| | | 16 | Incompatibility Fault |
| | | 17 | EEPROM Hardware Failure |
| | | 18 | Internal Fault (Edge Over Run) |
| | | 19 | Internal Fault (PWM Over Run) |
| | | 20 | Stack Overflow Fault |
| | | 21 | Stack Underflow Fault |
| | | 22 | Internal Fault (BGD Missing) |
| | | 23 | Watchdog Timeout Fault |
| | | 24 | Illegal OPCO Fault |
| | | 25 | Illegal Address Fault |
| | | 26 | Drive Hardware Fault |
| | | 27 | Internal Fault (AD Offset) |
| | | 28 | Internal Fault (RKPD Lost) |
| | | 29 | Assertion Level switched during operation Fault |
| | | 30 | Internal Fault (FGD Missing) |
| | | 31 | Internal Fault (PW Missing) |
| | | 32 | Current Loop Fault |
| | | 33 | Internal communication from JK1 Lost Fault |



Reference

| PARAMETER ATTRIBUTES | | | |
|------------------------------------|--------------------------|-------|---|
| ATTRIBUTE ID | ACCESS RULE | BIT # | ATTRIBUTE |
| 69 Present Fault (continued) | | 34 | Internal Fault (Module Communication (SPI) Timeout) |
| | | 35 | Internal Fault (FNR: Invalid Message Received) |
| | | 36 | Network Fault #1 |
| | | 37 | Network Fault #2 |
| | | 38 | Network Fault #3 |
| | | 39 | Network Fault #4 |
| | | 40 | Network Fault #5 |
| | | 41 | Network Fault #6 |
| | | 42 | Network Fault #7 |
| | | 43 | Network Fault #8 |
| | | 44 | Network Fault #9 |
| 70 Keypad PID Setpoint Command | GET/SET | | Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point) |
| 71 Network PID Setpoint Command | GET/SET | | Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point) |
| 72 Actual PID Setpoint | Read Only | | Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point) |
| 73 Actual PID Setpoint | Read Only | | Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point) |
| 74 Actual PID Feedback | Read Only | | Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point) |
| 80 Keypad Torque Setpoint (%) | GET/SET | | Min: 0[%] Max: 400[%] Default = 0 Precision = 0 |
| 81 Network Torque Setpoint (%) | GET/SET | | Min: 0[%] Max: 400[%] Default = 0 Precision = 0 |
| 91 Internal State FGD | AC Tech Diagnostics Only | | |
| 92 Internal State PWM | AC Tech Diagnostics Only | | |



7.2.7 Parameter Group Object - Class 0x10

| PARAMETER GROUP CLASS ATTRIBUTES | | | | |
|----------------------------------|-------------|---------------------------------|--------------|-------------|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 1 |
| 2 | GET | NUMBER OF INSTANCES | UINT | 4 |
| 8 | GET | NATIVE LANGUAGE | UINT | 0 = English |
| INSTANCE 1 - 3 | | | | |
| 1 | GET | GROUP NAME | SHORT STRING | |
| 2 | GET | NUMBER OF MEMBERS IN THE GROUP | UINT | |
| 3 | GET | 1st PARAMETER IN THE GROUP | UINT | |
| 4 | GET | 2nd PARAMETER IN THE GROUP | UINT | |
| n | GET | (n-2) th PARAMETER IN THE GROUP | UINT | |

7.2.8 Motor Data Object - Class 0x28

| MOTOR GROUP CLASS ATTRIBUTES | | | | |
|------------------------------|-------------|----------------------------------|-----------|-----------------------------|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 1 |
| 2 | GET | NUMBER OF INSTANCES | UINT | 1 |
| INSTANCE 1 | | | | |
| 1 | GET | NUMBER OF SUPPORTED ATTRIBUTES | USINT | 7 |
| 2 | GET | ATTRIBUTE LIST | ARRAY | |
| 3 | GET/SET | MOTOR TYPE | USINT | 0 - 10 |
| 6 | GET/SET | RATED CURRENT | UINT | RATED STATOR CURRENT (0.1A) |
| 7 | GET/SET | RATED VOLTAGE | UINT | RATED BASE VOLTAGE (V) |
| 9 | GET/SET | RATED FREQUENCY | UNIT | RATED FREQUENCY (Hz) |
| 11 | GET/SET | NOMINAL SPEED AT RATED FREQUENCY | UNIT | NOMINAL SPEED (RPM) |

| MOTOR DATA CLASS SERVICES | | | |
|---------------------------|-----------------|----------|----------------------|
| SERVICE CODE | IMPLEMENTED FOR | | SERVICE NAME |
| | CLASS | INSTANCE | |
| 0x0E | YES | YES | GET_ATTRIBUTE_SINGLE |
| 0x10 | NO | YES | SET_ATTRIBUTE_SINGLE |



Reference

7.2.9 Control Supervisor Object - Class 0x29

| CONTROL CLASS ATTRIBUTES | | | | |
|--|-------------|--------------------------------|-----------|--|
| ATTRIBUTE ID | ACCESS RULE | NAME | DATA TYPE | VALUE |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 1 |
| 2 | GET | NUMBER OF INSTANCES | UINT | 1 |
| INSTANCE 1 | | | | |
| 1 | GET | NUMBER OF SUPPORTED ATTRIBUTES | USINT | 16 |
| 2 | GET | ATTRIBUTE LIST | ARRAY | |
| 3 | GET/SET | RUNFWD | BOOL | 0 to 1 |
| 4 | GET/SET | RUNREV | BOOL | 0 to 1 |
| 5 | GET/SET | NETCTRL | BOOL | 0 to 1 |
| 6 | GET | STATE | UNIT | 3 = READY 4 = ENABLED 5 = FAULTED |
| 7 | GET | RUNNINGFWD | BOOL | 0 to 1 |
| 8 | GET | RUNNINGREV | BOOL | 0 to 1 |
| 9 | GET | READY | BOOL | 0 to 1 |
| 10 | GET | FAULTED | BOOL | 0 to 1 |
| 11 | GET | WARNING | UNIT | 0 (Not Supported) |
| 12 | GET/SET | FAULTRST | BOOL | 0 to 1 |
| 13 | GET | FAULT CODE | UNIT | 0 to 65535 |
| 15 | GET | CTRLFROMNET | US INT | 0 to 1 |
| 16 | GET/SET | ACTION ON LOSS OF DEVICE NET | US INT | 0 = FAULT 1 = IGNORE COMM FAULT 2 = AC TECH SPECIFIC |
| 17 | GET/SET | FORCE TRIP | BOOL | 0 to 1 |
| The drive shows the "nF" fault on the LED display. | | | | |

If Attribute #5 NET CONTROL is set to 1, the RUN and STOP events are triggered according to the following event table:

| ATTRIBUTE RUN FWD | ATTRIBUTE RUN REV | TRIGGER EVENT | RUN TYPE |
|-------------------|-------------------|---------------|-------------|
| 0 | 0 | STOP | N/A |
| 0 -> 1 | 0 | RUN | RUN FORWARD |
| 0 | 0 -> 1 | RUN | RUN REVERSE |
| 0 -> 1 | 0 -> 1 | NO ACTION | N/A |
| 1 | 1 | NO ACTION | N/A |
| 1 -> 0 | 1 | RUN | RUN REVERSE |
| 1 | 1 -> 0 | RUN | RUN FORWARD |

NOTE: If ACT PARAMETER #17 DIRECTION is set to FORWARD ONLY, the drive will not be able to run in the reverse direction.



| FAULT CODES | | |
|-------------|--------------|---|
| Fault Code | Fault Number | Fault Description |
| 0x0000 | 0 | NO FAULT |
| 0x2220 | 1 | Temperature Output Fault |
| 0x2220 | 2 | Over Current Fault |
| 0x2240 | 3 | Ground (Short to Earth) Fault |
| 0x4310 | 4 | Excess Drive Temperature Fault |
| 0x0000 | 5 | Fly Start Fault |
| 0x3210 | 6 | High Bus Voltage (Over Voltage) Fault |
| 0x3220 | 7 | Low Bus Voltage (Under Voltage) Fault |
| 0x7122 | 8 | Motor Overload Fault |
| 0x6320 | 9 | OEM Defaults Corrupted Fault |
| 0x6320 | 10 | Illegal Setup Fault |
| 0x7110 | 11 | Dynamic Brake Overheated Fault |
| 0x3130 | 12 | Single Phase Voltage Ripple to High Fault |
| 0x9000 | 13 | External Fault |
| 0x6310 | 14 | Control EEPROM Fault |
| 0x3120 | 15 | Start Power Loss Fault |
| 0x6320 | 16 | Incompatibility Fault |
| 0x6100 | 17 | EEPROM Hardware Failure |
| 0x6100 | 18 | Internal Fault (Edge Over Run) |
| 0x6100 | 19 | Internal Fault (PWM Over Run) |
| 0x6100 | 20 | Stack Overflow Fault |
| 0x6100 | 21 | Stack Underflow Fault |
| 0x6100 | 22 | Internal Fault (BGD Missing) |
| 0x6010 | 23 | Watchdog Timed Out Fault |
| 0x6100 | 24 | Illegal OPCO Fault |
| 0x6100 | 25 | Illegal Address Fault |
| 0x6100 | 26 | Drive Hardware Fault |
| 0x6100 | 27 | Internal Fault (AD Offset) |
| 0x7501 | 28 | Internal Fault (RKPD Lost) |
| 0x5200 | 29 | Assertion Level switched during Operation Fault |
| 0x6100 | 30 | Internal Fault (FGD Missing) |
| 0x6100 | 31 | Internal Fault (PW Missing) |
| 0x6100 | 32 | Current Loop Fault |



Reference

| FAULT CODES | | |
|-------------|--------------|---|
| Fault Code | Fault Number | Fault Description |
| 0x7500 | 33 | Internal Communication from JK1 Lost Fault |
| 0x7501 | 34 | Internal Fault (Module Communication (SPI) Timeout) |
| 0x7502 | 35 | Internal Fault (FNR: Invalid Message Received) |
| 0x7511 | 36 | Network Fault #1 |
| 0x7512 | 37 | Network Fault #2 |
| 0x7513 | 38 | Network Fault #3 |
| 0x7514 | 39 | Network Fault #4 |
| 0x7515 | 40 | Network Fault #5 |
| 0x7516 | 41 | Network Fault #6 |
| 0x7517 | 42 | Network Fault #7 |
| 0x7518 | 43 | Network Fault #8 |
| 0x7519 | 44 | Network Fault #9 |
| 0x1000 | 46 - 50 | RESERVED |

| CONTROL SUPERVISOR CLASS SERVICES | | | |
|-----------------------------------|-----------------|----------|----------------------|
| Service Code | Implemented For | | Service Name |
| | Class | Instance | |
| 0x0E | YES | YES | Get_Attribute_Single |
| 0x10 | NO | YES | Set_Attribute_Single |



7.2.10 AC/DC Drive Object - Class 0x2A

| AC/DC DRIVE CLASS ATTRIBUTES | | | | |
|------------------------------|-------------|-----------------------------|-----------|---|
| Attribute ID | Access Rule | Name | Data Type | Value |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 1 |
| 2 | GET | NUMBER OF INSTANCES | UINT | 1 |
| INSTANCE 1 | | | | |
| 1 | GET | NO. OF SUPPORTED ATTRIBUTES | USINT | 12 |
| 2 | GET | ATTRIBUTE LIST | ARRAY | |
| 3 | GET | AT REFERENCE | BOOL | Speed AtRef |
| 4 | GET/SET | NET REFERENCE | BOOL | 0 = Local SpdRef 1 = Net SpdRef |
| 6 | GET | DRIVE MODE | USINT | 1 = Open Loop Spd Control 2 = Vector Mode 3 = Torque Mode 4 = PID Mode |
| 7 | GET | ACTUAL SPEED | INT | Actual Speed (RPM) |
| 8 | GET/SET | SPEED REFERENCE | INT | Speed Reference (RPM) |
| 9 | GET | MOTOR PHASE CURRENT | INT | Actual Current (0.1A) |
| 15 | GET | MOTOR PHASE CURRENT | INT | Actual Power (W) |
| 16 | GET | INPUT VOLTAGE | INT | (V) |
| 17 | GET | OUTPUT VOLTAGE | IN | (V) |
| 29 | GET | STATUS OF SPEED REFERENCE | INT | 0 = Local Spd Ref 1 = Net Spd Ref |

| AC DRIVE CLASS SERVICES | | | |
|-------------------------|-----------------|----------|----------------------|
| Service Code | Implemented For | | Service Name |
| | Class | Instance | |
| 0x0E | YES | YES | Get_Attribute_Single |
| 0x10 | NO | YES | Set_Attribute_Single |



Reference

7.2.11 Acknowledge Handler Object - Class 0x2B

| ACKNOWLEDGE HANDLER CLASS ATTRIBUTES | | | | |
|--------------------------------------|-------------|-----------------------------|-----------|---------------|
| Attribute ID | Access Rule | Name | Data Type | Value |
| INSTANCE 0 | | | | |
| 1 | GET | REVISION | UINT | 1 |
| 2 | GET | NUMBER OF INSTANCES | UINT | 1 |
| INSTANCE 1 | | | | |
| 1 | GET/SET | ACKNOWLEDGE TIMER | UINT | 1 to 65535 ms |
| 2 | GET/SET | RETRY LIMIT | USINT | 0 to 255 |
| 3 | GET | COS PRODUCING CONN INSTANCE | UINT | 4 |

| ACKNOWLEDGE HANDLER CLASS SERVICES | | | |
|------------------------------------|-----------------|----------|----------------------|
| Service Code | Implemented For | | Service Name |
| | Class | Instance | |
| 0x0E | YES | YES | Get_Attribute_Single |
| 0x10 | NO | YES | Set_Attribute_Single |



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