Eaton Servo-Performance Proportional Directional Valve User Manual

AxisPro™

Powering Business Worldwide

Table of Contents

Table of Contents (Cont...)

Introduction

The hydraulic performance of the AxisPro valves are detailed in the following catalogues 'AxisPro Servo-Performance Proportional Directional Valve with Feedback'.

Documentation

AxisPro Servo-Performance Proportional Directional Valve with Feedback	
KBS*DG4V-3	E-VLPO-MC002-E
KBS*DG4V-5	E-VLPO-MC003-E
Pro-Fx: Configure Installation Guide	--
Installation and Start-up Guidelines for KBS AxisPro	V-VLPO-TI001-M2

1.1 Preface

This Manual is a step by step guide for set up and commissioning of the AxisPro proportional valve series. It contains an overview of the valves main features and benefits. As the valve can be used as an integral part of a larger control system/application it is not possible to cover all possible uses/operations in this manual.

1.2 Qualified Personnel

This manual has been created for the use by professionals in the field of hydraulics power motion and control with the appropriate knowledge of commissioning and optimization. Only skilled and trained personnel are advised to conduct the installation, connection, configuration, programming and operation for AxisPro valve. Personnel must be able to judge potential hazards arising from the above-mentioned tasks and also those arising, in general from the mechanical, electrical or electronic equipment. Only personnel who are familiar with the working principles of the AxisPro valve are recommended to install and service the product.

1.3 Software and Support Information

Pro-Fx : Configure

Pro-Fx: Configure is intended for use with all AxisPro™. It is a PC-based tool used for advanced electronic product set-up, commissioning, diagnostics and troubleshooting. For AxisPro level 2, 3 and 4 valves, Pro-Fx: Configure also provides access to closed loop CANopen DS408 motion control modes. More information on Pro-Fx Configure is available in later chapters

Pro-Fx: Control

For the ultimate flexibility into the control of your machine's hydraulic motion (including concepts such as customized ramps, coordinated master/slave axis arrangements, etc.), Pro-Fx: Control represents a major step forward in our IEC 61131-3 standards-based, application development environment. Pro-Fx: Control is intended for application development on AxisPro KBS4 valves only. More information on Pro-Fx Control is available in later chapters.

2.1 AxisPro Valve

Fig. 2.1

- AxisPro valves represent the next generation in electrohydraulic sophistication. They provide four levels of control capability in a modular design. From an entry level valve that is quick and easy to configure, the valves also offer two open architecture solutions for on board axis control:
  - o Hard coded algorithms as per industry standard DS408.
  - o 'White space' for customized application solutions – using Eaton Pro-Fx Control software (based on the IEC-61131-3 programming standard)
- The modular design AxisPro valve series provides an integrated, programmable control capability allowing you to take control of your most demanding applications. This flexible approach allows both centralized and decentralized control concepts by using the onboard axis control options.
- Additional features such as CANopen fieldbus control and communication capability, optional sensor inputs, embedded on board pressure and temperature sensor capability.
- The valves also contain easy to read LED status indicators as standard. The system parameters for all four levels are configured and saved via Eaton's Pro-Fx: Configure software.
- The AxisPro valves designed for performance, flexibility, reliability and easy diagnostics. The valves offer truly differentiated machine and application performance benefits which translate into significant improvements in efficiency, productivity, and repeatability for numerous industrial applications.

2.2 Application

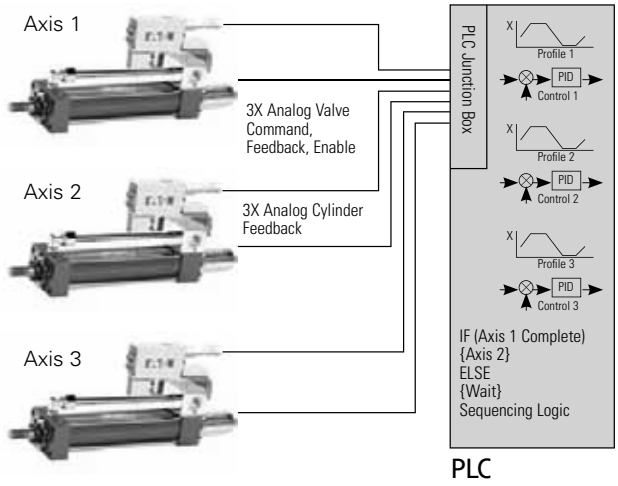
Axis Pro valves are designed to meet the needs of the most demanding and sophisticated industrial applications.

Typical applications can be found in plastic injection molding, metal forming, primary metals, wood processing and wind turbines.

Example:

Several AxisPro valves with different configurations communicate through the bus system with the controller PLC

Centralized Control



Distributed Control

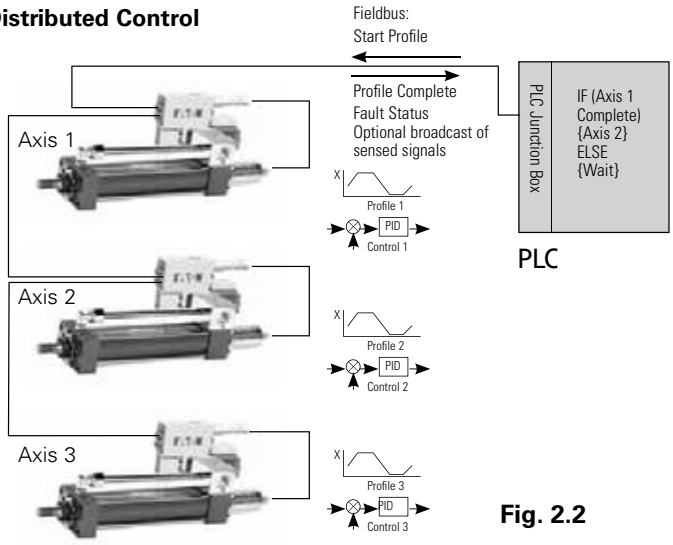


Fig. 2.2

2.3 Installation

2.3.1 Valve Installation

- The valve can be mounted in any attitude but it is good practice to ensure that the piping be arranged to ensure that the valve is kept full of fluid at all times. This applies particularly to port T.
- Do not remove the protection pad on the bottom face of the valve until immediately before installation. Take care not to lose the seals from the valve ports. Ensure that the

surface on which the valve is to be mounted is clean and free from burrs and damage. This applies also to any intermediate "stacking/sandwich" valves which may be used.

- Install the valve on the mounting surface and secure with bolts to class 12.9 (ISO 898) or better. Torque bolts according to the following recommendation.

Valve	Clamping height mm (in)	Bolts/studs for mounting surface: ISO 4401 (torque)	ANSI/B93.7M (torque)
KBSDG4V-3	21 (0.82)	(7-9 Nm)	(62-76 lbf in)
KBSDG4V-5	30 (1.18)	(17-20 Nm)	(13-15 lbf ft)

- Minimum actual bolt lengths are the sum of relevant clamping heights plus minimum engagement lengths in ferrous materials.

2.3.2 Service Information

- These products are preset at the factory for optimum performance. Disassembling critical items would destroy these settings. It is therefore essential that any valve requiring mechanical or electronic repair be returned to the nearest Eaton repair center.
- The products will be refurbished as necessary and retested to specification before return. Field repair is restricted to the replacement of the external seals only.

Getting Started
Topic 3

3.1 Interface overview

The AxisPro valve is equipped with interfaces at locations 1, 2, 3, 4 and 5. The interfaces 1, 2, 3, 4 and 5 are provided according to model type. Function of each interface is given below.

The overview below shows the arrangement of the AxisPro valve.

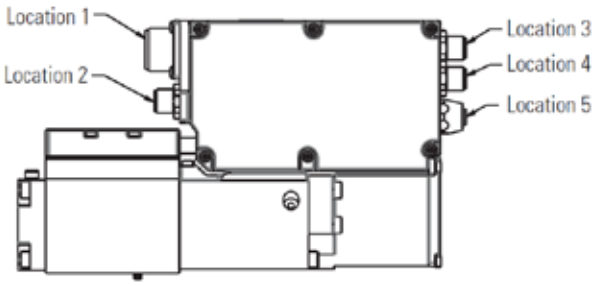


Fig. 3.1

Functions

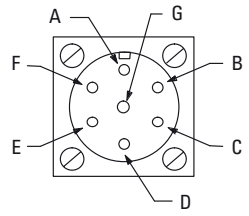
Hardware functions of the AxisPro valve interfaces:

- Location 1:
  - Supply of the AxisPro valve
  - Voltage and current command input
  - Monitor Output
- Location 2: CAN channel
- Location 3:
  - External current input (analog models)
  - Speed sensor inputs (analog models)
  - Synchronous Serial Interface (SSI) (digital models)
- Location 4: CAN channel
- Location 5: CAN channel

3.1.1 Device Interface

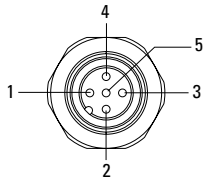
Connector Details

7-pin plug connector



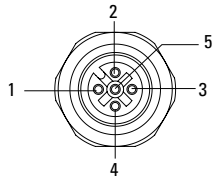
Pin	Description	Note:
A	Power supply positive (+)	Present at location 1 of the electronics enclosure (see figure 3.1).
B	Power supply 0V and current command return	
C	Not connected (PE7 & PC7)	To ensure EMI protection use only metal shielded mating connectors.
C	Valve enable (PH7 & PR7)	
D	Command signal (+V or current in)	
E	Command signal (-V or current GND)	
F	Monitor Output	
G	Protective earth	

M12 5-pin CAN Connector (Male)



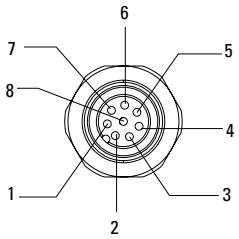
Pin	Description	Note:
1	GND	Present at location 2 and 4 of the electronics enclosure (see figure 3.1).
2	Not Connected	
3	GND	To ensure EMI protection use only metal shielded mating connectors.
4	CAN High	
5	CAN Low	Use only shielded twisted pair (STP) cables for mating connection.

M12 5-pin CAN Connector (Female)



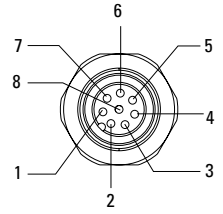
Pin	Description	Note:
1	GND	Present at location 5 of the electronics enclosure (see figure 3.1).
2	Not Connected	
3	GND	To ensure EMI protection use only metal shielded mating connectors.
4	CAN High	
5	CAN Low	Use only shielded twisted pair (STP) cables for mating connection.

External Sensor Connector (digital)



Pin	Description	Note:
1	Power supply 0V	Present at location 3 of the electronics enclosure (see figure 3.1).
2	+24V Supply	
3	SSI CLK-	To ensure EMI protection use only metal shielded mating connectors.
4	SSI DATA-	
5	SSI DATA+	24V to Power supply 0V (pin 2, 1) short circuit protected (max current 1.5 A).
6	Not Connected	
7	SSI CLK+	Use only shielded twisted pair (STP) cables for mating connection.
8	Not Connected	

External Sensor Connector(Analog)



Pin	Description	Note:
1	Speed Sensor Input1	Present at location 3 of the electronics enclosure (see figure 3.1).
2	Speed Sensor Input2	
3	4-20mA External Sensor Signal1	To ensure EMI protection use only metal shielded mating connectors.
4	+15V Supply	
5	4-20mA External Sensor Signal2	15V to Power supply 0V (pin 4, 6) short circuit protected (max current 500 mA).
6	Power supply 0V	
7	4-20mA External Sensor Signal3	
8	4-20mA External Sensor Signal4	

3.2 Cables and Connections

Additional documentation of all ports, cables, pinouts, and wiring instructions can be found in the valve catalog descriptions or supplied installation information.

3.2.1 Power and Analog Command

Power is provided to the valve via the 7 pin plug connector. AxisPro valves require a regulated 24VDC supply with a minimum 5 amp capability.

Table 3.1 7pin Plug Pinout

Pin	Signal
A	24V supply
B	Ground
C	Enable input
D	+VE input
E	-VE input
F	Monitor output

Table 3.2 7pin Plug Pin C (Enable) Model Options

Code	Pin C
PC7/PE7	High impedance
PH7/PR7	Enable signal

Table 3.3 7pin Plug Pin D/E (+/- Analog Command) Model Options

Code	Pin D/E
M1	+/-10VDC
M2	4-20mA
M3	+/-10mA
M4	+/-15mA
M9	Pins not used (CANbus cmd)

Table 3.4 7pin Plug Pin F (Monitor output) Model Options

Code	Pin F
F1	+/-10V
F2	4-20mA
F9	Disabled

3.2.2 CANbus

CANbus communication requires a connection from one of the available 5 pin M12 CANbus ports to the available CANbus network or adapter connected to a PC.

Table 3.5 CANbus M12 Pinout

Code	Pin D/E
1	Egnd
2	---
3	Egnd
4	CAN high
5	CAN low

Typically, PC CANbus adapters incorporate a standard male DB9 connector with pins 7 and 2 as CAN high and CAN low respectively.

All CANbus networks require the use of 120 ohm terminating resistors between CAN high and CAN low signal wires at the extents of the physical bus. This includes the simple network formed by a single valve to PC CANbus adapter for Pro-Fx: Configure parameterization. Communication without a terminating resistor should be expected to be unreliable. As cable length increases, bitrate is increased, or different devices are networked together, the need for termination becomes critical. Longer physical bus lengths also require slower bitrates to be used for all devices. For further information on wiring and terminating CANbus networks see CiA DS102.

Node-ID and Bitrate:

The Layer Setting Service (LSS) is implemented to change bitrate and node-ID of the valve.

LSS supported from CiA DSP305 are:

- Switch state global – LSS device state machine command
- Switch to configuration state
- Switch to waiting state - on demand (only) and an automatic NMT Reset Communications is executed.
- Inquire node-ID – request node-ID of the device
- Configure node-ID – change node-ID of the device
- Configure bit timing parameters – configure bitrate using standard enumeration

  1 = 800 Kbps
  2 = 500 Kbps
  3 = 250 Kbps
  4 = 125 Kbps
  6 = 50 Kbps
  7 = 20 Kbps
  8 = 10 Kbps

Store configuration protocol – save node-ID and bitrate parameters as configured.

3.2.3 Sensor Port

Available on KBS2DG4V-xxx, KBS3DG4V-xxx, KBS4DG4V-xxx models when configured. The sensor port, where present, interfaces to external 4-20mA sensors and pulse generating speed sensors.

Table 3.6 Sensor Port M12 Pinout

Pin	Signal
1	Speed 1
2	Speed 2
3	4-20mA #1
4	15Vout
5	4-20mA #2
6	Ground
7	4-20mA #3
8	4-20mA #4

Details of the analog sensor port signals:

Input Type	4-20mA
Range	0 to 22mA
Resolution	1uA
Accuracy	+/-1%
Input Impedance	100ohm shunt (max wattage or max voltage limitation)
Voltage Level (max)	5V
Sampling Frequency (max)	1KHz
Operation Notes	Single-ended operation (grounded internally)
	3mA cable break detect, 22mA overcurrent detect
	User configurable fault limit and criticality triggering

Input Type	Speed (frequency)
Frequency Range	8Hz to 40KHz
Voltage Levels (switching)	2.4V to 8V
Voltage Level (max)	45V steady-state
Input Impedance	20Kohm, 1.2mA sink @ 24V
Sampling Frequency (max)	1KHz
Operation Notes	User configurable fault limit and criticality triggering

Input Type	Speed (Incremental count and direction + frequency)
Count (max)	Signed 32bit, pulse count up/down
Frequency Range	0Hz to 40KHz
Voltage Levels (switching)	2.4V to 8V
Voltage Level (max)	36V steady state
Input Impedance	20Kohm, 1.2mA @ 24V
Sampling Frequency (max)	1KHz
Operation Notes	Adjustable software filter to achieve reliable lower speeds (default 99% filter applied for low speeds)
	Mode requires both speed inputs when available.
	User configurable fault limit and criticality triggering

Input Type	Speed (Quadrature phase A&B + frequency)
Count (max)	Signed 32bit, pulse count up/down
Frequency Range	0Hz to 40KHz
Voltage Levels (switching)	2.4V to 8V
Voltage Level (max)	36V steady state
Input Impedance	20Kohm, 1.2mA @ 24V
Sampling Frequency (max)	1KHz
Operation Notes	Adjustable software filter to achieve reliable lower speeds (default 99% filter applied for low speeds)
	Mode requires both speed inputs when available.
	User configurable fault limit and criticality triggering

3.2.4 Synchronous Serial Interface (SSI) Port

Available on KBS2DG4V-xxx, KBS3DG4V-xxx, KBS4DG4V-xxx models when configured. The SSI port, where present, interfaces to a single external SSI capable device, typically a position encoder.

Table 3.7 SSI Port M12 Pinout

Pin	Signal
1	Ground
2	+24V out
3	CLK -
4	DATA -
5	DATA +
6	NC
7	CLK +
8	NC

The AxisPro SSI Port options that may be configured:

Bitrate – data clocking rate of the SSI port

Resolution – encoded unit (distance, pressure) per binary bit of received SSI sequence

Bit length – number of bits of a SSI sequence that represent the numeric data

Control Mode Read Delay – if using sensor as feedback in a DS408 control, maximum sequence time allowed immediately before feedback control is processed.

Binary or Gray Code – standard binary or gray code decoding of the data.

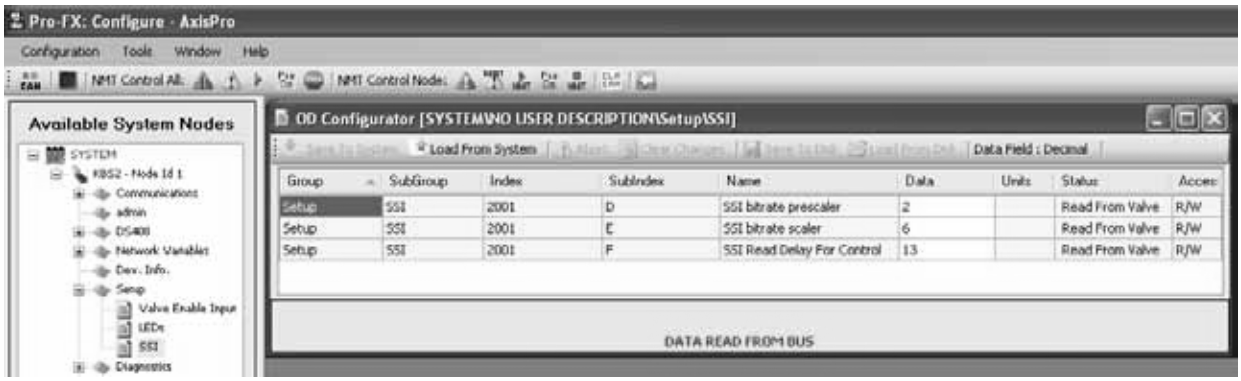


Fig. 3.2

Details of the digital sensor port signals:	
Input Type	SSI (synchronous serial interface)
Resolution	1 to 32bit adjustable (default 24Bit)
Bitrate	0.558kHz to 32,000kHz adjustable (default 400kHz)
Voltage Levels (switching)	2.4V to 8V opt isolated ???
Voltage Level (max)	45V steady-state???, max transient ???
Input Impedance	20Kohm, 1.2mA @ 24V ???
Sampling Frequency (max)	1kHz
Operation	binary or gray code, 32bits max, adjustable resolution and zero offset
	Adjustable zero offset applied to result (default 0 offset)
	0 to 255uS adjustable feedback control delay to synchronize reading with control cycle
	User configurable fault limit and criticality triggering
Input Type	Temperature (amplifier electronics)
Range	-40oC to 125oC
Resolution	1 Co (1.8 Fo)
Accuracy	+/-1%
Sampling Frequency (max)	1kHz
Operation	-25oC (-13oF) undertemp detect
	125oC (257oF) overtemp detect
	User configurable fault limit and criticality triggering
Input Type	Power Supply (internal sensor)
Range	0 to 44V
Resolution	0.01V
Accuracy	+/-1%
Sampling Frequency (max)	1kHz
Operation	19V under voltage detect
	36V overvoltage detect

The AxisPro SSI Port configuration options:

SSI Bitrate Prescaler & Scaler – data clocking rate of the SSI port is adjusted by these parameters.

Prescaler entry valid range: 0 to 3

Prescaler Entry	PSVAL
0	2
1	3
2	5
3	7

Scaler entry valid range: 0 to 15

Scaler entry	SVAL
0	2
1	4
2	6
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1024
11	2048
12	4096
13	8192
14	16384
15	32768

Bitrate = 128000000/(PSVAL * SVAL)

Ex. Default bitrate is 400Kbps

Prescaler = 2 (PSVAL = 5)

Scaler = 6 (SVAL = 64)

128000000/(5+64) = 400000 = 400Kbps

SSI Read Delay For Control – A precision adjustment to control loop processing where an SSI reading is used (ex. DS408 control modes). Value in microseconds. This parameter specifies an additional control loop delay (as maximum delay) prior to executing control to allow the sensor processing to finish obtaining the feedback value prior to computing the control. If sensor processing takes longer than the control update rate (1mS) plus this delay, the old value of SSI sensor feedback is used, and the control becomes out-of-phase with the sensor feedback. Value may be important for slowest SSI bitrates or unresponsive SSI devices.

SSI Type – Selection of type of encoding of the received data or port disable

Type Entry	Description
0	disable SSI clock output and processing
65	data processed as binary encoding
66	data processed as gray encoding

SSI Sign – allows sign inversion of the SSI result value

Sign Entry	Description
0	result = SSI Position Offset
1	positive result
-1	negative result

SSI Position Resolution and Offset – conversion from decoded raw serial data value to a scaled physical value (distance, pressure). Resolution is a multiplication times the raw data. Offset is a subtraction from the resolved result.

SSI result value = sign * (decoded raw data * Resolution) - Offset

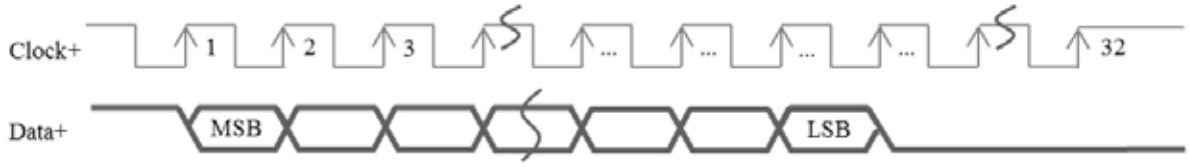
SSI Position Bit Size – number of bits of a SSI serial sequence that represent the numeric data. Max value is 32.

The maximum serial transmission is 32bits. The valve will output 32 clock pulses regardless of the configured bit size. The bit sampled on clock 1 is expected to be the most significant bit (MSB) of the data. The bit sampled on clock (32 – Bit Size) is expected to be the least significant bit (LSB) of the the data. Bits sampled after the LSB are disregarded.

All data bits are included as part of the data value and must represent data (i.e. no error, sign, or stuff bits should exist prior to the MSB as part of the bit size.

All other SSI parameters not listed above are to be ignored and have no effect.

SSI Pulse Diagram



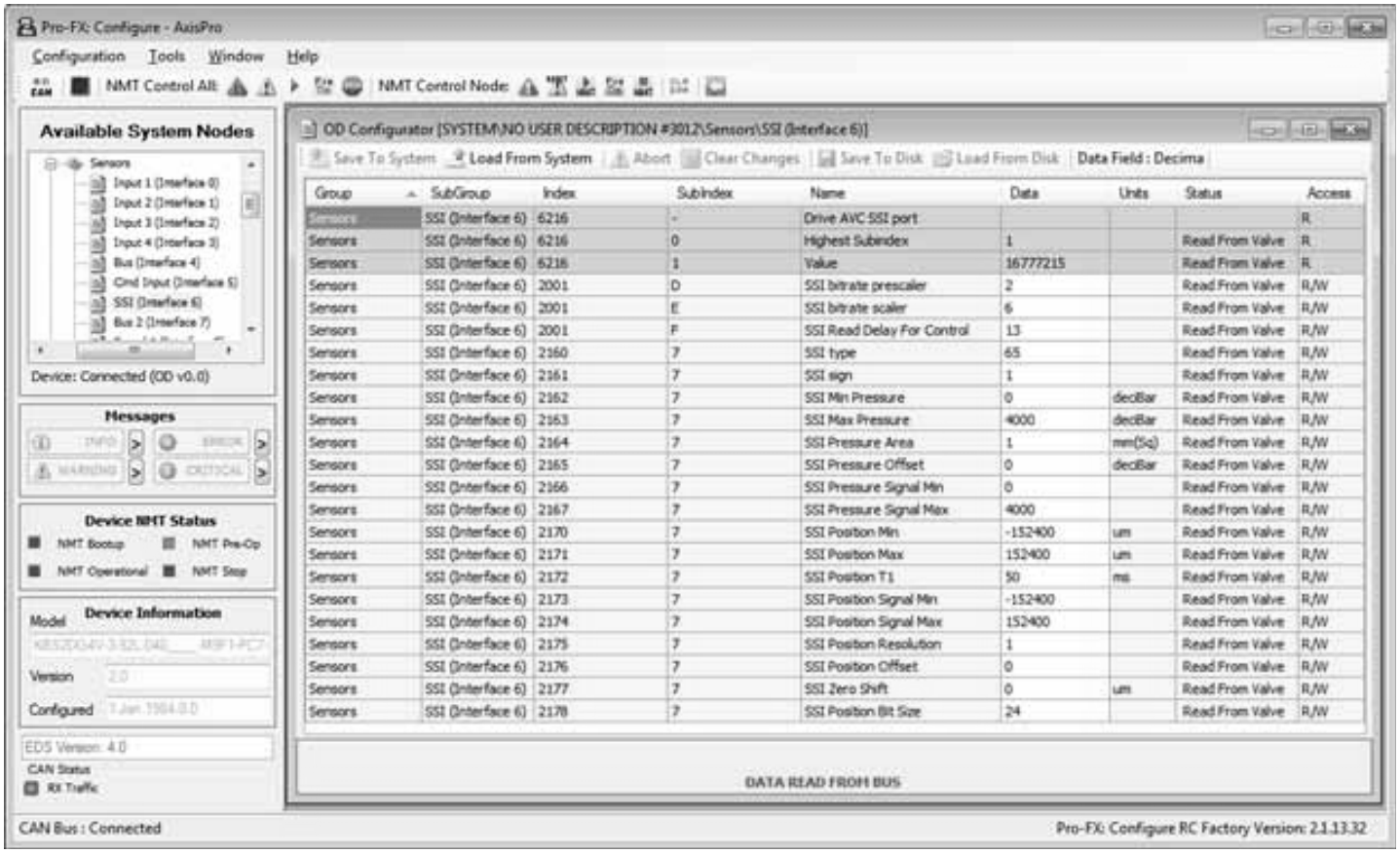


Fig. 3.3

3.3 LED Indicators:

The valve supports the CiA DR303-3 indicator specification with RED & GREEN LED's for CANopen communication. CANopen DR303 indicators are disabled for KBS1DG4Vxxx models and can be selectively disabled for all other models via object dictionary parameter 0x2001 subindex C (Setup: Enable CANopen LEDs).

Table 3.8 CANopen Error [red] LED

Indication	State	Description
Off	No error	The Device is in working condition
Single Flash	Warning limit reached	At lease one of the error counter of the CAN controller has reached the maximum error count
Flickering	Auto Baud/LSS	Auto baudrate detection is in progress or LSS service in progress
Double Flash	Error control event	Node guard or heart beat event has occurred
Triple Flash	Sync error	The Sync message has not been received within configured communication cycle period time out
On	Bus off	The CAN controller is bus off

Table 3.9 CANopen Run [green] LED

Indication	State	Description
Flickering	Auto Baud/LSS	Auto baudrate detection is in progress or LSS service in progress
Single Flash	STOPPED	The Device is in STOPPED state
Blinking	PRE OPERATIONAL	The Device is in the PREOPERATIONAL state
On	OPERATIONAL	The Device is in the OPERATIONAL state

Additionally the valve has Eaton specific device diagnostic LED's. There are two diagnostic LED's provided GREEN and RED. The GREEN Diagnostic LED default operation is to indicate the DS408 state. The RED Diagnostic LED indicates diagnostic faults per the highest criticality fault present.

Table 3.10 Diagnostic [green] LED

Indication	Description
Off	The Device is in NOT Ready state
Single Flash	The Device is in the INIT state
Double Flash	The Device is in the DISABLED state
Triple Flash	The Device is in the HOLD state
On	The Device is in the ACTIVE state
Blinking	The Device is in the FAULT/FAULT_HOLD state

Table 3.11 Diagnostic [red] LED

Indication	Description
Off	The Device has no Fault
Slow blinking	The Device has criticality Info fault
Medium blinking	The Device has criticality warning fault
Fast blinking	The Device has criticality shutdown fault

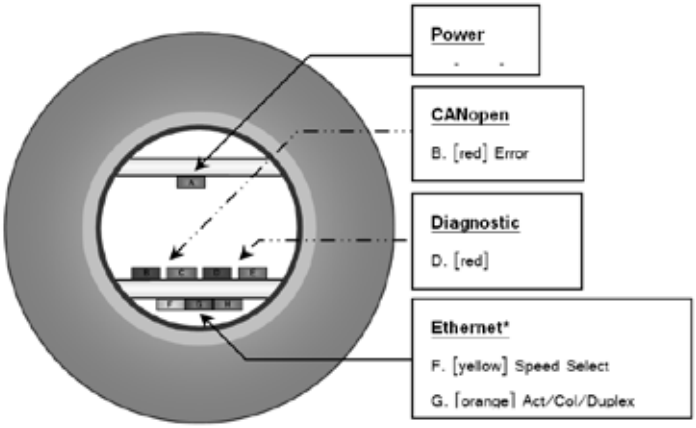


Figure 3.1 AxisPro LED Indicator Window

Fig. 3.4

The green Power LED is always illuminated when power is applied.

*In most cases, the yellow Ethernet LED is illuminated even though Ethernet functionality is not available.

Pro-Fx: Configure
Topic 4

4.1. Software installation

Install the Eaton Pro-Fx: Configure PC application engineering tool. Installation is supported on a wide range of Windows based operating systems including Windows 7 32bit and 64bit.

The Pro-Fx: Configure installation provides several options for PC USB peripheral CANbus adapters supported by the software. During installation the user can choose to install drivers for an available CANbus adapter.

The adapters supported by Pro-Fx Configure are:

PCAN-USB*	PEAK-System Technik GmbH (www.peak-system.com)
ValueCAN	Intrepid Control Systems, Inc. (www.intrepidcs.com)
CANusb	Softing AG (www.softing.com)
Leaf-Light	Kvaser AB (www.kvaser.com)

*The PCAN-USB adapter is recommended for compatibility with Eaton Pro-Fx: Control development environment used with KBS4DG4V-xxx and other Eaton Fx products.

4.2. Product Selection

Connect power and CANbus connections to the valve, and power on the AxisPro valve. Click on the Pro-Fx Launcher icon or select from the Eaton folder in the start menu, all programs, to start the application. First select Pro-Fx Configure from the launcher.

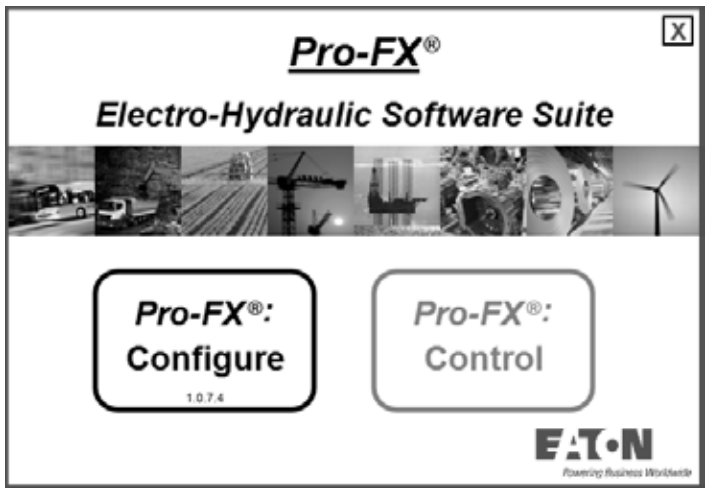


Fig. 4.1

The Pro-Fx Configure product selection screen will appear. Choose "AxisPro" and click "GO".

Fig. 4.2

4.3. CANbus adapter selection and baudrate

Pro-Fx: Configure will use the last configured CANbus adapter as specified in the menu Configuration -> Options. If the last configured adapter is not connected to the PC or has not had drivers properly installed, Pro-Fx: Configure will display an adapter error. The default baudrate is 125kBPS, if this setting is changed in the valve, Pro-Fx: Configure must be configured to match in this option screen.

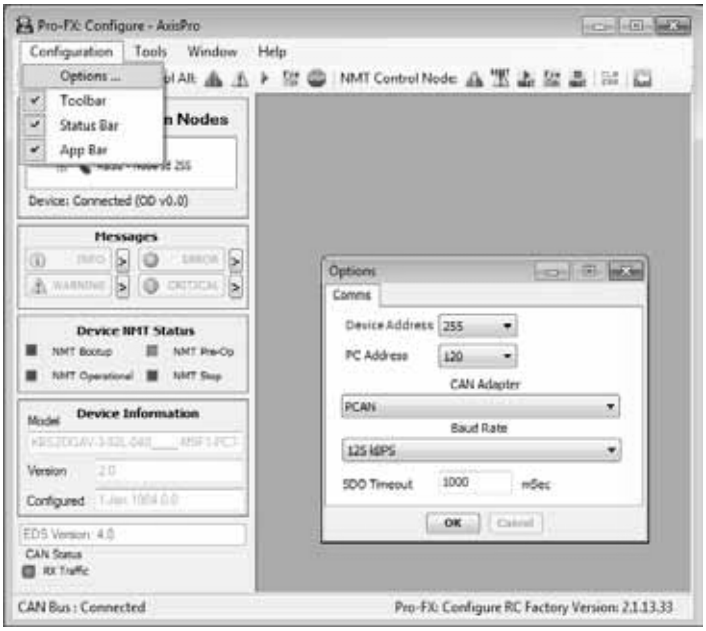


Fig. 4.3

4.4. Device Detection

Pro-Fx: Configure will start detection of AxisPro valves connected on the CANbus network. A listing of detected valves will be displayed. The list is continually updated until a selection is made and the "Connect to selected Device" button is clicked.

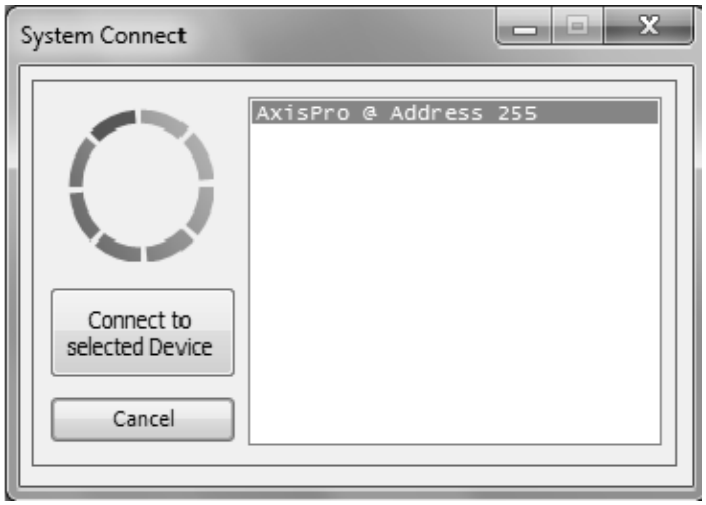


Fig. 4.4

4.5. Main Window

In the Configuration menu the Toolbar, App Bar, and Status Bar can be enabled/disabled in the main screen.

Toolbar – contains often used commands, including: NMT state controls and the CANbus Traffic Monitor

App bar – contains the detected device and OD grouping tree, messages, NMT status and device information

Status bar – indicates the CANbus network status and Pro-Fx: Configure version

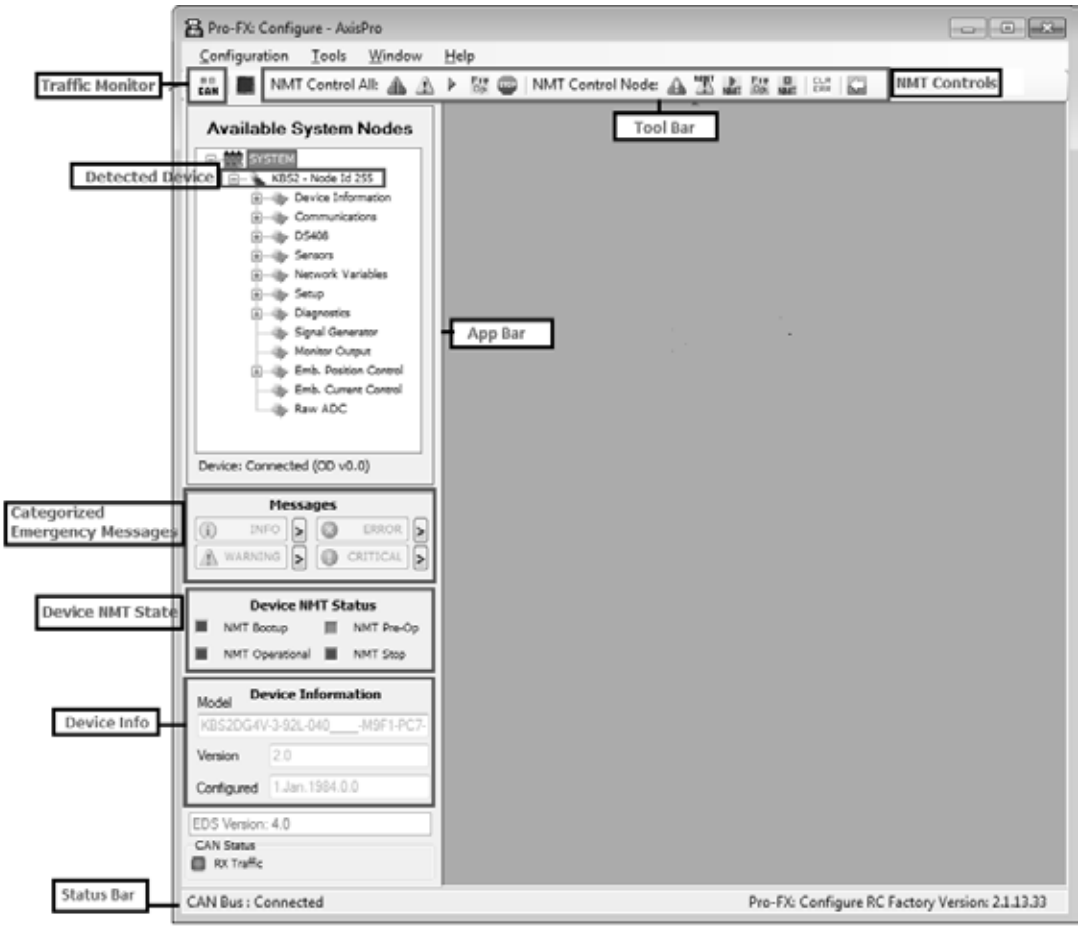


Fig. 4.5

LSS Protocol

Upon detection of a valve that has not yet been commissioned for a CANopen network, the valve will be detected with invalid node-id/address 255. Before putting an unconfigured valve into service on a CANopen network the node-id should be reconfigured per the CANopen Layer Setting Service (tools->LSS Protocol) to change Node ID or Baud Rate.

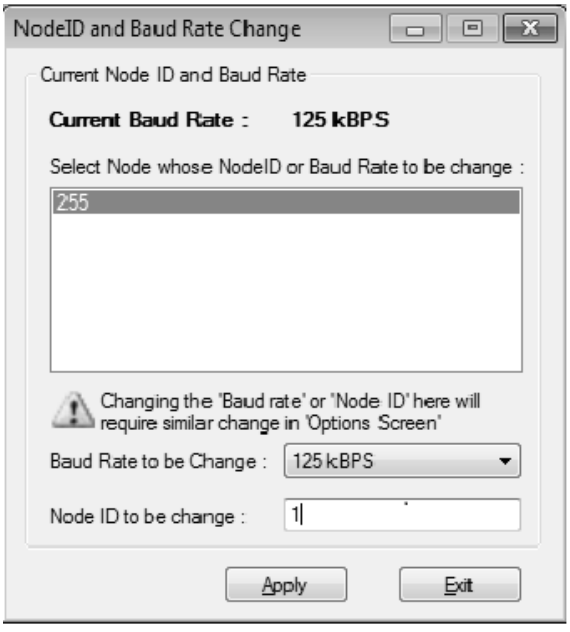


Fig. 4.6

4.6 NMT Controls

In CANopen networks the Network Management protocol can command device communication state machine(s). Pro-Fx: Configure provides the ability for the user to manually issue NMT commands for all networked CANbus nodes and separate ability to issue NMT commands for the single detected node with buttons on the toolbar.

- Reset communications: 

Networked devices receiving this command from the bus are expected to reset their communication state machine. The AxisPro valve's parameters of the communication profile area (object indices 0x1000 to 0x1FFF) are set to their power-on values.

- Reset node: 

Networked devices receiving this command from the bus are expected to reset as if they were power cycled. The AxisPro valve resets the processor internally and all parameters are initialized to their power-on values and NMT bootup ensues. Although this is a processor reset, this type of reset does not increment the power cycle count.

- Enter Pre-Operational: 

Network devices receiving this command from the bus are expected to enter pre-operational communication state. The AxisPro valve disables PDO protocol in this state. Configuration of object dictionary parameters is recommended in this state and is accomplished using SDO protocol.

- Enter Operational: 

Network devices receiving this command from the bus are expected to enter operational communication state. The AxisPro valve allows PDO protocol in this state. Object dictionary access via SDO is also possible. Effectivity of some communication profile parameter changes may require a transition to pre-operational and back to operational state or a NMT reset communication command.

- Stop NMT Command: 

Network devices receiving this command from the bus are expected to enter stopped communication state. The AxisPro valve stops PDO and SDO protocols in this state. Node-guard, Heartbeat, and LSS protocols are permitted if enabled.

NOTE: It is important to consider that in a CANopen network only one NMT master should be present and controlling the state of the entire network where such functionality is required. Any commands sent by Pro-Fx: Configure may be in conflict with what the designated network (NMT) master has already sent or be duplicates of previously sent messages. The user shall ensure that any communication from Pro-Fx: Configure does not adversely affect other network devices/nodes and critical network requirements.

4.7 Configurator and Object Dictionary

The complete listing of available object dictionary parameters is organized, retrieved and edited by the Pro-Fx: Configure Object Dictionary Configurator. The Configurator is the means in which Pro-Fx: Configure presents the object dictionary information found in the standardized CANopen electronic datasheet (.EDS) for the AxisPro valve.

Parameters are grouped per their functionality such as Comm. parameters, DS408 parameters, Sensors, etc…

Expand the detected device object dictionary categories in the device tree on the App bar. Click on the device name or

any group to open the Configurator window and Pro-Fx: Configure will read the parameters in the grouping selected from the AxisPro valve. To refresh the displayed parameters, click "Load From System" button from the Configurator toolbar.

The Configurator data field can be displayed in decimal or hexadecimal. The Index and SubIndex fields are always shown in hexadecimal.

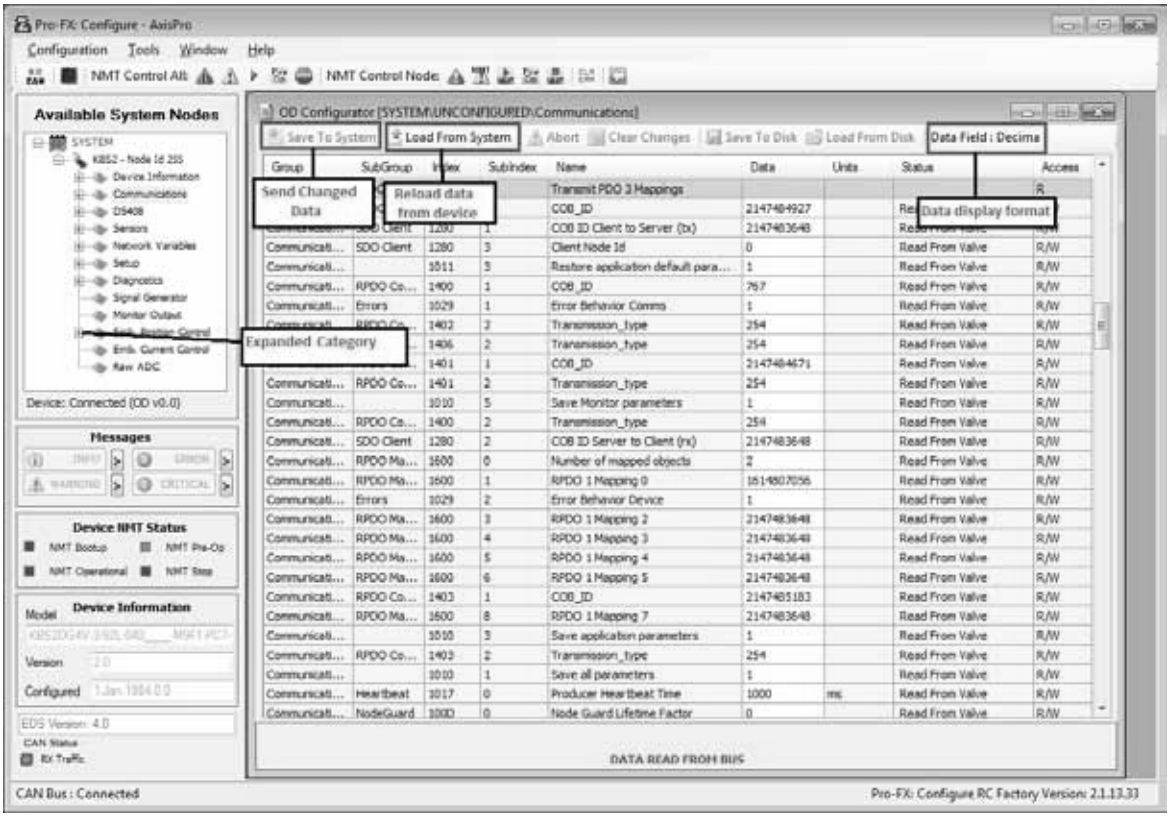


Fig. 4.7

4.7.1 User Access Levels

Many object dictionary entries have user level security which limits access. The user level may apply to read requests, write requests, or both. By default, Pro-Fx: Configure will access "service" level parameters.

- Any user access – parameters have no security and are accessible to all users.
- Service user access – parameters are not to be edited regularly. The service key code is required to unlock these parameters. Attempts to edit these parameters without entering the service key code is responded to by the SDO abort code: "Unsupported object access".

To unlock service access, provide the below value to the specified object. To lock service access, provide a different value than below to the specified object.

Service Access Key Code	
Object Index 0x2000s2	Value: 43690 (0xAAAA)

Note: The value of the object is stored to non-volatile EEPROM during commands to Commit RAM Values to EEPROM and is effective on device boot-up. Ensure that the lock state is as desired for subsequent user access before issuing a final Commit RAM Values to EEPROM command.

4.7.2 Editing Parameters

Editable parameters have an editable data field in the Configurator. Only parameters with write access (read/write [R/W] or write-only [WO]) may be edited and updated in the detected valve. To change a parameter, enter the desired value into the Configurator data column and press enter. The status column for the entry should change to "modified by user" and the background color of the entry should change. At this point the value has not been sent to the valve. Then click "Save To System". The status column for the entry will indicate if the value was transmitted to the valve. Multiple parameters can be edited on the same Configurator screen before clicking the "Save To System" button.

4.7.3 Save and Restore non-volatile parameters

Many configuration parameters are stored in non-volatile EEPROM and upon power up of the valve, their saved values are used.

Saving to EEPROM (Commit RAM Values to EEPROM)

Pro-Fx: Configure provides an easy way to save all parameters that can be stored in EEPROM after individual or groups of parameters have been edited.

Send each changed parameter to the valve by editing and then using the "Save To System" button in the Configurator. Then right-click anywhere on the Configurator and a contextual menu appears. Select "Commit RAM Values to EEPROM," and Pro-Fx: Configure will issue the save to EEPROM command for all parameters.

Note: The Configurator does not indicate which parameters can be stored to EEPROM. Continuously changing parameters such as sensor readings and commanded setpoint are examples of parameters that are not stored.

Restore Factory Defaults (Restore All Factory Values)

The factory default values can be re-issued from backup storage internal to the valve. From the contextual menu select "Restore All Factory Values" to send all backup data to RAM and EEPROM.

Note: Using this option will restore all parameters and overwrite any stored values in EEPROM with factory defaults and model code options

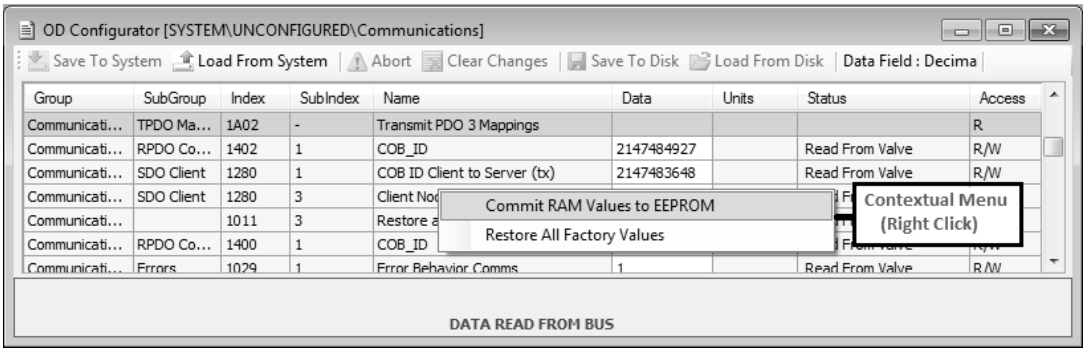


Fig. 4.8

4.7.4 Device Configuration Files

Pro-Fx: Configure allows a complete parameter configuration of a AxisPro valve to be preserved in a file called a device configuration file (DCF). DCF files are very similar to EDS files in structure with the exception that they capture the present value of each parameter rather than the default value of the parameter. Files saved by Pro-Fx: Configure adhere to **CiA DSP306**.

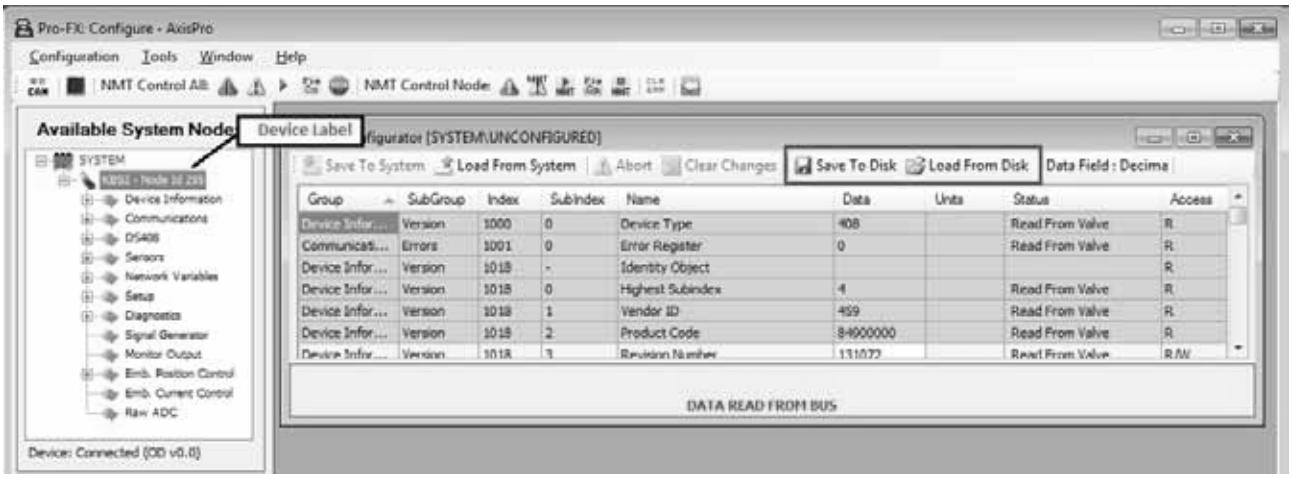


Fig. 4.9

Saving a DCF

Click the device label in the device tree. The OD Configurator will retrieve all parameters present in the device per the EDS used by Pro-Fx: Configure. Clicking the "Save To Disk" button will save the parameters as a DCF file format. The "Save To Disk" button becomes available only while this complete parameter display is shown on the OD Configurator.

Loading a DCF

Click the device label in the device tree. The OD Configurator will retrieve all parameters present in the device per the EDS used by Pro-Fx: Configure. Clicking the "Load From Disk" button will populate the OD Configurator with all parameters found in the DCF file. Clicking "Save to System" will send the changed parameters to the valve's RAM. Those parameters that are stored in EEPROM will not be saved to EEPROM unless the "Committ RAM values to EEPROM" (section 4.7.3) process is executed.

4.8 Device Configuration (DS408 Fluid Power Profiles)

The AxisPro valve implements several of the device control modes of the DS408 Fluid Power Profile. The following sections describe Pro-Fx: Configure widgets created to interface directly with the AxisPro implementation of this profile. For additional information refer to the CiA and VDMA standards listed in the reference section.

4.8.1 DS408 Monitor widget

The DS408 Monitor widget provides an interface for often read parameters which, when turned "ON," continuously requests the values at the rate indicated in the Event Timer box*. The DS408 Device Monitor widget can be accessed via the Tools->DS408 menu or right click on the main form and select DS408 sub-menu.

- Device State – indicates the DS408 state machine status (power-on default: INIT)
  - o INIT — device control inactive, initial state
  - o DISABLED — device control mode inactive
  - o HOLD — device control mode active with hold setpoint only
  - o DEVICE MODE ACTIVE — device control mode active and normal function
  - o FAULT — critical fault state, device control mode inactive
  - o FAULT HOLD — fault state, device control mode with hold setpoint
- Device Control Mode – indicates the control mode in use by the valve (power-on default: per model code)

- o No — internal valve and drive controls are disabled
- o VCC — valve current control of the solenoid (open loop spool control)
- o VSC — valve closed-loop spool control (a.k.a. VPOC)
- o DSC — drive speed control
- o DFP — DFP drive force/pressure control (a.k.a. DFPC)
- o DPC — drive position control
- o DPQ — force/pressure flow control

- Device Mode – control mechanism (power-on default: per model code)
  - o M1 — +/-10V analog command input
  - o M2 — 4-20mA analog command input
  - o M3 — +/-10mA analog command input
  - o M4 — +/-15mA analog command input
  - o M9 — Setpoint via CANbus

- Device Local – control word source (power-on default: per model code)
  - o Local — device control word generated internally
  - o CANbus — device control word accepted from CANbus

- Actual Value – feedback value for the device control mode (power-on default: per device control)
  - o VCC — current through the solenoid (internal sensor)
  - o VSC — spool position (internal LVDT sensor)
  - o DSC — speed signal from sensors (external signal)
  - o DFP — force/pressure from sensors (internal or external sensor)
  - o DPC — position from sensors (external sensor)
  - o DPQ — force/pressure and speed from sensors (internal or external sensors)

Note: Device State and Actual Value are read by enabling and receiving TPD01 which is automatically configured for Device Status Word and Actual Value. When this widget is turned "ON" the rate indicated by the Event Timer selection will be issued to the TPD01 Event Timer. The remaining values are read by SDO protocol at the rate specified.

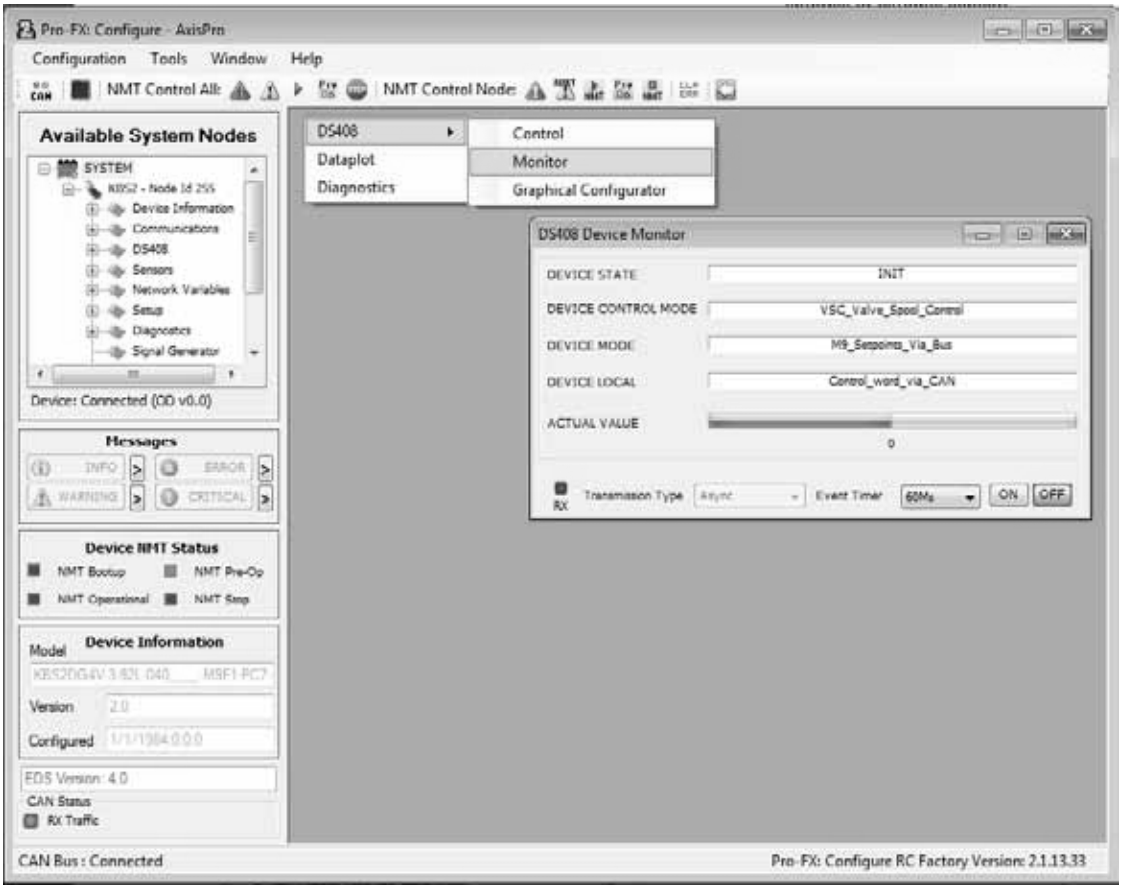


Fig. 4.10

4.8.2 DS408 Control widget – Device Setup

The DS408 Device Control widget displays and allows editing of the most often used control parameters for setup and tuning purposes as an alternate to editing the Object Dictionary directly via the Configurator. The DS408 Device Control widget can be accessed via the Tools->DS408 menu or right click on the main form and select DS408 sub-menu. The present values of each item is read when the widget is opened. To refresh the items, click the refresh button.

The setup items provided on the DS408 Control widget are:

- o Device Local
- o Device Control Mode
- o Device Mode
- o Analog Enable Pin

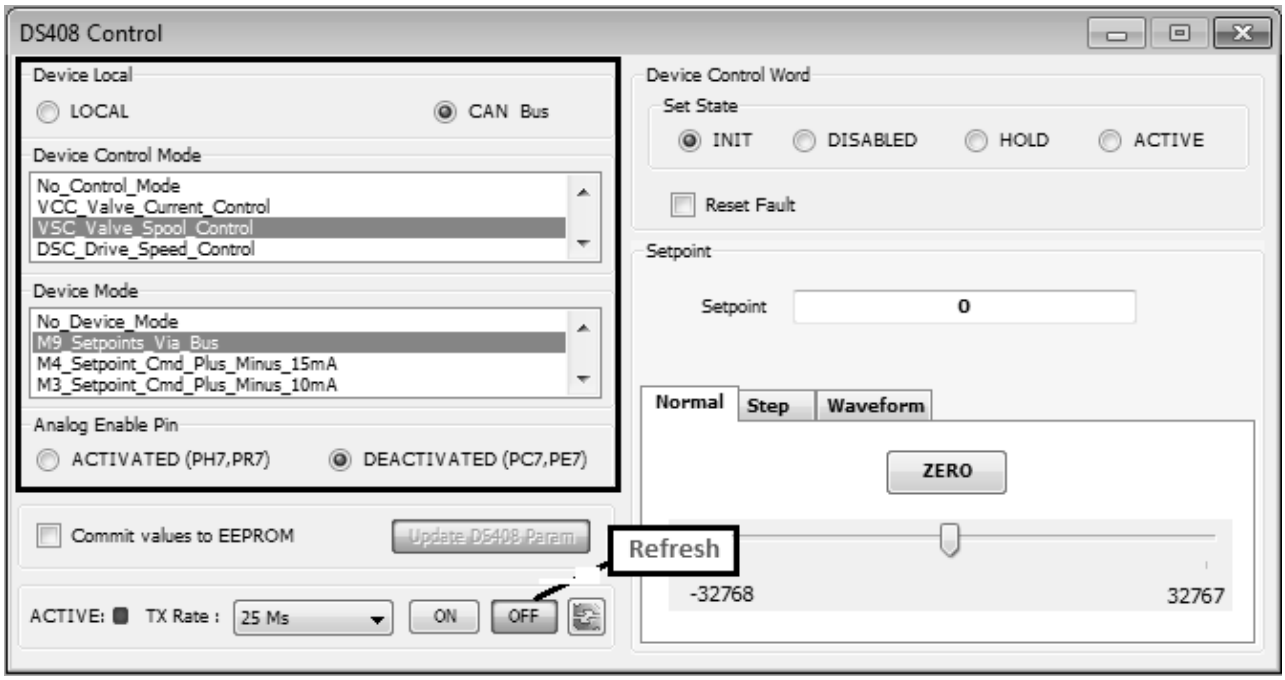


Fig. 4.11

- Device Local – selection for the origin of the device control word which commands the device state.

  Select the appropriate control mode then click "Update DS408 Param" button.

  Note: For valve models KBS1DG4Vxxx, CANbus option is not supported.

  - o Local device control word generated internally
  - o CANbus device control word accepted from CANbus
- Device Control Mode – selection for the control mode to be used by the valve. The valve beings control activity when the device control word successfully commands HOLD or ACTIVE (Device Mode Active) states.

  Select the appropriate control mode then click "Update DS408 Param" button.

  Note: For valve models KBS1DG4Vxxx, only VCC and VSC options are supported.

  - o No internal valve and drive controls are disabled
  - o VCC valve current control (open-loop hydraulic flow control)
    - Internal feedback via solenoid current sensing
    - Current output is scaled to max mA resolution for positive setpoint range
    - Negative setpoints result in 0mA output.
  - o VSC valve closed-loop spool control (hydraulic flow control)
    - Internal feedback via LVDT position sensing
    - Analog command range is scaled to internal resolution +/-16384 (applies to device modes M1,M2, M3, M4)
    - Bus command range is expected to be +/-16384 (applies to device mode M9)
    - Spool position is controlled linearly from hydraulic null to max P to A opening for positive commands
    - Spool position is controlled linearly from hydraulic null to max P to B opening for negative commands
    - Depending on spool selection, de-energized solenoid results in a position outside the specified control range.
  - o DSC drive speed control (speed control of a hydraulic axis or actuator)
    - Analog command range is scaled between high (A) and low (B) references [0x6512s1], [0x6513s1]. (applies to device modes M1,M2, M3, M4)
    - Bus command range is not rescaled (applies to device mode M9)
    - External sensors provide drive's speed feedback

Table 4-1 DSC Feedback Options

Feedback Source	Unit	DSC Interface Selection [0x6502s0]	Note
Input 1	um/sec	0	1
Input 2	um/sec	1	1
Input 3	um/sec	2	1
Input 4	um/sec	3	1
CANbus	Hz or um/sec	4	1
Speed input 1	Hz	6	
Speed input 2	Hz	7	
CANbus2	Hz or um/sec	9	1

Note: 1 – DSC "speed" feedback may be derived from a position signal connected to Input 1,2,3,4, CANbus, or CANbus2 if the value of the DSC Differentiate Feedback Switch [0x2400s2] object is set to True ("1").

- o DFP drive force/pressure control (force/pressure control of a hydraulic axis or actuator)
- Analog command range is scaled between high (A) and low (B) references [0x6592s1], [0x6593s1]. (applies to device modes M1,M2, M3, M4)
- Bus command range is not rescaled (applies to device mode M9)
- External sensors provide drive's force or pressure feedback

Table 4-2 DFP Feedback Options

Feedback Source	Unit	DFP interface Selection [0x6582s0]	Note
Input 1	dBar or mN	0	1,2
Input 2	dBar or mN	1	1,2
Input 3	dBar or mN	2	1,2
Input 4	dBar or mN	3	1,2
CANbus	dBar or mN	4	1,2
CANbus2	dBar or mN	9	1,2
Pressure A	dBar or mN	10	2,4
Pressure B	dBar or mN	11	2,4
Pressure P	dBar or mN	12	2,4
Pressure T	dBar or mN	13	2,4
Pressure A - Pressure B	dBar or mN	14	2, 3, 4, 5
Input 1 – Input 2	dBar or mN	15	1, 2, 3

Note:

1 - interface must be configured as pressure type (interface type 2) to be useful in this device control mode

2 - interface value is calculated as force when configured cylinder area is not 1. (force = pressure * cylinder area)

3 - differential pressure or force from two independent interfaces

4 - interface only available on KBS3DG4Vxxx or KBS4DG4Vxxx models

5 - interface type cannot be changed

- o DPC drive position control (position control of a hydraulic axis or actuator)
- Analog command range is scaled between high (A) and low (B) references [0x6612s1], [0x6613s1]. (applies to device modes M1,M2, M3, M4)
- Bus command range is not rescaled (applies to device mode M9)
- External sensors provide drive's position feedback

Table 4-3 DPC Feedback Options

Feedback Source	Unit	DFP Interface Selection [0x6602s0]	Note
Input 1	um	0	1
Input 2	um	1	1
Input 3	um	2	1
Input 4	um	3	1
CANbus	um	4	1
CANbus2	um	9	1

Note:

1 - interface must be configured as analog type (interface type 67) to be useful in this device control mode

- o DPQ combination force/pressure - flow control which combines DSC and DFP device control modes with automatic transition from one mode to another
- Feedback configured per DSC and DFP device control modes listed above
- Device Mode – control mechanism, origin of the setpoint Select the appropriate control mode then click "Update DS408 Param" button.
  - o M1 +/-10V analog command input
  - o M2 4-20mA analog command input
  - o M3 +/-10mA analog command input
  - o M4 +/-15mA analog command input
  - o M9 Setpoint via CANbus
- Analog Enable Pin – when activated Pin C of the 7-pin connector functions to activate/disable the device control mode. This analog enable may be used for either Device Local selection.

  Select the appropriate control mode then click "Update DS408 Param" button.
  - o Activated Pin C functions as enable input
  - o Deactivated Pin C has no function
- Commit values to EEPROM – when checked the settings will be written to RAM as well as EEPROM when the Update DS408 Param button is pressed. This is the same functionality as the contextual menu option, "Commit RAM Values To EEPROM," in the OD Configurator. Saving to EEPROM preserves the settings across power cycles.

4.8.3 DS408 Control Widget – Device Operation

- Device Control Word – the standard method of setting the device state. The value can be set to one of the following to command a transition of the state.
  - INIT (initialization state)
  - DISABLED (Device Mode Disabled)
  - HOLD (Device Mode Active with setpoint held constant)
  - ACTIVE (Device Mode Active)

Pro-Fx: Configure (Cont...)

Faults occurs during operation may override FAULT HOLD or FAULT state as per configuration and thus the commanded Device Control Word will not match the device state as viewed in the Device Monitor widget. Please refer to the VDMA Fluid Power Profile listed in the reference section to learn more about each state.

- Setpoint – a setpoint slider, manual entry box, and waveform generator options are available if the Device Mode is set to M9. If the Device Mode is set to another type, the setpoint is derived from the configured source and the control widget setpoint options are disabled.

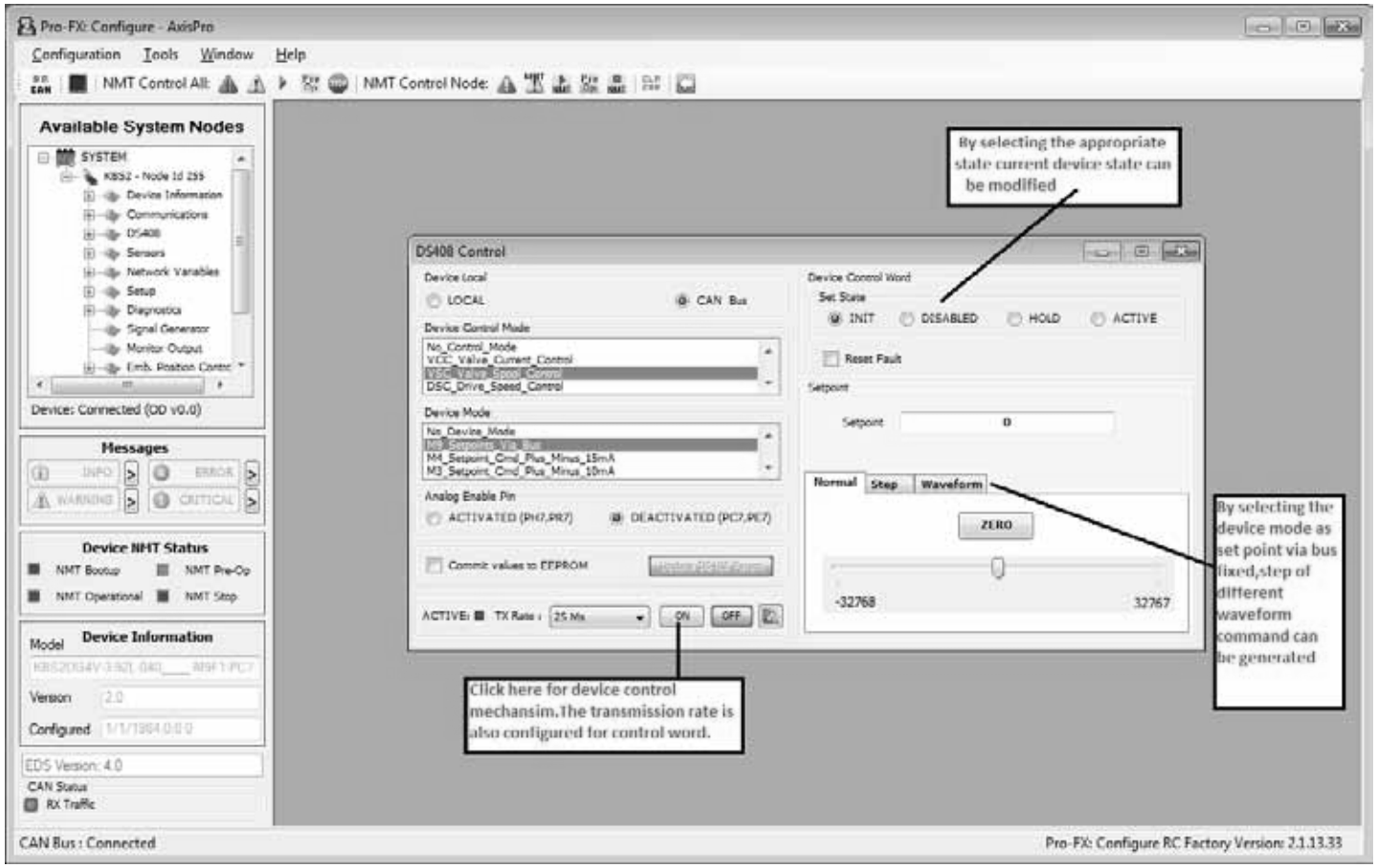


Fig. 4.12

4.9 DS408 graphic mode selection

The DS408 graphical Configurator makes it easier to understand and configure groups of functionality that affect system operation and performance. The graphical Configurator supports. Before using the DS408 graphical Configurator the required drive control mode would be selected using the DS408 control widget as shown in the image below.

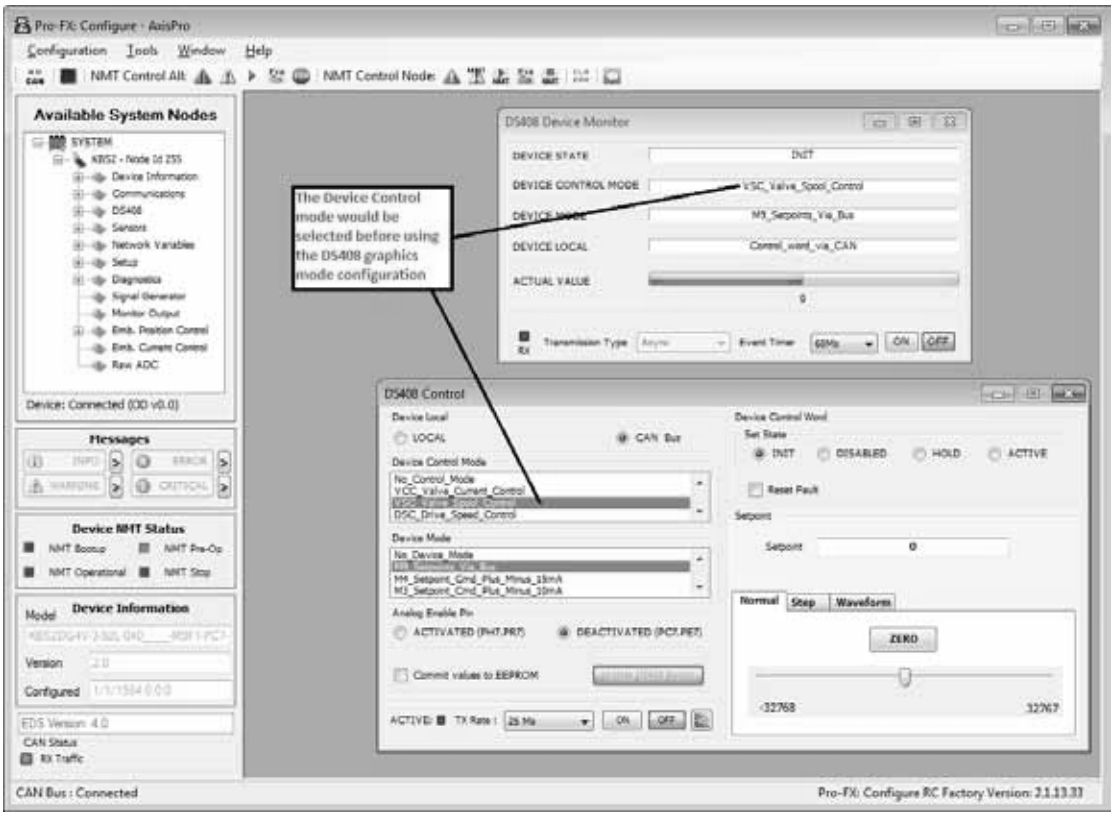


Fig. 4.13

To do the drive control parameterization for DPC mode go to Valve Fx tool menu select the DS408 graphics.

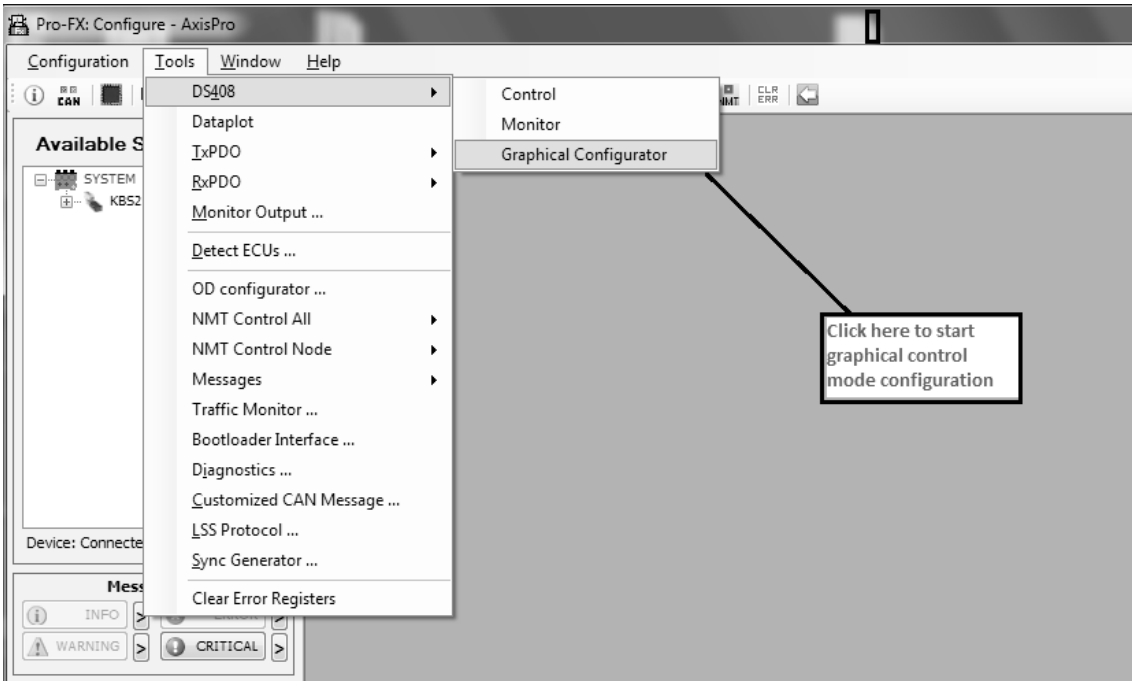


Fig. 4.14

4.9.1 DPC Mode Selection

After clicking to DS408 graphics below window will be opened for DPC control mode with DPC box is highlighted.

This control mode is designed as DS408 standard. For more detail information please refer the VDMA profile document.

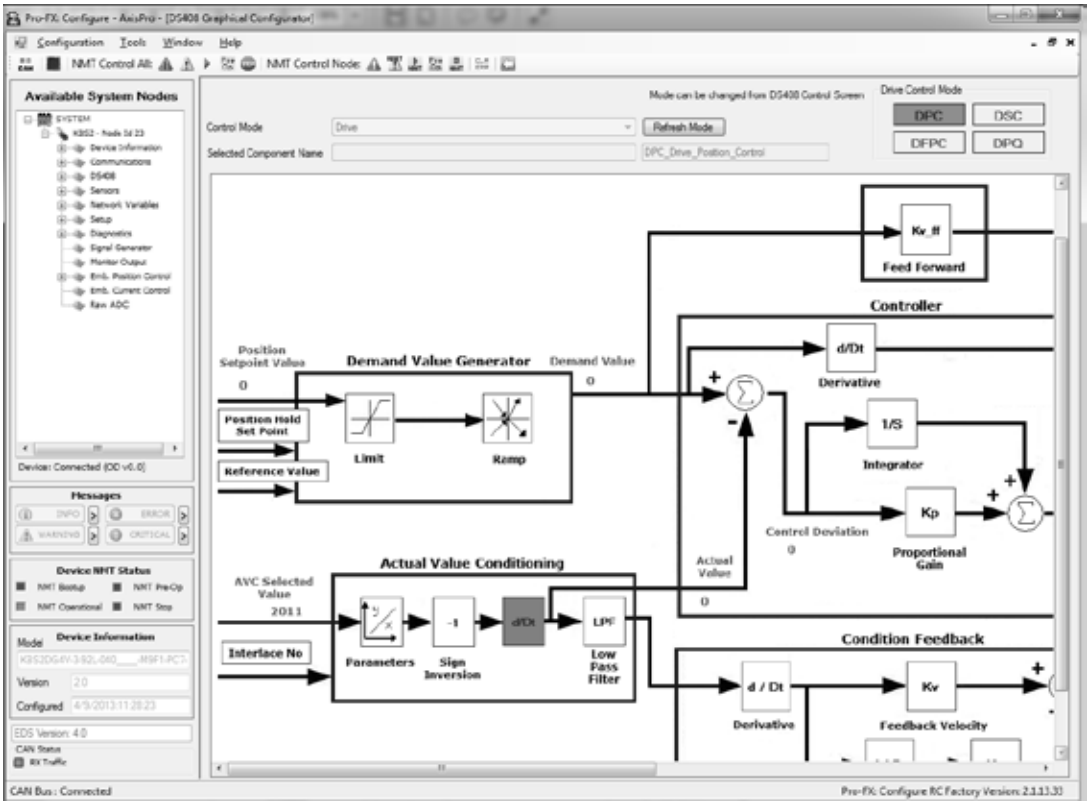


Fig. 4.15

4.9.2 Demand value generator

This block configures the set point for drive position control.

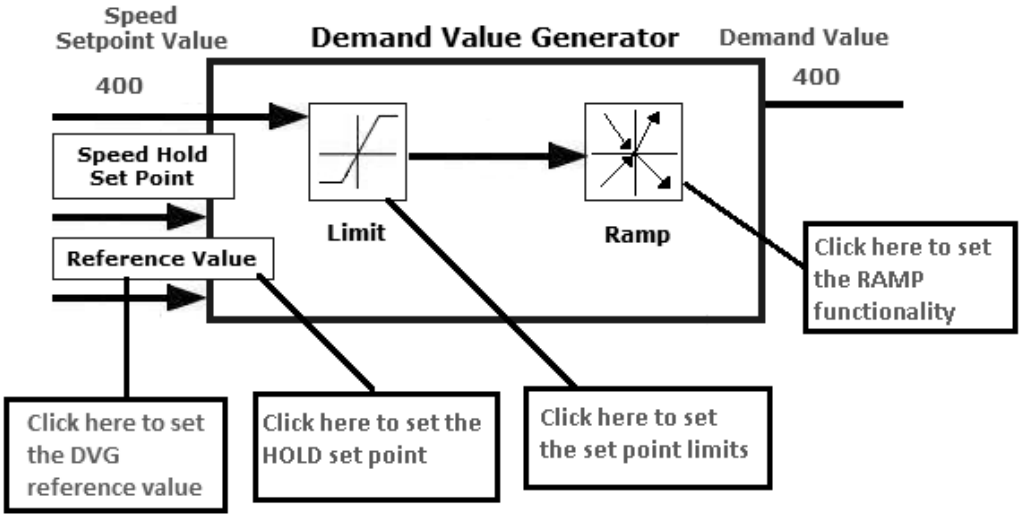


Fig. 4.16

4.9.2.1 Hold Setpoint

When the control is commanded or automatically transitions to "HOLD" or "FAULT HOLD" control states the "ACTIVE" control state setpoint is disabled. A constant preset or the value of the control feedback that immediately preceeded entry to "HOLD" or "FAULT HOLD" control state is used as the setpoint to the demand value generator. It is important to configure the related parameters for systems that will utilize these control states as the setpoint chosen can be configured to a value that is very different than the ACTIVE control state setpoint.

The parameter "Hold Actual or Preset Value" changes the source of the hold setpoint.

The options allowed for the Hold Actual or Preset Value parameter are:

The options allowed for the Hold Actual or Preset Value parameter are:

0 – preset *

1 – last feedback reading prior to entering "hold" for 1st setpoint (applies to control modes with only one setpoint, or the DFPC setpoint for DPQ mode)

2 – last feedback reading prior to entering "hold" for 2nd setpoint (applies to DSC setpoint for DPQ mode only)

3 – combination of option 1 and 2 for DPQ mode

*DPQ Device Control Mode uses DSC and DFPC DVG hold setpoint values.

Configuration

1. Disable the active Device Control Mode (if running)
2. Configure the Device Control Mode, Device Mode, and Interface Selection as desired.
3. If using option "0" for the "Hold Actual or Preset Value", the preset value must be defined. Set the "x DVG hold setpoint value" object present for the Device Control Mode. (ex. DSC DVG hold setpoint. Value is object 0x6514 sub 1)
4. New configuration takes effect on transition from "Init" to "Disabled" state.
5. (Optional) Commit the changes to EEPROM for continued use across power cycles.

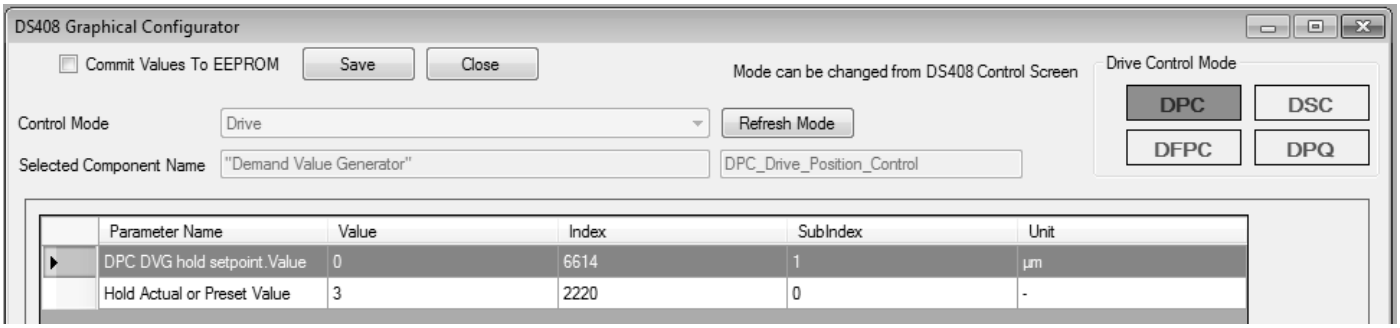


Fig. 4.17

4.9.2.2 Reference Value

To configure the DPC demand value generator reference A & B click to Reference value block enter the value in terms of um in data fields then click to "Save" button. This object contains the reference value for direction A & direction B, a value corresponding to 100% of physical capabilities.

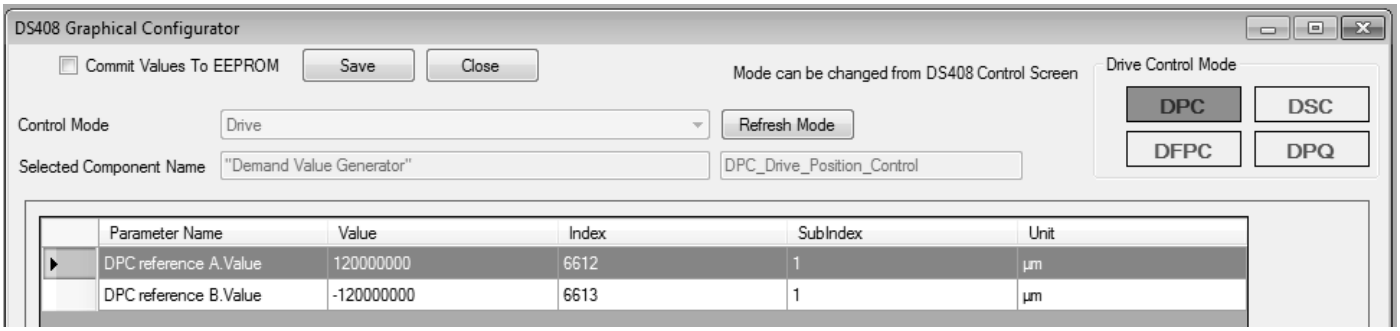


Fig. 4.18

4.9.2.3 Limit

To configure demand value generator upper & lower limit click to Limit block enter the value into the data field in terms of um then click to "Save" button.

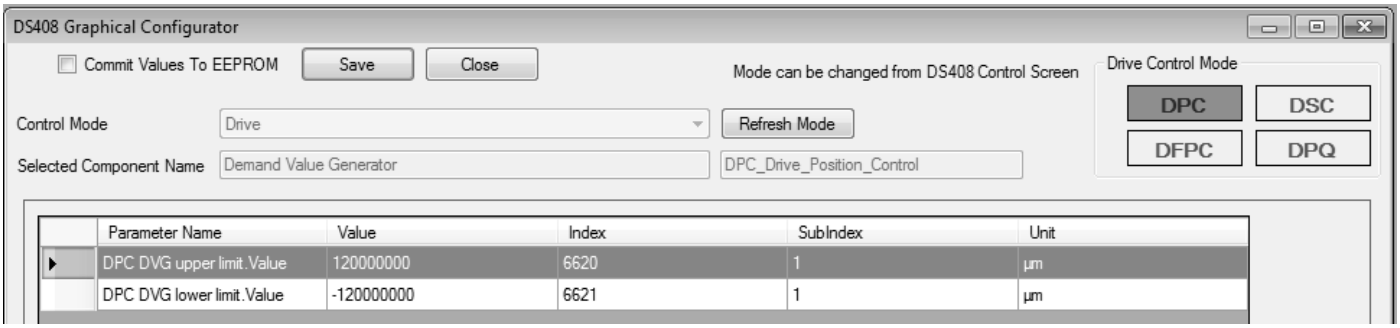


Fig. 4.19

4.9.2.4 Ramp

To configure the Ramp functionality click to "Ramp" block, the AxisPro valve supports only the Ramp type -1 that is manufacture specific type. This four quadrant ramp that accepts the rate in terms of um/sec & gives output in terms of um. The object 0x6632 sub0x01 defines the positive acceleration rate, 0x6633 sub0x01 defines negative acceleration rate, 0x6635 sub0x01 defines positive deceleration rate & 0x6636 sub0x01 defines negative deceleration rate. All rates are in unit of um/sec.

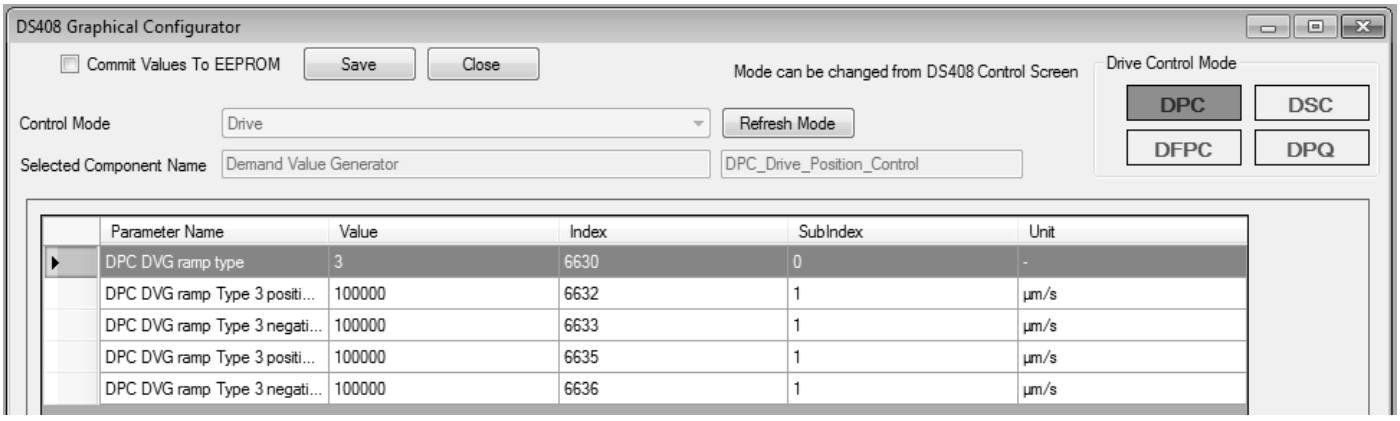


Fig. 4.20

4.9.3 Actual value conditioning:

This block configures the drive feedback sensor.

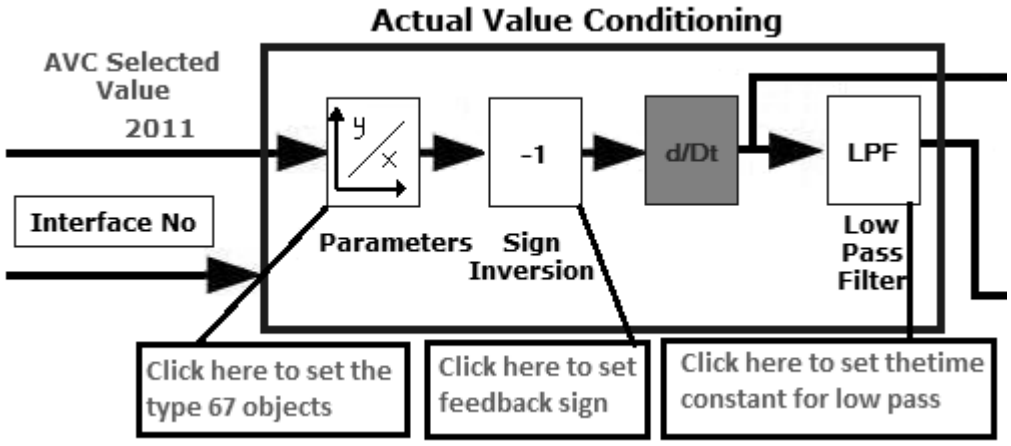


Fig. 4.21

4.9.3.1 To configure the sensor interface as analog position sensor (4-20mA) click to the "Parameters" block then value should be set to 67 as per DS408 standard.

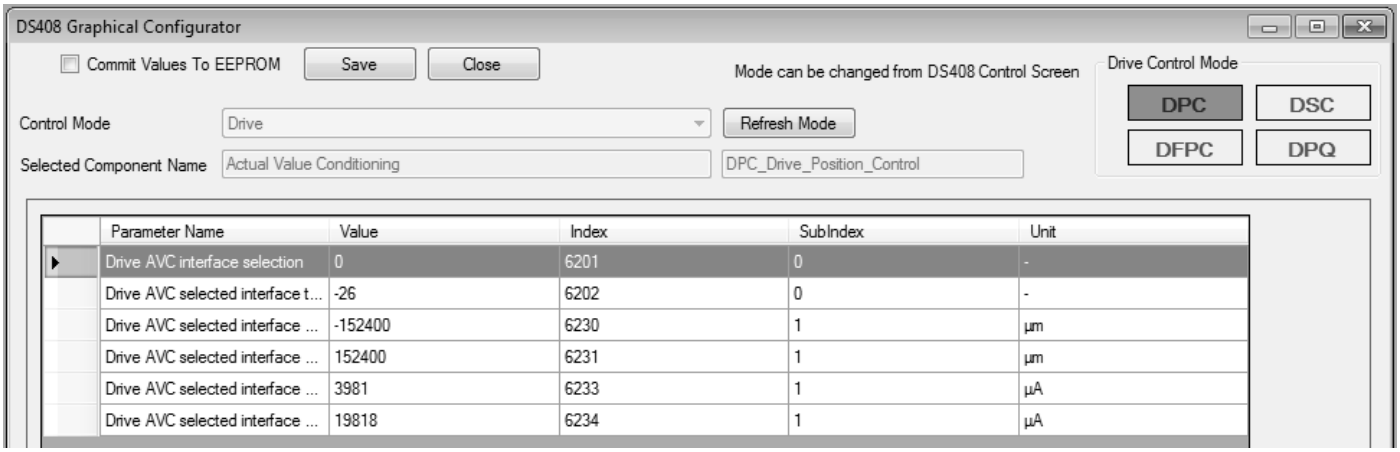


Fig. 4.22

- Steps to calculate the sensor Interface ranges:

  Consider the stroke length of cylinder & then calculate the zero position where users want to set. The zero position is important as it determine the four quadrant ramp. Depending upon the stroke length of cylinder determines the minimum & maximum values of position sensor signal by putting the AxisPro Valve into VPOC mode then set the command such way that cylinder will be fully retracted & extended. The Interface reference value minimum & maximum value should be set as per cylinder stroke length.

  For e.g. For 12 inch cylinder that corresponds to stroke range of 304800 um. The zero position at mid stroke so minimum & maximum reference value are -152400 & 152400 respectively. If the position sensor is connected to external sensor input channel 2 so that values can be monitored using Pro-Fx: Configure by plotting the respective external sensor input channel data i.e. object 0x6204 sub 0x01. In below example the sensor value gives 3981uA when cylinder is retracted while it gives 19818 uA when cylinder is extended.
- To configure objects defines the minimum & maximum reference for an analog position transducer type = 67 by writing the value to respective data field then click to "Save" button.
- To configure objects defines the minimum & maximum transducer output value for an analog position transducer type = 67 by writing the value to respective data field then click to "Save" button.

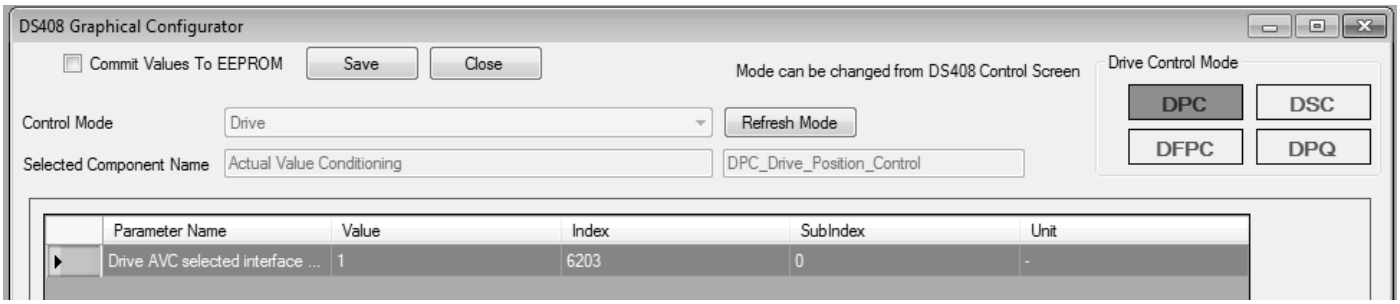


Fig. 4.23

4.9.3.2 The sign parameter the sign of the actual value interface currently selected by interface number can be configured by clicking the sign inversion block then writing value to the data field then click to "Save" button.

- The sign value 1 means as cylinder position increases sensor output in mA will increases.
- The sign value -1 means as cylinder position increased sensor output in mA will decreases.

- The sign value 1 means as cylinder position increases sensor output in mA will increases.
- The sign value -1 means as cylinder position increased sensor output in mA will decreases.

4.9.3.3 The time constant of the low pass filter for an analog position transducer (4-20mA) can be set by writing value in terms of millisecond to the data field then click to "Save" button.

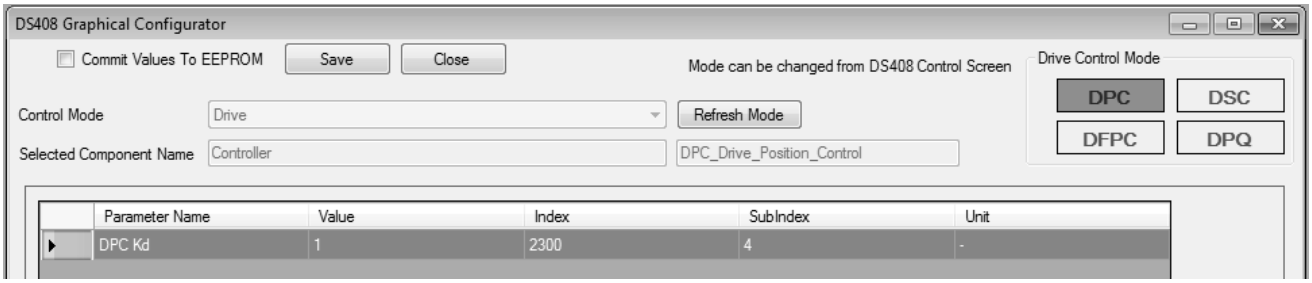


Fig. 4.24

4.9.4 Controller Configuration:

This block configures the gains of position controller.

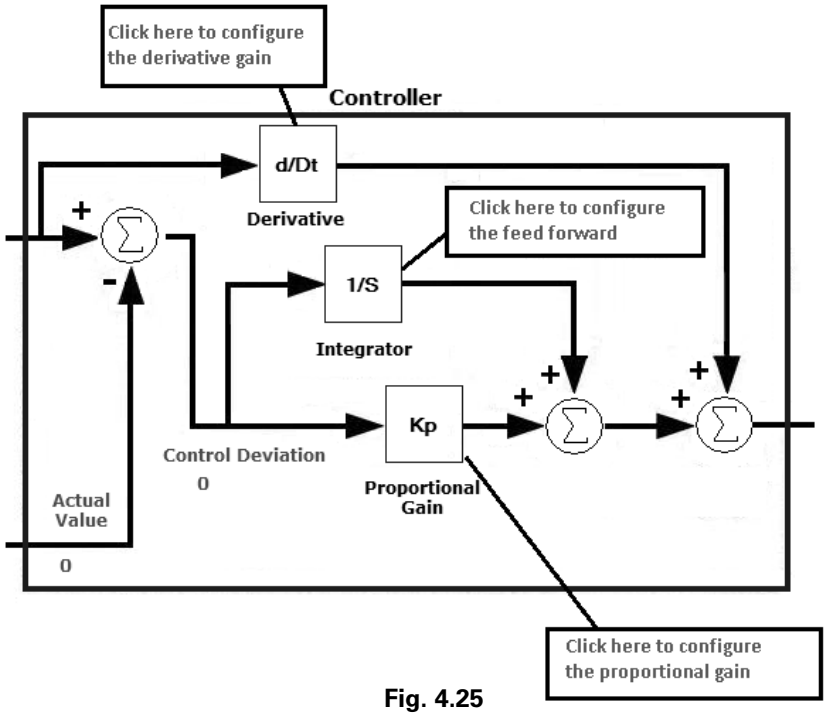


Fig. 4.25

4.9.4.1 The derivative gain can be set by writing value in to the data field then click to "Save" button.

The tuning of DPC need to done as per load connected to valve. The tuning mechanism has mention in detain in section.

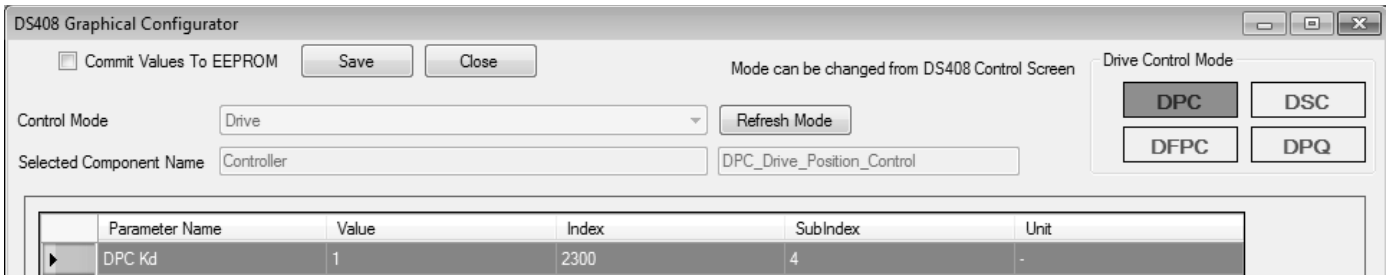


Fig. 4.26

4.9.4.2 The integral gain, Integration time and Integrator upper & lower limits can be set by writing value in to the respective data field then click to "Save" button. The tuning of DPC need to done as per load connected to valve. The tuning mechanism has mention in detain in section.

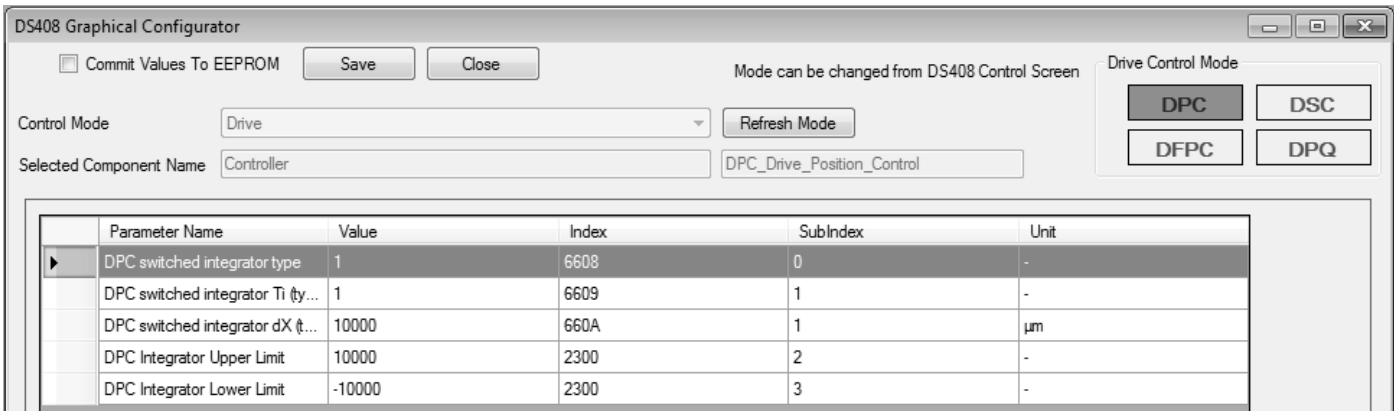


Fig. 4.27

4.9.4.3 The feedforwad gain can be set by writing value in to the data field then click to "Save" button. The tuning of DPC need to require as per load connected to valve. The tuning mechanism has mention in detain in section.

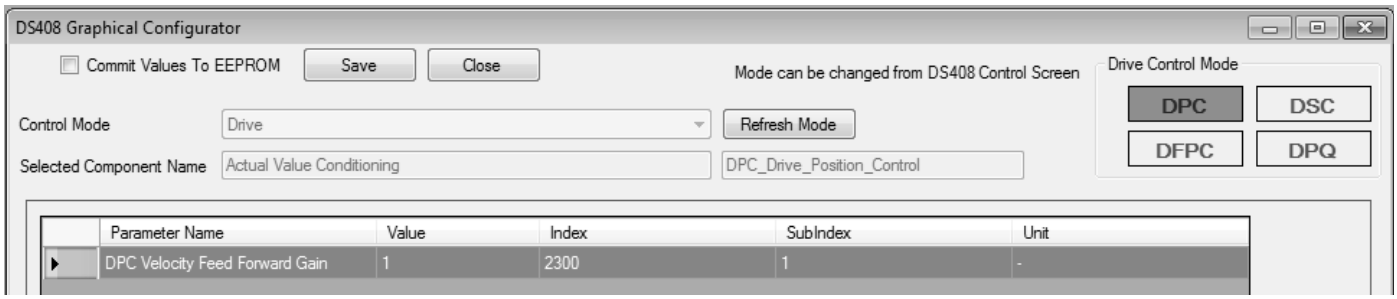


Fig. 4.28

4.9.4.4 The proportional gain can be set by writing value in to the data field then click to "Save" but ton. The tuning of DPC need to require as per load connected to valve. The tuning mechanism has mention in detain in section.

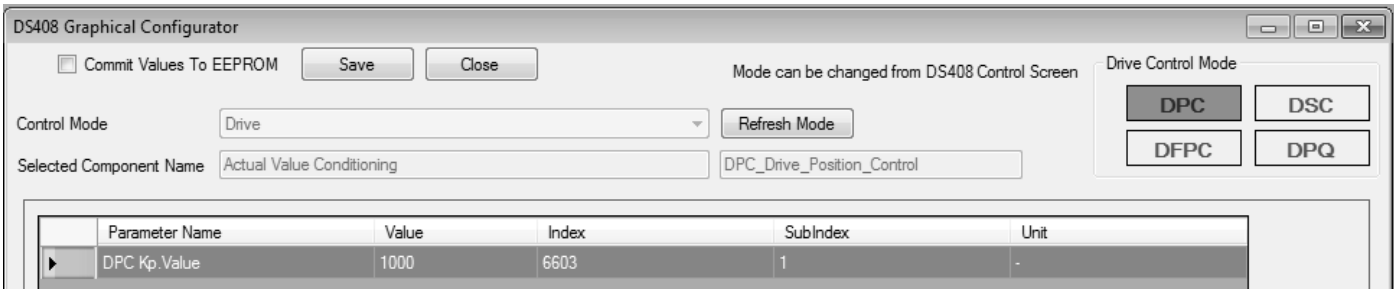


Fig. 4.29

4.9.5 Conditioning Feedback:

This block configures the feedback gains for position controller.

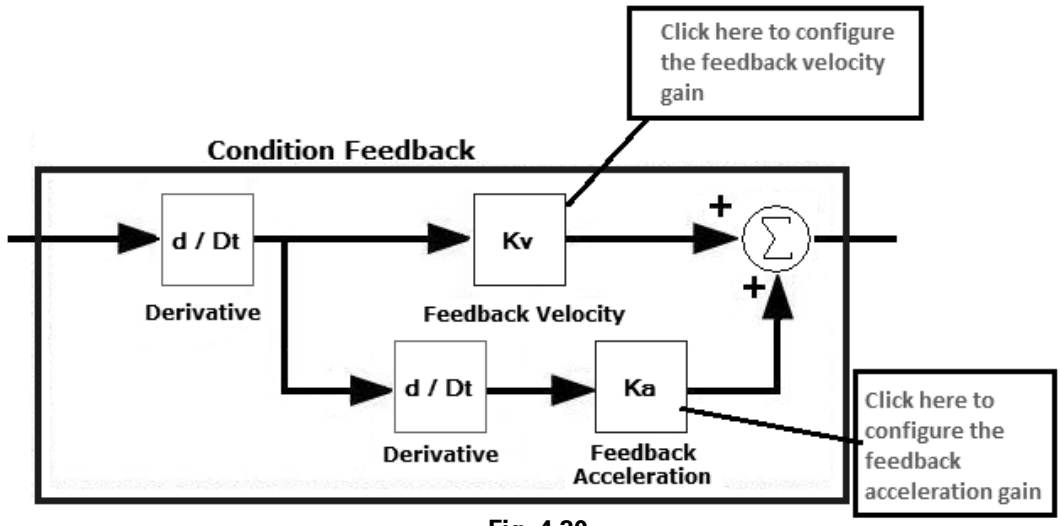


Fig. 4.30

4.9.5.1 The feedback velocity gain can be set by writing value in to the data field then click to "Save" button. The tuning of DPC need to require as per load connected to valve. The tuning mechanism has mentioned in detail in section.

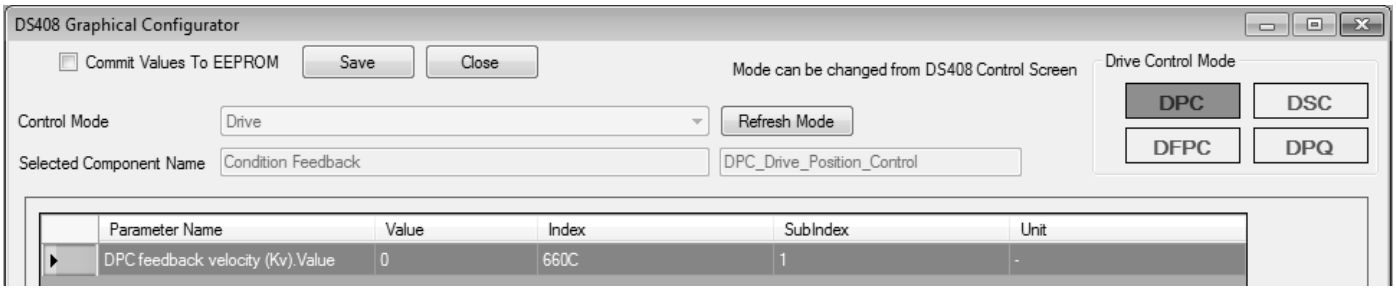


Fig. 4.31

4.9.5.2 The feedback acceleration gain can be set by writing value in to the data field then click to "Save" button. The tuning of DPC need to require as per load connected to valve. The tuning mechanism has mentioned in detail in section.

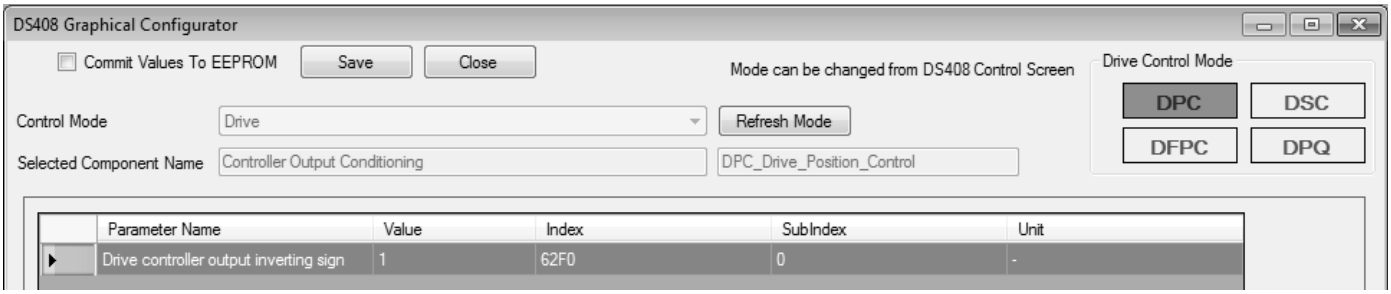


Fig. 4.32

4.9.6 Controller Output Conditioning:

This block configures the Drive position controller output conditioning.

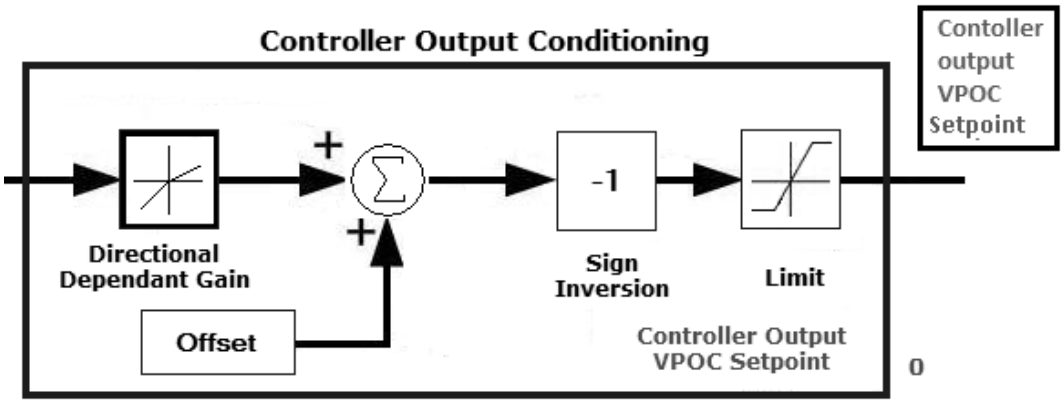


Fig. 4.33

4.9.6.1 The device supports only the directional dependent gain type 1. To configure the directional dependent gain (upper 16 bits represents the numerator while lower 16 bits represents the denominator) click to directional dependent block then write value to data field then click to "Save" button.

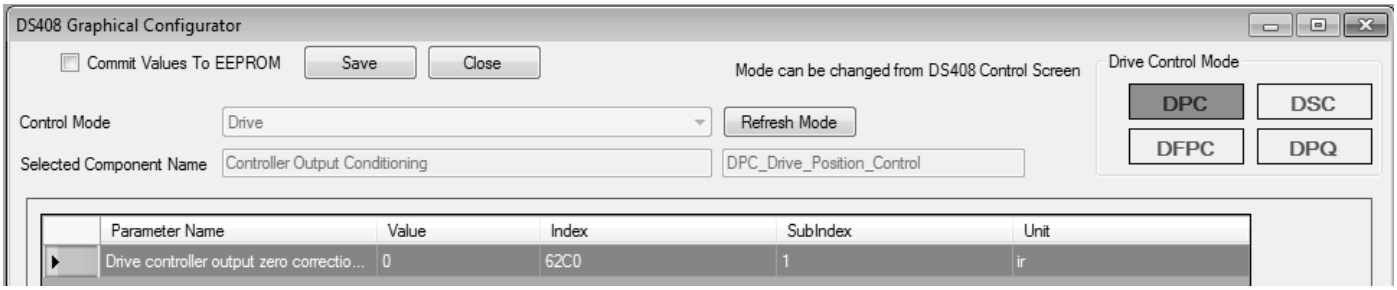


Fig. 4.34

4.9.6.2 To configure the zero correction offset click to offset block then write value to data field then click to "Save" button.

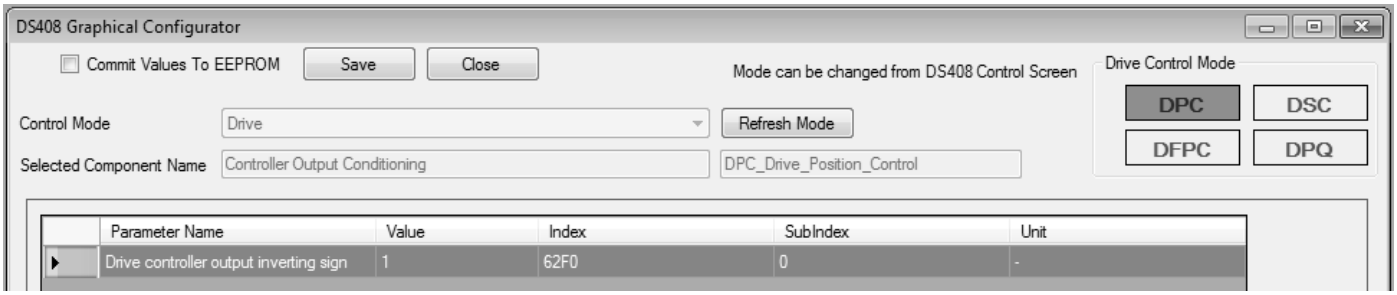


Fig. 4.35

4.9.6.3 To configure the inverting sign of the controller output click to inversion sign block then write the value into the data field then click to "Save" button.

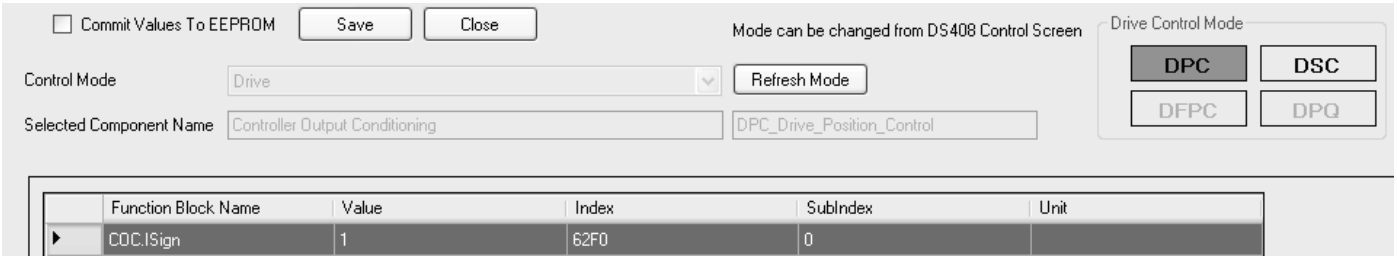


Fig. 4.36

4.9.6.4 To configure the upper and lower limit of controller output click to limit block then write the value into the data field then click to "Save" button.

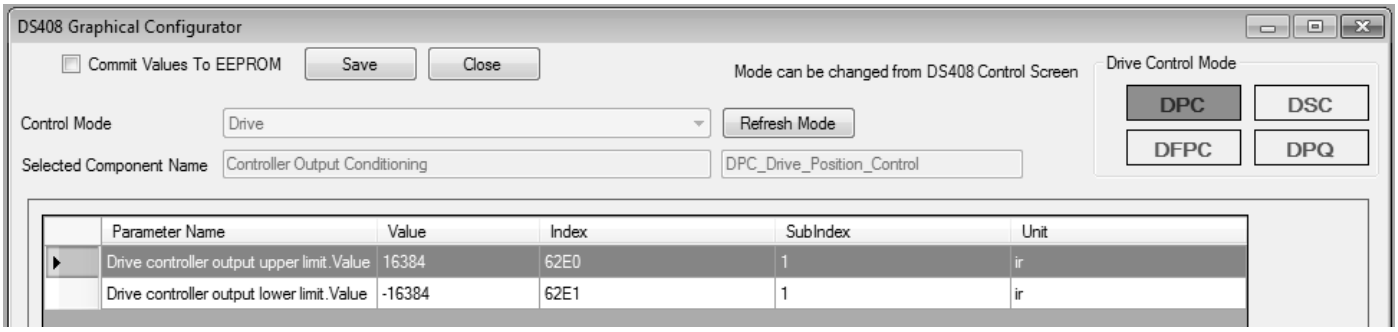


Fig. 4.37

4.10 Steps for Tuning DPC Mode

- Set the Proportional and Integral gain of drive control mode to zero.
- Set the ramp acceleration and deceleration time to 1,000,000um/ms.
- Set the Feed forward gain to unity value
- Give the set point 16,384 adjust the directional dependent gain
- Give the set point -16,384 adjust the directional dependent gain in such way that rate at which piston moves should be same as that in positive command.
- Now tune the feed forward gain
- Finally tune the Proportional and Integral gain of drive control mode till get good step response

4.11 DSC Mode Configuration

4.11.1 DSC mode selection

After clicking to DS408 graphics below window will be opened for DSC control mode with DSC box is highlighted.

This control mode is designed as DS408 standard. For more detail information please refer the VDMA profile document.

Fig. 4.38

4.11.2 Demand Value Generator

This block configures the set point for drive speed control.

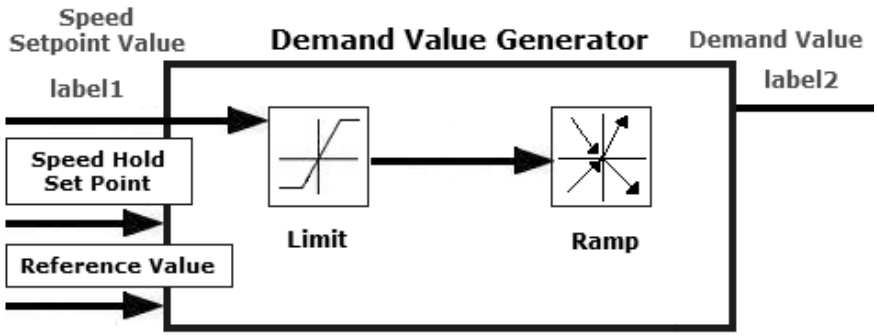


Fig. 4.39

4.11.2.1 Hold Setpoint

When the control is commanded or automatically transitions to "HOLD" or "FAULT HOLD" control states the "ACTIVE" control state setpoint is disabled. A constant preset or the value of the control feedback that immediately preceded entry to "HOLD" or "FAULT HOLD" control state is used as the setpoint to the demand value generator. It is important to configure the related parameters for systems that will utilize these control states as the setpoint chosen can be configured to a value that is very different than the ACTIVE control state setpoint.

The parameter "Hold Actual or Preset Value" changes the source of the hold setpoint.

The options allowed for the Hold Actual or Preset Value parameter are:

0 – preset *

1 – last feedback reading prior to entering "hold" for 1st setpoint (applies to control modes with only one setpoint, or the DFPC setpoint for DPQ mode)

2 – last feedback reading prior to entering "hold" for 2nd setpoint (applies to DSC setpoint for DPQ mode only)

3 – combination of option 1 and 2 for DPQ mode

*DPQ Device Control Mode uses DSC and DFPC DVG hold setpoint values

Configuration:

1. Disable the active Device Control Mode (if running)
2. Configure the Device Control Mode, Device Mode, and Interface Selection as desired.
3. If using option "0" for the "Hold Actual or Preset Value", the preset value must be defined. Set the "x DVG hold setpoint value" object present for the Device Control Mode. (ex. DSC DVG hold setpoint. Value is object 0x6514 sub 1)
4. New configuration takes effect on transition from "Init" to "Disabled" state.
5. (Optional) Commit the changes to EEPROM for continued use across power cycles.

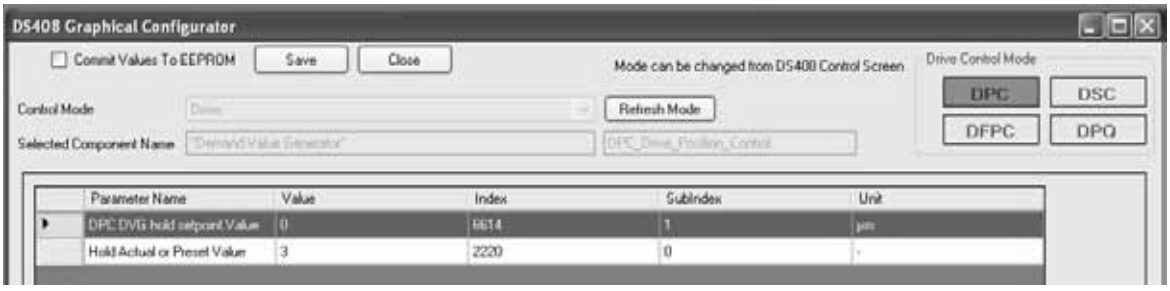


Fig. 4.40

4.11.2.2 To configure the DSC demand value generator reference A and B click to reference value block enter the value in terms of um/sec in data fields then click to "Save" button. This object contains the reference value for direction A and direction B, a value corresponding to 100% of physical capabilities.

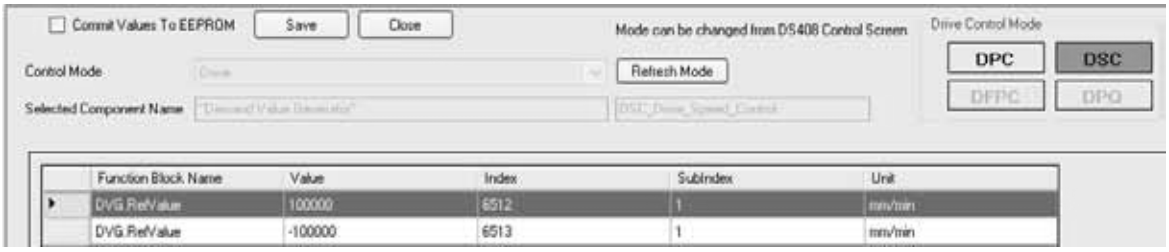


Fig. 4.41

4.11.2.3 To configure demand value generator upper and lower limit click to limit block enter the value into the data field in terms of um then click to "Save" button.

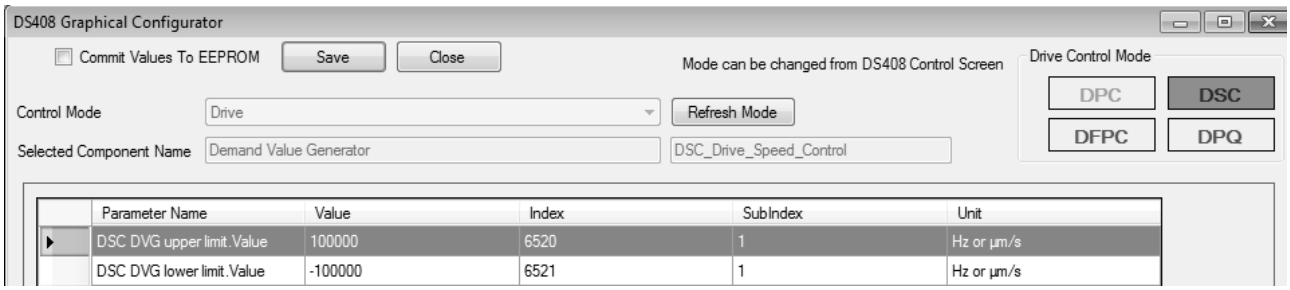


Fig. 4.42

4.11.2.4 To configure the Ramp functionality click to "Ramp" block, the AxisPro valve supports only the Ramp type -1 that is manufacture specific type. This four quadrant ramp that accepts the rate in terms of um/sec and gives output in terms of um/sec. The object 0x6632 sub0x01 defines the positive acceleration rate, 0x6633 sub0x01 defines negative acceleration rate, 0x6635 sub0x01 defines positive deceleration rate and 0x6636 sub0x01 defines negative deceleration rate. All rates are in unit of um/sec.

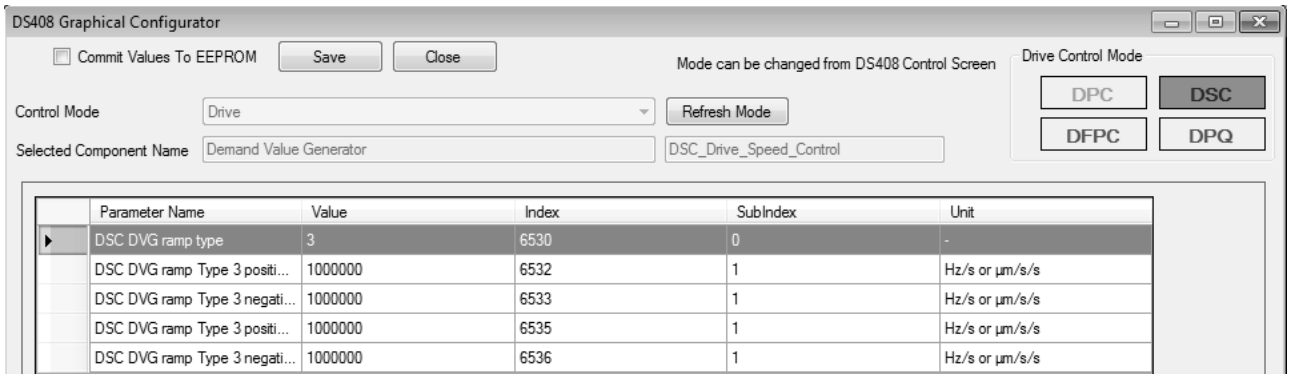


Fig. 4.43

4.11.3 Actual value conditioning:

This block configures the drive position or speed feedback sensor depending upon which actuator needs to be controlled.

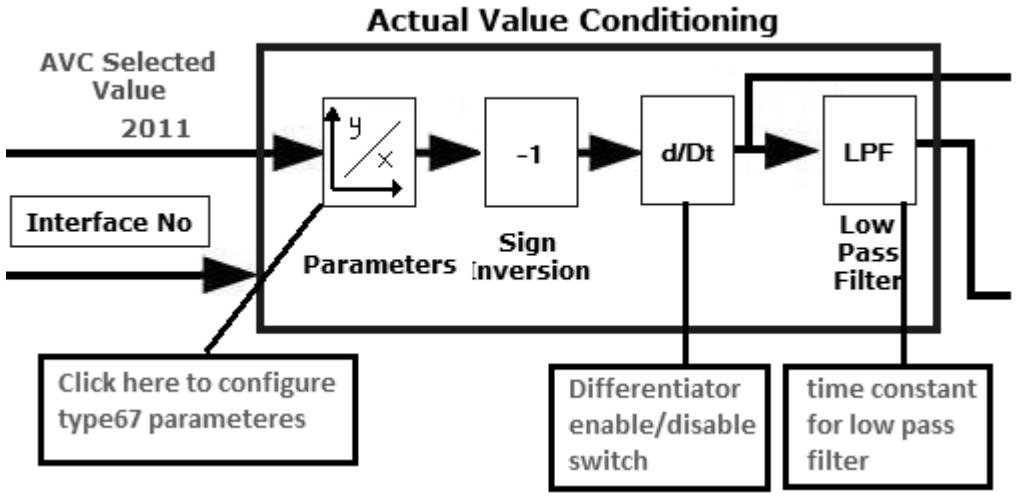


Fig. 4.44

4.11.3.1 To configure the sensor interface as analog position sensor (4-20mA) click to the "Parameters" block then value should be set to 67 as per DS408 standard.

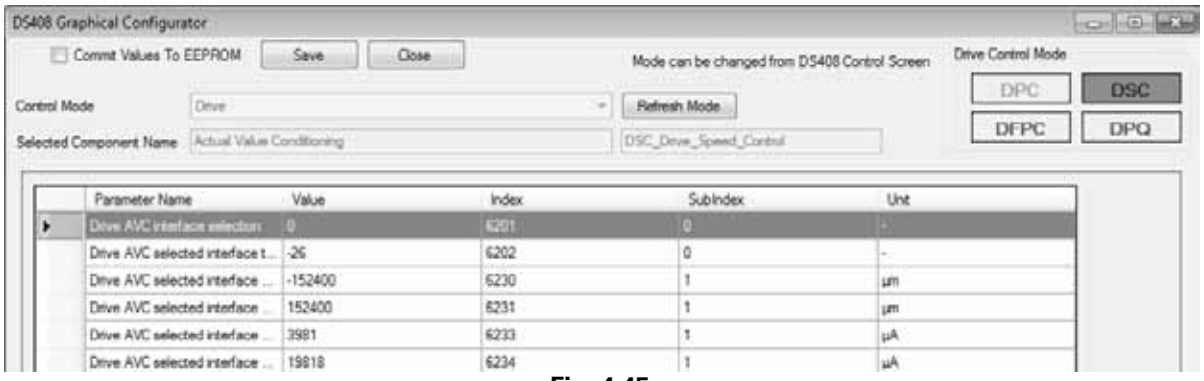


Fig. 4.45

Steps to calculate the sensor Interface ranges for Cylinder:

Consider the stroke length of cylinder and then calculate the zero position where users want to set. The zero position is important as it determine the four quadrant ramp.

Depending upon the stroke length of cylinder determines the minimum and maximum values of position sensor signal by putting the AxisPro Valve into VPOC mode then set the command such way that cylinder will be fully retracted and extended. The Interface reference value minimum and maximum value should be set as per cylinder stroke length.

For e.g. For 12 inch cylinder that corresponds to stroke range of 304,800 um. The zero position at mid stroke so minimum and maximum reference value are -152,400 & 152,400 respectively. If the position sensor is connected to external sensor input channel 2 so that values can be monitored using Pro-Fx: Configure by plotting the respective external sensor input channel data i.e. object 0x6204 sub 0x01. In below example the sensor value gives 3,981uA when cylinder is retracted while it gives 19,818 uA when cylinder is extended.

- To configure objects defines the minimum and maximum reference for an analog position transducer type = 67 by writing the value to respective data field then click to "Save" button.
- To configure objects defines the minimum and maximum transducer output value for an analog position transducer type = 67 by writing the value to respective data field then click to "Save" button.

In DSC mode if position sensor is used for speed control then the differential switch should be enabled to take the derivative of position to get the velocity as a sensor feedback.

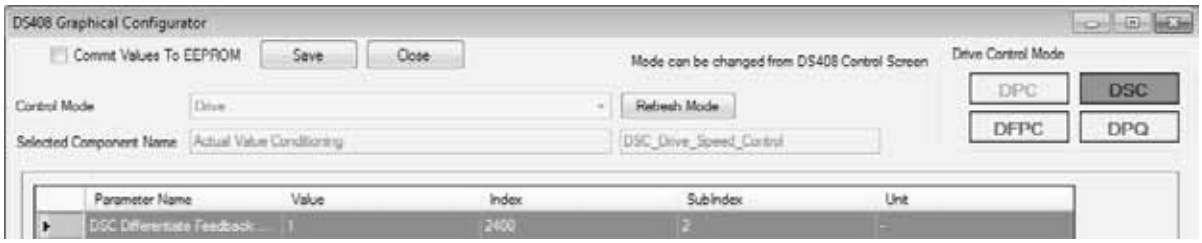


Fig. 4.46

Steps to calculate the sensor Interface ranges for Hydraulic motor:

If the DSC mode used for speed control of motor that has Quad decode speed sensor on it then it gives the train pulses with respect to change in speed of motor. The speed can be represented in terms of Hz or RPM. . If Quad encoder sensor interface is used then it gives value in terms of milliHz. The raw values will be represented in Hz that can be converted into RPM by configuring the Actual value conditioning block.

4.11.3.2 The sign parameter that decides sign of the actual value interface currently selected by interface number can be configured by clicking the sign inversion block then writing value to the data field then click to "Save" button.

Fig. 4.47

- AxisPro valve support four 4-20mA drive interfaces so as per connection to external connector appropriate index for sensor should be written to above selected interface object.
- The sign value 1 means as cylinder position increases sensor output in mA will increases.
- The sign value -1 means as cylinder position increased sensor output in mA will decreases.

4.11.3.3 The time constant of the low pass filter for an analog position transducer (4-20mA) can be set by writing value in terms of millisecond to the data field then click to "Save" button.

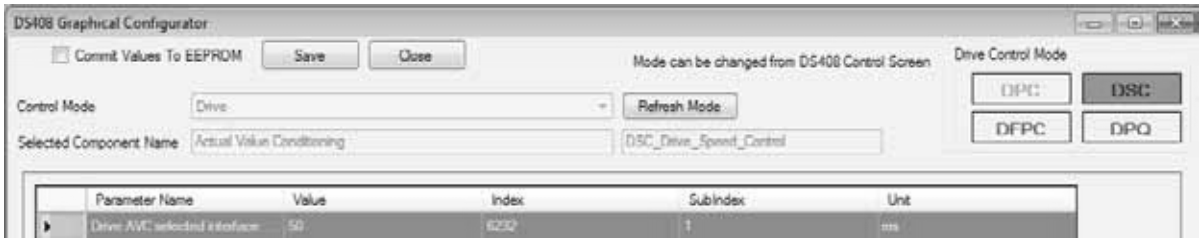


Fig. 4.48

Controller Configuration:

This block configures the gains of speed controller.

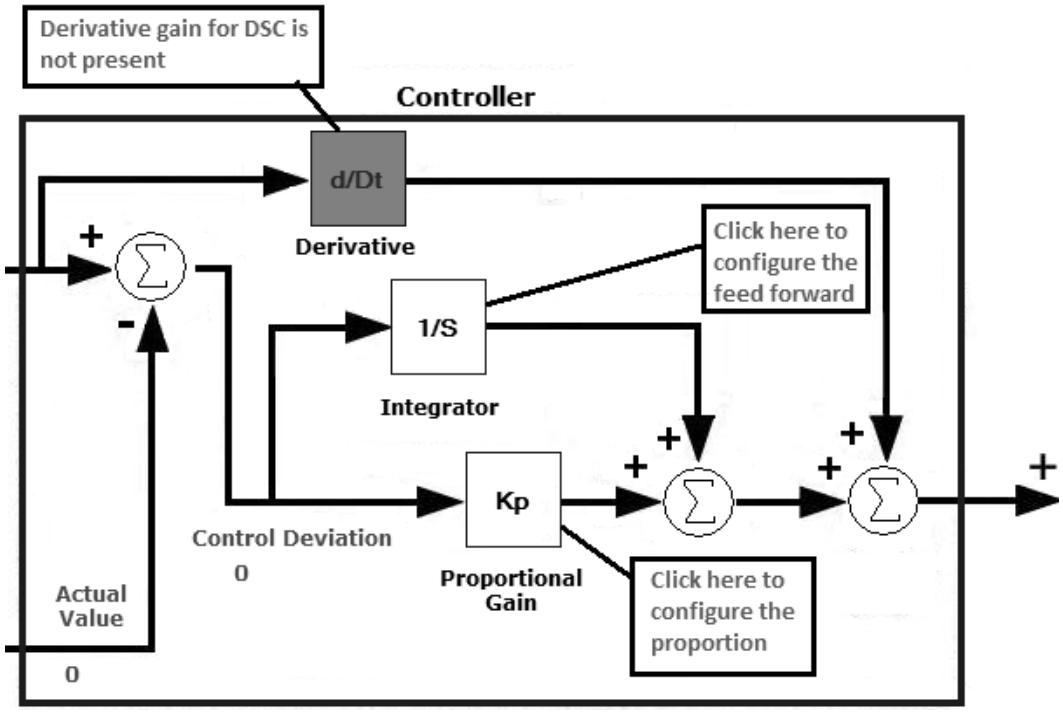


Fig. 4.49

4.11.4.1 The integral gain, Integration time and Integrator upper and lower limits can be set by writing value in to the respective data field then click to "Save" button. The tuning of DSC need to done as per load connected to valve. The tuning mechanism has mention in detain in section.

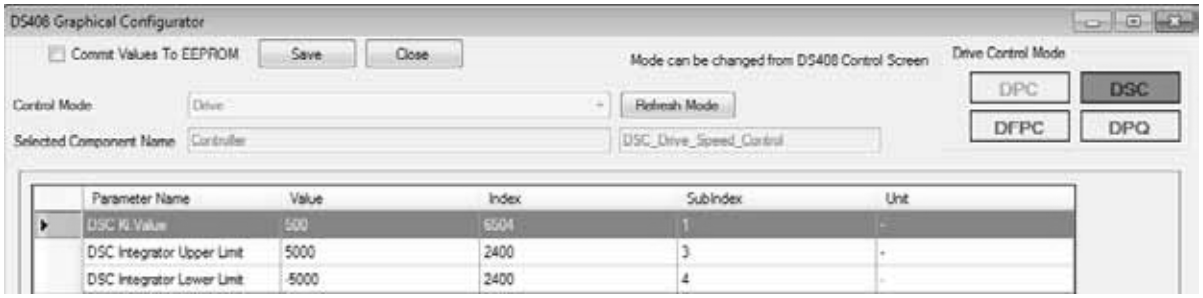


Fig. 4.50

4.11.4.2 The feed forward gain can be set by writing value in to the data field then click to "Save" button. The tuning of DSC need to require as per load connected to valve. The tuning mechanism has mention in detain in section.

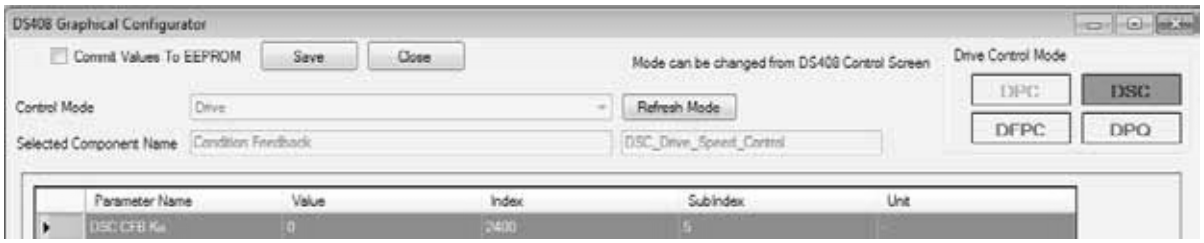


Fig. 4.51

4.11.4.3 The proportional gain can be set by writing value in to the data field then click to "Save" but ton. The tuning of DSC need to require as per load connected to valve. The tuning mechanism has mention in detain in section.

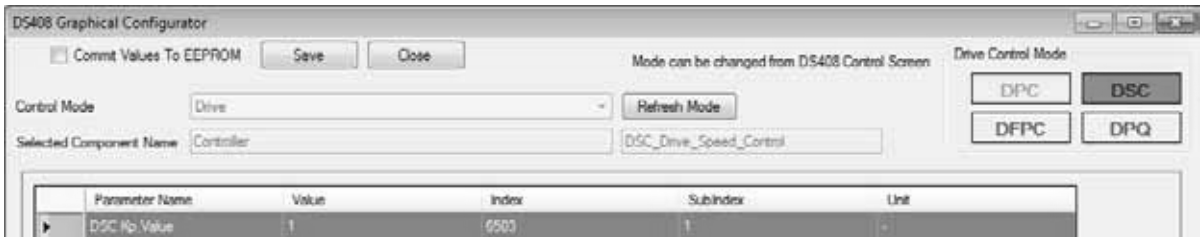


Fig. 4.52

4.11.5 Conditioning Feedback:

This block configures the feedback gains for speed controller.

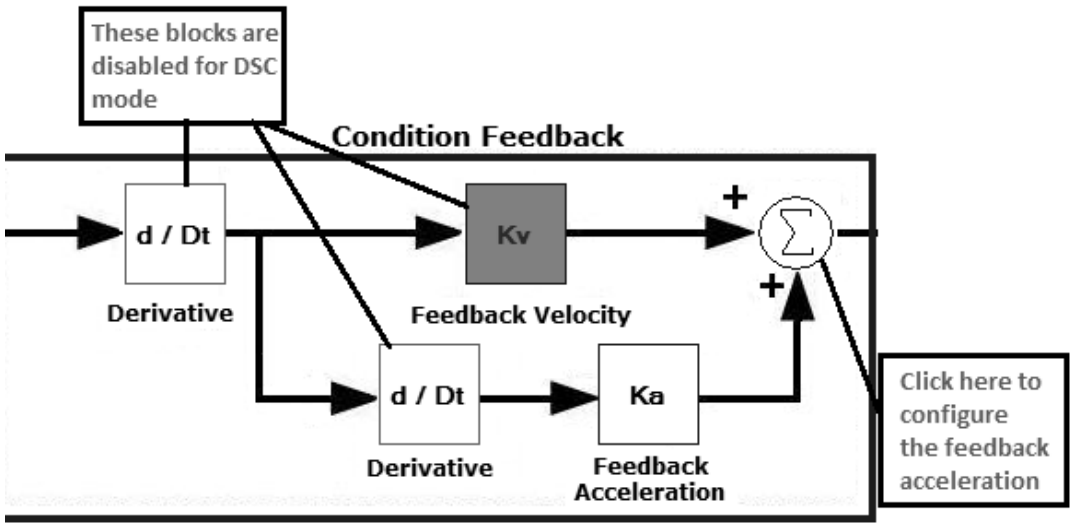


Fig. 4.53

4.11.5.1 The feedback acceleration gain can be set by writing value in to the data field then click to "Save" button. The tuning of DSC need to require as per load connected to valve. The tuning mechanism has mentioned in detail in section.

Fig. 4.54

4.11.6 Controller Output Conditioning:

This block configures the Drive speed controller output conditioning.

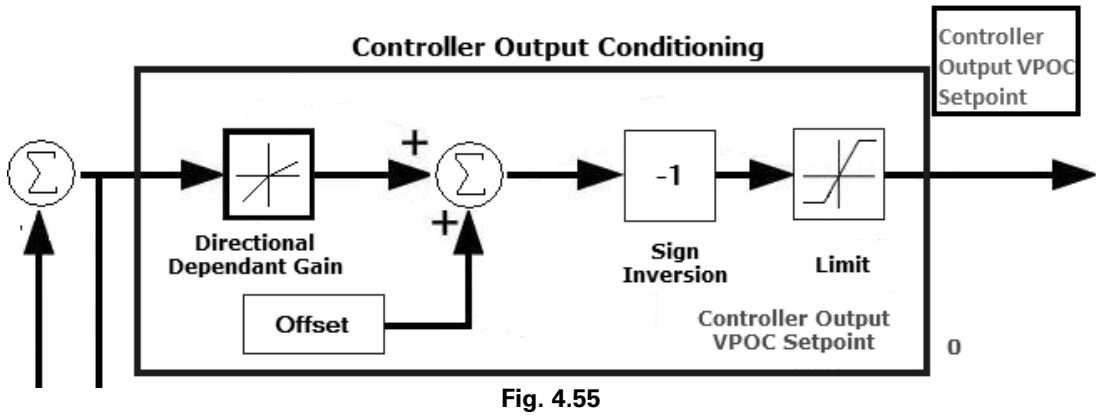


Fig. 4.55

4.11.6.1 The Device supports only the directional dependent gain type 1. To configure the directional dependent gain (upper 16 bits represents the numerator while lower 16 bits represents the denominator) click to directional dependent block then write value to data field then click to "Save" button.

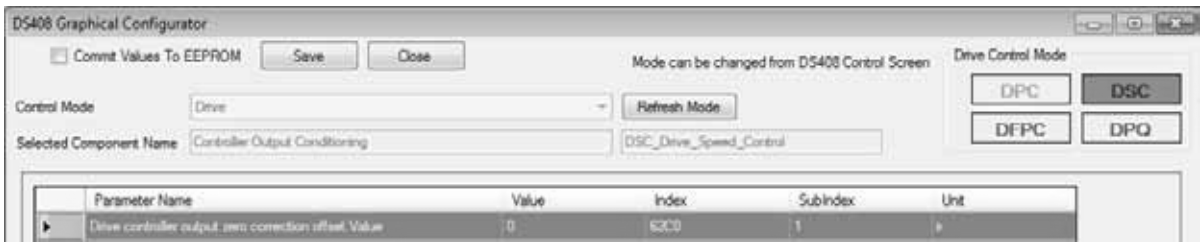


Fig. 4.56

4.11.6.2 To configure the zero correction offset click to offset block then write value to data field then click to "Save" button.

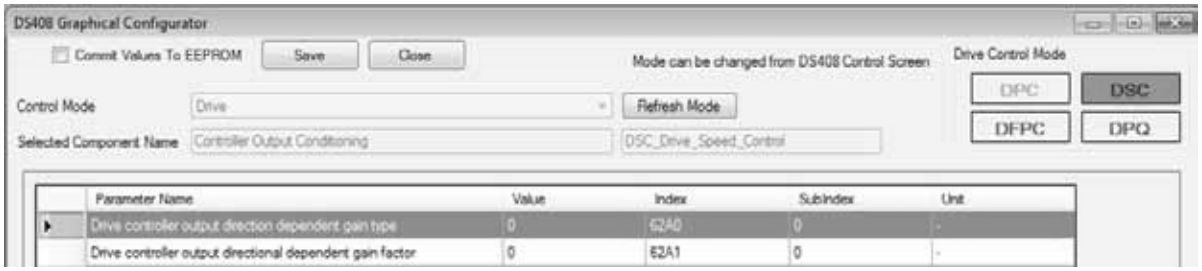


Fig. 4.57

4.11.6.3 To configure the inverting sign of the Controller output click to inversion sign block then write the value into the data field then click to "Save" button.

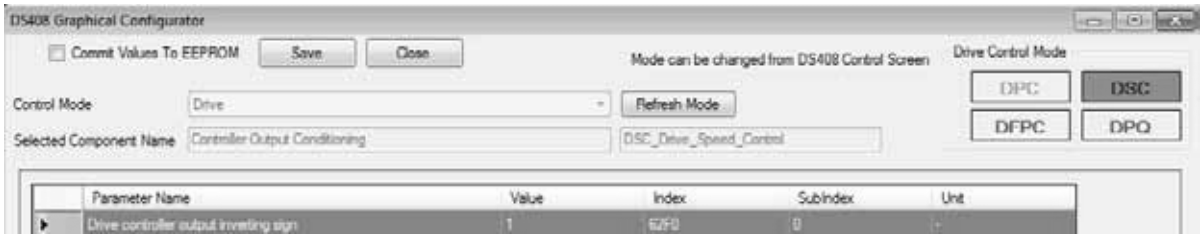


Fig. 4.58

4.11.6.4 To configure the upper and lower limit of controller output click to limit block then write the value into the data field then click to "Save" button.

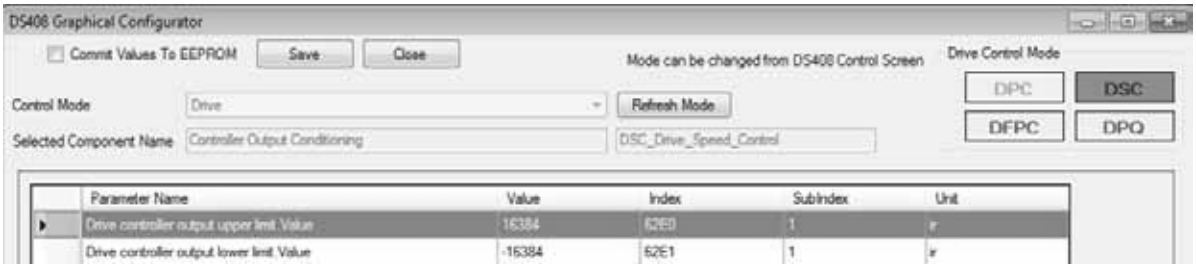


Fig. 4.59

4.12 Steps for tuning DSC mode

- Set the Proportional and Integral gain of drive control mode to zero.
- Set the Upper and Lower demand value generator as per maximum velocity from cylinder can be achieved.
- Set the DSC interface reference value depending upon at which position sensor has connected.
- Set the ramp acceleration and deceleration time to 1,000,000um/ms.
- Set the controller output sign as per cylinder direction.
- Set the AVC values as per cylinder length and position sensor feedback.
- Set the Feed Forward gain to 150.
- Disable the directional independent gain.
- Enable the differentiator switch so that position feedback gets converted into velocity.
- Set the step velocity command of 100,000um/s adjust the gain till feedback matches with setpoint.
- Now set the integrator upper and lower limit +/- 10,000 respectively.
- Now adjust the integrator gain till get minimum steady state error.

Adjust the proportional gain to 1 to improve the dynamic response.

4.13 Sensor Interfaces & Calibration

AxisPro controllers contain various sensor interfaces that may be enabled and calibrated per application needs. Several interfaces are configurable for more than one type, though only one type may be active at one time per interface. Not all interfaces described in this section are present on each valve. See the valve's model code for the device capabilities. Some interfaces are calibrated at the factory and are read-only.

The access and calibration of these sensors is in accordance with the DS408 Actual Value Conditioning mechanism.

The following table lists the possible sensor interfaces and their default type and unit. If the interface type is changed, the calibration and unit are specific to the new type and the default table below does not apply.

Table 4-4 Sensor interface options

Interface Selection Number	AVC Converted Value Location	Default Unit	Default Interface Type	Supported Types	Description
0	0x6210 sub1	uA	-26	2, 67, -26	Sensor port - input 1
1	0x6211 sub1	uA	-26	2, 67, -26	Sensor port - input 2
2	0x6212 sub1	uA	-26	2, 67, -26	Sensor port - input 3
3	0x6213 sub1	uA	-26	2, 67, -26	Sensor port - input 4
4	0x6214 sub1	-	0	2,67	CAN bus input 1 (free object)
5	0x6215 sub1	mV/uA	-2	2,67,-2,-3,	Analog command input
6	0x6216 sub1	-	0	65,66	SSI bus input
7	0x6217 sub1	-	0	2,67	CAN bus input 2 (free object)
8	0x6218 sub1	Hz	-4	-4,-6,64	• Speed Input 1(minimum frequency it can measure upto 8Hz while maximum frequency it can measure upto 300KHz) • For Encoder interface this object gives increment or decrement count as per type selected.
9	0x6219 sub1	Hz	-4	-4,-6,64	• Speed Input 1(minimum frequency it can measure upto 8Hz while maximum frequency it can measure upto 300KHz) • For Count,direction type & Phase AB type encoders can read the minimum frequency fo 0.1Hz while maximum frequency as 800KHz.
10	0x621A sub1	decibar/mN	2	2	Pressure Port A input
11	0x621B sub1	decibar/mN	2	2	Pressure Port T input
12	0x621C sub1	decibar/mN	2	2	Pressure Port P input
13	0x621D sub1	decibar/mN	2	2	Pressure Port B input
14	0x621E sub1	uA	-20	-20	Difference between Sensor port input 1 & input 2
15	0x621F sub1	uA	-21	-21	Difference between Sensor port input 1 & input 3
16	Indirect*	uA	-22	-22	Difference between Sensor port input 1 & input 4
17	Indirect*	uA	-23	-23	Difference between Sensor port input 2 & input 3
18	Indirect*	uA	-24	-24	Difference between Sensor port input 2 & input 4
19	Indirect*	uA	-25	-25	Difference between Sensor port input 3 & input 4
20	Indirect*	decibar/mN	-10	-10	Difference between Pressure Port P & Port A
21	Indirect*	decibar/mN	-11	-11	Difference between Pressure Port P & Port B
22	Indirect*	decibar/mN	-12	-12	Difference between Pressure Port P & Port T
23	Indirect*	decibar/mN	-13	-13	Difference between Pressure Port A & Port B
24	Indirect*	decibar/mN	-14	-14	Difference between Pressure Port A & Port T
25	Indirect*	decibar/mN	-15	-15	Difference between Pressure Port B & Port T

*Indirect access is made via Device Control Mode "interface reference" (eg. 0x6502, 0x6582, 0x6602) just as all other interfaces are chosen for use in the control mode or via 0x6204 sub 1 when the AVC interface selection (0x6201 sub 0) is set to the interface number.

Table 4-5 Sensor interface supported types

Interface Type Number	Description
0	No conversion, raw value
1	Valve Spool Position
2	Pressure
64	Incremental position encoders
65	Synchronous Serial Interface (SSI) binary
66	Synchronous Serial Interface (SSI) gray coded
67	Analog position
-1	Solenoid current sense
-2	Command input voltage
-3	Command input amperage
-4	Speed input (frequency)
-5	Quadrature sensor (Phase A & B signals)
-6	Quadrature sensor (speed and direction signals)
-10	Difference between Pressure Port P & Port A
-11	Difference between Pressure Port P & Port B
-12	Difference between Pressure Port P & Port T
-13	Difference between Pressure Port A & Port B
-14	Difference between Pressure Port A & Port T
-15	Difference between Pressure Port B & Port T
-20	Difference between Sensor port input 1 & input 2
-21	Difference between Sensor port input 1 & input 3
-22	Difference between Sensor port input 1 & input 4
-23	Difference between Sensor port input 2 & input 3
-24	Difference between Sensor port input 2 & input 4
-25	Difference between Sensor port input 3 & input 4
-26	Input microamperes

The correct sensor interface should be selected and configured to an appropriate type for the device control mode being used.

Type 2 and 67 may be calibrated by setting the interface minimum, interface maximum, reference minimum, and reference maximum values to create a point slope form which rescales the input to the desired type.

e.g. If an analog position sensor of a cylinder is connected to the sensor port input 2, which is initially a 4-20mA current input, then to rescale the amperage to units of position, the following setup is required:

1. Set the device in INIT ort DISABLED mode
2. Set the interface selection number (0x6201 sub0x0) to 1 (selecting sensor port input 2 – see table above)
3. Set the interface type (0x6202 sub0x0) to 67 (selecting analog position sensor type)
4. Set the minimum current value (in uA) that is produced by the sensor (interface minimum) (0x6233 sub 0x1) ex. 4000 = 4mA
5. Set the maximum current value (in uA) that is produced by the sensor (interface maximum) (0x6234 sub0x1) ex. 20,000 = 20mA
6. Set the position reference value that corresponds to the interface minimum (0x6230 sub0x1). This is the minimum measured cylinder position and can be a negative value. e,g. -1,200,000um corresponds to 4mA sensor output
7. Set the position reference value that corresponds to the interface maximum (0x6231 sub0x1). This is the maximum measured cylinder position and can be a negative value. e.g. 1,200,000um corresponds to 20mA sensor output
8. Check the result of the point slope conversion of sensor port input 2 in 0x6204 sub0x1. The value is also available in 0x6211 sub 0x1 when the interface selection number is other than 1.

There are various combination of sensor interface is possible that can be calibrated as per derive control mode using below table. So each of input can be scales for 4 analog current input channels along with dedicated pressure sensors.

Table 4-6 Sensor interface scaling

Parameter Value	Default Values [Unit]	Comment
6220:1 (position sensor minimum position value)	-120000000 um	Input of the min. position
6221:1 (position sensor maximum position value)	120000000 um	Input of the max. position
6224:1 (position sensor minimum transducer signal value)	4000 uA	lower limit reading in signal range
6225:1 (position sensor maximum transducer signal value)	20000 uA	upper limit reading in signal range
6220:1 (pressure sensor minimum pressure value)	0 decibar	Input of the min. pressure
6221:1 (pressure sensor maximum pressure value)	100 decibar	Input of the max. pressure
6224:1 (pressure sensor minimum transducer signal value)	4481	lower limit reading in signal range
6225:1 (pressure sensor maximum transducer signal value)	11805	upper limit reading in signal range
6222:1 (Cylinder area)	1 mm(Sq)	Area of cylinder
6223:1 (pressure sensor offset value)	0 decibar	Offset value

For e.g. If Pressure sensor is connected to port. The embedded pressure sensor on each port available on AxisPro level 3 device that can be configuring with flowchart for example similarly other port can also be configured by changed the interface selection interface number from 10 to 13.

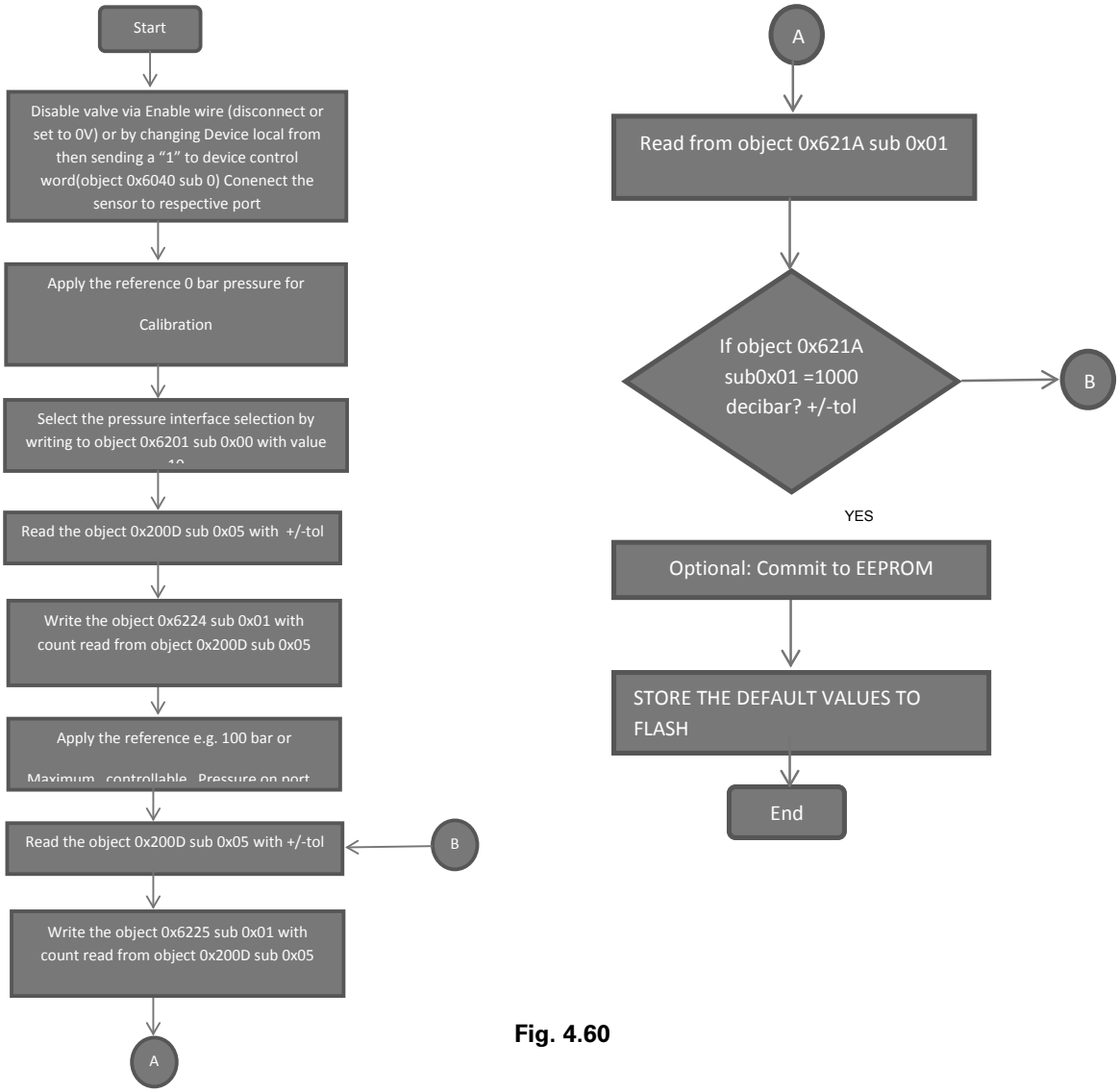


Fig. 4.60

4.13.1 Quad sensor input decoding:

Quadrature encoders (also known as incremental encoders or optical encoders) are used for position and speed detection of rotating motion systems. Quadrature encoders enable closed loop control of many motor control applications. There two types of Quad decoding supports AxisPro first is Quadrature decode for phase_A and phase_B encoders type & other is for count and direction encoders' type. This can be configure by selecting the appropriate drive interface number & drive interface type as per above table. Below is the pin connection with respect to Table 3 6 should be made. The AxisPro supports only X4 type of Quad decoding.

Speed 1	Connect the Phase A signal
Speed 2	Connect the Phase B signal

Table 4-8 phase_A and phase_B encoders type configuration

0x2001 sub 0x11	Incremental Encoder Type
0x2001 sub 0x12	Incremental Encoder Speed Filter constant

Table 4-10 configuration parameters for QEI

The selection of encoder type interface can be done by writing object index 0x2001 sub 0x11 if it one then selected Encoder type is phase_A and phase_B encoders' type configuration if it is zero then selected Encoder type is count and direction encoders' type. Also to get stable velocity value weighted filter constant can be configured by writing to object index 0x2001 sub 0x12. The maximum value will be 9999. As the const and value goes on increasing time required to calculate the speed will be increased.

Speed 1	Connet the count signal of the quadrature encoder
Speed 2	Connect the direction signal of the quadrature encoder

Table 4-9 count and direction encoders' type

0x6218 sub 0x01	Counter value for number of pulses
0x6219 sub 0x01	Linear/angular Velocity in term of milliHz

Table 4-10 result of QEI input decoding values

4.14 Monitor output configuration

The monitor output can be configured as shown below.

Two different types of output can be configured:

- Voltage output (+/-10V)
- Current output (4-20mA)

There are two modes of operation:

Auto – the monitored object is configured based on the valve control mode being used (configured to LVDT sensed spool position when closed loop spool position is the Device Control Mode.

Custom – the monitored object, scaling, and offset is specified by the user.

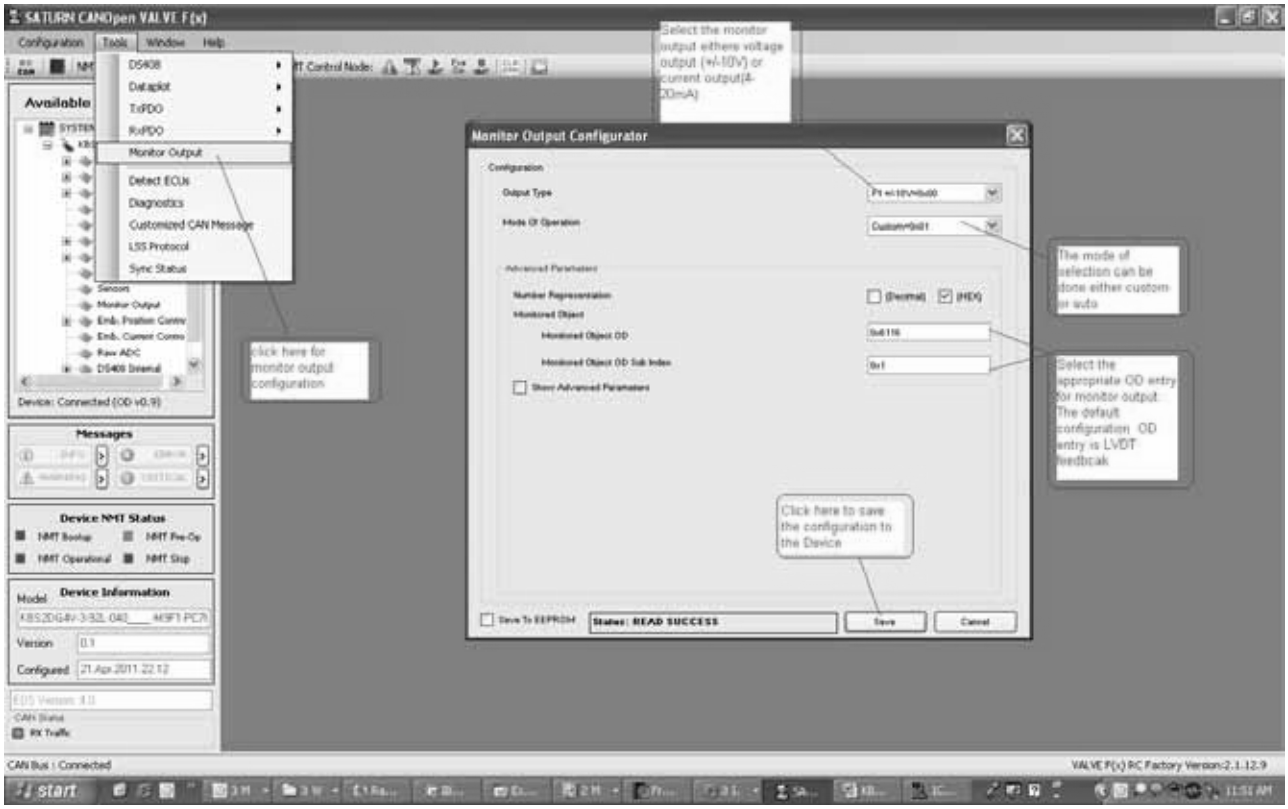


Fig. 4.61

By default in "AUTO" mode monitor output "automatically" rescales to match the command of the Device Control Mode type for -

VSC – spool control, monitor output monitors spool position

VCC – open loop current control, monitor output monitors solenoid current

To change the monitor output to any variable in the Object dictionary, there is a complete widget in Pro-Fx for "customized" monitoring set the Mode operation to Custom. (Tools menu -> Monitor Output) as shown in above figure, below are the steps to configure the monitor output in custom mode.

1. Set the Device Local to "CAN Bus"
2. Update DS408 Param button
3. Click "ON"
4. Device Control Word set state to "DISABLED"

   Or

1. "ACTIVATE (PH7, PR7)" the Analog Enable Pin (on DS408 Control Widget
2. Update DS408 Param button
3. Set the voltage on the enable wire to 0V
4. Open Monitor Output widget (Tools menu -> Monitor Output)
5. Change the "mode of operation" to "custom" (from "auto")
6. Change the Monitored Object OD (index) to 0x6110 and OD sub index to 0x6110 subindex 0x1 (this is the object for LVDT position as if using "VSC" Device Control Mode)
7. Click "Save"
8. Set Device Control Word to "ACTIVE"

   Or

9. Set the voltage on the enable pin to greater than 8volts

The monitor output should now be tracking LVDT position even if in current control mode (VCC).

To undo the change, simply set the monitor output "mode of operation" back to "auto". To save these changes to non volatile memory select the checkbox "save to EEPROM".

4.15 Sync Producer

The sync message needs to be sent when synchronization between other nodes is required. This SYNC provides the basic network clock. The time period between the SYNCs is specified by the standard parameter communication cycle period as shown in below image, which can be set in terms of millisecond. There can be a time jitter in transmission by the SYNC producer corresponding approximately to the latency due to some other message being transmitted just before the SYNC. There should be only one sync producer on network.

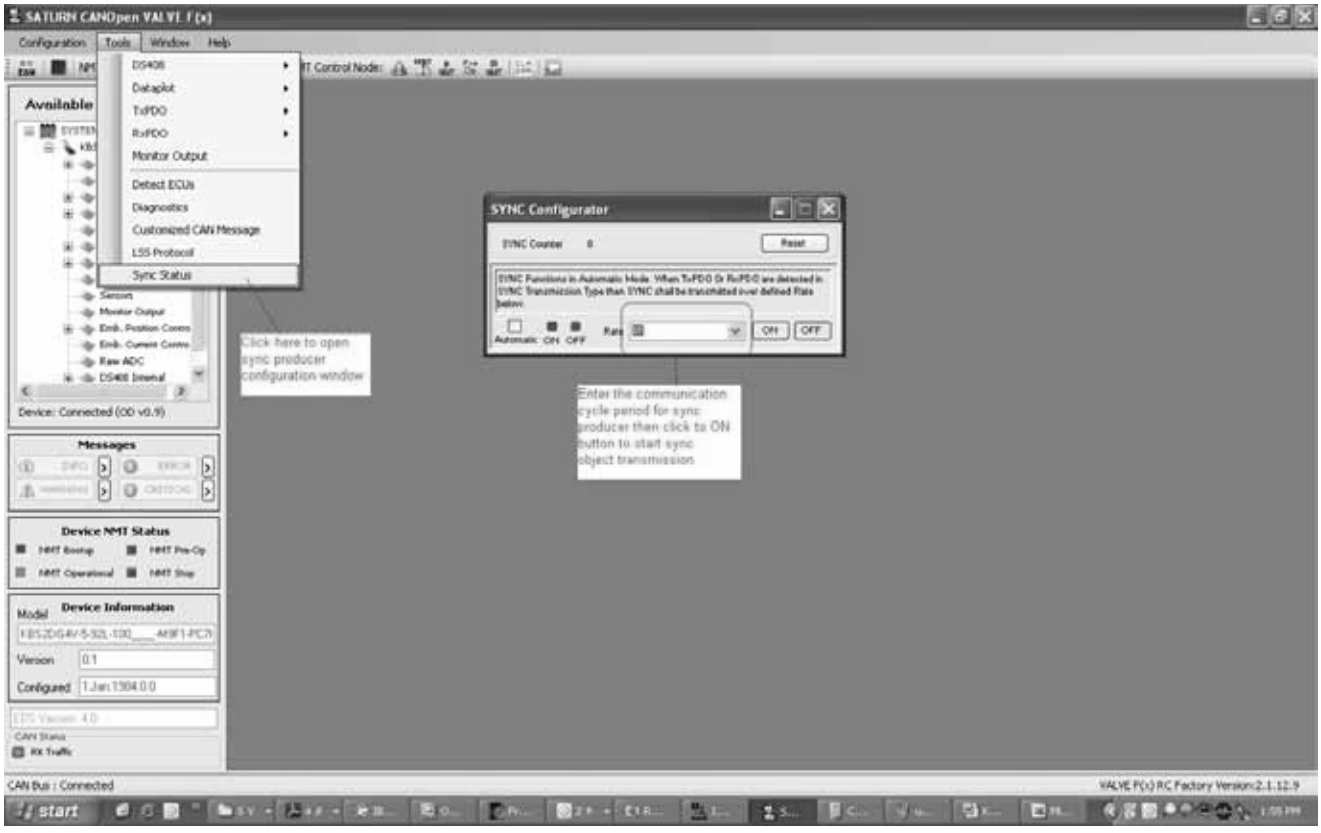


Fig. 4.62

4.16 Diagnostics

The AxisPro device health can be monitored and reacted-to using configurable diagnostics for sensors and valve behaviors. Critical parameters are continuously monitored and some parameters can be configured for the level of criticality or disabled from being monitored.

The Pro-Fx: Configure Diagnostics widget organizes the related object dictionary parameters for easy configuration and monitoring.

There are a total of 22 diagnostic parameters which can be continuously monitored per a configurable rate. Diagnostic data related to each parameter can be logged in a *.csv file. Each diagnostic has an upper and lower limit configuration. Status for each monitor (in/above/below range) is displayed.

Diagnostics which are always important to proper functioning of the AxisPro, such as supply voltage, are grayed in the Diagnostics widget and cannot be altered. These critical diagnostics will be continuously monitored by AxisPro.

Many diagnostics can be edited per application requirement. Diagnostics are enabled by setting bits in the Diagnostic Enables mask. The mask bits are set or cleared by using the check boxes shown in the Diagnostic widget.

The status of all diagnostics can be quickly determined by reading the Fault Status Word which is a bit field having each bit represent one diagnostic state of ok or fault.

See related: Fault Status Word

The Diagnostic widget is as shown as below:

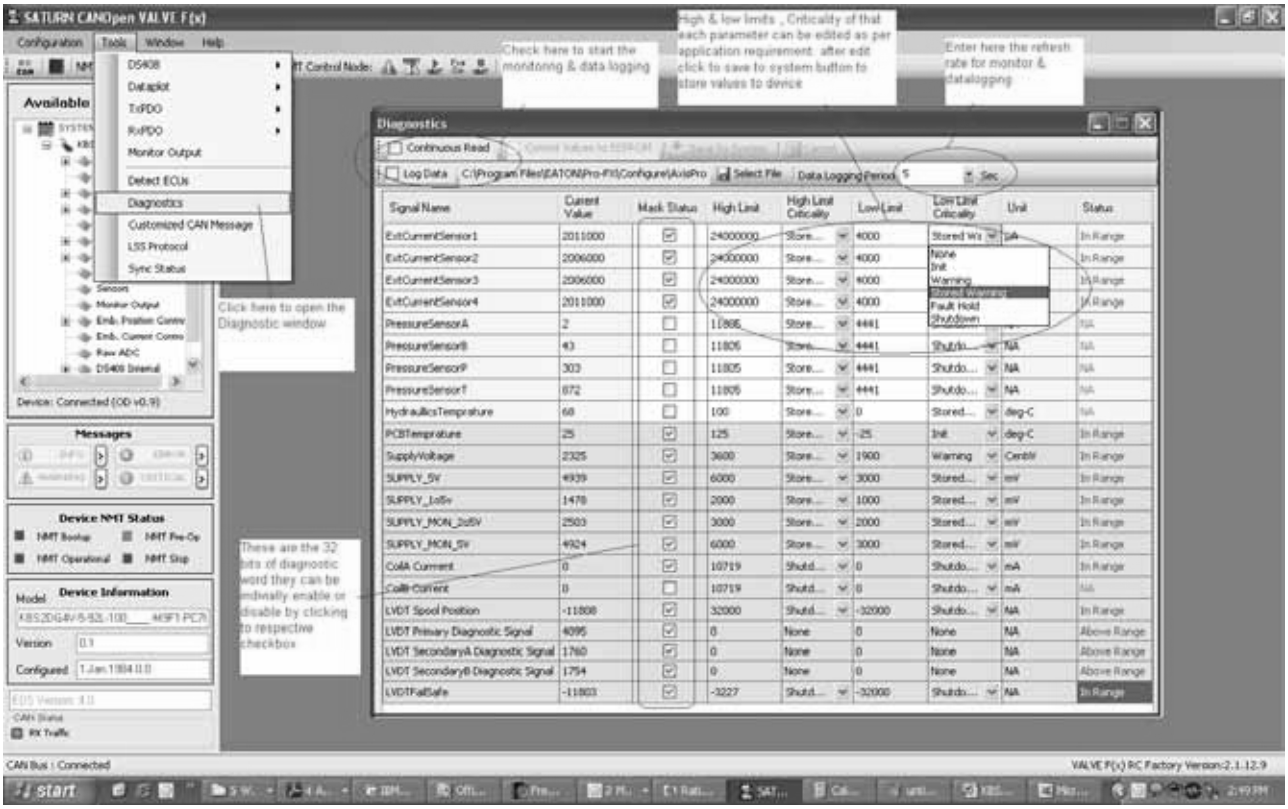


Fig. 4.63

4.16.1 Criticality Definitions:

Criticality of the diagnostic indicates the severity of the fault and determines the AxisPro reaction to the fault. The device supports 5 types of criticality as described as below.

- CRITICALITY_NONE (0): Fault word is not updated. No emergency message transmitted. No effect on DS408 device state. Similar to disabling the diagnostic.
- CRITICALITY_INFO (1): Fault word is updated, but no emergency message transmitted. No effect on DS408 device state.
- CRITICALITY_WARNING (2): Fault word is updated. Emergency message is transmitted. No effect on DS408 device state.
- CRITICALITY_STORED_WARNING (3): Fault word is updated. Emergency message is transmitted. No effect on DS408 device state. The fault is noted in the Error Field and stored in non-volatile memory.
- CRITICALITY_FAULT_HOLD (4): Fault word is updated. Emergency message is transmitted. The fault is appended to the Error Field bytes (@ object 0x1003) and stored in non-volatile memory. The DS408 device state will transition from present state to “FAULT_HOLD” state.
- CRITICALITY_SHUTDOWN (5): Fault word is updated. Emergency message is transmitted. The fault is appended in the Error Field bytes (@ object 0x1003) and stored in non-volatile memory. The DS408 device state will transition from present state to “FAULT” state.

4.16.2 Emergency Messages:

Emergency messages (a.k.a. telegrams) are transmitted to the CANbus based on criticality of diagnostics. The telegram is sent once per each new occurrence of an error in the Device. Repeated occurrence of the same event that generated a telegram will not generate a new telegram unless the event had cleared.

The AxisPro message structure of 8 bytes is shown below.

COB-ID	Byte 0-1	Byte 2	Byte 3-7
0x80 + Node ID	Error Code	Error register	Manufacturer specific error register

Each source of error is categorized and enumerated with an Error Code. This code is part of the transmitted emergency message. The number of errors currently present is saved in the object dictionary at Index 1003 and sub index 0x00. The Error Field bytes (@ object 0x1003 sub 1 to 8) contain a maximum of eight errors. Errors are listed in reverse order of their occurrence.

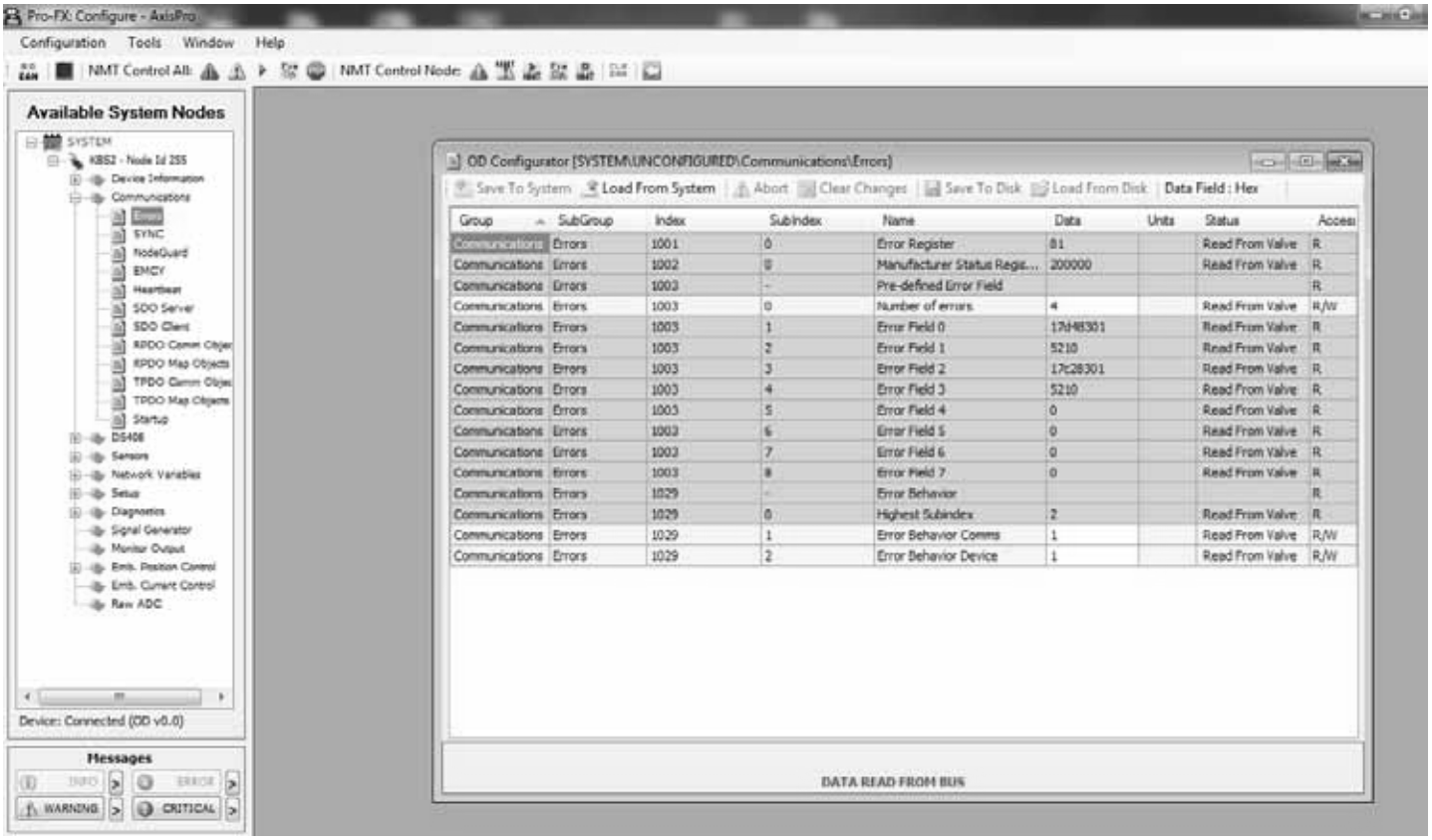


Fig. 4.64

Pro-Fx: Configure decodes emergency messages that it receives in the Messages widgets (Info, Warning, Error, Critical). The bytes representing the Error Code within the emergency message and the values stored in the Error Field can be deciphered from the following table.

Error Code	Description	Error Bit
0x0000	No error	0x00
0x6100	Parameter Not Supported	0x02
0x5530	EEPROM Checksum is wrong	0x03
0x8220	PDO Length Exceeded	0x04
0x5210	Sensors Measurement error	0x05
0x8150	Invalid Node-id or Bit rate	0x06
0x5510	RAM is not Initialized	0x07
0x5231	External Current Sensor1 High	0x08
0x5231	External Current Sensor1 Low	0x09
0x5232	External Current Sensor2 High	0x0A
0x5232	External Current Sensor2 Low	0x0B
0x5233	External Current Sensor3 High	0x0C
0x5233	External Current Sensor3 Low	0x0D
0x5234	External Current Sensor4 High	0x0E
0x5234	External Current Sensor4 Low	0x0F
0x3411	Supply Voltage High	0x10
0x3412	Supply Voltage Low	0x11
0x3210	Internal 5V Dig High	0x12
0x3220	Internal 5V Dig Low	0x13
0x3210	Internal 1.5V High	0x14
0x3220	Internal 1.5V Low	0x15
0x3210	Internal 2.5V High	0x16
0x3220	Internal 2.5V Low	0x17
0x4221	Hydraulic Temperature High	0x18
0x4222	Hydraulic Temperature Low	0x19
0x4211	PCB Temperature High	0x1A
0x4212	PCB Temperature Low	0x1B
0x8301	Spool Not In Failsafe Position	0x1C
0x8301	LVDT Primary Error	0x1D
0x8301	LVDT Secondary A Error	0x1E
0x8301	LVDT Secondary B Error	0x1F
0x8100	CAN Bit1 Error	0x20
0x8140	CAN Tx Bus Off	0x21
0x8120	CAN Tx Bus Passive	0x22
0x8100	CAN CRC Error	0x23
0x8110	CAN Tx Overflow	0x24
0x8200	TPDO Outside Window	0x25
0x8130	Heartbeat Consumer	0x26
0x8200	SYNC Timeout	0x27
0x8301	Spool Position High	0x28
0x8301	Spool Position Low	0x29
0x2310	Solenoid Coil A current High	0x2A
0x2320	Solenoid Coil A current Low	0x2B
0x3210	Solenoid Coil B current High	0x2C
0x3220	Solenoid Coil B current Low	0x2D
0x3210	Internal 5V Analog High	0x2E
0x3220	Internal 5V Analog Low	0x2F
0x7310	Port A Pressure High	0x30
0x7310	Port A Pressure Low	0x31
0x7310	Port B Pressure High	0x32
0x7310	Port B Pressure Low	0x33
0x7310	Port P Pressure High	0x34
0x7310	Port P Pressure Low	0x35
0x7310	Port T Pressure High	0x36
0x7310	Port T Pressure Low	0x37
0x8210	Rx PDO Length Error	0x38
0x8200	Rx message Length Error	0x39
0x8200	Rx NMT Command Error	0x3A
0x8200	Rx message Inhibit Error	0x3B
0x8100	CAN Frame Error	0x3C
0x8200	SYNC Early	0x3D
0x8130	Lifeguard Error	0x3E
0x6010	Watchdog reset	0x3F
0x5231	ERROR in User Input 1	0x40
0x5232	ERROR IN User Input 2	0x41
0x5233	ERROR in User Input 3	0x42
0x5234	ERROR in User Input 4	0x43
0x5235	ERROR in UserBus	0x44
0x5236	ERROR in UserCmd	0x45
0x5237	ERROR in UserSSI	0x46
0x5238	ERROR in UserBus2	0x47
0x5239	ERROR in UserSpeed1	0x48
0x523A	ERROR in UserSpeed2	0x49
0x523B	ERROR in UserPressA	0x4A
0x523C	ERROR in UserPressT	0x4B
0x523D	ERROR in UserPressP	0x4C
0x523E	ERROR in UserPressB	0x4D
0x523F	ERROR in UserTempPCB	0x4E
0x5240	ERROR in UserTempOil	0x4F

Table 4-7 Error codes

4.16.3 Abort Codes:

The Device sends the abort code if CANopen protocol violated or due to device internal state has not allowed accessing the objects.

Table 4-8 Abort Codes

Abort Codes	Description
0503 0000h	Toggle bit not alternated.
0504 0000h	SDO protocol timed out.
0504 0001h	Client/server command specifier not valid or unknown.
0504 0004h	CRC error (block mode only).
0504 0005h	Out of memory.
0601 0000h	Unsupported access to an object.
0601 0001h	Attempt to read a write only object.
0601 0002h	Attempt to write a read only object.
0602 0000h	Object does not exist in the object dictionary.
0604 0041h	Object cannot be mapped to the PDO.
0604 0042h	The number and length of the objects to be mapped would exceed PDO length.
0604 0043h	General parameter incompatibility reason.
0604 0047h	General internal incompatibility in the device.
0606 0000h	Access failed due to an hardware error.
0607 0010h	Data type does not match, length of service parameter does not match
0607 0012h too high	Data type does not match, length of service parameter

Abort Codes	Description
0607 0013h	Data type does not match, length of service parameter too low
0609 0011h	Sub-index does not exist.
0609 0030h	Value range of parameter exceeded (only for write access).
0609 0031h	Value of parameter written too high.
0609 0032h	Value of parameter written too low.
0609 0036h	Maximum value is less than minimum value.
0800 0000h	general error
0800 0020h	Data cannot be transferred or stored to the application.
0800 0021h	Data cannot be transferred or stored to the application because of local control. Parameters are Factory protected can't read or write.
0800 0022h	Data cannot be transferred or stored to the application because of the present device state.
0800 0023h	Object dictionary dynamic generation fails or no object dictionary is present (e.g. object dictionary is generated from file and generation fails because of an file error).

4.16.4 Fault Level

Object 0x2004 sub0x01 indicates the current fault status level. The fault status level indicates the highest criticality of all active faults. If the value is non-zero at least one fault of the level indicated was triggered. Fault levels of 4 or 5 will continue to be indicated until the device status exits fault mode. See Criticality Definitions.

4.16.5 Fault Status Word

Object 0x2004 sub0x02 is 32bit word with each bit representing a single fault type, one for each of the built-in diagnostics of the AxisPro. The AxisPro updates the fault status word continuously upon successful device initialization after power is applied. If bit value is 1, that means the fault represented by that bit has occurred.

Ex. Fault Status Word indicates "0x0000000F"

4 bits set (0xF hexadecimal = 1111 binary)

Bits 0,1,2,3 are set to "1" = external current sensors 1 to 4 high or low limits have been crossed

bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
IN1	IN2	IN3	IN4	PR_A	PR_B	PR_P	PR_T

- IN1 : External current sensor 1 high or low limit crossed
- IN2 : External current sensor 2 high or low limit crossed
- IN3 : External current sensor 3 high or low limit crossed
- IN4 : External current sensor 4 high or low limit crossed
- PR_A : Pressure sensor at port A high or low limit crossed
- PR_B : Pressure sensor at port B high or low limit crossed
- PR_P : Pressure sensor at port P high or low limit crossed
- PR_T : Pressure sensor at port T high or low limit crossed

bit 8	bit 9	bit 10	bit 11	bit 12	bit 13	bit 14	bit 15
Temp_P	Temp_PCB	Vsup	V1.5	V5D	V2.5	V5A	SolA

- Temp_P : Temperature sensor at port high or low limit has crossed
- Temp_PCB : Temperature sensor on PCB high or low limit has crossed
- Vsup : 24V supply voltage high or low limit crossed
- V1.5 : Internal supply high or low limit crossed
- V5D : Internal supply high or low limit crossed
- V2.5 : Internal supply high or low limit crossed
- V5A : Internal supply high or low limit crossed
- SolA : Solenoid coil current high or low limit crossed

bit 16	bit 17	bit 18	bit 19	bit 20	bit 21	bit 22	bit 23
SolB	LVDT	LVDT_Pri	LVDT_SB	LVDT_SA	Failsafe	NA	NA

- SolB : Solenoid coil current high or low limit crossed
- LVDT : LVDT spool position high or low limit crossed
- LVDT_Pri : LVDT primary is disconnected
- LVDT_SB : LVDT Secondary B is disconnected
- LVDT_SA : LVDT Secondary B is disconnected
- Failsafe : Spool position high or low limit has crossed
- NA : Reserved for future diagnostic

bit 24	bit 25	bit 26	bit 27	bit 28	bit 29	bit 30	bit 31
NA	NA	NA	NA	WD	SENS	MEM	CKSM

- WD : Watchdog reset has occurred
- SENS : Senors are failed
- MEM : EEPROM memory corrupted
- CKSM : EEPROM Checksum has failed
- NA : Reserved for future diagnostic

4.16.6 Stored Fault Status Word

Object 0x2004 sub0x03 is a copy of the Fault Status word stored in non-volatile EEPROM memory to preserve fault indications across power cycles. The stored value may be cleared to begin tracking new faults at any time.

4.16.7 Error Status Bits

The specific fault indications are represented by object 0x2100 sub 0x01 to sub 0x09 where each bit from each object represents the status of a fault that may occur in the device. Each error status byte consists of 8 status bits. If a bit is one the corresponding fault has occurred and has not cleared. If a bit is zero the corresponding fault did not occur or has cleared. The tables below give detail information about each bit.

Table 4-9 Fault status bits object 1 decode

Parameter index & name : 0x2100:0x01 Eaton Error Status_1	
bit 0	No error
bit 1	Parameter Not Supported
bit 2	EEPROM Checksum invalid
bit 3	PDO Length Exceeded
bit 4	Sensors Measurement error
bit 5	Invalid Node-ID or Bit rate
bit 6	RAM error
bit 7	Reserved

Table 4-10 Fault status bits object 2 decode

Parameter index & name : 0x2100:0x02 Eaton Error Status_2	
bit 0	External Current Sensor 1 High
bit 1	External Current Sensor 1 Low
bit 2	External Current Sensor 2 High
bit 3	External Current Sensor 2 Low
bit 4	External Current Sensor 3 High
bit 5	External Current Sensor 3 low
bit 6	External Current Sensor 4 High
bit 7	External Current Sensor 4 Low

Table 4-11 Fault status bits object 3 decode

Parameter index & name : 0x2100:0x03 Eaton Error Status_3	
bit 0	Supply Voltage High
bit 1	Supply Voltage Low
bit 2	Internal 5V Dig High
bit 3	Internal 5V Dig Low
bit 4	Internal 1.5V High
bit 5	Internal 1.5V Low
bit 6	Internal 2.5V High
bit 7	Internal 2.5V Low

Table 4-12 Fault status bits object 4 decode

Parameter index & name : 0x2100:0x04 Eaton Error Status_4	
bit 0	Hydraulic Port P Temperature High
bit 1	Hydraulic Port P Temperature Low
bit 2	PCB Temperature High
bit 3	PCB Temperature Low
bit 4	Spool Not In Failsafe Position
bit 5	LVDT Primary Error
bit 6	LVDT Secondary A Error
bit 7	LVDT Secondary B Error

Table 4-13 Fault status bits object 5 decode

Parameter index & name : 0x2100:0x05 Eaton Error Status_5	
bit 0	CAN Bit 1 Error
bit 1	CAN Tx Bus Off
bit 2	CAN Tx Bus Passive
bit 3	CAN CRC Error
bit 4	CAN Tx Overflow
bit 5	TPDO Outside Window
bit 6	Heartbeat Consumer
bit 7	SYNC Timeout

Table 4-14 Fault status bits object 6 decode

Parameter index & name : 0x2100:0x06 Eaton Error Status_6	
bit 0	Spool Position High
bit 1	Spool Position Low
bit 2	Solenoid Coil A current High
bit 3	Solenoid Coil A current Low
bit 4	Solenoid Coil B current High
bit 5	Solenoid Coil B current Low
bit 6	Internal 5V Analog High
bit 7	Internal 5V Analog Low

Table 4-15 Fault status bits object 7 decode

Parameter index & name : 0x2100:0x07 Eaton Error Status_7	
bit 0	Port A Pressure High
bit 1	Port A Pressure Low
bit 2	Port B Pressure High
bit 3	Port B Pressure Low
bit 4	Port P Pressure High
bit 5	Port P Pressure Low
bit 6	Port T Pressure High
bit 7	Port T Pressure Low

Table 4-16 Fault status bits object 8 decode

Parameter index & name : 0x2100:0x08 Eaton Error Status_8	
bit 0	Rx PDO Length Error
bit 1	Rx message Length Error
bit 2	Rx NMT Command Error
bit 3	Rx message Inhibit Error
bit 4	CAN Frame Error
bit 5	SYNC Early
bit 6	Lifeguard Error
bit 7	Watchdog reset

Table 4-17 Fault status bits object 9 decode

Parameter index & name : 0x2100:0x09 Eaton Error Status_9	
bit 0	User specified limit exceeded: Current Sensor Input 1
bit 1	User specified limit exceeded: Current Sensor Input 2
bit 2	User specified limit exceeded: Current Sensor Input 3
bit 3	User specified limit exceeded: Current Sensor Input 4
bit 4	User specified limit exceeded: Bus Input
bit 5	User specified limit exceeded: Cmd Input
bit 6	User specified limit exceeded: SSI Input
bit 7	User specified limit exceeded: Bus 2 Input

Table 4-18 Fault status bits object 10 decode

Parameter index & name : 0x2100:0x0A Eaton Error Status_10	
bit 0	User specified limit exceeded: Speed 1 Input
bit 1	User specified limit exceeded: Speed 2 Input
bit 2	User specified limit exceeded: Port A Pressure
bit 3	User specified limit exceeded: Port T Pressure
bit 4	User specified limit exceeded: Port P Pressure
bit 5	User specified limit exceeded: Port B Pressure
bit 6	User specified limit exceeded: PCB Temperature
bit 7	User specified limit exceeded: Hyd Port P Temperature

4.16.8 User's Diagnostics

Users can set custom threshold monitoring limits and fault behavior for many of the sensor diagnostics within the AxisPro. Custom max and min limits that the user chooses are specified instead of the limits of device malfunction/damage provided by the standard diagnostics. These limits may be configured using the OD Configurator when Diagnostics->User Setup section is selected. Individual sensor diagnostics may be enabled or disabled via the User's Diagnostics Enables bitfield (@ 0x2001 sub 9) where each bit represents a single sensor diagnostic.

The user's diagnostics feature of the AxisProuses the scaled sensor values per the first 14 DS408 Actual Value Conditioning (AVC) for Drive Interfaces with addition of two temperature sensors (if available). Thus, high and low thresholds can be specified in configured units of pressure, temperature, position, etc…

Example:

System requires valve shutdown when pressure exceeds 200 Bar as sensed on external current input 1.

External current input 1 is configured per DS408 AVC to be a type 2 (pressure) sensor with related parameters configured appropriately. (External current input 1 is enumerated as DS408 Drive Interface 1. See: Actual Value Conditioning)

The user's input 1 Max value is set to 2,000 deciBar and the associated criticality is set to Criticality_Shutdown (level 5). The diagnostic is enabled by setting bit 0 of the User's Diagnostics Enables (@ 0x2001 sub 9).

The converted AVC value for input 1 is used to compare with the user min/max limits.

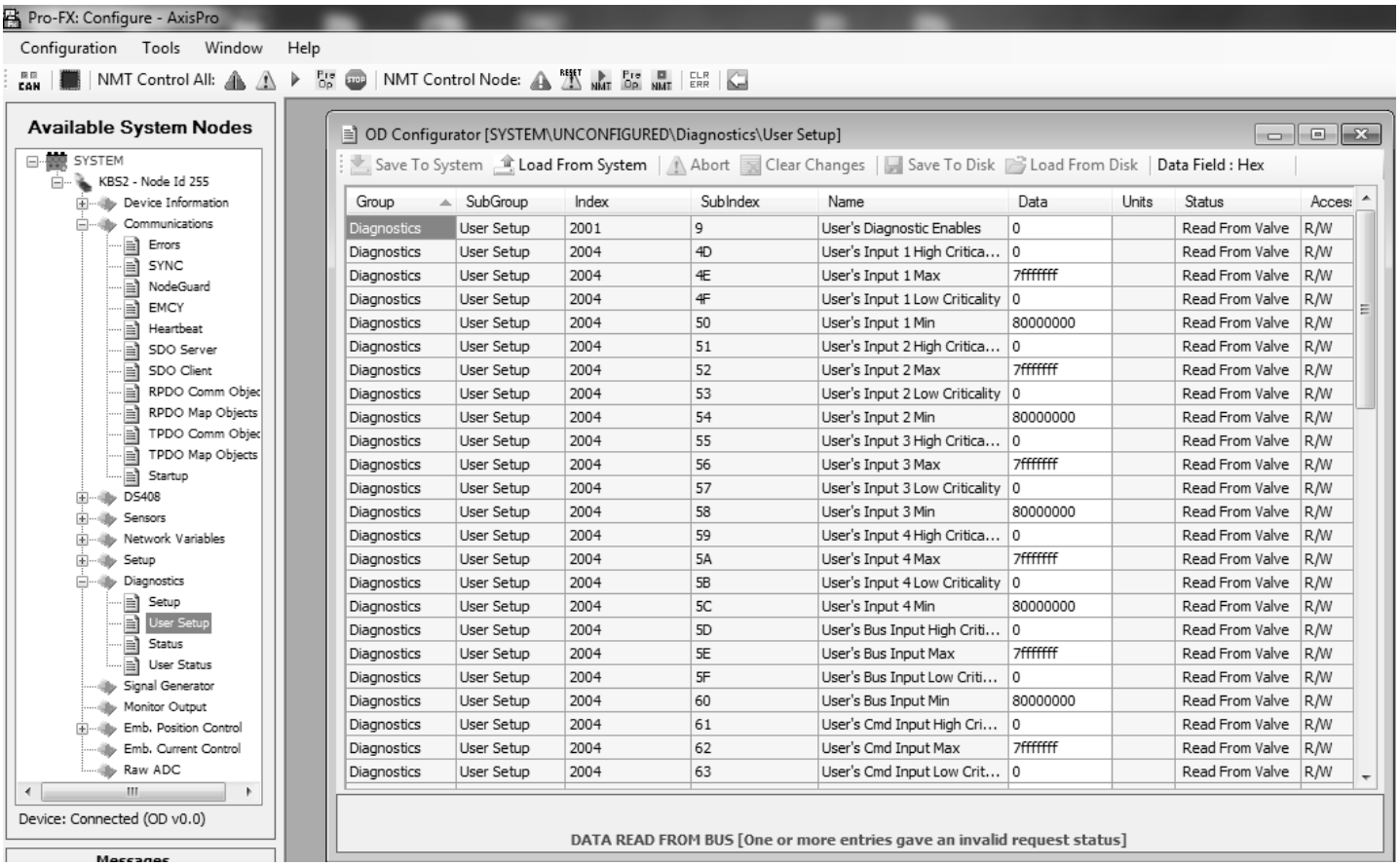


Fig. 4.65

4.16.9 User's Fault Level

Object 0x2004 sub0x4A indicates the current user's fault status level. The fault status level indicates the highest criticality of all active faults. If the value is non-zero at least one fault of the level indicated was triggered. Fault levels of 4 or 5 will continue to be indicated until the device status exits fault mode. See Criticality Definitions.

4.16.10 User's Fault Status Word:

Object 0x2004 sub0x4B is a 16bit word with each bit representing a fault status for each sensor mirroring the enables per the User's Diagnostic Enables object (@ 0x2001 sub 9). If a bit value is 1 that means fault has occurred, else no fault for that diagnostic.

bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
IN1	IN2	IN3	IN4	USR_BUS	CMD_INPUT	USR_SSI	USR_BUS2

- IN1 : AVC for external current sensor 1 high or low limit crossed (Drive AVC interface 1)
- IN2 : AVC for external current sensor 2 high or low limit crossed (Drive AVC interface 2)
- IN3 : AVC for external current sensor 3 high or low limit crossed (Drive AVC interface 3)
- IN4 : AVC for external current sensor 4 high or low limit crossed (Drive AVC interface 4)
- USR_BUS: AVC for bus sensor input high or low limit crossed (Drive AVC interface 5)
- CMD_INPUT : AVC for command input high or low limit crossed (Drive AVC interface 6)
- USR_SSI : AVC for SSI sensor high or low limit crossed (Drive AVC interface 7)
- USR_BUS2 : AVC for bus sensor input 2 at port T high or low limit has crossed (Drive AVC interface 8)

bit 8	bit 9	bit 10	bit 11	bit 12	bit 13	bit 14	bit 15
SPEED1	SPEED2	PRESS_A	PRESS_T	PRESS_P	PRESS_B	TEMP_PCB	TEMP_OIL

- SPEED 1 : AVC for speed 1 sensor high or low limit crossed (Drive AVC interface 9)
- SPEED 2 : AVC for speed 2 sensor high or low limit crossed (Drive AVC interface 10)
- PRESS_A : AVC for pressure sensor at port A high or low limit crossed (Drive AVC interface 11)
- PRESS_T : AVC for pressure sensor at port T high or low limit crossed (Drive AVC interface 12)
- PRESS_P : AVC for pressure sensor at port P high or low limit crossed (Drive AVC interface 13)
- PRESS_B : AVC for pressure sensor at port B high or low limit crossed (Drive AVC interface 14)
- TEMP_PCB : Temperature on PCB high or low limit crossed
- TEMP_OIL : Temperature of oil high or low limit crossed (KBS3 or KBS4 models only)

4.16.11 Stored User's Fault Status word:

Object 0x2004 sub0x4C is a copy of the User's Fault Status word stored in non-volatile EEPROM memory to preserve fault indications across power cycles. The stored value may be cleared to begin tracking new faults at any time.

5. Device Control:

The AxisPro valves comply with DS408 standard. As per below digital state machine device operation can be controller each of that state is digitally controlled through the control word & status word.

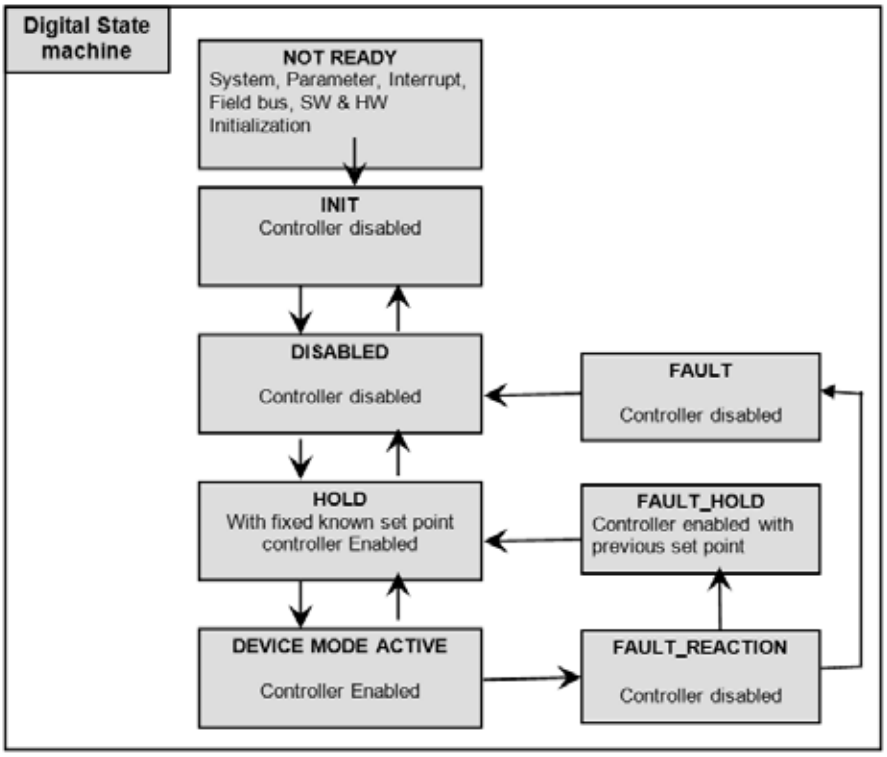


Fig. 4.65

5.1.1 Device status word

The status word will send on CAN bus to inform master about present state of device. AxisPro valves comply with DS408 standard. As per above digital state machine device operation can be controller each of that state is digitally controlled through the control word and status word. This object is present in object dictionary having index 0x6040 Subindex 0x00.

COB-ID	DLC	D1	D2	D3	D4
0x180 + NodeID	0x04	Status word	Actual feedback value		

Status word	State
0x00	Not Ready
0x08	Initialization
0x09	Disabled
0x0F	Active
0x07	Fault Reaction
0x03	Fault Hold Reaction
0x01	Fault

5.1.2 Device Control Word

The control word will send on CAN bus by master to control the device. The device can be transitioned to different state by sending the specific control word, each bit of word represent specific operation. First four bits represents the device control command such DISABLED, HOLD, ACTIVE the meaning of each bit mentioned in below table.. This object is present in object dictionary having index 0x6040 Subindex 0x00.

For details transition of device please refer the DS408 document.

COB-ID	DLC	D1	D2	D3	D4
0x200 + NodeID	0x04	Control word	Set point		

Control Word Structure:

	Byte 1								Byte 0							
Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Bits	Control bit	meaning
0	Disabled	These bits used for State transition
1	Hold	
2	Active	
3	Reset Fault	Clear the fault by toggling the bit
4..7	Reserved	
8	DPQ mode switching	Pressure control enable =1 Pressure control disable =0
9..15	Reserved	

5.1.3 Analog State Machine:

In this state machine status word and control word is not available after power on it will directly enter into the active mode but external Enable pin (Analog voltage) provided to disable or enable the device. It contains only four states Active, Disable and Fault. The object Device local having index 0x6042 Subindex 0x00 is used to put valve in Local mode this would make the analog state machine where the set point configured for analog input so any control word through bus will be ignored.

6. Pro-Fx: Control with the AxisPro

6.1. Installing a Device.

6.1.1.1. Introduction

Installation and uninstalling of devices can be done in the Device Repository dialog. The installation bases on device description files in xml-format. Currently the default name for a valid device description file for KBS Valve is AxisPro_KBS4. devdesc.xml.

6.1.1.2. Installation

The device is selected while creating a new project. The default device selected would be AxisPro KBS4 Valve (Eaton).

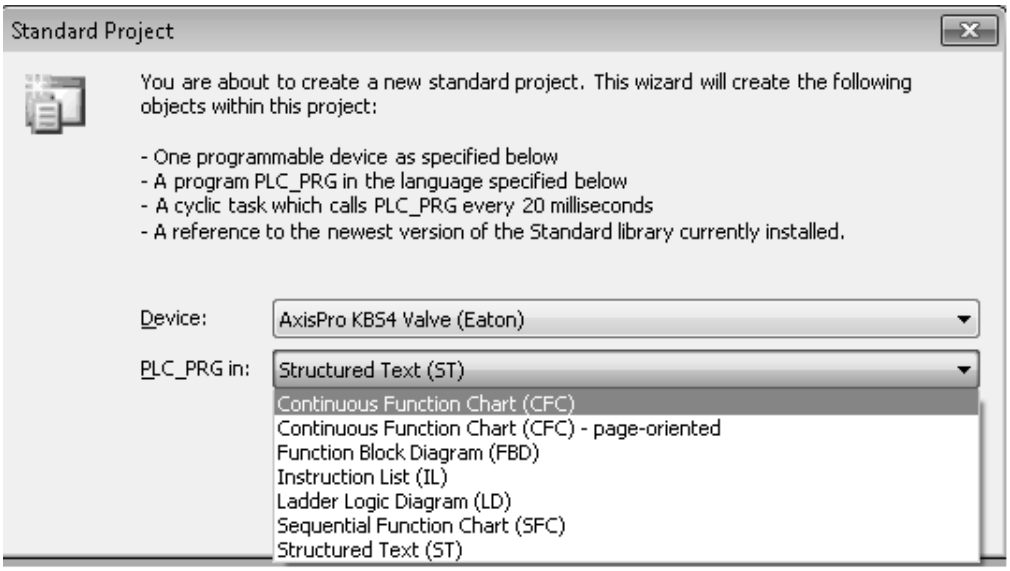


Fig. 5.2

The installation of device as well as the definition of device folders (repositories) is done by the Device Repository dialog and can be opened by the respective command in the menu bar (by default in the 'Tools' menu). 'Device Repository...' handles device locations and installing and uninstalling of device.

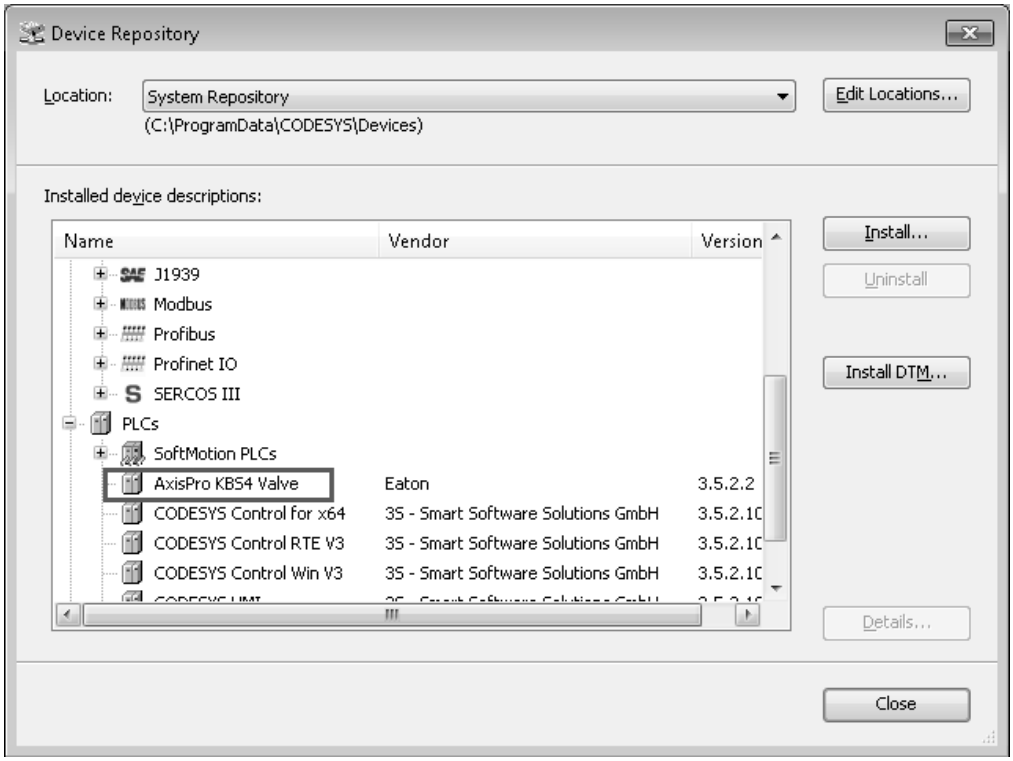


Fig. 5.3

6.2.1. Introduction

The Library Manager is used for including and handling libraries in a project. The installation of libraries as well as the definition of library folders (repositories) is done by the Library Repository dialog which is also a component of the Library Manager and can be opened by the respective command in the menu bar (by default in the 'Tools' menu) or in the editor window.

6.2.2. Installation

The library standard library (3.4.1.0) and IO standard (3.4.2.0) are installed by default. The standard library contains all functions and function blocks which are required according to the IEC61131-3 standard as default POUs for an IEC programming system.

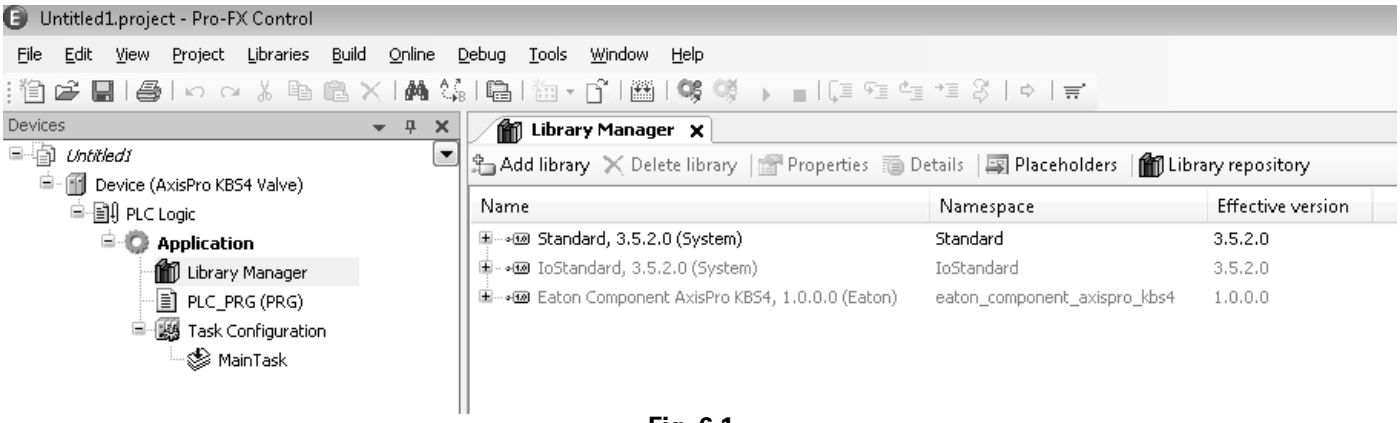


Fig. 6.1

The 'Library Manager' has an option to open the 'Library Repository...'. The Library Repository handles library locations and installing and uninstalling of libraries.

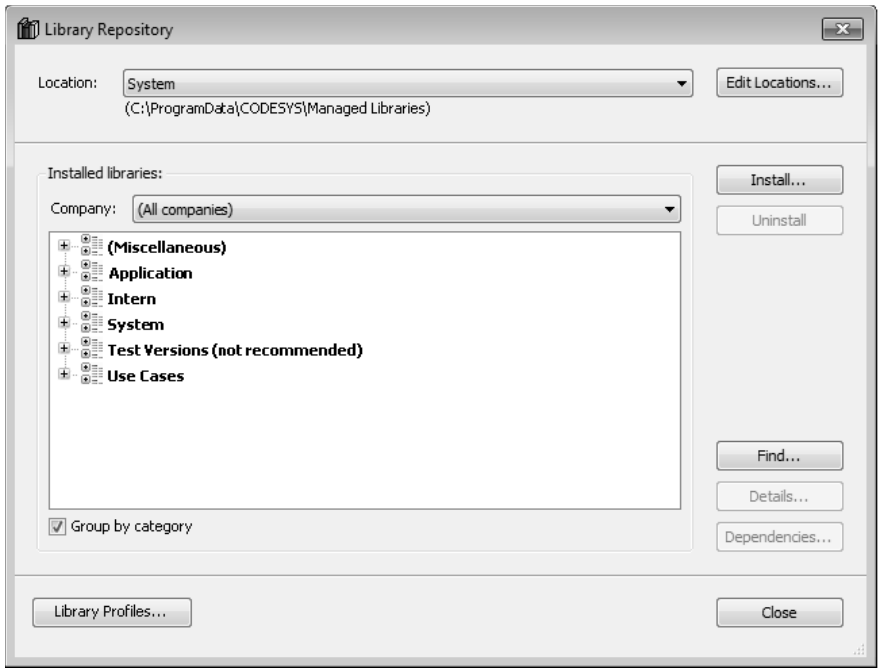


Fig. 6.2

The Library Manager is part of the default 'Tools' menu.

6.3. Communications

6.3.1. Configure Device

6.3.1.1. Introduction

The Device Node-ID and baudrate for CoDeSys Master channel can be configured using Pro-Fx configure Eaton tool. Refer the Pro-Fx configure manual for configuring parameters and saving them to system.

6.3.1.2. Configure Node-ID

The default configured node-id is 10. The Device node ID is configurable between values 0-127 using the Pro-Fx configure Eaton tool. To configure the node-id browse the device tree of Pro-Fx configure tool to object 2103 subindex 0. Configure the parameter to desired value and save the value to system. Reset the device for node-id to be effective.

6.3.1.3. Configure Baudrate

The default configured Baudrate is 125Kbps. The Device baudrate is configurable using the Pro-Fx configure Eaton tool. Following are the baud rate values can be set: 10000, 20000, 50000, 100000, 125000, 250000, 500000, 800000 and 1000000. The unit is bits/s, whereby in the configuration data the baud rate will be stored in KBit/s. To configure the node-id browse the device tree of Pro-Fx configure tool to object 2104 subindex 0. Configure the parameter to desired value and save the value to system. Reset the device for baudrate to be effective.

6.3.2. Configure CANbus

6.3.2.1. Configure Network

Number of the CAN network to be connected via the CANbus interface. Values from 0 to 100 can be entered. Since the Device support only one CAN Network the value of this should always be zero.

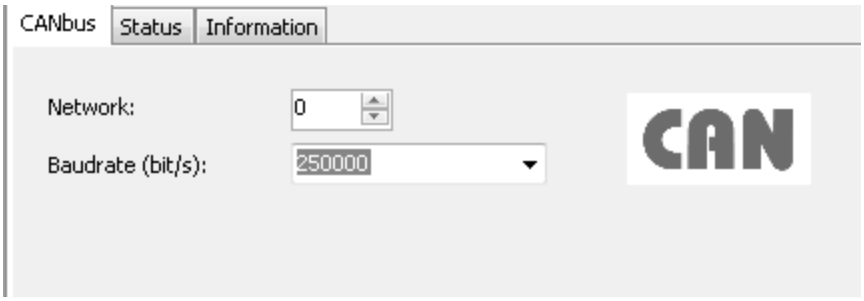


Fig. 6.3

6.3.2.2. Configure Baudrate

Baud rate for the data transfer on the bus. The default value is read from the description file (*.devdesc) of the CANbus device. The following baud rate values can be set: 10000, 20000, 50000, 100000, 125000, 250000, 500000, 800000 and 1000000. The unit is bits/s, whereby in the configuration data the baud rate will be stored in KBit/s.

6.3.3. Gateway

6.3.3.1. Introduction

After a CoDeSys standard installation, at Windows system start the Gateway Server will be started automatically as a service. In addition, and also automatically, a separate application (GatewaySysTray) will be started, providing the gateway symbol in the system

The gateway symbol indicates whether the gateway service is stopped ( ) or running ( ).

The gateway men contains commands for explicit starting and stopping the gateway service as well as command "Exit Gateway Control" for terminating the GatewaySysTray application (not however the gateway service). The GatewaySysTray application also might be started via the Programs menu.

Note: The Windows firewall should be deactivated for the gateway system application. If the gateway service is running ( ), other programs (e.g. Pro-Fx: Configure) may not be able to access the same interfaces that would be used by the Gateway service (e.g. PCAN USB adapter.)

6.3.4. Configuration of Gateway

The CAN block driver itself is just configurable with the Gateway.cfg file at the moment and not with the dialog but you can select the CAN communication gateway by selecting the 'BlkDrvCanClient' on router tab. In order to configure the baudrate you need to edit the parameters 0.Baudrate=xxx in gateway.cfg file. The gateway.cfg file can be found in the installed directory folder i.e. "installed directory\EATON\Pro-Fx\Control\GatewayPLC\". The Gateway can be configured for CAN.

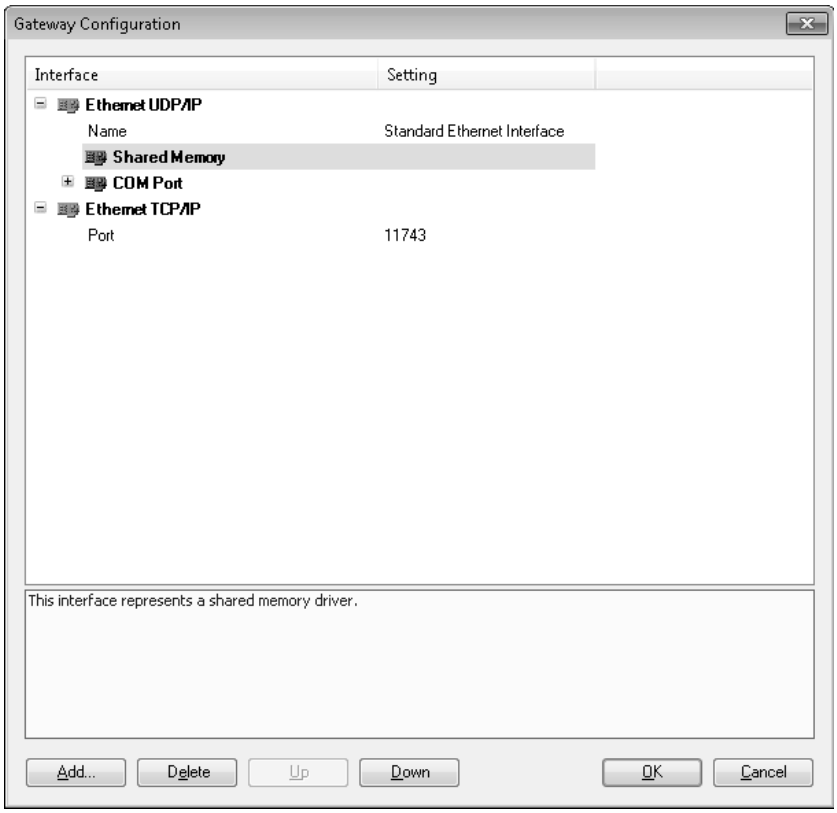


Fig. 6.4

Note: Unresolved Driver reference warning is a known bug in the gateway configuration dialog.

6.4. Create a Project

6.4.1. New Project

1 Start Pro-Fx: Control

2 Create a project

   a. In the New Project dialog select Standard project in the Templates field and enter a Name and a Location path for the project file. Press OK to confirm.

   b. Choose device 'AxisPro KBS4 Valve' and programming language PLC_PRG. Confirm with OK

   c. The POU windows contains the project setting

   d. View the hardware components in a dialog and to enable the user to directly map them in the device tree in the project

3 Write an AxisPro Device program

   a. Declare variables in PLC_PRG

   b. Enter programming code in the body of PLC_PRG

   c. Gateway Server and AxisPro KBS4 device started

   d. Set the "Active Application"

      i. Click on the Scan network to find KBS4 valve connect to CAN network

      ii. Right click on the detected KBS4 value and set it as active application (Please refer the below images)

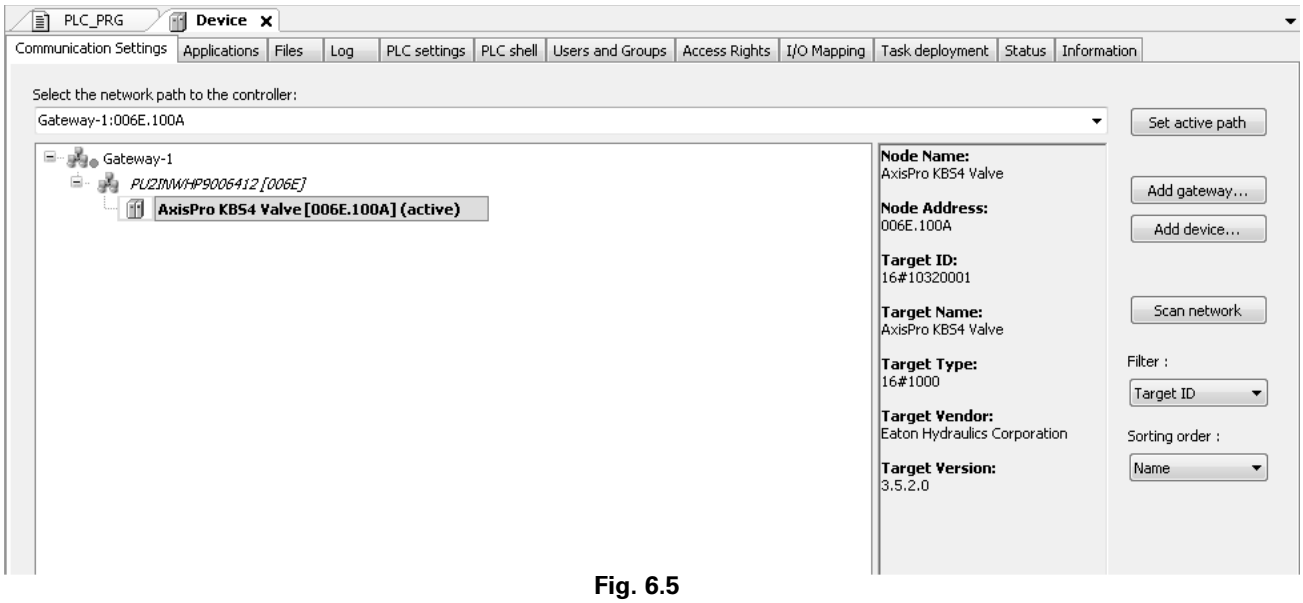


Fig. 6.5

e. Configure a communication channel to the AxisPro KBS4 device

   i. Right click on the gateway selected

   ii. Select Connect to local gateway to configure the CAN communication channel (Refer section 5 for more details)

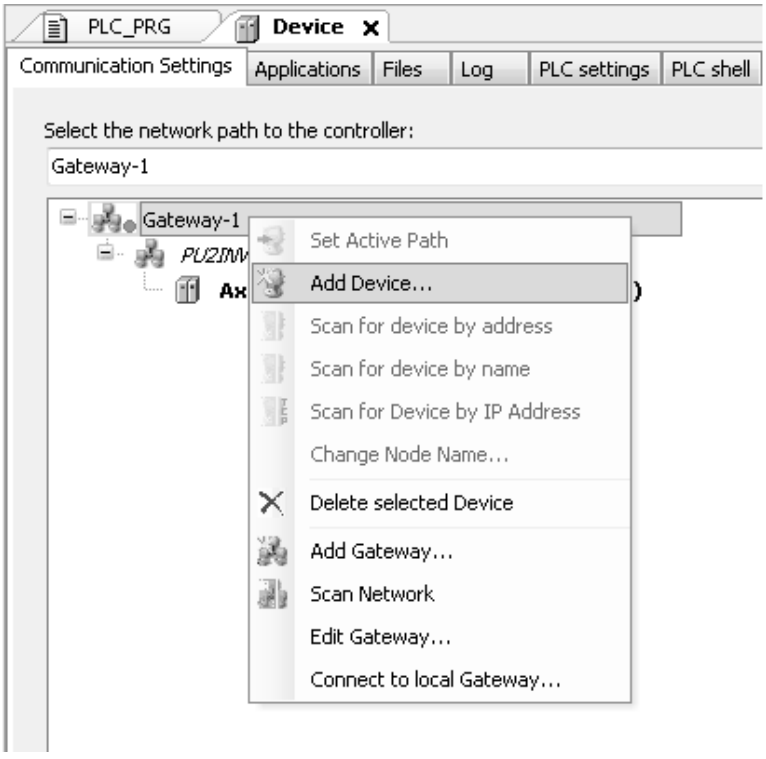


Fig. 6.6

f. Compile and load application to the AxisPro KBS4 device

   i. Click the Build item Tool menu and select Build/Rebuild to build the application or press F11 to build the application

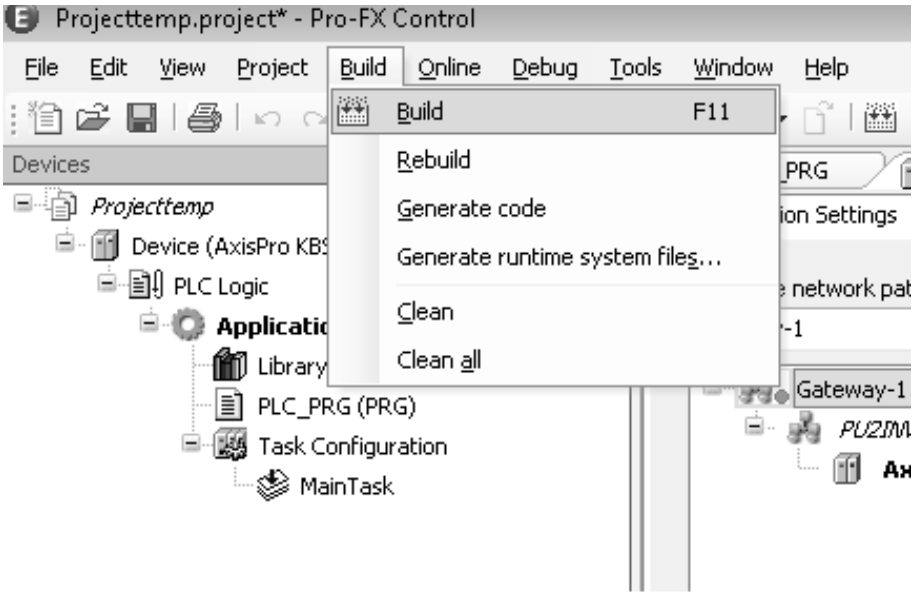


Fig. 6.7

ii. After a successful build select the login button from online tool menu item to login or Press Alt + F8. This will load the application into the device

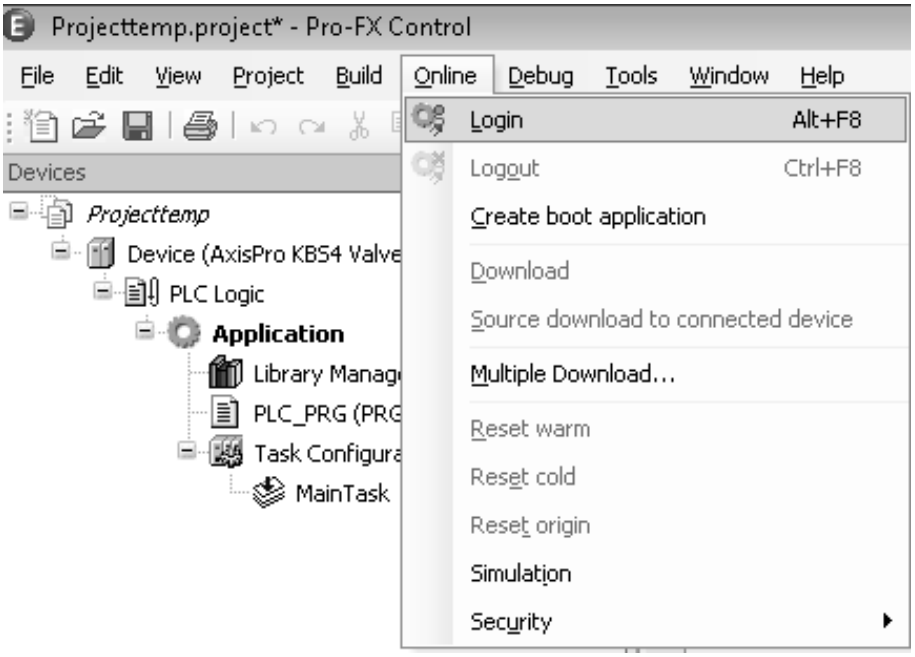


Fig. 6.8

g. Start and monitor application

i. After application download click on the start button menu option item of the debug toolbar menu to start and monitor the application or press F5

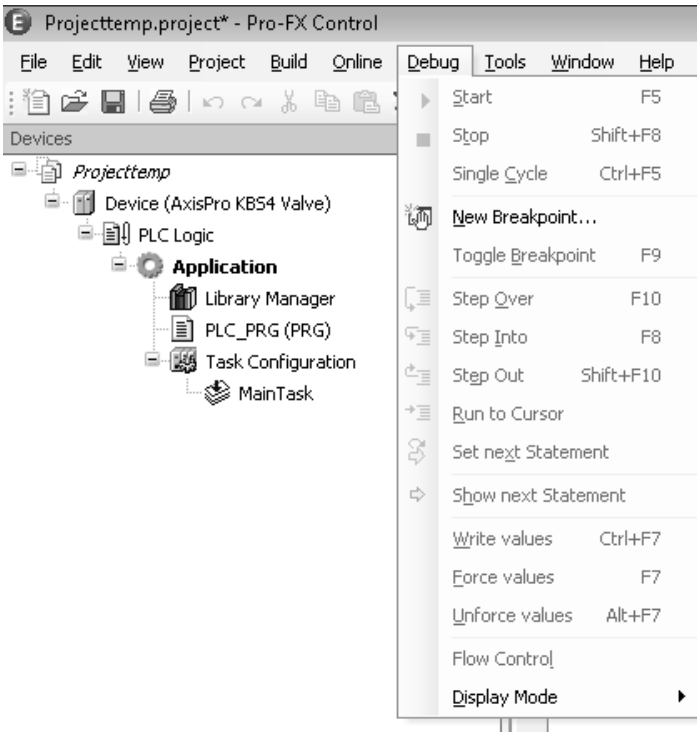


Fig. 6.9

h. Set breakpoint and step through the program

i. New breakpoint can be added to new breakpoint item selected from Debug menu. You can also use F9 to toggle the breakpoint.(refer section 5.2 for more details)

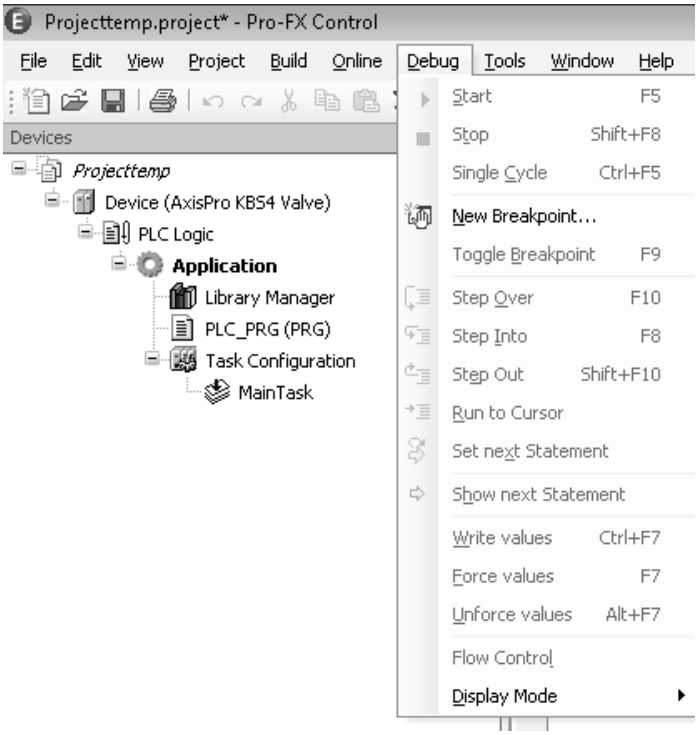


Fig. 6.10

6.4.2. Debug

To evaluate programming errors you can use the debugging functionality in online mode. Breakpoints can be set at certain positions to force an execution break.

Symbols:

- Breakpoint enabled
- Breakpoint disabled
- Halt on breakpoint in online mode

Step into example:

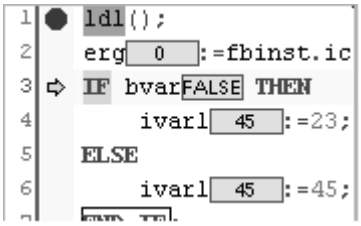


Fig. 6.11

Shown in this example is the break-and-step method of debugging. A breakpoint was set and enabled at line 1 of a program. The program was run in online mode. The breakpoint triggered, halting execution, when execution progressed to line 1. The user then issued the "step into" command twice, causing the program to execute line 1 and line 2, preceding the arrow at line 3. Line 3 will be executed on the next "step into" command or by the "start" command. The values of program variables are visible in boxes while debugging in online mode.

6.4.3 Monitor

In online mode there are various possibilities to display/ monitor the current values of the watch expressions of an object on the AxisPro KBS4 device:

- Inline monitoring in the implementation editor of an object.
- Online view of the declaration editor of an object.

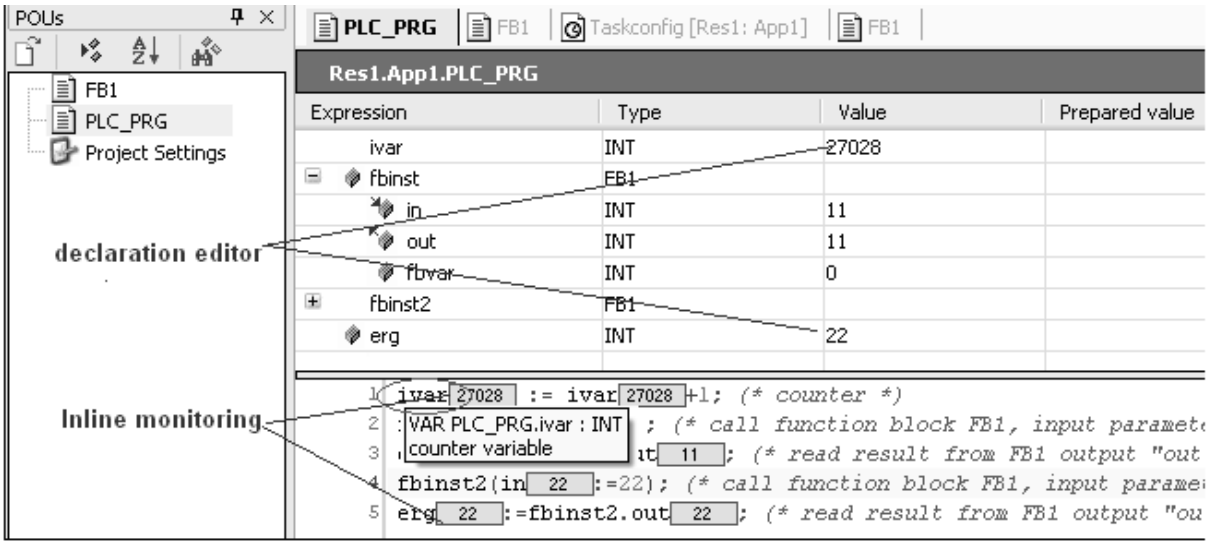


Fig. 6.12

- Object-independent watch lists.

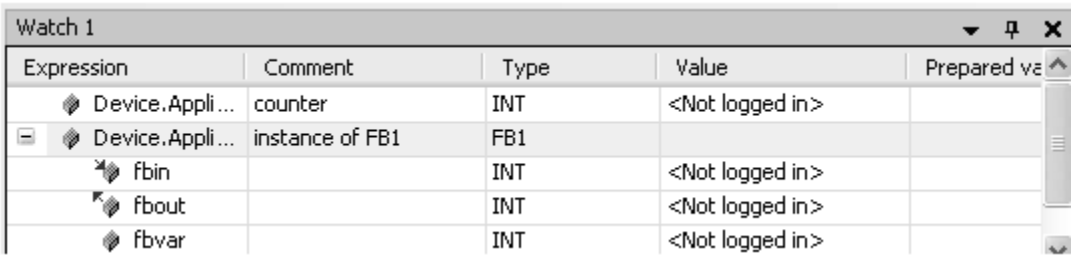


Fig. 6.13

6.5 Connectors

6.5.1 Introduction

Connectors form the connections between devices and have their own configuration data in the form of a parameter set. So a device is fully described with a single child connector, one or more parent connectors and a set of so-called parameters for each connector. Parameters hold the information to configure a connector (e.g. baudrate of a CANOpen master connector).

6.5.2 CANOpen Connectors

6.5.2.1 CANbus

6.5.2.1.1 Introduction

The CANbus node object is the obligatory top level entry of a CANbus Configuration in the device tree.

6.5.2.1.2 Configuration

1. The CANbus is selected by mapping the CANbus hardware in the devices tree. The device tree pop menu is activated on right click on Device tree and selecting the "Add Device…" menu item.

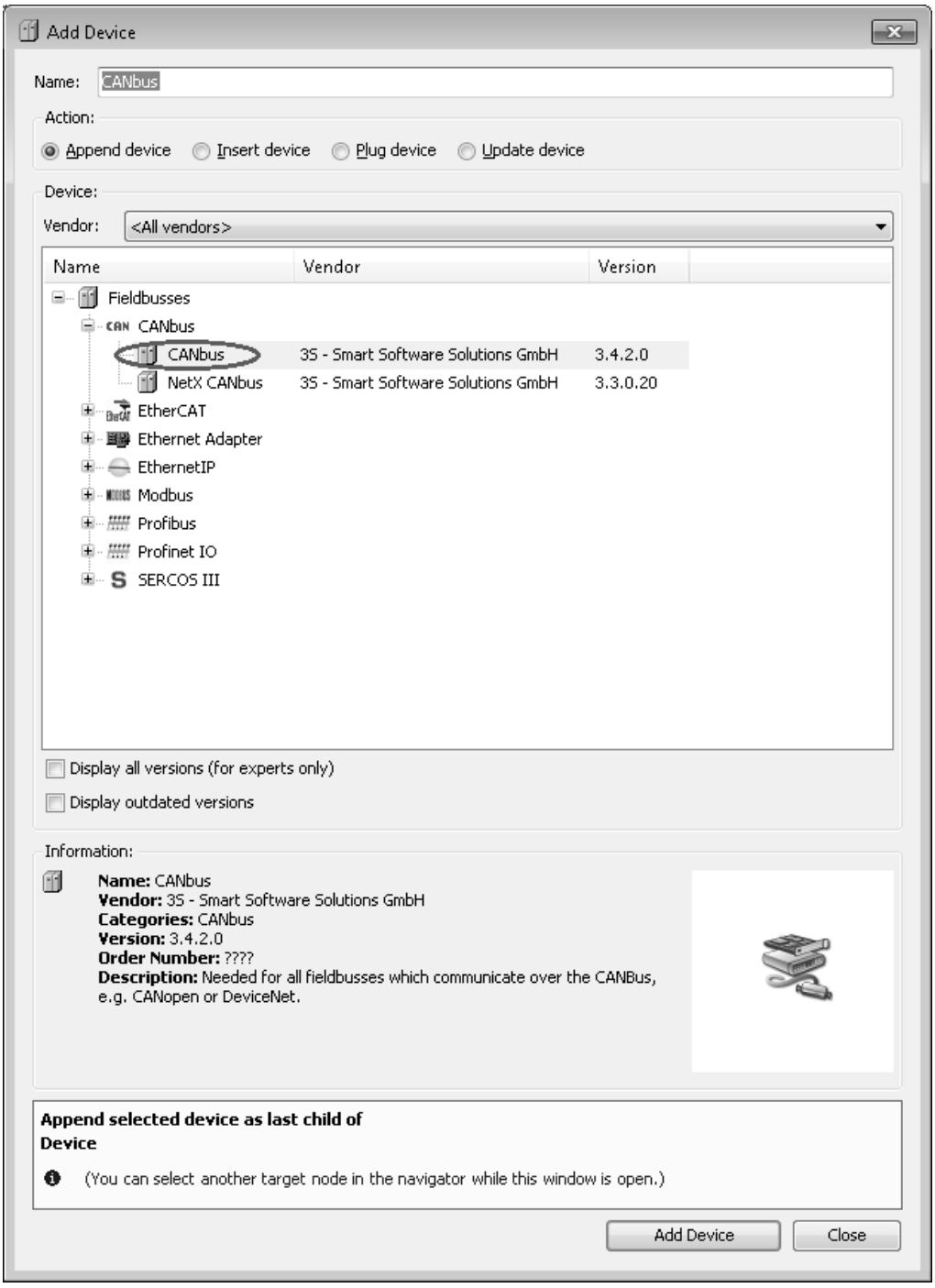


Fig. 6.14

2. The CANbus is selected by mapping the CANbus hardware in the devices tree. The device tree pop menu is activated on right click on Device tree and selecting the "Add Device…" menu item.

a. Configure the Network address (this should be always set to zero since the device support only one network) of the CANbus tab.

b. Configure the baudrate on the CANbus tab.

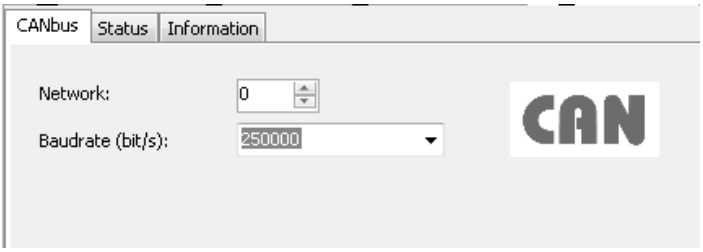


Fig 6.15

Note: the device baudrate, Gateway baudrate and CANbus baudrate should be configured will the same baudrate or else the application might not communicate with the device or vice versa.

6.5.2.2 CANOpen Manager

6.5.2.2.1 Introduction

The CANopen Manager is an obligatory node below the CANbus node in a □ CANbus configuration. It is supporting the CANbus configuration by internal functions, thus usually serving as the CANbus master.

6.5.2.2.2 Add CANOpen Manager

1. To add CANOpen Manager module right on the CANbus on device tree(Add CANbus hardware to device list if it is not added refer 6.3), The device tree pop menu is activated on right click on CANBus hardware and selecting the "Add Device…" menu item. A popup menu is activated select added device. Browse to CANOpenManager select the CANOpen_Manager to add to project.

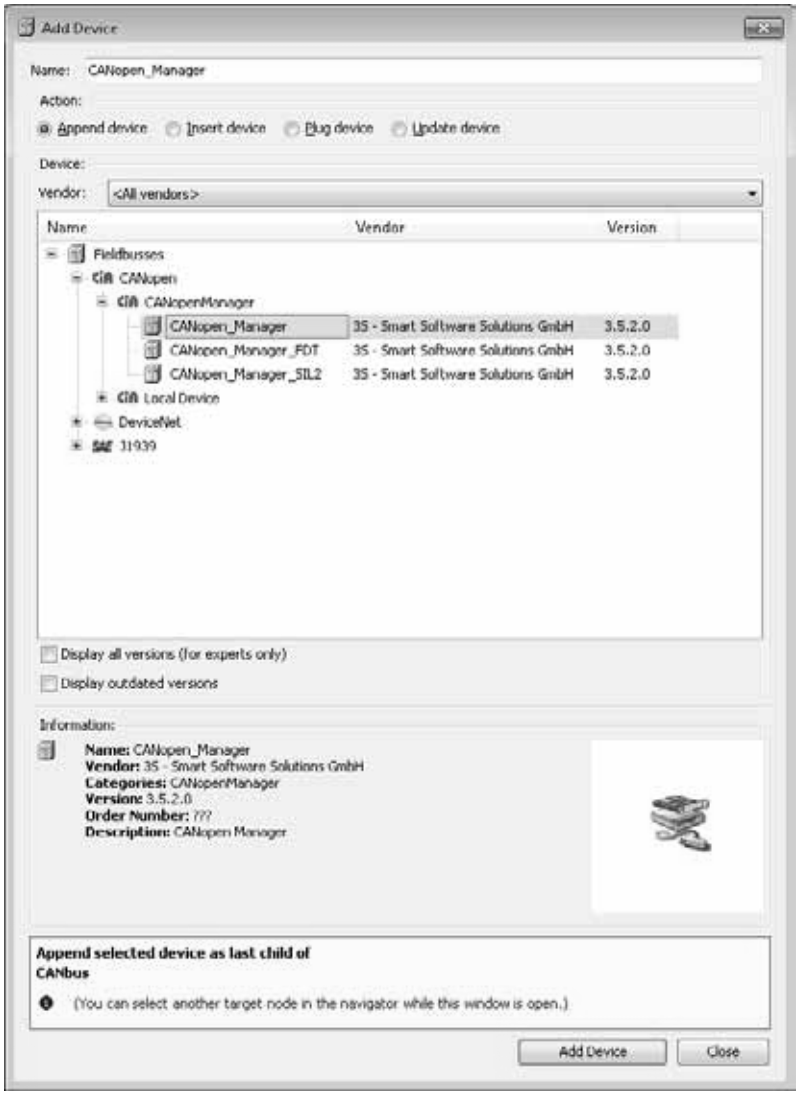


Fig 6.16

6.5.2.2.3 Configure CANOpen Manager

CANOpen Manager Tab

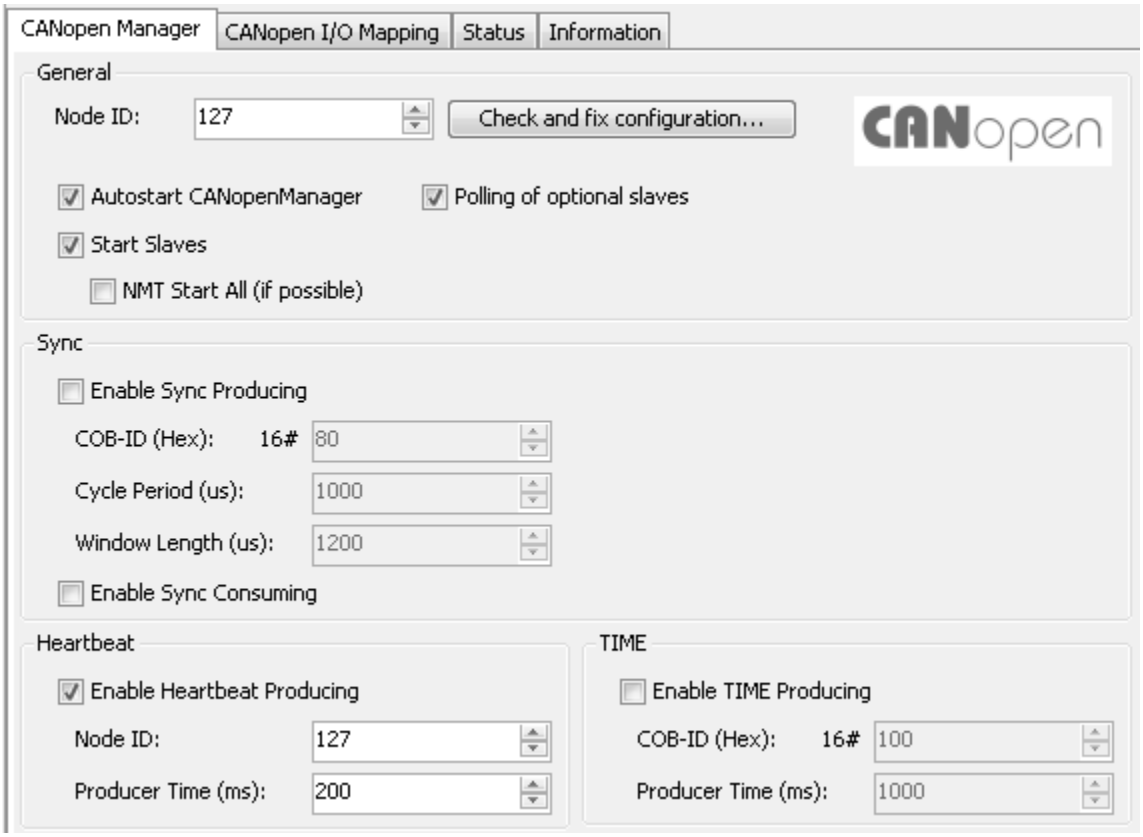


Fig 6.17

1. Sync:

Enable Sync generation: If this option is enabled (default: disabled), the transmission on the bus will be synchronized and the following defaults can be set:

Sync cycle period (µs): Interval in microseconds in which the synchronization message will be sent. Possible values: [100, 232-1].

Sync COB-ID: Communication Object Identifier, which identifies the synchronization message. Possible values: [1, 2047].

Synchronous window length (µs): Contains the length of the time window for synchronous PDOs in microseconds: [1,232-1] or 0 if not used.

The synchronous PDO's will be transmitted directly after the synchronisation message.

Enable Sync consuming: If this option is enabled (default: disabled), another device will generate the synchronization messages that the CANopen manager will receive.

2. Heartbeat

Working with Heartbeats is an alternative guarding mechanism: In contrast to the Node guarding functionality it can be executed by Master- and Slave-Modules. Usually the master will be configured to send heartbeats to the slaves.

Enable heartbeat generation: If this option is activated, the master will send heartbeats according to the interval defined in "Heartbeat time". If new slaves with heartbeat functionality are added, their heartbeat behavior will automatically be enabled and configured appropriately, that is, the node-ID is identical to the setting in the manager configuration, whereas the heartbeat interval gets multiplied by the factor 1.2. If heartbeat generation of the CANopen manager is not enabled, then node guarding is enabled instead for the slave (with life time factor 10 and a guard time of 100ms). Notice that the CANopen (slave) devices might be configured as heartbeat producer.

Node ID: Unique identifier of the heartbeat producer (1 - 127) on the bus.

Heartbeat time (ms): Interval of heartbeats in milliseconds.

6.5.2.3 CANOpen Remote Device

6.5.2.3.1 Introduction

The CANOpen Remote device are devices which the master communicates on the network.

6.5.2.3.2 Add CANOpen Remote Device

To add a CANopen remote device, the EDS file of the Device has to be installed first to Device repository of the CoDeSys system. Once the Files are installed they can be easily by added right click on CoDeSys_Manager and Select "Add device" menu item. Select the desired device from device list to add as remote device under CANOpen_Manager.

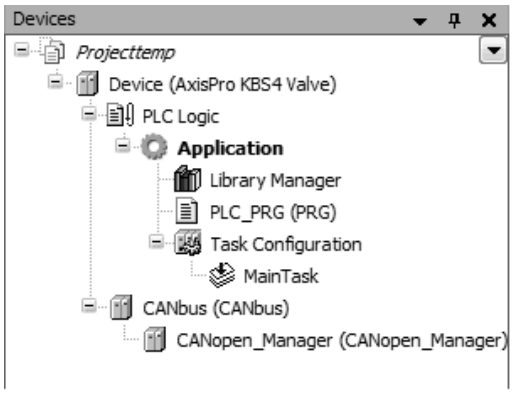


Fig 6.18

6.5.2.3.3 Configure CANOpen Remote Device

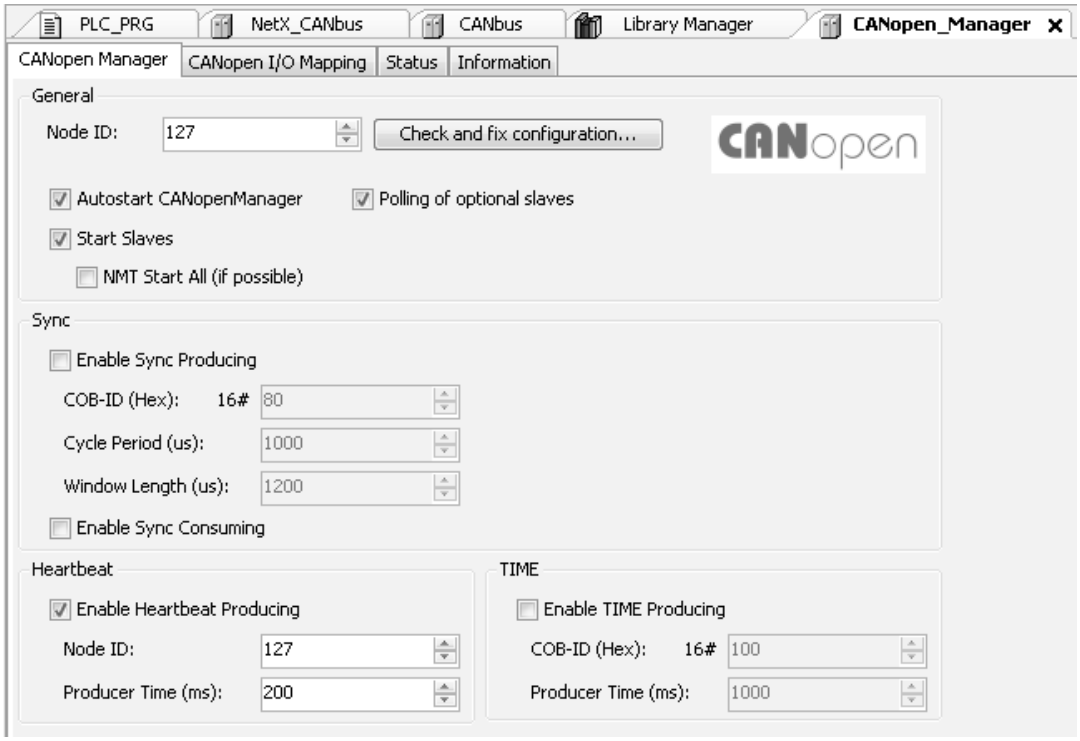


Fig 6.19

General:

Autoconfig PDO Mapping: If this option is activated (which is strongly recommended for standard applications!), the PDO Mapping (dialogs □ Receive PDO Mapping and □ Send PDO Mapping) will be generated automatically basing on the definition given by the device description file and cannot be modified in the Mapping dialogs. This option is not available for non-modular devices.

Node ID: The Node ID serves to identify the CAN module uniquely and corresponds to the set number on the module itself which is between 1 and 127. The Id must be entered as a decimal number.

Create all SDO's: All objects independent on the fact the default value has been changed or not will be downloaded to the PLC.

Factory settings: It depends on the content of the device description file, if this option is available. If so, the option is activated by default. It causes a reset of the CANopen communication parameters of the slaves to their defaults before downloading the configuration. It depends on the device, which parameters can be reset at all, and the particular configuration is done by choosing a subindex from the selection list next to the option box. For example per default via subindex 2 (1000h to 1FFFh, object 1011h) the CANopen communication settings are addressed.

Optional device: If this option is activated (availability in dialog is target dependent), the master only once will try to read from this node. Then the node, if not answering, will be ignored, that is the master will return to normal operation mode.

No initialization: If this option is activated (availability in dialog is target dependent), the master immediately will activate the node, without sending configuration SDOs. (The SDO data nevertheless will be created and saved on the controller.)

Node Guard:

Enable Node guarding: If this option is activated, a message will be sent to the module according to the Guard Time interval (milliseconds, 100 by default). If the module does not then send a message with the given Guard COB-ID (Communication Object Identifier), it will receive the status 'timeout'. As soon as the number of attempts (Life Time Factor, 10 by default if there are no other default settings within the device configuration file or if this default setting equals 0) has been reached, the module will receive the status "not OK". The status of the module will be stored at the diagnosis address. No monitoring of the module will occur if the variables Guard Time and Life Time Factor are not defined (0).

Emergency:

Enable Emergency: If this option is enabled, a module will send an emergency message with an unique COB-ID, as soon as an internal error is detected. These messages, which vary from module to module, are stored in the diagnosis address

Heartbeat:

Enable Heartbeat Generation: If this option is activated, the module will send heartbeats according to the interval defined in Heartbeat Producer Time (ms, 10 by default if there are no other default settings within the device configuration file or if this default setting equals 0).

Change Properties Heartbeat Consumer: This button opens a dialog where the nodes defined in the EDS-file are listed and can be selected for getting guarded. For this purpose set a check in the Enable field and enter the desired value in milliseconds in the Heartbeat time field (by a double-click on this field you can open a selection box of time values). If the Hearbeat Consumer option is activated, then the respective module will listen to heartbeats which are sent by the master. As soon as no more heartbeats are received, the module will switch off the I/Os.

Note: for more details on CANOpen connector you can refer the Pro-Fx: Control help menu.

6.6. Visualization

6.6.1. Introduction

The data of a controller programmed with CoDeSys can easily be visualized without the need of an additional tool. The Pro-Fx control itself contains an integrated visualization editor and while programming his application the user can develop visualization masks in one and the same user interface. Pro-Fx control supports diagnosis visualization it run the application-assigned visualization(s) only within the programming system without the need of downloading visualization code to the device. The diagnosis visualization mode only supports expressions which can be handled by the monitoring mechanism of the programming system

6.6.2. Add Visualization

1. To add Visualization module right click on the Application on device tree The device tree pop menu is activated, select "Add Object…" from menu item. Browse to menu item and select the Visualization item to add to project.

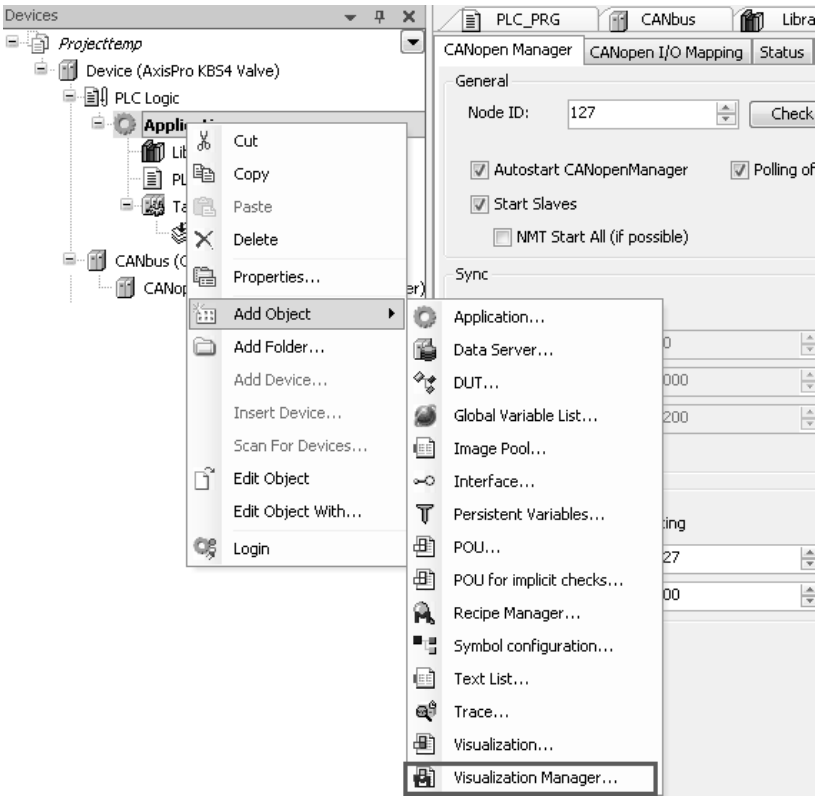


Fig 6.20

2. With Visualization object added visualization manager object is also added to device tree by default. Visualization manager handling common settings for all application-specific visualizations.

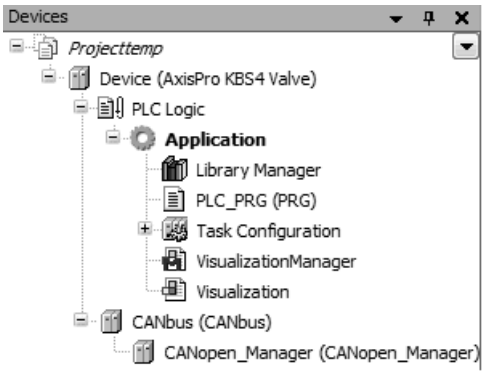


Fig 6.21

6.6.3. Visualization Elements

Following are elements used to design the visualization.

Elements:

- Line, polygon, polyline, curve
- Rectangle, ellipse, rounded rectangle
- Bitmap and vector graphics
- Button, slider, text display
- Reference to other visualizations

Complex Elements:

- Meter instrument, bar chart, histogram
- Tab control
- Alarm handling

Animations (not always for all elements):

- Text display, change colour, visible/invisible
- Shift, rotation, scale
- Offset individual edges of an object (for bar graphs)
- Button active/inactive
- Current line (only text display)

Input (not always for all elements):

- Toggle/tip boolean values and masks
- Text input via keyboard/numpad/keypad or proprietary keys
- Zoom to visualization
- Auxiliary functions (exit visualization, read/write recipe, switch language, call external EXE etc.)
- Shift slider (only slider)
- Choose line (only text display)

Further Characteristics (not always for all elements):

- Switch language
- Tool tips for all elements
- ASCII import/export
- Background bitmap
- Automatic scaling
- Grid functions: align, arrange, group
- Place holder concept for generating complex, graphical elements (templates), as well for libraries
- Programmed visualization expressions
- Changing of all graphical properties during runtime

6.6.4. Visualization Characteristics

Some of the common visualizations characteristics are

1. Each particular visualization element has own Properties like its designated use (“visualization”, “numpad/keypad” or “dialog”) or the display size. This visualization can be created and configured explicitly for being used as user Input dialog. Implicitly also a standard numpad and a keypad mask are available for this purpose. The use of such key pads and dialogs can be defined in the configuration of a visualization element.
2. The Visualization Editor is assisted by a toolbox providing the available visualization elements and a properties editor for the configuration of the inserted elements. The elements are provided via appropriate libraries according to the currently active visualization profile The visualization elements can be easily arranged and grouped. CoDeSys V2.3 visualizations can be imported.
3. The visualization elements can be animated by the direct use of the CoDeSys project variables, or in the form of expressions, that is combined with operators and constants. For example this allows to scale the variables for the usage in the visualization.
4. Language switching (ANSI or UNICODE) within a visualization is possible by use of textlists
5. The variables of an application can be entered (written) or displayed (read) in the visualization in a text field. The formatting of this input and output is based on the standard function sprints (C-Library).
6. External data sources can be used.
7. Each visualization element can be assigned a tooltip.
8. Besides the Zoom function also an automatic scaling (visualization size matches screen size) of the visualization is possible
9. Visualizations can be stored in Libraries and thus be made available for use in other projects.
10. Visual Element Repositories are used to manage the visualization elements and profiles available on the local system.

6.6.5. Visualization Example

Below is visualization example of CANOpen DS408 slave device. Various objects have been used to design this form. Characteristics of each object are being configured to display/ Change the status of the device.

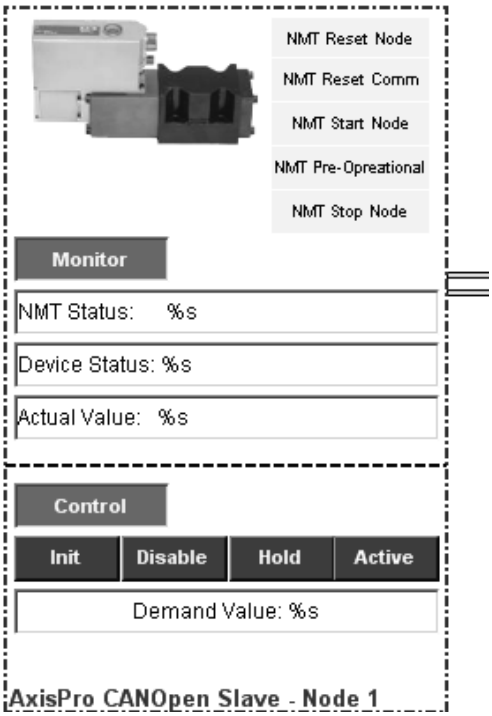


Fig 6.22

References:

1. http://www.3s-software.com/
2. Pro-Fx: Control help
3. For detailed information you can use the Pro-Fx: Control help provided with the installation package. You can select help menu from toolbar menu or just press Ctrl+Shift+F1 or Ctrl+Shift+F2

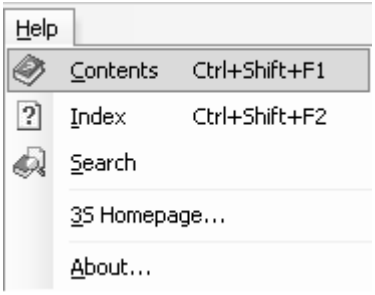


Fig 6.23

References
Topic 7

- CiA Standard, "CAN Physical Layer for Industrial Applications," CAN in Automation Draft Standard 102, Ver 2.0 Apr. 1994.
- CiA Standard, "CANopen Application Layer and Communication Profile," CAN in Automation Draft Standard 301, Ver 4.2 Dec. 2007.
- CiA Standard, "CANopen Electronic Data Sheet Specification," CAN in Automation Draft Standard Proposal 306, Ver 1.1 Jun. 2001.
- CiA Standard, "Device Profile Fluid Power Technology – Proportional Valves and Hydrostatic Transmissions," CAN in Automation Draft Standard 408, Ver 1.5.2 Jan. 2005.
- VDMA Standard, "Profile Fluid Power Technology - Proportional Valves and Hydrostatic Transmissions," VDMA Fluid Power Committee, Ver 1.5, Nov. 2001.

Appendix - Object Dictionary
A

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1	Device Type	1000	0	uint32_t	408	N/A	ro	Device Type
2	Error Register	1001	0	uint8_t	0	N/A	ro	error register
3	Manufacturer Status Register	1002	0	uint32_t	0	N/A	ro	Manufacturer status register
4	Number of errors	1003	0	uint8_t	0	N/A	rw	number of errors
5	Error Field 0	1003	1	uint32_t	0	N/A	ro	Error field
6	Error Field 1	1003	2	uint32_t	0	N/A	ro	Error field
7	Error Field 2	1003	3	uint32_t	0	N/A	ro	Error field
8	Error Field 3	1003	4	uint32_t	0	N/A	ro	Error field
9	Error Field 4	1003	5	uint32_t	0	N/A	ro	Error field
10	Error Field 5	1003	6	uint32_t	0	N/A	ro	Error field
11	Error Field 6	1003	7	uint32_t	0	N/A	ro	Error field
12	Error Field 7	1003	8	uint32_t	0	N/A	ro	Error field
13	SYNC COB-ID	1005	0	uint32_t	0x80	N/A	rw	Sync COB-ID
14	Communication Cycle Period	1006	0	uint32_t	0	uS	rw	Communication Cycle Period in uS, 0 = not used
15	Sync window length	1007	0	uint32_t	0	uS	rw	Sync Window Length in uS, 0 = not used
16	Manufacturer Device Name	1008	0	visible_char_t	AxisPro Proportional Valve - Servo Performance	N/A	const	Eaton Device Name
17	Manufacturer Hardware Version	1009	0	visible_char_t	6026638-XXXB	N/A	const	Eaton Hardware Version
18	Manufacturer Software Version	100A	0	visible_char_t	6026641-001A	N/A	const	Eaton Software Version
19	Node Guard Time	100C	0	uint16_t	0	mS	rw	Node Guard Time
20	Node Guard Lifetime Factor	100D	0	uint8_t	0	N/A	rw	Node Guard Lifetime Factor
21	Highest Subindex	1010	0	uint8_t	0xA	N/A	ro	Largest sub-index supported by the store parameters function, all, comms, application, mfg specific = 4 different sections
22	Save all parameters	1010	1	uint32_t	1	N/A	rw	ALL save - write “save” to this index to store all ODEE params. Read returns 0x01 for non-autonomous save + save on command
23	Save communication	1010	2	uint32_t	1	N/A	rw	COMMS save - write “save” to this index to store any parameters params in range 0x1000 to 0x1FFF which are saved in the EEPROM. Read returns 0x01 for non-autonomous save + save on command
24	Save application parameters	1010	3	uint32_t	1	N/A	rw	DS408 save - write “save” to this index to store any params in range 0x6000 to 0x6FFF which are saved in the EEPROM. Read returns 0x01 for non-autonomous save + save on command
25	Save manufacturer defined parameters	1010	4	uint32_t	1	N/A	rw	EATON specific save - write “save” to this index to store any params in range 0x2000 to 0x5FFF which are saved in the EEPROM. Read returns 0x01 for non-autonomous save + save on command
26	Save Monitor parameters	1010	5	uint32_t	1	N/A	rw	EATON specific save - write “save” to this index to store any params in range 0x2000 to 0x5FFF which are saved in the EEPROM. Read returns 0x01 for non-autonomous save + save on command
27	Save All parameters to Flash	1010	A	uint32_t	1	N/A	rw	EATON specific save - write “save” to this index to store any params in range 0x2000 to 0x5FFF which are saved in the EEPROM. Read returns 0x01 for non-autonomous save + save on command
28	Highest Subindex	1011	0	uint8_t	0xA	N/A	ro	Largest sub-index supported by the store parameters function, all, comms, application, mfg specific = 4 different sections
29	Load all parameters	1011	1	uint32_t	1	N/A	rw	ALL save - write “save” to this index to store all ODEE params. Read returns 0x01 for non-autonomous save + save on command
30	Restore communication default parameters	1011	2	uint32_t	1	N/A	rw	COMMS load - write “load” to this index to restore any params in range 0x1000 to 0x1FFF which are saved in the EEPROM. Read returns 0x1 as indication that it is able to restore this parameter section
31	Restore application default	1011	3	uint32_t	1	N/A	rw	DS408 load - write “load” to this index to store any params in range parameters 0x6000 to 0x6FFF which are saved in the EEPROM (DS408 application). Read returns 0x01 for non-autonomous save + save on command
32	Restore manufacturer defined	1011	4	uint32_t	1	N/A	rw	EATON specific load - write “load” to this index to default parameters store any params in range 0x2000 to 0x5FFF which are saved in the EEPROM (Eaton specific). Read returns 0x01 for non-autonomous save + save on command
33	Load Monitor parameters to RAM	1011	5	uint32_t	1	N/A	rw	EATON specific save - write “save” to this index to store any params in range 0x2000 to 0x5FFF which are saved in the EEPROM. Read returns 0x01 for non-autonomous save + save on command
34	Load All Flash parameters to RAM	1011	A	uint32_t	1	N/A	rw	EATON specific save - write “save” to this index to store any params in range 0x2000 to 0x5FFF which are saved in the EEPROM. Read returns 0x01 for non-autonomous save + save on command

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
35	Emergency Cob Id	1014	0	uint32_t	$NODEID+0x80	N/A	rw	Emergency Cob Id
36	Inhibit Time Emergency	1015	0	uint16_t	0	100uS	rw	Inhibit Time Emergency
37	Producer Heartbeat Time	1017	0	uint16_t	1000	mS	rw	Producer Heartbeat Time
38	Highest Subindex	1018	0	uint8_t	4	N/A	ro	Vendor ID
39	Vendor ID	1018	1	uint32_t	0x000001CB	N/A	ro	Vendor ID
40	Product Code	1018	2	uint32_t	0x5BF58E	N/A	ro	Product Code
41	Revision Number	1018	3	uint32_t	0x00000001	N/A	ro	Revision Number
42	Serial Number	1018	4	uint32_t	0x00000000	N/A	ro	Unique 32bit serial number
43	Highest Subindex	1020	0	uint8_t	2	N/A	ro	Verify Configuration - number of entries
44	Configuration date	1020	1	uint32_t	0	N/A	rw	Configuration date
45	Configuration time	1020	2	uint32_t	0	N/A	rw	Configuration time
46	Highest Subindex	1029	0	uint8_t	2	N/A	ro	number of errors
47	Error Behavior Comms	1029	1	uint8_t	0x00	N/A	rw	Configures the NMT state to enter when a communications error ccurrs
48	Error Behavior Device	1029	2	uint8_t	0x01	N/A	rw	Configures the NMT state to enter when a device profile or mfg specific error occurrs
49	Highest Subindex	1200	0	uint8_t	2	N/A	ro	Server SDO parameters number of entries
50	COB ID Client to Server (rx)	1200	1	uint32_t	$NODEID+0x600	N/A	ro	COB ID Client to Server (rx)
51	COB ID Server to Client (tx)	1200	2	uint32_t	$NODEID+0x580	N/A	ro	COB ID Server to Client (tx)
52	Highest Subindex	1280	0	uint8_t	3	N/A	ro	Server SDO parameters number of entries
53	COB ID Client to Server (tx)	1280	1	uint32_t	0x80000000	N/A	rw	COB ID Client to Server (rx)
54	COB ID Server to Client (rx)	1280	2	uint32_t	0x80000000	N/A	rw	COB ID Server to Client (tx)
55	Client Node Id	1280	3	uint8_t	1	N/A	rw	COB ID Server to Client (tx)
56	Highest Subindex	1400	0	uint8_t	2	N/A	const	Receive PDO Comm. Parameters number of entries
57	COB_ID	1400	1	uint32_t	$NODEID+0x200	N/A	rw	Receive PDO Communication Parameter 0
58	Transmission_type	1400	2	uint8_t	254	N/A	rw	Receive PDO Communication Parameter 0
59	Highest Subindex	1401	0	uint8_t	2	N/A	const	Receive PDO Comm. Parameters number of entries
60	COB_ID	1401	1	uint32_t	0x80000300	N/A	rw	Receive PDO Communication Parameter 1
61	Transmission_type	1401	2	uint8_t	254	N/A	rw	Receive PDO Communication Parameter 1
62	Highest Subindex	1402	0	uint8_t	2	N/A	const	Receive PDO Comm. Parameters number of entries
63	COB_ID	1402	1	uint32_t	0x80000400	N/A	rw	Receive PDO Communication Parameter 1
64	Transmission_type	1402	2	uint8_t	254	N/A	rw	Receive PDO Communication Parameter 1
65	Highest Subindex	1403	0	uint8_t	2	N/A	const	Receive PDO Comm. Parameters number of entries
66	COB_ID	1403	1	uint32_t	0x80000500	N/A	rw	Receive PDO Communication Parameter 3
67	Transmission_type	1403	2	uint8_t	254	N/A	rw	Receive PDO Communication Parameter 3
68	Highest Subindex	1404	0	uint8_t	2	N/A	const	Receive PDO Comm. Parameters number of entries
69	COB_ID	1404	1	uint32_t	0x80000000	N/A	rw	Receive PDO Communication Parameter 4
70	Transmission_type	1404	2	uint8_t	254	N/A	rw	Receive PDO Communication Parameter 4
71	Highest Subindex	1405	0	uint8_t	2	N/A	const	Receive PDO Comm. Parameters number of entries
72	COB_ID	1405	1	uint32_t	0x80000000	N/A	rw	Receive PDO Communication Parameter 5
73	Transmission_type	1405	2	uint8_t	254	N/A	rw	Receive PDO Communication Parameter 5
74	Highest Subindex	1406	0	uint8_t	2	N/A	const	Receive PDO Comm. Parameters number of entries
75	COB_ID	1406	1	uint32_t	0x80000000	N/A	rw	Receive PDO Communication Parameter 6
76	Transmission_type	1406	2	uint8_t	254	N/A	rw	Receive PDO Communication Parameter 6
77	Highest Subindex	1407	0	uint8_t	2	N/A	const	Receive PDO Comm. Parameters number of entries
78	COB_ID	1407	1	uint32_t	0x80000000	N/A	rw	Receive PDO Communication Parameter 7
79	Transmission_type	1407	2	uint8_t	254	N/A	rw	Receive PDO Communication Parameter 7
80	Number of mapped objects	1600	0	uint8_t	2	N/A	rw	Receive PDO Mapping Parameter Number of Entries
81	RPDO 1 Mapping 0	1600	1	uint32_t	0x60400010L	N/A	rw	Receive PDO Mapping Parameter 0
82	RPDO 1 Mapping 1	1600	2	uint32_t	0x63000110L	N/A	rw	Receive PDO Mapping Parameter 0
83	RPDO 1 Mapping 2	1600	3	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 0
84	RPDO 1 Mapping 3	1600	4	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 0
85	RPDO 1 Mapping 4	1600	5	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 0
86	RPDO 1 Mapping 5	1600	6	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 0
87	RPDO 1 Mapping 6	1600	7	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 0
88	RPDO 1 Mapping 7	1600	8	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 0

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
89	Number of mapped objects	1601	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
90	RPDO 2 Mapping 0	1601	1	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 1
91	RPDO 2 Mapping 1	1601	2	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 1
92	RPDO 2 Mapping 2	1601	3	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 1
93	RPDO 2 Mapping 3	1601	4	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 1
94	RPDO 2 Mapping 4	1601	5	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 1
95	RPDO 2 Mapping 5	1601	6	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 1
96	RPDO 2 Mapping 6	1601	7	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 1
97	RPDO 2 Mapping 7	1601	8	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 1
98	Number of mapped objects	1602	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
99	RPDO 3 Mapping 0	1602	1	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 2
100	RPDO 3 Mapping 1	1602	2	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 2
101	RPDO 3 Mapping 2	1602	3	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 2
102	RPDO 3 Mapping 3	1602	4	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 2
103	RPDO 3 Mapping 4	1602	5	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 2
104	RPDO 3 Mapping 5	1602	6	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 2
105	RPDO 3 Mapping 6	1602	7	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 2
106	RPDO 3 Mapping 7	1602	8	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 2
107	Number of mapped objects	1603	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
108	RPDO 4 Mapping 0	1603	1	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 3
109	RPDO 4 Mapping 1	1603	2	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 3
110	RPDO 4 Mapping 2	1603	3	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 3
111	RPDO 4 Mapping 3	1603	4	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 3
112	RPDO 4 Mapping 4	1603	5	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 3
113	RPDO 4 Mapping 5	1603	6	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 3
114	RPDO 4 Mapping 6	1603	7	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 3
115	RPDO 4 Mapping 7	1603	8	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 3
116	Number of mapped objects	1604	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
117	RPDO 5 Mapping 0	1604	1	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 4
118	RPDO 5 Mapping 1	1604	2	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 4
119	RPDO 5 Mapping 2	1604	3	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 4
120	RPDO 5 Mapping 3	1604	4	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 4
121	RPDO 5 Mapping 4	1604	5	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 4
122	RPDO 5 Mapping 5	1604	6	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 4
123	RPDO 5 Mapping 6	1604	7	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 4
124	RPDO 5 Mapping 7	1604	8	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 4
125	Number of mapped objects	1605	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
126	RPDO 6 Mapping 0	1605	1	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 5
127	RPDO 6 Mapping 1	1605	2	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 5
128	RPDO 6 Mapping 2	1605	3	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 5
129	RPDO 6 Mapping 3	1605	4	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 5
130	RPDO 6 Mapping 4	1605	5	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 5
131	RPDO 6 Mapping 5	1605	6	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 5
132	RPDO 6 Mapping 6	1605	7	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 5
133	RPDO 6 Mapping 7	1605	8	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 5
134	Number of mapped objects	1606	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
135	RPDO 7 Mapping 0	1606	1	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 6
136	RPDO 7 Mapping 1	1606	2	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 6
137	RPDO 7 Mapping 2	1606	3	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 6
138	RPDO 7 Mapping 3	1606	4	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 6
139	RPDO 7 Mapping 4	1606	5	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 6
140	RPDO 7 Mapping 5	1606	6	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 6
141	RPDO 7 Mapping 6	1606	7	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 6
142	RPDO 7 Mapping 7	1606	8	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 6
143	Number of mapped objects	1607	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
144	RPDO 8 Mapping 0	1607	1	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 7

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
145	RPDO 8 Mapping 1	1607	2	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 7
146	RPDO 8 Mapping 2	1607	3	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 7
147	RPDO 8 Mapping 3	1607	4	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 7
148	RPDO 8 Mapping 4	1607	5	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 7
149	RPDO 8 Mapping 5	1607	6	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 7
150	RPDO 8 Mapping 6	1607	7	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 7
151	RPDO 8 Mapping 7	1607	8	uint32_t	0x80000000	N/A	rw	Receive PDO Mapping Parameter 7
152	Highest Subindex	1800	0	uint8_t	5	N/A	ro	Transmit PDO Comm. Parameters number of entries
153	COB_ID	1800	1	uint32_t	$NODEID+0x180	N/A	rw	COB_ID
154	Transmission_type	1800	2	uint8_t	254	N/A	rw	Transmission_type
155	Inhibit_Time	1800	3	uint16_t	0x0000	100uS	rw	Inhibit_Time
156	Event_Timer	1800	5	uint16_t	0	mS	rw	Event_Timer
157	Highest Subindex	1801	0	uint8_t	5	N/A	ro	Transmit PDO Comm. Parameters number of entries
158	COB_ID	1801	1	uint32_t	0xC0000280	N/A	rw	COB_ID
159	Transmission_type	1801	2	uint8_t	254	N/A	rw	Transmission_type
160	Inhibit_Time	1801	3	uint16_t	0x0000	100uS	rw	Inhibit_Time
161	Event_Timer	1801	5	uint16_t	0	mS	rw	Event_Timer
162	Highest Subindex	1802	0	uint8_t	5	N/A	ro	Transmit PDO Comm. Parameters number of entries
163	COB_ID	1802	1	uint32_t	0xC0000380	N/A	rw	COB_ID
164	Transmission_type	1802	2	uint8_t	254	N/A	rw	Transmission_type
165	Inhibit_Time	1802	3	uint16_t	0x0000	100uS	rw	Inhibit_Time
166	Event_Timer	1802	5	uint16_t	0	mS	rw	Event_Timer
167	Highest Subindex	1803	0	uint8_t	5	N/A	ro	Transmit PDO Comm. Parameters number of entries
168	COB_ID	1803	1	uint32_t	0xC0000480	N/A	rw	COB_ID
169	Transmission_type	1803	2	uint8_t	254	N/A	rw	Transmission_type
170	Inhibit_Time	1803	3	uint16_t	0x0000	100uS	rw	Inhibit_Time
171	Event_Timer	1803	5	uint16_t	0	mS	rw	Event_Timer
172	Highest Subindex	1804	0	uint8_t	5	N/A	ro	Transmit PDO Comm. Parameters number of entries
173	COB_ID	1804	1	uint32_t	0xC00003F0	N/A	rw	COB_ID
174	Transmission_type	1804	2	uint8_t	254	N/A	rw	Transmission_type
175	Inhibit_Time	1804	3	uint16_t	0x0000	100uS	rw	Inhibit_Time
176	Event_Timer	1804	5	uint16_t	0	mS	rw	Event_Timer
177	Highest Subindex	1805	0	uint8_t	5	N/A	ro	Transmit PDO Comm. Parameters number of entries
178	COB_ID	1805	1	uint32_t	0xC00003F1	N/A	rw	COB_ID
179	Transmission_type	1805	2	uint8_t	254	N/A	rw	Transmission_type
180	Inhibit_Time	1805	3	uint16_t	0x0000	100uS	rw	Inhibit_Time
181	Event_Timer	1805	5	uint16_t	0	mS	rw	Event_Timer
182	Highest Subindex	1806	0	uint8_t	5	N/A	ro	Transmit PDO Comm. Parameters number of entries
183	COB_ID	1806	1	uint32_t	0xC00003F2	N/A	rw	COB_ID
184	Transmission_type	1806	2	uint8_t	254	N/A	rw	Transmission_type
185	Inhibit_Time	1806	3	uint16_t	0x0000	100uS	rw	Inhibit_Time
186	Event_Timer	1806	5	uint16_t	0	mS	rw	Event_Timer
187	Highest Subindex	1807	0	uint8_t	5	N/A	ro	Transmit PDO Comm. Parameters number of entries
188	COB_ID	1807	1	uint32_t	0xC00003F3	N/A	rw	COB_ID
189	Transmission_type	1807	2	uint8_t	254	N/A	rw	Transmission_type
190	Inhibit_Time	1807	3	uint16_t	0x0000	100uS	rw	Inhibit_Time
191	Event_Timer	1807	5	uint16_t	0	mS	rw	Event_Timer
192	Number of mapped objects	1A00	0	uint8_t	2	N/A	rw	Receive PDO Mapping Parameter Number of Entries
193	TPDO 1 Mapping 0	1A00	1	uint32_t	0x60410010	N/A	rw	Transmit PDO Mapping Parameter 0
194	TPDO 1 Mapping 1	1A00	2	uint32_t	0x63010110	N/A	rw	Transmit PDO Mapping Parameter 0
195	TPDO 1 Mapping 2	1A00	3	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 0
196	TPDO 1 Mapping 3	1A00	4	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 0
197	TPDO 1 Mapping 4	1A00	5	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 0
198	TPDO 1 Mapping 5	1A00	6	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 0
199	TPDO 1 Mapping 6	1A00	7	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 0
200	TPDO 1 Mapping 7	1A00	8	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 0

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
201	Number of mapped objects	1A01	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
202	TPDO 2 Mapping 0	1A01	1	uint32_t	0x20050220	N/A	rw	Transmit PDO Mapping Parameter 1
203	TPDO 2 Mapping 1	1A01	2	uint32_t	0x20050120	N/A	rw	Transmit PDO Mapping Parameter 1
204	TPDO 2 Mapping 2	1A01	3	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 1
205	TPDO 2 Mapping 3	1A01	4	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 1
206	TPDO 2 Mapping 4	1A01	5	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 1
207	TPDO 2 Mapping 5	1A01	6	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 1
208	TPDO 2 Mapping 6	1A01	7	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 1
209	TPDO 2 Mapping 7	1A01	8	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 1
210	Number of mapped objects	1A02	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
211	TPDO 3 Mapping 0	1A02	1	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 2
212	TPDO 3 Mapping 1	1A02	2	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 2
213	TPDO 3 Mapping 2	1A02	3	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 2
214	TPDO 3 Mapping 3	1A02	4	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 2
215	TPDO 3 Mapping 4	1A02	5	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 2
216	TPDO 3 Mapping 5	1A02	6	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 2
217	TPDO 3 Mapping 6	1A02	7	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 2
218	TPDO 3 Mapping 7	1A02	8	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 2
219	Number of mapped objects	1A03	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
220	TPDO 4 Mapping 0	1A03	1	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 3
221	TPDO 4 Mapping 1	1A03	2	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 3
222	TPDO 4 Mapping 2	1A03	3	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 3
223	TPDO 4 Mapping 3	1A03	4	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 3
224	TPDO 4 Mapping 4	1A03	5	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 3
225	TPDO 4 Mapping 5	1A03	6	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 3
226	TPDO 4 Mapping 6	1A03	7	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 3
227	TPDO 4 Mapping 7	1A03	8	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 3
228	Number of mapped objects	1A04	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
229	TPDO 5 Mapping 0	1A04	1	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 4
230	TPDO 5 Mapping 1	1A04	2	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 4
231	TPDO 5 Mapping 2	1A04	3	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 4
232	TPDO 5 Mapping 3	1A04	4	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 4
233	TPDO 5 Mapping 4	1A04	5	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 4
234	TPDO 5 Mapping 5	1A04	6	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 4
235	TPDO 5 Mapping 6	1A04	7	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 4
236	TPDO 5 Mapping 7	1A04	8	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 4
237	Number of mapped objects	1A05	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
238	TPDO 6 Mapping 0	1A05	1	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 5
239	TPDO 6 Mapping 1	1A05	2	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 5
240	TPDO 6 Mapping 2	1A05	3	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 5
241	TPDO 6 Mapping 3	1A05	4	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 5
242	TPDO 6 Mapping 4	1A05	5	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 5
243	TPDO 6 Mapping 5	1A05	6	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 5
244	TPDO 6 Mapping 6	1A05	7	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 5
245	TPDO 6 Mapping 7	1A05	8	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 5
246	Number of mapped objects	1A06	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
247	TPDO 7 Mapping 0	1A06	1	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 6
248	TPDO 7 Mapping 1	1A06	2	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 6
249	TPDO 7 Mapping 2	1A06	3	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 6
250	TPDO 7 Mapping 3	1A06	4	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 6
251	TPDO 7 Mapping 4	1A06	5	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 6
252	TPDO 7 Mapping 5	1A06	6	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 6
253	TPDO 7 Mapping 6	1A06	7	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 6
254	TPDO 6 Mapping 7	1A06	8	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 6
255	Number of mapped objects	1A07	0	uint8_t	0	N/A	rw	Receive PDO Mapping Parameter Number of Entries
256	TPDO 8 Mapping 0	1A07	1	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 7

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
257	TPDO 8 Mapping 1	1A07	2	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 7
258	TPDO 8 Mapping 2	1A07	3	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 7
259	TPDO 8 Mapping 3	1A07	4	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 7
260	TPDO 8 Mapping 4	1A07	5	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 7
261	TPDO 8 Mapping 5	1A07	6	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 7
262	TPDO 8 Mapping 6	1A07	7	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 7
263	TPDO 8 Mapping 7	1A07	8	uint32_t	0x80000000	N/A	rw	Transmit PDO Mapping Parameter 7
264	Highest Subindex	1F50	0	uint8_t	2	N/A	ro	Program Data No. of Entries
265	Program 1	1F50	1	uint8_t		N/A	rw	Downlaod data
266	Program 2	1F50	2	uint8_t		N/A	rw	Downlaod data2
267	Highest Subindex	1F51	0	uint32_t	2	N/A	ro	Program Control No of Entries
268	Program 1	1F51	1	uint8_t	1	N/A	rw	ProgramControl
269	Program 2	1F51	2	uint8_t	255	N/A	rw	ProgramControl2
270	Highest Subindex	1F56	0	uint8_t	2	N/A	const	Application Sw ID No of Entries
271	Program 1	1F56	1	uint32_t		N/A	ro	Unique Software ID - Program 1
272	Program 2	1F56	2	uint32_t	0	N/A	ro	Unique Software ID - Program 2
273	Highest Subindex	1F57	0	uint8_t	2	N/A	const	Flash Status No of Entries
274	Program 1	1F57	1	uint32_t	0	N/A	rw	Flash Status Identification
275	Program 2	1F57	2	uint32_t	2	N/A	rw	Flash Status Identification2
276	NMT Startup	1F80	0	uint32_t	2	N/A	rw	NMT Startup
277	Highest Subindex	2000	0	uint8_t	9	N/A	ro	
278	Factory Access Key	2000	1	uint32_t	0	N/A	wo	Key to gain write access to factory, service, and any (all) parameters
279	Service Access Key	2000	2	uint16_t	0	N/A	wo	Key to gain write access to service, and any parameters
280	Bootloader Major Version	2000	3	uint16_t	1	N/A	rw	Bootloader Major Version
281	Bootloader Minor Version	2000	4	uint16_t	0	N/A	rw	Bootloader Minor Version
282	OD Major Version	2000	5	uint16_t	1	N/A	rw	OD Major Version
283	OD Minor Version	2000	6	uint16_t	7	N/A	rw	OD Minor Version
284	Power Cycle	2000	7	uint16_t	1	Undef	rw	Number of power-on cycles
285	EEPROM pointer	2000	8	uint32_t	1	Undef	ro	Pointer to EEPROM(ODEE) object dictionary
286	RAM pointer	2000	9	uint32_t	1	Undef	ro	Pointer to RAM(ODParam) object dictionary
287	Highest Subindex	2001	0	uint8_t	20	N/A	ro	
288	Fieldbus Enables	2001	1	uint8_t	FIELDBUS_CO _MASTER_SLAVE	Enum	rw	4 = Ethernet, 3 = CANopen Master and CANopen Slave, 2 = CANopen Master, 1 = CANOpen Slave, 0 = Analog Interface
289	CoDeSys Control Bit	2001	2	uint8_t	0	Enum	rw	1 = CoDeSys Is enabled; 0 = CoDeSys is disabled
290	CANbus controller swap	2001	3	uint8_t	0	Enum	rw	
291	Valve-Enable Input Enable	2001	4	uint8_t	DISABLED	Enum	rw	0 = input is not enabled, 1= valve enable function active
292	Valve-Enable Input Threshold	2001	5	uint16_t	ENABLE_INPUT _THRESHOLD	Enum	rw	Threshold value for enable input (ADC counts)
293	Diagnostic Enables	2001	8	uint32_t	DIAGNOSTICS _LEVEL2	Enum	rw	
294	User's Diagnostic Enables	2001	9	uint16_t	0	Enum	rw	
295	Customer Led Mode	2001	A	uint8_t	1	Enum	rw	
296	Customer Led Blink Rate	2001	B	uint16_t	0	ms	rw	
297	Enable CANopen LEDs	2001	C	uint8_t	1	N/A	rw	Enable or disable CANbus LEDs
298	SSI bitrate prescaler	2001	D	uint8_t	2	N/A	rw	
299	SSI bitrate scaler	2001	E	uint8_t	6	N/A	rw	
300	SSI Read Delay For Control	2001	F	uint8_t	13	N/A	rw	
301	CoDeSys Reset Option	2001	10	uint8_t	0	N/A	rw	To avoid self reset when codesys running on other channel
302	Incremental Encoder Type	2001	11	uint8_t	1	N/A	rw	Encoder type 0 - Count & direction type,1- Phase A& B type
303	Incremental Encoder Speed Filter	2001	12	uint16_t	1	N/A	rw	Weighted filter value varies from 0-9999
304	Default PDO mapping Enable	2001	13	uint8_t	0	N/A	rw	Selection bit for defaul PDO mapping enable
305	Command Input Volts or Amps	2001	14	uint8_t	0	N/A	rw	Voltage or current command selection bit
306	Highest Subindex	2003	0	uint8_t	16	N/A	ro	
307	Port P Temperature Sensor Offset	2003	1	int32_t	-68	Undef	rw	Calibrated Temperature Sensor Offset for Port P
308	Port P Temperature Sensor Gain	2003	2	int32_t	160	Undef	rw	Calibrated Temperature Sensor Gain for Port P
309	In1Vibration Sensor Offset	2003	3	int32_t	0	Undef	rw	In1Vibration Sensor Offset
310	In1Vibration Sensor Gain	2003	4	int32_t	1	Undef	rw	In1Vibration Sensor Gain

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
311	In2 Vibration Sensor Offset	2003	5	int32_t	0	Undef	rw	In2 Vibration Sensor Offset
312	In2 Vibration Sensor Gain	2003	6	int32_t	1	Undef	rw	In2 Vibration Sensor Gain
313	PCB Temperature Offset	2003	7	int32_t	50	Undef	rw	PCB Temperature Offset
314	PCB Temperature Gain	2003	8	int32_t	33	Undef	rw	PCB Temperature Gain
315	Ext. Current Sensor 1 Offset	2003	9	int32_t	2002	Undef	rw	Ext. Current Sensor 1 Offset
316	Ext. Current Sensor 1 Gain	2003	A	int32_t	488	Undef	rw	Ext. Current Sensor 1 Gain
317	Ext. Current Sensor 2 Offset	2003	B	int32_t	2002	Undef	rw	Ext. Current Sensor 2 Offset
318	Ext. Current Sensor 2 Gain	2003	C	int32_t	488	Undef	rw	Ext. Current Sensor 2 Gain
319	Ext. Current Sensor 3 Offset	2003	D	int32_t	2002	Undef	rw	Ext. Current Sensor 3 Offset
320	Ext. Current Sensor 3 Gain	2003	E	int32_t	488	Undef	rw	Ext. Current Sensor 3 Gain
321	Ext. Current Sensor 4 Offset	2003	F	int32_t	2002	Undef	rw	Ext. Current Sensor 4 Offset
322	Ext. Current Sensor 4 Gain	2003	10	int32_t	488	Undef	rw	Ext. Current Sensor 4 Gain
323	Highest Subindex	2004	0	uint8_t	140	N/A	ro	
324	Fault Level	2004	1	uint8_t	0	Enum	rwr	Summary of all diagnostics: 0 = No Fault, 1 = Low, 2 = Medium, 3 = High
325	All Status	2004	2	uint32_t	0	Enum	rwr	Identifies the state of the diagnostic system
326	PCB Temperature High Criticality	2004	3	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
327	PCB Temperature Limit High	2004	4	int16_t	125	Celsius	rw	High threshold temperature for PCB
328	PCB Temperature Low Criticality	2004	5	uint8_t	1	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
329	PCB Temperature Limit Low	2004	6	int16_t	-25	Celsius	rw	Low threshold temperature for PCB
330	Supply Voltage High Criticality	2004	7	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
331	Supply Voltage Limit High	2004	8	int16_t	3600	CentiV	rw	High threshold voltage for supply
332	Supply Voltage Low Criticality	2004	9	uint8_t	2	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
333	Supply Voltage Limit Low	2004	A	int16_t	1900	CentiV	rw	Low threshold voltage for supply
334	Solenoid A Current High Criticality	2004	B	uint8_t	5	N/A	rw	High threshold resistance for Coil A
335	Solenoid A Current Low Criticality	2004	C	uint8_t	5	N/A	rw	Low threshold resistance for Coil A
336	Solenoid B Current High Criticality	2004	D	uint8_t	5	N/A	rw	High threshold resistance for Coil A
337	Solenoid B Current Low Criticality	2004	E	uint8_t	5	N/A	rw	Low threshold resistance for Coil A
338	Spool Position High Criticality	2004	F	uint8_t	5	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
339	Spool Position Limit High	2004	10	int16_t	32000	N/A	rw	High threshold position for spool
340	Spool Position Low Criticality	2004	11	uint8_t	5	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
341	Spool Position Limit Low	2004	12	int16_t	-32000	N/A	rw	Low threshold position for spool
342	Port P Temp High Criticality	2004	13	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
343	Port P Temp Limit High	2004	14	int16_t	125	Celsius	rw	High threshold temperature for hydraulic oil
344	Port P Temp Low Criticality	2004	15	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
345	Port P Temp Limit Low	2004	16	int16_t	0	Celsius	rw	Low threshold temperature for hydraulic oil
346	Port A Press Limit High Criticality	2004	17	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
347	Port A Press Limit High Limit	2004	18	uint16_t	11805	Enum	rw	High limit of port A pressure
348	Port A Press Limit Low Criticality	2004	19	uint8_t	5	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
349	Port A Press Limit Low Limit	2004	1A	uint16_t	4441	Enum	rw	Low limit of port A pressure
350	Port T Press Limit High Criticality	2004	1B	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
351	Port T Press Limit High Limit	2004	1C	uint16_t	11805	Enum	rw	High limit of port T pressure
352	Port T Press Limit Low Criticality	2004	1D	uint8_t	5	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
353	Port T Press Limit Low Limit	2004	1E	uint16_t	4441	Enum	rw	Low limit of port T pressure
354	Port P Press Limit High Criticality	2004	1F	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
355	Port P Press Limit High Limit	2004	20	uint16_t	11805	Enum	rw	High limit of port P pressure
356	Port P Press Limit Low Criticality	2004	21	uint8_t	5	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
357	Port P Press Limit Low Limit	2004	22	uint16_t	4441	Enum	rw	Low limit of port P pressure
358	Port B Press Limit High Criticality	2004	23	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
359	Port B Press Limit HighLimit	2004	24	uint16_t	11805	Enum	rw	High limit of port B pressure
360	Port B Press Limit Low Criticality	2004	25	uint8_t	5	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
361	Port B Press Limit Low Limit	2004	26	uint16_t	4441	Enum	rw	Low limit of port B pressure
362	5V Digital High Criticality	2004	27	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
363	5V Digital Limit High	2004	28	int16_t	6000	mV	rw	High threshold voltage for V1
364	5V Digital Low Criticality	2004	29	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
365	5V Digital Limit Low	2004	2A	int16_t	3000	mV	rw	Low threshold voltage for V1

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
366	1.5V High Criticality	2004	2B	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
367	1.5V Limit High	2004	2C	int16_t	2000	mV	rw	High threshold voltage for V2
368	1.5V Low Criticality	2004	2D	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
369	1.5V Limit Low	2004	2E	int16_t	1000	mV	rw	Low threshold voltage for V2
370	2.5V High Criticality	2004	2F	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
371	2.5V Limit High	2004	30	int16_t	3000	mV	rw	High threshold voltage for V3
372	2.5V Low Criticality	2004	31	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
373	2.5V Limit Low	2004	32	int16_t	2000	mV	rw	Low threshold voltage for V3
374	5V Analog High Criticality	2004	33	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
375	5V Analog Limit High	2004	34	int16_t	6000	mV	rw	High threshold voltage for V4
376	5V Analog Low Criticality	2004	35	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
377	5V Analog Limit Low	2004	36	int16_t	3000	mV	rw	Low threshold voltage for V4
378	Ext. Current Sensor 1 High Criticality	2004	37	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
379	Ext. Current Sensor 1 Limit High	2004	38	int16_t	24000	uA	rw	High threshold current for External sensor 1
380	Ext. Current Sensor 1 Low Criticality	2004	39	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
381	Ext. Current Sensor 1 Limit Low	2004	3A	int16_t	4	uA	rw	Low threshold current for External sensor 1
382	Ext. Current Sensor 2 High Criticality	2004	3B	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
383	Ext. Current Sensor 2 Limit High	2004	3C	int16_t	24000	uA	rw	High threshold current for External sensor 2
384	Ext. Current Sensor 2 Low Criticality	2004	3D	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
385	Ext. Current Sensor 2 Limit Low	2004	3E	int16_t	4	uA	rw	Low threshold current for External sensor 2
386	Ext. Current Sensor 3 High Criticality	2004	3F	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
387	Ext. Current Sensor 3 Limit High	2004	40	int16_t	24000	uA	rw	High threshold current for External sensor 3
388	Ext. Current Sensor 3 Low Criticality	2004	41	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
389	Ext. Current Sensor 3 Limit Low	2004	42	int16_t	4	uA	rw	Low threshold current for External sensor 3
390	Ext. Current Sensor 4 High Criticality	2004	43	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
391	Ext. Current Sensor 4 Limit High	2004	44	int16_t	24000	uA	rw	High threshold current for External sensor 4
392	Ext. Current Sensor 4 Low Criticality	2004	45	uint8_t	3	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
393	Ext. Current Sensor 4 Limit Low	2004	46	int16_t	4	uA	rw	Low threshold current for External sensor 4
394	Spool Position Failsafe Criticality	2004	47	uint8_t	5	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
395	Spool Position Failsafe Level	2004	48	int16_t	-4000	uA	rw	Threshold LVDT ratio for failsafe when in disabled state
396	Stored Faults	2004	49	uint32_t	0	Enum	rw	EEPROM storage of faults enabled for EEPROM storage (criticality 3,4,5)
397	User's Faults Level	2004	4A	uint8_t	0	Enum	rwr	EEPROM storage of faults enabled for EEPROM storage (criticality 3,4,5)
398	User's Faults Status	2004	4B	uint16_t	0	Enum	rwr	EEPROM storage of faults enabled for EEPROM storage (criticality 3,4,5)
399	User's Stored Faults	2004	4C	uint16_t	0	Enum	rw	EEPROM storage of faults enabled for EEPROM storage (criticality 3,4,5)
400	User's Input 1 High Criticality	2004	4D	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
401	User's Input 1 Max	2004	4E	int32_t	0x7FFFFFFF	Enum	rw	User input for Pressure sensor High limit
402	User's Input 1 Low Criticality	2004	4F	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
403	User's Input 1 Min	2004	50	int32_t	0x80000000	Enum	rw	User input for Pressure sensor Low limit
404	User's Input 2 High Criticality	2004	51	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
405	User's Input 2 Max	2004	52	int32_t	0x7FFFFFFF	Enum	rw	User input for Pressure sensor High limit
406	User's Input 2 Low Criticality	2004	53	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
407	User's Input 2 Min	2004	54	int32_t	0x80000000	Enum	rw	User input for Pressure sensor Low limit
408	User's Input 3 High Criticality	2004	55	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
409	User's Input 3 Max	2004	56	int32_t	0x7FFFFFFF	Enum	rw	User input for Pressure sensor High limit
410	User's Input 3 Low Criticality	2004	57	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
411	User's Input 3 Min	2004	58	int32_t	0x80000000	Enum	rw	User input for Pressure sensor Low limit
412	User's Input 4 High Criticality	2004	59	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
413	User's Input 4 Max	2004	5A	int32_t	0x7FFFFFFF	Enum	rw	User input for Pressure sensor High limit
414	User's Input 4 Low Criticality	2004	5B	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
415	User's Input 4 Min	2004	5C	int32_t	0x80000000	Enum	rw	User input for Pressure sensor Low limit
416	User's Bus Input High Criticality	2004	5D	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
417	User's Bus Input Max	2004	5E	int32_t	0x7FFFFFFF	Enum	rw	User input for external current sensor High limit
418	User's Bus Input Low Criticality	2004	5F	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
419	User's Bus Input Min	2004	60	int32_t	0x80000000	Enum	rw	User input for external current sensor Low limit

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
420	User's Cmd Input High Criticality	2004	61	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
421	User's Cmd Input Max	2004	62	int32_t	0x7FFFFFFF	Enum	rw	User input for external current sensor High limit
422	User's Cmd Input Low Criticality	2004	63	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
423	User's Cmd Input Min	2004	64	int32_t	0x80000000	Enum	rw	User input for external current sensor Low limit
424	User's SSI Input High Criticality	2004	65	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
425	User's SSI Input Max	2004	66	int32_t	0x7FFFFFFF	Enum	rw	User input for external current sensor High limit
426	User's SSI Input Low Criticality	2004	67	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
427	User's SSI Input Min	2004	68	int32_t	0x80000000	Enum	rw	User input for external current sensor High limit
428	User's Bus Input 2 High Criticality	2004	69	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
429	User's Bus Input 2 Max	2004	6A	int32_t	0x7FFFFFFF	Enum	rw	User input for external current sensor High limit
430	User's Bus Input 2 Low Criticality	2004	6B	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
431	User's Bus Input 2 Min	2004	6C	int32_t	0x80000000	Enum	rw	User input for external current sensor Low limit
432	User's Speed Input 1 High Criticality	2004	6D	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
433	User's Speed Input 1 Max	2004	6E	int32_t	0x7FFFFFFF	Enum	rw	User input for external current sensor High limit
434	User's Speed Input 1 Low Criticality	2004	6F	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
435	User's Speed Input 1 Min	2004	70	int32_t	0x80000000	Enum	rw	User input for external current sensor Low limit
436	User's Speed Input 2 High Criticality	2004	71	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
437	User's Speed Input 2 Max	2004	72	int32_t	0x7FFFFFFF	Enum	rw	User input for external current sensor High limit
438	User's Speed Input 2 Low Criticality	2004	73	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
439	User's Speed Input 2 Min	2004	74	int32_t	0x80000000	Enum	rw	User input for external current sensor Low limit
440	User's Pressure A High Criticality	2004	75	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
441	User's Pressure A Max	2004	76	int32_t	4000	Enum	rw	User input for external current sensor High limit
442	User's Pressure A Low Criticality	2004	77	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
443	User's Pressure A Min	2004	78	int32_t	0	Enum	rw	User input for external current sensor Low limit
444	User's Pressure T High Criticality	2004	79	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
445	User's Pressure T Max	2004	7A	int32_t	4000	Enum	rw	User input for external current sensor High limit
446	User's Pressure T Low Criticality	2004	7B	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
447	User's Pressure T Min	2004	7C	int32_t	0	Enum	rw	User input for external current sensor Low limit
448	User's Pressure P High Criticality	2004	7D	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
449	User's Pressure P Max	2004	7E	int32_t	4000	Enum	rw	User input for external current sensor High limit
450	User's Pressure P Low Criticality	2004	7F	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
451	User's Pressure P Min	2004	80	int32_t	0	Enum	rw	User input for external current sensor Low limit
452	User's Pressure B High Criticality	2004	81	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
453	User's Pressure B Max	2004	82	int32_t	4000	Enum	rw	User input for external current sensor High limit
454	User's Pressure B Low Criticality	2004	83	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
455	User's Pressure B Min	2004	84	int32_t	0	Enum	rw	User input for external current sensor Low limit
456	User's Temp PCB High Criticality	2004	85	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
457	User's Temp PCB Max	2004	86	int32_t	0x7FFFFFFF	Enum	rw	User input for Temperature sensor High limit
458	User's Temp PCB Low Criticality	2004	87	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
459	User's Temp PCB Min	2004	88	int32_t	0x80000000	Enum	rw	User input for Temperature sensor Low limit
460	User's Temp Oil High Criticality	2004	89	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
461	User's Temp Oil Max	2004	8A	int32_t	0x7FFFFFFF	Enum	rw	User input for Temperature sensor High limit
462	User's Temp Oil Low Criticality	2004	8B	uint8_t	0	Enum	rw	1 = High Criticality; 2 = Medium Criticality; 3 = Low Criticality
463	User's Temp Oil Min	2004	8C	int32_t	0x80000000	Enum	rw	User input for Temperature sensor Low limit
464	Highest Subindex	2005	0	uint8_t	15	N/A	ro	
465	PCB Temperature	2005	1	int32_t	0	Celsius	ro	PCB sensed temperature
466	Supply Voltage	2005	2	int32_t	0	mV	ro	Sensed voltage supplied to valve power
467	5V Digital	2005	3	int32_t	0	mV	ro	Sensed voltage output from +3.2V DC/DC converter
468	1.5V	2005	4	int32_t	0	mV	ro	Sensed voltage output from +5V DC/DC converter
469	2.5V	2005	5	int32_t	0	mV	ro	Sensed voltage output from +15V DC/DC converter
470	5V Analog	2005	6	int32_t	0	mV	ro	Sensed voltage output from -15V DC/DC converter
471	Port P Temperature	2005	7	int32_t	0	Celsius	ro	Approximate temperature from Port P pressure sensor
472	LVDT Ratio	2005	A	int16_t	0	micron/s	ro	Sensed LVDT ratio before scaling
473	Current input 1	2005	B	int32_t	0	uA	ro	External current sensor input
474	Current input 2	2005	C	int32_t	0	uA	ro	External current sensor input
475	Current input 3	2005	D	int32_t	0	uA	ro	External current sensor input

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
476	Current input 4	2005	E	int32_t	0	uA	ro	External current sensor input
477	LVDT A+B Ratio	2005	F	int16_t	0	Undef	ro	Sensed LVDT A+B ratio before scaling
478	Highest Subindex	2007	0	uint8_t	20		ro	
479	Type	2007	1	uint8_t	0	Enum	rw	0 = Voltage Monitor ;1 = Current Monitor
480	Mode	2007	2	uint8_t	0		rw	Monitor Output User Mode
481	Object Dictionary Index	2007	3	uint16_t	0x6110		rw	Object Dictionary Index
482	Object Dictionary SubIndex	2007	4	uint8_t	1		rw	Object Dictionary SubIndex
483	PM10V Max Duty Cycle	2007	5	uint16_t	9250	%	rw	Monitor Output Max Duty Cycle
484	PM10V Min Duty Cycle	2007	6	uint16_t	250	%	rw	Monitor Output Min Duty Cycle
485	PM10V Mid Duty Cycle	2007	7	uint16_t	4750	%	rw	Monitor Output Mid Duty Cycle
486	4to20mA Max Duty Cycle	2007	8	uint16_t	9250	%	rw	Monitor Output Max Duty Cycle
487	4to20mA Min Duty Cycle	2007	9	uint16_t	1900	%	rw	Monitor Output Min Duty Cycle
488	4to20mA Mid Duty Cycle	2007	A	uint16_t	5575	%	rw	Monitor Output Mid Duty Cycle
489	Interface Max Value	2007	B	int16_t	16384		rw	Monitor Output Interface Max Value
490	Interface Min Value	2007	C	int16_t	-16384		rw	Monitor Output Interface Min Value
491	Interface Mid Value	2007	D	int16_t	0		rw	Monitor Output Interface Mid Value
492	Max Interface Duty Cycle	2007	E	uint16_t	0	%	ro	Monitor Output Max Duty Cycle
493	Min Interface Duty Cycle	2007	F	uint16_t	0	%	ro	Monitor Output Min Duty Cycle
494	Mid Interface Duty Cycle	2007	10	uint16_t	0	%	ro	Monitor Output Mid Duty Cycle
495	Duty Cycle	2007	11	uint16_t	0	%	ro	Monitor Output Duty Cycle
496	Max Interface	2007	12	int16_t	0		ro	Monitor Output Max Interface
497	Min Interface	2007	13	int16_t	0		ro	Monitor Output Min Interface
498	Mid Interface	2007	14	int16_t	0		ro	Monitor Output Mid Interface
499	Highest Subindex	2009	0	uint8_t	27	N/A	ro	
500	Ki[0]	2009	1	uint32_t	50		rw	Position Integration gain
501	Ki[1]	2009	2	uint32_t	50		rw	Position Integration gain
502	Ki[2]	2009	3	uint32_t	55		rw	Position Integration gain
503	Ki[3]	2009	4	uint32_t	50		rw	Position Integration gain
504	Ki[4]	2009	5	uint32_t	40		rw	Position Integration gain
505	Kif	2009	6	uint32_t	1500000		rw	Position Integration gain Second
506	Kp[0]	2009	7	uint32_t	100		rw	Position proportional gain
507	Kp[1]	2009	8	uint32_t	125		rw	Position proportional gain
508	Kp[2]	2009	9	uint32_t	200		rw	Position proportional gain
509	Kp[3]	2009	A	uint32_t	300		rw	Position proportional gain
510	Kp[4]	2009	B	uint32_t	450		rw	Position proportional gain
511	Kp0	2009	C	uint32_t	400		rw	Position proportional gain at zero command
512	Ba[0]	2009	D	uint32_t	2000		rw	Position 2 input to Current lookup table
513	Ba[1]	2009	E	uint32_t	2000		rw	Position 2 input to Current lookup table
514	Ba[2]	2009	F	uint32_t	2000		rw	Position 2 input to Current lookup table
515	Ba[3]	2009	10	uint32_t	2000		rw	Position 2 input to Current lookup table
516	Ba[4]	2009	11	uint32_t	2000		rw	Position 2 input to Current lookup table
517	Ma	2009	12	uint32_t	1		rw	Position 3 input to Current lookup table
518	Pos_FF_Gain	2009	13	uint32_t	90000		rw	Position 4 input to Current lookup table
519	Pos_FF_Offset	2009	14	uint32_t	1600		rw	Position 5 input to Current lookup table
520	Vel_FF_Gain	2009	15	uint32_t	0		rw	Position 6 input to Current lookup table
521	Acc_FF_Gain	2009	16	uint32_t	0		rw	Position 7 input to Current lookup table
522	B_Est_Cmd_Gen	2009	17	uint32_t	892		rw	Current 1 Output from Current lookup table
523	M_Est_Cmd_Gen	2009	18	uint32_t	2664030		rw	Current 2 Output from Current lookup table
524	Hyst_Comp_Current	2009	19	uint32_t	35		rw	Position Hysteresis Compensation Current
525	Max Current Limit	2009	1A	uint16_t	3200	mA	rw	Upper saturation limit for current
526	Min Current Limit	2009	1B	uint16_t	600	mA	rw	Lower saturation limit for current
527	Position Cmd	2009	1C	int16_t	0	x100	ro	Observer calculate the position estimation as per model
528	Velocity Cmd	2009	1D	int16_t	0	x100	ro	Observer calculate the velocity Command as per model
529	Acceleration Cmd	2009	1E	int16_t	0	x100	ro	Observer calculate the acceleration estimation as per model
530	Hystersis Deadband	2009	1F	uint16_t	0		rw	Hystersis deadband
531	Current limit fast	2009	20	uint16_t	25		rw	current limit I fast

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
532	Lvdt_Xdata[0]	2009	21	int16_t	-16384		rw	Lvdt feedback for lookup table
533	Lvdt_Xdata[1]	2009	22	int16_t	-8000		rw	Lvdt feedback for lookup table
534	Lvdt_Xdata[2]	2009	23	int16_t	0		rw	Lvdt feedback for lookup table
535	Lvdt_Xdata[3]	2009	24	int16_t	8000		rw	Lvdt feedback for lookup table
536	Lvdt_Xdata[5]	2009	25	int16_t	-16384		rw	Lvdt feedback for lookup table
537	Velocity Cmd Limit	2009	26	uint16_t	300		rw	Velocity command limit
538	Acceleration Cmd Limit	2009	27	uint16_t	150		rw	Acceleration command limit
539	Highest Subindex	200A	0	uint8_t	12	N/A	ro	
540	Pwm Frequency A	200A	1	uint32_t	20000	mA	rw	Solenoid A PWM Frequency
541	Pwm Frequency B	200A	2	uint32_t	20000		rw	Solenoid B PWM Frequency
542	PID Kp A	200A	3	uint32_t	600000		rw	Solenoid A PID Proportional Gain
543	PID Kp B	200A	4	uint32_t	600000		rw	Solenoid B PID Proportional Gain
544	PID Ki A	200A	5	uint32_t	600000		rw	Solenoid A PID Integral Gain
545	PID Ki B	200A	6	uint32_t	600000		rw	Solenoid B PID Integral Gain
546	PID Kd A	200A	7	uint32_t	0		rw	Solenoid A PID Derivative Gain
547	PID Kd B	200A	8	uint32_t	0		rw	Solenoid B PID Derivative Gain
548	PID Limit Positive A	200A	9	uint32_t	32767		rw	Solenoid A PID Derivative Gain
549	PID Limit Positive B	200A	A	uint32_t	32767		rw	Solenoid B PID Derivative Gain
550	PID Limit Negative A	200A	B	uint32_t	33024		rw	Solenoid A PID Derivative Gain
551	PID Limit Negative B	200A	C	uint32_t	33024		rw	Solenoid B PID Derivative Gain
552	Highest Subindex	200B	0	uint8_t	8		ro	
553	Kp Gain	200B	1	int32_t	4500000	mA/micron	rw	Observer proportional gain
554	Ki Gain	200B	2	int32_t	1200000	mA/micron/sec	rw	Observer integral gain
555	Kd Gain	200B	3	int32_t	2000000	mA*sec/micron	rw	Observer derivative gain
556	Inverse Mass Gain	200B	4	int32_t	666666	kg^-1	rw	Observer inverse mass parameter
557	Solenoid TC Gain	200B	5	int32_t	300		rw	Observer Damping gain
558	Position Estimate	200B	6	int16_t	0	x100	ro	Observer calculate the position estimation as per model
559	Velocity Estimate	200B	7	int16_t	0	x100	ro	Observer calculate the Velocity estimation as per model
560	Acceleration Estimate	200B	8	int16_t	0	x100	ro	Observer calculate the Acceleration estimation as per model
561	Highest Subindex	200C	0	uint8_t	13		ro	
562	position Adaption Gain	200C	1	uint32_t	0		rw	position Adaption Gain for tunning the control algorithm
563	position Offset Adaption Gain	200C	2	uint32_t	0		rw	position Adaption Gain offset for tunning the control algorithm
564	velocity Adaption Gain	200C	3	uint32_t	0		rw	velocity Adaption Gain for tunning the control algorithm
565	acceleration Adaption Gain	200C	4	uint32_t	0		rw	acceleration Adaption Gain for tunning the control algorithm
566	Amplitude	200C	5	uint32_t	0		rw	Amplitude for tunning the control algorithm
567	Frequency	200C	6	uint32_t	0		rw	Frequency for tunning the control algorithm
568	DC Offset	200C	7	int32_t	0		rw	DC offset for tunning the control algorithm
569	Position FF Offset	200C	8	int32_t	0		ro	Position offset for tunning the control algorithm
570	Position FF Gain	200C	9	int32_t	0		ro	Position feedforward for tunning the control algorithm
571	Velocity FF Gain	200C	A	int32_t	0		ro	velocity feedforward for tunning the control algorithm
572	Accel FF Gain	200C	B	int32_t	0		ro	Acceleration feedforward for tunning the control algorithm
573	State Command	200C	C	uint8_t	0		rw	command to change the training state
574	State	200C	D	uint8_t	0		ro	current training state
575	Number of ADC Parameters	200D	0	uint8_t	37	N/A	ro	
576	Current Input 1	200D	1	uint16_t	0	Undef	ro	raw ADC value storage
577	Current Input 2	200D	2	uint16_t	0	Undef	ro	raw ADC value storage
578	Current Input 3	200D	3	uint16_t	0	Undef	ro	raw ADC value storage
579	Current Input 4	200D	4	uint16_t	0	Undef	ro	raw ADC value storage
580	Pressure Sensor A	200D	5	uint16_t	0	Undef	ro	raw ADC value storage
581	Pressure Sensor T	200D	6	uint16_t	0	Undef	ro	raw ADC value storage
582	Pressure Sensor P	200D	7	uint16_t	0	Undef	ro	Raw ADC value storage
583	Pressure Sensor B	200D	8	uint16_t	0	Undef	ro	Raw ADC value storage
584	Temperature Sensor 1	200D	9	uint16_t	0	Undef	ro	Raw ADC value storage
585	Temperature Sensor 2	200D	A	uint16_t	0	Undef	ro	Raw ADC value storage
586	Supply Voltage	200D	D	uint16_t	0	Undef	ro	Raw ADC value storage
587	+15V	200D	E	uint16_t	0	Undef	ro	Raw ADC value storage

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
588	-15V	200D	F	uint16_t	0	Undef	ro	Raw ADC value storage
589	5V digital	200D	10	uint16_t	0	Undef	ro	Raw ADC value storage
590	3.3V	200D	11	uint16_t	0	Undef	ro	Raw ADC value storage
591	1.5V	200D	12	uint16_t	0	Undef	ro	Raw ADC value storage
592	2.5V	200D	13	uint16_t	0	Undef	ro	Raw ADC value storage
593	5V analog	200D	14	uint16_t	0	Undef	ro	Raw ADC value storage
594	LVDT Primary	200D	15	uint16_t	0	Undef	ro	Raw ADC value storage
595	LVDT Secondary B	200D	16	uint16_t	0	Undef	ro	Raw ADC value storage
596	LVDT Secondary A	200D	17	uint16_t	0	Undef	ro	Raw ADC value storage
597	External Enable	200D	18	uint16_t	0	Undef	ro	Raw ADC value storage
598	LVDT A-B 1	200D	19	uint16_t	0	Undef	ro	Raw ADC value storage
599	LVDT A-B 2	200D	1A	uint16_t	0	Undef	ro	Raw ADC value storage
600	LVDT A-B 3	200D	1B	uint16_t	0	Undef	ro	Raw ADC value storage
601	LVDT A-B 4	200D	1C	uint16_t	0	Undef	ro	Raw ADC value storage
602	LVDT A-B 5	200D	1D	uint16_t	0	Undef	ro	Raw ADC value storage
603	LVDT A-B 6	200D	1E	uint16_t	0	Undef	ro	Raw ADC value storage
604	LVDT A-B 7	200D	1F	uint16_t	0	Undef	ro	Raw ADC value storage
605	LVDT A-B 8	200D	20	uint16_t	0	Undef	ro	Raw ADC value storage
606	+Command	200D	21	uint16_t	0	Undef	ro	Raw ADC value storage
607	-Command	200D	22	uint16_t	0	Undef	ro	Raw ADC value storage
608	Solenoid A Current	200D	23	uint16_t	0	Undef	ro	Raw ADC value storage
609	Solenoid B Current	200D	24	uint16_t	0	Undef	ro	Raw ADC value storage
610	LVDT A+B	200D	25	uint16_t	0	Undef	ro	Raw ADC value storage
611	Highest Subindex	200E	0	uint8_t	13	Undef	ro	
612	Log Enable	200E	1	uint8_t	0	Undef	rw	LVDT logging enable flag
613	LVDT Raw Sample 1	200E	2	uint16_t	0	Undef	ro	LVDT Sample when primary is low
614	LVDT Raw Sample 1	200E	3	uint16_t	0	Undef	ro	LVDT Sample when primary is low
615	LVDT Raw Sample 1	200E	4	uint16_t	0	Undef	ro	LVDT Sample when primary is low
616	LVDT Raw Sample 1	200E	5	uint16_t	0	Undef	ro	LVDT Sample when primary is low
617	LVDT Raw Sample 1	200E	6	uint16_t	0	Undef	ro	LVDT Sample when primary is low
618	LVDT Raw Sample 1	200E	7	uint16_t	0	Undef	ro	LVDT Sample when primary is low
619	LVDT Raw Sample 1	200E	8	uint16_t	0	Undef	ro	LVDT Sample when primary is low
620	LVDT Raw Sample 1	200E	9	uint16_t	0	Undef	ro	LVDT Sample when primary is low
621	LVDT Sample Time	200E	A	uint16_t	0	Undef	ro	LVDT Sample when primary is high
622	LVDT A-B	200E	B	uint16_t	0	Undef	ro	LVDT Sample when primary is high
623	LVDT A+B	200E	C	uint16_t	0	Undef	ro	LVDT Sample when primary is high
624	Instantaneous Velocity	200E	D	uint16_t	0	Undef	ro	LVDT Sample when primary is high
625	Highest Subindex	2100	0	uint8_t	10	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
626	Eaton error status 1	2100	1	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
627	Eaton error status 2	2100	2	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
628	Eaton error status 3	2100	3	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
629	Eaton error status 4	2100	4	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
630	Eaton error status 5	2100	5	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
631	Eaton error status 6	2100	6	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
632	Eaton error status 7	2100	7	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
633	Eaton error status 8	2100	8	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
634	Eaton error status 9	2100	9	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
635	Eaton error status 10	2100	A	uint8_t	0	Undef	ro	error registers: byte0=generic, byte1=current, byte2=voltage, byte3=temperature, byte4=communication, byte5=DS408 specific, byte6=reserved, byte7=manufacturer specific
636	Highest Subindex	2101	0	uint8_t	2	Undef	ro	
637	Eaton comms status sla	2101	1	uint8_t		Undef	ro	
638	Eaton comms status mst	2101	2	uint8_t		Undef	ro	
639	Highest Subindex	2102	0	uint8_t	5	Undef	ro	CANbus parameters
640	CAN node ID	2102	1	uint8_t	255	Undef	rw	Node ID - 1 to 127 , 255= unconfigured
641	CAN bit rate	2102	2	uint8_t	4	Undef	rw	4=125kbps, 3=250kbps, 2=500kbps, 1=800kbps,0=1000kbps
642	CoDeSys CAN node ID	2102	3	uint8_t	10	Undef	rw	Node ID - 1 to 127
643	CoDeSys CAN bit rate	2102	4	uint16_t	125	Undef	rw	4=125kbps, 3=250kbps, 2=500kbps, 1=800kbps,0=1000kbps
644	Bus Off Recovery	2102	5	uint8_t	0	Undef	rw	
645	Highest Subindex	2140	0	uint8_t	5	N/A	ro	
646	LVDT type	2140	1	int8_t	1	Undef	ro	selection of sensor feedback to control
647	Solenoid Current A type	2140	2	int8_t	-1	Undef	ro	selection of sensor feedback to control
648	Solenoid Current B type	2140	3	int8_t	1	Undef	ro	selection of sensor feedback to control
649	Bus type	2140	4	int8_t	0	Undef	rw	selection of sensor feedback to control
650	Bus 2 type	2140	5	int8_t	0	Undef	rw	selection of sensor feedback to control
651	Highest Subindex	2141	0	uint8_t	5	N/A	ro	
652	LVDT sign	2141	1	int8_t	1	Undef	ro	sign of sensor feedback to control
653	Solenoid Current A sign	2141	2	int8_t	1	Undef	ro	sign of sensor feedback to control
654	Solenoid Current B sign	2141	3	int8_t	1	Undef	ro	sign of sensor feedback to control
655	Bus sign	2141	4	int8_t	1	Undef	rw	sign of sensor feedback to control
656	Bus 2 sign	2141	5	int8_t	1	Undef	rwr	sign of sensor feedback to control
657	Highest Subindex	2150	0	uint8_t	2	N/A	ro	
658	Solenoid A Min Current	2150	1	uint16_t	SOL_CURRENT _AMP_MIN	Undef	rw	min measureable current from solenoid A
659	Solenoid B Min Current	2150	2	uint16_t	SOL_CURRENT _AMP_MIN	Undef	rw	min measureable current from solenoid A
660	Highest Subindex	2151	0	uint8_t	2	N/A	ro	
661	Solenoid A Max Current	2151	1	uint16_t	SOL_CURRENT _AMP_MAX	Undef	rw	max measureable current from solenoid A
662	Solenoid B Max Current	2151	2	uint16_t	SOL_CURRENT _AMP_MAX	Undef	rw	max measureable current from solenoid A
663	Highest Subindex	2152	0	uint8_t	2	N/A	ro	
664	Solenoid A Min ADC	2152	1	uint16_t	SOL_CURRENT _ADC_MIN	Undef	rw	ADC output at minimum current solenoid A
665	Solenoid B Min ADC	2152	2	uint16_t	SOL_CURRENT _ADC_MIN	Undef	rw	ADC output at minimum current solenoid A
666	Highest Subindex	2153	0	uint8_t	2	N/A	ro	
667	Solenoid A Max ADC	2153	1	uint16_t	SOL_CURRENT _ADC_MAX	Undef	rw	ADC output at maximum current solenoid A
668	Solenoid B Max ADC	2153	2	uint16_t	SOL_CURRENT _ADC_MAX	Undef	rw	ADC output at maximum current solenoid A
669	Highest Subindex	2160	0	uint8_t	26	N/A	ro	
670	Input 1 type	2160	1	int8_t	-26	Undef	rw	selection of sensor feedback to drive control
671	Input 2 type	2160	2	int8_t	-26	Undef	rw	selection of sensor feedback to drive control
672	Input 3 type	2160	3	int8_t	-26	Undef	rw	selection of sensor feedback to drive control
673	Input 4 type	2160	4	int8_t	-26	Undef	rw	selection of sensor feedback to drive control
674	Bus type	2160	5	int8_t	0	Undef	rw	selection of sensor feedback to drive control
675	Cmd Input type	2160	6	int8_t	0	Undef	rw	selection of sensor feedback to drive control

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
676	SSI type	2160	7	int8_t	0	Undef	rw	selection of sensor feedback to drive control
677	Bus 2 type	2160	8	int8_t	0	Undef	rw	selection of sensor feedback to drive control
678	Speed 1 type	2160	9	int8_t	-4	Undef	rw	selection of sensor feedback to drive control
679	Speed 2 type	2160	A	int8_t	-4	Undef	ro	selection of sensor feedback to drive control
680	Pressure A type	2160	B	int8_t	2	Undef	ro	selection of sensor feedback to drive control
681	Pressure T type	2160	C	int8_t	2	Undef	ro	selection of sensor feedback to drive control
682	Pressure P type	2160	D	int8_t	2	Undef	ro	selection of sensor feedback to drive control
683	Pressure B type	2160	E	int8_t	2	Undef	ro	selection of sensor feedback to drive control
684	Input Diff 1-2 type	2160	F	int8_t	-20	Undef	ro	selection of sensor feedback to drive control
685	Input Diff 1-3 type	2160	10	int8_t	-21	Undef	ro	selection of sensor feedback to drive control
686	Input Diff 1-4 type	2160	11	int8_t	-22	Undef	ro	selection of sensor feedback to drive control
687	Input Diff 2-3 type	2160	12	int8_t	-23	Undef	ro	selection of sensor feedback to drive control
688	Input Diff 2-4 type	2160	13	int8_t	-24	Undef	ro	selection of sensor feedback to drive control
689	Input Diff 3-4 type	2160	14	int8_t	-25	Undef	ro	selection of sensor feedback to drive control
690	Pressure Diff P-A type	2160	15	int8_t	-10	Undef	ro	selection of sensor feedback to drive control
691	Pressure Diff P-B type	2160	16	int8_t	-11	Undef	ro	selection of sensor feedback to drive control
692	Pressure Diff P-T type	2160	17	int8_t	-12	Undef	ro	selection of sensor feedback to drive control
693	Pressure Diff A-B type	2160	18	int8_t	-13	Undef	ro	selection of sensor feedback to drive control
694	Pressure Diff A-T type	2160	19	int8_t	-14	Undef	ro	selection of sensor feedback to drive control
695	Pressure Diff B-T type	2160	1A	int8_t	-15	Undef	ro	selection of sensor feedback to drive control
696	Highest Subindex	2161	0	uint8_t	26	N/A	ro	
697	Input 1 sign	2161	1	int8_t	1	Undef	rw	sign of sensor feedback to drive control
698	Input 2 sign	2161	2	int8_t	1	Undef	rw	sign of sensor feedback to drive control
699	Input 3 sign	2161	3	int8_t	1	Undef	rw	sign of sensor feedback to drive control
700	Input 4 sign	2161	4	int8_t	1	Undef	rw	sign of sensor feedback to drive control
701	Bus sign	2161	5	int8_t	1	Undef	rw	sign of sensor feedback to drive control
702	Cmd Input sign	2161	6	int8_t	1	Undef	rw	sign of sensor feedback to drive control
703	SSI sign	2161	7	int8_t	1	Undef	rw	sign of sensor feedback to drive control
704	Bus 2 sign	2161	8	int8_t	1	Undef	rw	sign of sensor feedback to drive control
705	Speed 1 sign	2161	9	int8_t	1	Undef	rw	sign of sensor feedback to drive control
706	Speed 2 sign	2161	A	int8_t	1	Undef	rw	sign of sensor feedback to drive control
707	Pressure A sign	2161	B	int8_t	1	Undef	rw	sign of sensor feedback to drive control
708	Pressure T sign	2161	C	int8_t	1	Undef	rw	sign of sensor feedback to drive control
709	Pressure P sign	2161	D	int8_t	1	Undef	rw	sign of sensor feedback to drive control
710	Pressure B sign	2161	E	int8_t	1	Undef	rw	sign of sensor feedback to drive control
711	Input Diff 1-2 sign	2161	F	int8_t	1	Undef	rw	sign of sensor feedback to drive control
712	Input Diff 1-3 sign	2161	10	int8_t	1	Undef	rw	sign of sensor feedback to drive control
713	Input Diff 1-4 sign	2161	11	int8_t	1	Undef	rw	sign of sensor feedback to drive control
714	Input Diff 2-3 sign	2161	12	int8_t	1	Undef	rw	sign of sensor feedback to drive control
715	Input Diff 2-4 sign	2161	13	int8_t	1	Undef	rw	sign of sensor feedback to drive control
716	Input Diff 3-4 sign	2161	14	int8_t	1	Undef	rw	sign of sensor feedback to drive control
717	Pressure Diff P-A sign	2161	15	int8_t	1	Undef	rw	sign of sensor feedback to drive control
718	Pressure Diff P-B sign	2161	16	int8_t	1	Undef	rw	sign of sensor feedback to drive control
719	Pressure Diff P-T sign	2161	17	int8_t	1	Undef	rw	sign of sensor feedback to drive control
720	Pressure Diff A-B sign	2161	18	int8_t	1	Undef	rw	sign of sensor feedback to drive control
721	Pressure Diff A-T sign	2161	19	int8_t	1	Undef	rw	sign of sensor feedback to drive control
722	Pressure Diff B-T sign	2161	1A	int8_t	1	Undef	rw	sign of sensor feedback to drive control
723	Highest Subindex	2162	0	uint8_t	12	N/A	ro	
724	Input 1 Min Pressure	2162	1	int32_t	0	decibar	rw	minimun reference of Pressure sensor
725	Input 2 Min Pressure	2162	2	int32_t	0	decibar	rw	minimun reference of Pressure sensor
726	Input 3 Min Pressure	2162	3	int32_t	0	decibar	rw	minimun reference of Pressure sensor
727	Input 4 Min Pressure	2162	4	int32_t	0	decibar	rw	minimun reference of Pressure sensor
728	Bus Min Pressure	2162	5	int32_t	0	decibar	rw	minimun reference of Pressure sensor
729	Cmd Input Min Pressure	2162	6	int32_t	0	decibar	rw	minimun reference of Pressure sensor
730	SSI Min Pressure	2162	7	int32_t	0	decibar	rw	minimun reference of Pressure sensor
731	Bus 2 Min Pressure	2162	8	int32_t	0	decibar	rw	minimun reference of Pressure sensor

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
732	Pressure A Min	2162	9	int32_t	0	decibar	rw	minimun reference of Pressure sensor
733	Pressure T Min	2162	A	int32_t	0	decibar	rw	minimun reference of Pressure sensor
734	Pressure P Min	2162	B	int32_t	0	decibar	rw	minimun reference of Pressure sensor
735	Pressure B Min	2162	C	int32_t	0	decibar	rw	minimun reference of Pressure sensor
736	Highest Subindex	2163	0	uint8_t	12	N/A	ro	
737	Input 1 Max Pressure	2163	1	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
738	Input 2 Max Pressure	2163	2	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
739	Input 3 Max Pressure	2163	3	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
740	Input 4 Max Pressure	2163	4	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
741	Bus Max Pressure	2163	5	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
742	Cmd Input Max Pressure	2163	6	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
743	SSI Max Pressure	2163	7	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
744	Bus 2 Max Pressure	2163	8	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
745	Pressure A Max	2163	9	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
746	Pressure T Max	2163	A	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
747	Pressure P Max	2163	B	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
748	Pressure B Max	2163	C	int32_t	4000	decibar	rw	maximum reference of Pressure sensor
749	Highest Subindex	2164	0	uint8_t	12	N/A	ro	
750	Input 1 Pressure Area	2164	1	int32_t	1	mm(Sq)	rw	Area of cylinder
751	Input 2 Pressure Area	2164	2	int32_t	1	mm(Sq)	rw	Area of cylinder
752	Input 3 Pressure Area	2164	3	int32_t	1	mm(Sq)	rw	Area of cylinder
753	Input 4 Pressure Area	2164	4	int32_t	1	mm(Sq)	rw	Area of cylinder
754	Bus Pressure Area	2164	5	int32_t	1	mm(Sq)	rw	Area of cylinder
755	Cmd Input Pressure Area	2164	6	int32_t	1	mm(Sq)	rw	Area of cylinder
756	SSI Pressure Area	2164	7	int32_t	1	mm(Sq)	rw	Area of cylinder
757	Bus 2 Pressure Area	2164	8	int32_t	1	mm(Sq)	rw	Area of cylinder
758	Pressure A Area	2164	9	int32_t	1	mm(Sq)	rw	Area of cylinder
759	Pressure T Area	2164	A	int32_t	1	mm(Sq)	rw	Area of cylinder
760	Pressure P Area	2164	B	int32_t	1	mm(Sq)	rw	Area of cylinder
761	Pressure B Area	2164	C	int32_t	1	mm(Sq)	rw	Area of cylinder
762	Highest Subindex	2165	0	uint8_t	12	N/A	ro	
763	Input 1 Pressure Offset	2165	1	int32_t	0	decibar	rw	pressure sensor offset value
764	Input 2 Pressure Offset	2165	2	int32_t	0	decibar	rw	pressure sensor offset value
765	Input 3 Pressure Offset	2165	3	int32_t	0	decibar	rw	pressure sensor offset value
766	Input 4 Pressure Offset	2165	4	int32_t	0	decibar	rw	pressure sensor offset value
767	Bus Pressure Offset	2165	5	int32_t	0	decibar	rw	pressure sensor offset value
768	Cmd Input Pressure Offset	2165	6	int32_t	0	decibar	rw	pressure sensor offset value
769	SSI Pressure Offset	2165	7	int32_t	0	decibar	rw	pressure sensor offset value
770	Bus 2 Pressure Offset	2165	8	int32_t	0	decibar	rw	pressure sensor offset value
771	Pressure A Offset	2165	9	int32_t	0	decibar	rw	pressure sensor offset value
772	Pressure T Offset	2165	A	int32_t	0	decibar	rw	pressure sensor offset value
773	Pressure P Offset	2165	B	int32_t	0	decibar	rw	pressure sensor offset value
774	Pressure B Offset	2165	C	int32_t	0	decibar	rw	pressure sensor offset value
775	Highest Subindex	2166	0	uint8_t	12	N/A	ro	
776	Input 1 Pressure Signal Min	2166	1	int32_t	3981	decibar	rw	Minimum ADC signal value of pressure sensor
777	Input 2 Pressure Signal Min	2166	2	int32_t	3981	decibar	rw	Minimum ADC signal value of pressure sensor
778	Input 3 Pressure Signal Min	2166	3	int32_t	3981	decibar	rw	Minimum ADC signal value of pressure sensor
779	Input 4 Pressure Signal Min	2166	4	int32_t	3981	decibar	rw	Minimum ADC signal value of pressure sensor
780	Bus Pressure Signal Min	2166	5	int32_t	0	decibar	rw	Minimum ADC signal value of pressure sensor
781	Cmd Input Pressure Signal Min	2166	6	int32_t	0	decibar	rw	Minimum ADC signal value of pressure sensor
782	SSI Pressure Signal Min	2166	7	int32_t	0	decibar	rw	Minimum ADC signal value of pressure sensor
783	Bus 2 Pressure Signal Min	2166	8	int32_t	4441	decibar	rw	Minimum ADC signal value of pressure sensor
784	Pressure A Signal Min	2166	9	int32_t	4441	decibar	rw	Minimum ADC signal value of pressure sensor
785	Pressure T Signal Min	2166	A	int32_t	4441	decibar	rw	Minimum ADC signal value of pressure sensor
786	Pressure P Signal Min	2166	B	int32_t	4441	decibar	rw	Minimum ADC signal value of pressure sensor
787	Pressure B Signal Min	2166	C	int32_t	4441	decibar	rw	Minimum ADC signal value of pressure sensor

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
788	Highest Subindex	2167	0	uint8_t	12	N/A	ro	
789	Input 1 Pressure Signal Max	2167	1	int32_t	19818	decibar	rw	Maximum ADC signal value of pressure sensor
790	Input 2 Pressure Signal Max	2167	2	int32_t	19818	decibar	rw	Maximum ADC signal value of pressure sensor
791	Input 3 Pressure Signal Max	2167	3	int32_t	19818	decibar	rw	Maximum ADC signal value of pressure sensor
792	Input 4 Pressure Signal Max	2167	4	int32_t	19818	decibar	rw	Maximum ADC signal value of pressure sensor
793	Bus Pressure Signal Max	2167	5	int32_t	4000	decibar	rw	Maximum ADC signal value of pressure sensor
794	Cmd Input Pressure Signal Max	2167	6	int32_t	4000	decibar	rw	Maximum ADC signal value of pressure sensor
795	SSI Pressure Signal Max	2167	7	int32_t	4000	decibar	rw	Maximum ADC signal value of pressure sensor
796	Bus 2 Pressure Signal Max	2167	8	int32_t	4000	decibar	rw	Maximum ADC signal value of pressure sensor
797	Pressure A Signal Max	2167	9	int32_t	6282	decibar	rw	Maximum ADC signal value of pressure sensor
798	Pressure T Signal Max	2167	A	int32_t	6282	decibar	rw	Maximum ADC signal value of pressure sensor
799	Pressure P Signal Max	2167	B	int32_t	6282	decibar	rw	Maximum ADC signal value of pressure sensor
800	Pressure B Signal Max	2167	C	int32_t	6282	decibar	rw	Maximum ADC signal value of pressure sensor
801	Highest Subindex	2170	0	uint8_t	8	N/A	ro	
802	Input 1 Position Min	2170	1	int32_t	-152400	um	rw	minimun reference of posttion sensor
803	Input 2 Position Min	2170	2	int32_t	-152400	um	rw	minimun reference of posttion sensor
804	Input 3 Position Min	2170	3	int32_t	-152400	um	rw	minimun reference of posttion sensor
805	Input 4 Position Min	2170	4	int32_t	-152400	um	rw	minimun reference of posttion sensor
806	Bus Position Min	2170	5	int32_t	-152400	um	rw	minimun reference of posttion sensor
807	Cmd Input Position Min	2170	6	int32_t	-152400	um	rw	minimun reference of posttion sensor
808	SSI Position Min	2170	7	int32_t	-152400	um	rw	minimun reference of posttion sensor
809	Bus 2 Position Min	2170	8	int32_t	-152400	um	rw	minimun reference of posttion sensor
810	Highest Subindex	2171	0	uint8_t	8	N/A	ro	
811	Input 1 Position Max	2171	1	int32_t	152400	um	rw	maximum reference of posttion sensor
812	Input 2 Position Max	2171	2	int32_t	152400	um	rw	maximum reference of posttion sensor
813	Input 3 Position Max	2171	3	int32_t	152400	um	rw	maximum reference of posttion sensor
814	Input 4 Position Max	2171	4	int32_t	152400	um	rw	maximum reference of posttion sensor
815	Bus Position Max	2171	5	int32_t	152400	um	rw	maximum reference of posttion sensor
816	Cmd Input Position Max	2171	6	int32_t	152400	um	rw	maximum reference of posttion sensor
817	SSI Position Max	2171	7	int32_t	152400	um	rw	maximum reference of posttion sensor
818	Bus 2 Position Max	2171	8	int32_t	152400	um	rw	maximum reference of posttion sensor
819	Highest Subindex	2172	0	uint8_t	8	N/A	ro	
820	Input 1 Position T1	2172	1	int32_t	50	ms	rw	ow pass filter time constant for feedback signal
821	Input 2 Position T1	2172	2	int32_t	50	ms	rw	ow pass filter time constant for feedback signal
822	Input 3 Position T1	2172	3	int32_t	50	ms	rw	ow pass filter time constant for feedback signal
823	Input 4 Position T1	2172	4	int32_t	50	ms	rw	ow pass filter time constant for feedback signal
824	Bus Position T1	2172	5	int32_t	50	ms	rw	ow pass filter time constant for feedback signal
825	Cmd Input Position T1	2172	6	int32_t	50	ms	rw	ow pass filter time constant for feedback signal
826	SSI Position T1	2172	7	int32_t	50	ms	rw	ow pass filter time constant for feedback signal
827	Bus 2 Position T1	2172	8	int32_t	50	ms	rw	ow pass filter time constant for feedback signal
828	Highest Subindex	2173	0	uint8_t	8	N/A	ro	
829	Input 1 Position Signal Min	2173	1	int32_t	3981		rw	Minimum ADC signal value of position sensor
830	Input 2 Position Signal Min	2173	2	int32_t	3981		rw	Minimum ADC signal value of position sensor
831	Input 3 Position Signal Min	2173	3	int32_t	3981		rw	Minimum ADC signal value of position sensor
832	Input 4 Position Signal Min	2173	4	int32_t	3981		rw	Minimum ADC signal value of position sensor
833	Bus Position Signal Min	2173	5	int32_t	-152400		rw	Minimum ADC signal value of position sensor
834	Cmd Input Position Signal Min	2173	6	int32_t	-10000		rw	Minimum ADC signal value of position sensor
835	SSI Position Signal Min	2173	7	int32_t	-152400		rw	Minimum ADC signal value of position sensor
836	Bus 2 Position Signal Min	2173	8	int32_t	-152400		rw	Minimum ADC signal value of position sensor
837	Highest Subindex	2174	0	uint8_t	8	N/A	ro	
838	Input 1 Position Signal Max	2174	1	int32_t	19818		rw	Maximum ADC signal value of position sensor
839	Input 2 Position Signal Max	2174	2	int32_t	19818		rw	Maximum ADC signal value of position sensor
840	Input 3 Position Signal Max	2174	3	int32_t	19818		rw	Maximum ADC signal value of position sensor
841	Input 4 Position Signal Max	2174	4	int32_t	19818		rw	Maximum ADC signal value of position sensor
842	Bus Position Signal Max	2174	5	int32_t	152400		rw	Maximum ADC signal value of position sensor
843	Cmd Input Position Signal Max	2174	6	int32_t	10000		rw	Maximum ADC signal value of position sensor

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
844	SSI Position Signal Max	2174	7	int32_t	152400		rw	Maximum ADC signal value of position sensor
845	Bus 2 Position Signal Max	2174	8	int32_t	152400		rw	Maximum ADC signal value of position sensor
846	Highest Subindex	2175	0	uint8_t	8	N/A	ro	
847	Input 1 Position Resolution	2175	1	int32_t	1		rw	resolution of position sensor as per drive
848	Input 2 Position Resolution	2175	2	int32_t	1		rw	resolution of position sensor as per drive
849	Input 3 Position Resolution	2175	3	int32_t	1		rw	resolution of position sensor as per drive
850	Input 4 Position Resolution	2175	4	int32_t	1		rw	resolution of position sensor as per drive
851	Bus Position Resolution	2175	5	int32_t	1		rw	resolution of position sensor as per drive
852	Cmd Input Position Resolution	2175	6	int32_t	1		rw	resolution of position sensor as per drive
853	SSI Position Resolution	2175	7	int32_t	1		rw	resolution of position sensor as per drive
854	Bus 2 Position Resolution	2175	8	int32_t	1		rw	resolution of position sensor as per drive
855	Highest Subindex	2176	0	uint8_t	8	N/A	ro	
856	Input 1 Position Offset	2176	1	int32_t	0		rw	offset of position sensor as per drive
857	Input 2 Position Offset	2176	2	int32_t	0		rw	offset of position sensor as per drive
858	Input 3 Position Offset	2176	3	int32_t	0		rw	offset of position sensor as per drive
859	Input 4 Position Offset	2176	4	int32_t	0		rw	offset of position sensor as per drive
860	Bus Position Offset	2176	5	int32_t	0		rw	offset of position sensor as per drive
861	Cmd Input Position Offset	2176	6	int32_t	0		rw	offset of position sensor as per drive
862	SSI Position Offset	2176	7	int32_t	0		rw	offset of position sensor as per drive
863	Bus 2 Position Offset	2176	8	int32_t	0		rw	offset of position sensor as per drive
864	Highest Subindex	2177	0	uint8_t	8	N/A	ro	
865	Input 1 Position Zero Shift	2177	1	int32_t	0		rw	zero shift of position sensor as per drive
866	Input 2 Position Zero Shift	2177	2	int32_t	0		rw	zero shift of position sensor as per drive
867	Input 3 Position Zero Shift	2177	3	int32_t	0		rw	zero shift of position sensor as per drive
868	Input 4 Position Zero Shift	2177	4	int32_t	0		rw	zero shift of position sensor as per drive
869	Bus Position Zero Shift	2177	5	int32_t	0		rw	zero shift of position sensor as per drive
870	Cmd Input Position Zero Shift	2177	6	int32_t	0		rw	zero shift of position sensor as per drive
871	SSI Position Zero Shift	2177	7	int32_t	0		rw	zero shift of position sensor as per drive
872	Bus 2 Position Zero Shift	2177	8	int32_t	0		rw	zero shift of position sensor as per drive
873	Highest Subindex	2178	0	uint8_t	8	N/A	ro	
874	Input 1 Position Bit Size	2178	1	uint8_t	24		rw	Bit size of position sensor
875	Input 2 Position Bit Size	2178	2	uint8_t	24		rw	Bit size of position sensor
876	Input 3 Position Bit Size	2178	3	uint8_t	24		rw	Bit size of position sensor
877	Input 4 Position Bit Size	2178	4	uint8_t	24		rw	Bit size of position sensor
878	Bus Position Bit Size	2178	5	uint8_t	24		rw	Bit size of position sensor
879	Cmd Input Position Bit Size	2178	6	uint8_t	24		rw	Bit size of position sensor
880	SSI Position Bit Size	2178	7	uint8_t	24		rw	Bit size of position sensor
881	Bus 2 Position Bit Size	2178	8	uint8_t	24		rw	Bit size of position sensor
882	ADC Signal Min Pos Cmd Voltage	2200	0	uint16_t	30		rw	ADC value for minimum positive voltage command
883	ADC Signal Max Pos Cmd Voltage	2201	0	uint16_t	16125		rw	ADC value for maximum positive voltage command
884	ADC Signal Min Neg Cmd Voltage	2202	0	uint16_t	30		rw	ADC value for minimum negative voltage command
885	ADC Signal Max Neg Cmd Voltage	2203	0	uint16_t	16160		rw	ADC value for maximum negative voltage command
886	ADC Signal Min Pos Cmd Current	2210	0	uint16_t	30		rw	ADC value for minimum positive current command
887	ADC Signal Max Pos Cmd Current	2211	0	uint16_t	13400		rw	ADC value for maximum positive current command
888	ADC Signal Min Neg Cmd Current	2212	0	uint16_t	30		rw	ADC value for minimum negative current command
889	ADC Signal Max Neg Cmd Current	2213	0	uint16_t	13430		rw	ADC value for maximum negative current command
890	Hold Actual or Preset Value	2220	0	uint8_t	3		rw	Selector to use actual value or preset as hold setpoint
891	Highest Subindex	2300	0	uint8_t	4	N/A	ro	Drive position Control parameters
892	DPC Velocity Feed Forward Gain	2300	1	uint32_t	1	Undef	rw	DPC velocity feedforward gain
893	DPC Integrator Upper Limit	2300	2	int32_t	10000	Undef	rw	DPC_IntegratorUpperLimit
894	DPC Integrator Lower Limit	2300	3	int32_t	-10000	Undef	rw	DPC_IntegratorLowerLimit
895	DPC Kd	2300	4	uint32_t	1	Undef	rw	DPC_Kd
896	Highest Subindex	2400	0	uint8_t	5	N/A	ro	Drive Speed Control parameters
897	DSC Velocity Feed Forward Gain	2400	1	uint32_t	150	Undef	rw	DSC velocity feedforward gain
898	DSC Differentiate Feedback Switch	2400	2	uint8_t	1	Undef	rw	DSC_Differentiate_Feedback_Switch
899	DSC Integrator Upper Limit	2400	3	int32_t	5000	Undef	rw	DSC_IntegratorUpperLimit

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
900	DSC Integrator Lower Limit	2400	4	int32_t	-5000	Undef	rw	DSC_IntegratorLowerLimit
901	DSC CFB Ka	2400	5	uint32_t	0	Undef	rw	Acceleration feedback of the feedback function
902	Highest Subindex	2500	0	uint8_t	3	N/A	ro	Drive Force Pressure Control parameters
903	DFPC CFB Kv	2500	1	uint32_t	0	Undef	rw	DFPC_Ka
904	DFPC Integrator Upper Limit	2500	2	int32_t	16384	Undef	rw	DFPC_IntegratorUpperLimit
905	DFPC Integrator Lower Limit	2500	3	int32_t	-16384	Undef	rw	DFPC_IntegratorLowerLimit
906	Highest Subindex	2600	0	uint8_t	1	N/A	ro	Drive Forece Speed Control parameters
907	DPQ Speed Deadband	2600	1	uint32_t	0	Undef	rw	DPQ Speed Deadband
908	Dev control word	6040	0	Device ControlWord	0	Undef	rww	Device Control Word
909	Dev status word	6041	0	Device StatusWord	0	Undef	ro	Device status word
910	Device mode	6042	0	int8_t	1	Undef	rw	0=None, 1=Setpt Bus/CoDeSys, 2=Setpt Local, 3=Install, 4=Ref, 5=Auto, 6=Auto_step, -1=Setpt Voltage Input, -2=Setpoint Current Input, -3=Calibrate, -4=Train, -5=Airbleed
911	Device control mode	6043	0	int8_t	2	Undef	rw	0=NA, 1=Spool OL, 2=Spool CL, 3=Pressure OL, 4=Pressure CL, 5=pQ, 6=Axis Pos OL, 7=Axis Velocity, 8=Axis Force/Pressure, 9=Axis CL, 10=Pos Decel
912	Device error code	604E	0	uint16_t	0	Undef	ro	Device error code
913	Device local	604F	0	int8_t	1	Undef	rw	0=Bus, 1=Local, -1=CoDeSys
914	Device version	6050	0	visible_char_t	1	Undef	rw	Device version
915	Device code number	6051	0	uint16_t	0	Undef	rw	Device code number
916	Device serial number	6052	0	visible_char_t	0	Undef	rw	Device serial number
917	Device description	6053	0	visible_char_t	NO USER DESCRIPTION	Undef	rw	Device description
918	Device model description	6054	0	visible_char_t	KBS2DG4V-3-92L-040 _____-M9F1-PC7H8-COA____-LFB-1A	Undef	rw	Device model description
919	Device model URL	6055	0	visible_char_t	eaton.com	Undef	rw	Device model URL
920	Device parameter set code	6056	0	uint8_t	255	Undef	rw	Device parameter set code
921	Device Vendor Name	6057	0	visible_char_t	Eaton Hydraulics Corporation	Undef	ro	Device Vendor Name
922	Device Capability	605F	0	uint32_t	0x71D8031	Undef	rw	Device Capability
923	Number of Valve interfaces	6100	0	uint8_t	5	Undef	ro	Number of Valve interfaces (sensors) used for control algorithm
924	Valve AVC interface selection	6101	0	uint8_t	0	Undef	rw	Index of the selected valve interface
925	Valve AVC selected interface type	6102	0	int8_t	1	Undef	rw	Type of the selected valve interfac
926	Valve AVC selected interface sign	6103	0	int8_t	1	Undef	rw	Sign of the valve selected interface
927	Highest Subindex	6104	0	uint8_t	1	N/A	ro	
928	Value	6104	1	int16_t	0	Undef	ro	Value of the currently selected valve interface
929	Highest Subindex	6110	0	uint8_t	1	N/A	ro	
930	Value	6110	1	int16_t	0	Undef	ro	Value of the LVDT
931	Highest Subindex	6111	0	uint8_t	1	N/A	ro	
932	Value	6111	1	int16_t	0	mA	ro	Value of the solenoid A current
933	Highest Subindex	6112	0	uint8_t	1	N/A	ro	
934	Value	6112	1	int16_t	0	mA	ro	Value of the solenoid B current
935	Highest Subindex	6113	0	uint8_t	1	N/A	ro	
936	Value	6113	1	int16_t	0	Undef	rww	Value of the CANbus input
937	Highest Subindex	6114	0	uint8_t	1	N/A	ro	
938	Value	6114	1	int16_t	0	Undef	rww	Value of the CANbus input 2
939	Highest Subindex	6130	0	uint8_t	1	N/A	ro	
940	Value	6130	1	int16_t	0	Undef	rw	Valve Interface - Type 67 Analog Position transducer Min reference position
941	Highest Subindex	6131	0	uint8_t	1	N/A	ro	
942	Value	6131	1	int16_t	0	Undef	rw	Valve Interface - Type 67 Analog Position transducer Max reference position
943	Highest Subindex	6132	0	uint8_t	1	N/A	ro	
944	Value	6132	1	uint32_t	0	mS	rw	Valve Interface - Type 67 Analog Position transducer LPF time constant position
945	Highest Subindex	6133	0	uint8_t	1	N/A	ro	

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
946	Value	6133	1	int16_t	-3127	Undef	rw	Valve Interface - Type 67 Analog Position transducer output at minimum position
947	Highest Subindex	6134	0	uint8_t	1	N/A	ro	
948	Value	6134	1	int16_t	3127	Undef	rw	Valve Interface - Type 67 Analog Position transducer output at maximum position
949	Number of Drive Interfaces	6200	0	uint8_t	26	Undef	ro	Number of Drive interfaces (inputs) used for control algorithm
950	Drive AVC interface selection	6201	0	uint8_t	0	Undef	rw	Index of the selected drive interface
951	Drive AVC selected interface type	6202	0	int8_t	-26	Undef	rw	Type of the selected drive interfac
952	Drive AVC selected interface sign	6203	0	int8_t	1	Undef	rw	Sign of the drive selected interface
953	Highest Subindex	6204	0	uint8_t	1	N/A	ro	
954	Value	6204	1	int32_t	0	Undef	ro	Value of the currently selected interface (defaults to first interface)i
955	Highest Subindex	6210	0	uint8_t	1	N/A	ro	
956	Value	6210	1	int32_t	0	Undef	ro	Value of drive interface 1 - Input 1
957	Highest Subindex	6211	0	uint8_t	1	N/A	ro	
958	Value	6211	1	int32_t	0	Undef	ro	Value of drive interface 2 - Input 2
959	Highest Subindex	6212	0	uint8_t	1	N/A	ro	
960	Value	6212	1	int32_t	0	Undef	ro	Value of drive interface 3 - Input 3
961	Highest Subindex	6213	0	uint8_t	1	N/A	ro	
962	Value	6213	1	int32_t	0	Undef	ro	Value of drive interface 4 - Input 4
963	Highest Subindex	6214	0	uint8_t	1	N/A	ro	
964	Value	6214	1	int32_t	0	Undef	rww	Value of drive interface 5 - Bus input
965	Highest Subindex	6215	0	uint8_t	1	N/A	ro	
966	Value	6215	1	int32_t	0	Undef	ro	Value of drive interface 6 - Command input
967	Highest Subindex	6216	0	uint8_t	1	N/A	ro	
968	Value	6216	1	int32_t	0	Undef	ro	Value of drive interface 7 - Speed input 1
969	Highest Subindex	6217	0	uint8_t	1	N/A	ro	
970	Value	6217	1	int32_t	0	Undef	rww	Value of drive interface 8 - Speed input 2
971	Highest Subindex	6218	0	uint8_t	1	N/A	ro	
972	Value	6218	1	int32_t	0	Undef	ro	Value of drive SSI sensor
973	Highest Subindex	6219	0	uint8_t	1	N/A	ro	
974	Value	6219	1	int32_t	0	Undef	ro	Value of CAN input 2
975	Highest Subindex	621A	0	uint8_t	1	N/A	ro	
976	Value	621A	1	int32_t	0	decibar/ mN	ro	Value of drive pressure/force port A
977	Highest Subindex	621B	0	uint8_t	1	N/A	ro	
978	Value	621B	1	int32_t	0	decibar/ mN	ro	Value of drive pressure/force port B
979	Highest Subindex	621C	0	uint8_t	1	N/A	ro	
980	Value	621C	1	int32_t	0	decibar/ mN	ro	Value of drive pressure/force port P
981	Highest Subindex	621D	0	uint8_t	1	N/A	ro	
982	Value	621D	1	int32_t	0	decibar/ mN	ro	Value of drive pressure/force port T
983	Highest Subindex	621E	0	uint8_t	1	N/A	ro	
984	Value	621E	1	int32_t	0	decibar/ mN	ro	Value of drive pressure/force difference A-B
985	Highest Subindex	621F	0	uint8_t	1	N/A	ro	
986	Value	621F	1	int32_t	0	decibar/ mN	ro	Drive AVC external curent sensor input difference 1-2
987	Highest Subindex	6220	0	uint8_t	1	N/A	ro	
988	Value	6220	1	int32_t	0	decibar	rw	Drive Interface - Type 2 pressure transducer lower measurement range limit
989	Highest Subindex	6221	0	uint8_t	1	N/A	ro	
990	Value	6221	1	int32_t	4000	decibar	rw	Drive Interface - Type 2 pressure transducer upper measurement range limit
991	Highest Subindex	6222	0	uint8_t	1	N/A	ro	
992	Value	6222	1	int32_t	1	mmSq	rw	Drive Interface - Type 2 pressure transducer cylinder area
993	Highest Subindex	6223	0	uint8_t	1	N/A	ro	

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
994	Value	6223	1	int32_t	0	decibar	rw	Drive Interface - Type 2 Pressure offset of a pressure transducer
995	Highest Subindex	6224	0	uint8_t	1	N/A	ro	
996	Value	6224	1	int32_t	3981	uA	rw	Drive Interface - Type 2 Pressure transducer output at min pressure
997	Highest Subindex	6225	0	uint8_t	1	N/A	ro	
998	Value	6225	1	int32_t	19818	uA	rw	Drive Interface - Type 2 Pressure transducer output at max pressure
999	Highest Subindex	6230	0	uint8_t	1	N/A	ro	
1000	Value	6230	1	int32_t	-152400	um	rw	Drive Interface - Type 67 Analog Position transducer Min reference position
1001	Highest Subindex	6231	0	uint8_t	1	N/A	ro	
1002	Value	6231	1	int32_t	152400	um	rw	Drive Interface - Type 67 Analog Position transducer Max reference position
1003	Highest Subindex	6232	0	uint8_t	1	N/A	ro	
1004	Value	6232	1	uint32_t	50	ms	rw	Drive Interface - Type 67 Analog Position transducer LPF time constant position
1005	Highest Subindex	6233	0	uint8_t	1	N/A	ro	
1006	Value	6233	1	int32_t	3981	uA	rw	Drive Interface - Type 67 Analog Position transducer output at minimum position
1007	Highest Subindex	6234	0	uint8_t	1	N/A	ro	
1008	Value	6234	1	int32_t	19818	uA	rw	Drive Interface - Type 67 Analog Position transducer output at maximum position
1009	Highest Subindex	6240	0	uint8_t	1	N/A	ro	
1010	Value	6240	1	int32_t	1	Undef	rw	Resolution of the sensor
1011	Highest Subindex	6241	0	uint8_t	1	N/A	ro	
1012	Value	6241	1	int32_t	0	Undef	rw	Offset of the sensor
1013	Highest Subindex	6242	0	uint8_t	1	N/A	ro	
1014	Value	6242	1	int32_t	0	Undef	rw	Zero shift of the sensor
1015	Drive AVC selected interface type 65,66 sensor bit size	6243	0	uint8_t	0	Undef	rw	Bit size (resolution) of the sensor
1016	Highest Subindex	6244	0	uint8_t	1	N/A	ro	
1017	Value	6244	1	int32_t	0	Undef	rw	Speed of sound of the sensor
1018	Drive AVC selected interface type 68 start-stop type	6245	0	int8_t	0	Undef	rw	Type of the start-stop sensor
1019	Highest Subindex	6280	0	uint8_t	1	N/A	ro	
1020	Value	6280	1	int32_t	0	Undef	ro	Drive controller output
1021	Highest Subindex	6281	0	uint8_t	1	N/A	ro	
1022	Value	6281	1	int32_t	-16384	Undef	rw	Drive controller output interface min
1023	Highest Subindex	6282	0	uint8_t	1	N/A	ro	
1024	Value	6282	1	int32_t	16384	Undef	rw	Drive controller output interface max
1025	Drive controller output direction dependent gain type	62A0	0	int8_t	0	Undef	rw	Drive controller output directional dependent gain type
1026	Drive controller output directional dependent gain factor	62A1	0	uint32_t	0	Undef	rw	Drive controller output directional dependent gain factor
1027	Highest Subindex	62C0	0	uint8_t	1	N/A	ro	
1028	Value	62C0	1	int32_t	0	Undef	rw	Drive controller output zero correction offset
1029	Highest Subindex	62E0	0	uint8_t	1	N/A	ro	
1030	Value	62E0	1	int32_t	-16384	Undef	rw	Drive controller output upper limit
1031	Highest Subindex	62E1	0	uint8_t	1	N/A	ro	
1032	Value	62E1	1	int32_t	16384	Undef	rw	Drive controller output Lower limit
1033	Drive controller output inverting sign	62F0	0	int8_t	1	Undef	rw	Drive controller output inverting sign
1034	Highest Subindex	6300	0	uint8_t	3	N/A	ro	
1035	Value	6300	1	int16_t	0	Undef	rww	valve position OL, CL or pressure OL, CL mode command setpoint
1036	Unit	6300	2	uint8_t	0	Undef	ro	valve position OL, CL unit
1037	Prefix	6300	3	int8_t	0	Undef	ro	valve position OL, CL prefix
1038	Highest Subindex	6301	0	uint8_t	3	N/A	ro	
1039	Value	6301	1	int16_t	0	Undef	ro	Default sensor interface is solenoid A current
1040	Unit	6301	2	uint8_t	0	Undef	ro	valve position OL, CL unit
1041	Prefix	6301	3	int8_t	0	Undef	ro	valve position OL, CL prefix

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1042	VPOC interface selection	6302	0	uint8_t	0	Undef	rw	Number of the interface to use with the control mode
1043	Highest Subindex	6310	0	uint8_t	1	N/A	ro	
1044	Value	6310	1	int16_t	0	Undef	ro	Calculated demand from setpoint
1045	Highest Subindex	6311	0	uint8_t	1	N/A	ro	
1046	Value	6311	1	int16_t	16384	Undef	rww	VPOC reference value (100% of setpoint)
1047	Highest Subindex	6314	0	uint8_t	1	N/A	ro	
1048	Value	6314	1	int16_t	0	Undef	rww	The hold setpoint is active in the states HOLD and FAULT HOLD
1049	Highest Subindex	6320	0	uint8_t	1	N/A	ro	
1050	Value	6320	1	int16_t	16384	Undef	rww	Upper limit of generated command
1051	Highest Subindex	6321	0	uint8_t	1	N/A	ro	
1052	Value	6321	1	int16_t	-16384	Undef	rww	Lower limit of generated command
1053	VPOC DVG scaling factor	6322	0	uint32_t	0x00010001	Undef	rw	VPOC scaling factor numerator and denominator
1054	Highest Subindex	6323	0	uint8_t	1	N/A	ro	
1055	Value	6323	1	int16_t	0	Undef	rw	VPOC scaling offset
1056	Highest Subindex	6324	0	uint8_t	1	N/A	ro	
1057	Value	6324	1	int16_t	0	Undef	rw	VPOC zero correction offset
1058	VPOC DVG ramp type	6330	0	int8_t	0	Undef	rw	VPOC ramp Type
1059	Highest Subindex	6332	0	uint8_t	1	N/A	ro	
1060	Value	6332	1	uint16_t	32000	iu/s	rww	VPOC ramp Type 3 Positive input accel
1061	Highest Subindex	6333	0	uint8_t	1	N/A	ro	
1062	Value	6333	1	uint16_t	32000	iu/s	rww	VPOC ramp Type 3 Negative input accel
1063	Highest Subindex	6335	0	uint8_t	1	N/A	ro	
1064	Value	6335	1	uint16_t	32000	iu/s	rww	VPOC ramp Type 3 Positive input decel
1065	Highest Subindex	6336	0	uint8_t	1	N/A	ro	
1066	Value	6336	1	uint16_t	32000	iu/s	rww	VPOC ramp Type 3 Negative input decel
1067	VPOC DVG Directional Dependent Gain Type	6340	0	int8_t	0	Undef	rw	VPOC Directional Dependent Gain Type
1068	VPOC DVG Directional Dependent Gain Factor	6341	0	uint32_t	0x00010001	Undef	rw	VPOC Directional Dependent Gain Factor
1069	Highest Subindex	6350	0	uint8_t	1	N/A	ro	
1070	Value	6350	1	int16_t	0	Undef	ro	VPOC deviation
1071	Highest Subindex	6352	0	uint8_t	1	N/A	ro	
1072	Value	6352	1	uint16_t	1	Undef	rw	vpoc_control_monitoring_delay_time
1073	Highest Subindex	6354	0	uint8_t	1	N/A	ro	
1074	Value	6354	1	int16_t	1000	Undef	rww	vpoc_control_monitoring_upper_threshold
1075	Highest Subindex	6355	0	uint8_t	1	N/A	ro	
1076	Value	6355	1	int16_t	-1000	Undef	rww	vpoc_control_monitoring_lower_threshold
1077	Highest Subindex	6500	0	uint8_t	3	N/A	ro	
1078	Value	6500	1	int32_t	0	Undef	rww	Drive Speed CL mode command setpoint
1079	Unit	6500	2	uint8_t	160	Undef	ro	DSC unit
1080	Prefix	6500	3	int8_t	-6	Undef	ro	DSC prefix
1081	Highest Subindex	6501	0	uint8_t	3	N/A	ro	
1082	Value	6501	1	int32_t	0	Undef	ro	Holds the actual value of the sensor interface instance used for the control algorithm.
Default sensor interface is 4-20mA Sensor Input 1								
1083	Unit	6501	2	uint8_t	160	Undef	ro	DSC unit
1084	Prefix	6501	3	int8_t	-6	Undef	ro	DSC prefix
1085	DSC interface selection	6502	0	uint8_t	1	Undef	rw	This object creates a reference between the controller and the actual value. The parameter specifies the number of the interface, which provides the actual value.
1086	Highest Subindex	6503	0	uint8_t	1	N/A	ro	
1087	Value	6503	1	uint32_t	1	Undef	rw	Proportional gain of a PDT1-controller
1088	Highest Subindex	6504	0	uint8_t	1	N/A	ro	
1089	Value	6504	1	uint32_t	500	ms	rw	Rate time of a PDT1-controller
1090	Highest Subindex	6510	0	uint8_t	1	N/A	ro	
1091	Value	6510	1	int32_t	0	Undef	ro	Calculated demand from setpoint
1092	Highest Subindex	6512	0	uint8_t	1	N/A	ro	

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1093	Value	6512	1	int32_t	100000	Undef	rw	DSC reference value (100% of physical capabilities) for direction A. If only one reference value is used, reference A value is valid for both directions.
1094	Highest Subindex	6513	0	uint8_t	1	N/A	ro	
1095	Value	6513	1	int32_t	-100000	Undef	rww	DSC reference value (100% of physical capabilities) for direction B. If only one reference value is used, reference A value is valid for both directions.
1096	Highest Subindex	6514	0	uint8_t	1	N/A	ro	
1097	Value	6514	1	int32_t	0	Undef	rww	The hold setpoint is active in the states HOLD and FAULT HOLD
1098	Highest Subindex	6520	0	uint8_t	1	N/A	ro	
1099	Value	6520	1	int32_t	100000	um/s	rww	Upper limit of generated command
1100	Highest Subindex	6521	0	uint8_t	1	N/A	ro	
1101	Value	6521	1	int32_t	-100000	um/s	rww	Lower limit of generated command
1102	DSC DVG ramp type	6530	0	int8_t	3	Undef	rw	DSC ramp Type
1103	Highest Subindex	6532	0	uint8_t	1	N/A	ro	
1104	Value	6532	1	uint32_t	1000000	Hz/s or um/s/s	rww	DSC ramp Type 3 Positive input accel
1105	Highest Subindex	6533	0	uint8_t	1	N/A	ro	
1106	Value	6533	1	uint32_t	1000000	Hz/s or um/s/s	rww	DSC ramp Type 3 Negative input accel
1107	Highest Subindex	6535	0	uint8_t	1	N/A	ro	
1108	Value	6535	1	uint32_t	1000000	Hz/s or um/s/s	rww	DSC ramp Type 3 Positive input decel
1109	Highest Subindex	6536	0	uint8_t	1	N/A	ro	
1110	Value	6536	1	uint32_t	1000000	Hz/s or um/s/s	rww	DSC ramp Type 3 Negative input decel
1111	Highest Subindex	6550	0	uint8_t	1	N/A	ro	
1112	Value	6550	1	int32_t	0	Undef	ro	DSC deviation. control deviation = demand value - actual value.
1113	DSC CM Type	6551	0	int8_t	1	Undef	ro	Type of the control monitoring function
1114	Highest Subindex	6552	0	uint8_t	1	N/A	ro	
1115	Value	6552	1	uint32_t	10	us	rw	After the delay time a control deviation will be shown as a control fault.
1116	Highest Subindex	6554	0	uint8_t	1	N/A	ro	
1117	Value	6554	1	int32_t	25000	um/s	rw	Upper threshold for control monitoring type = 1.
1118	Highest Subindex	6555	0	uint8_t	1	N/A	ro	
1119	Value	6555	1	int32_t	-25000	um/s	rw	Lower threshold for control monitoring type = 1.
1120	DSC TWM type	6570	0	int8_t	1	Undef	ro	Type of the target window monitoring function
1121	Highest Subindex	6571	0	uint8_t	1	N/A	ro	
1122	Value	6571	1	uint32_t	10	ms	rw	DSC target window monitoring switch on time
1123	Highest Subindex	6572	0	uint8_t	1	N/A	ro	
1124	Value	6572	1	uint32_t	5	ms	rw	DSC target window monitoring switch off time
1125	Highest Subindex	6574	0	uint8_t	1	N/A	ro	
1126	Value	6574	1	int32_t	20000	Undef	rww	Upper threshold for target window monitoring type = 1.
1127	Highest Subindex	6575	0	uint8_t	1	N/A	ro	
1128	Value	6575	1	int32_t	-30000	Undef	rww	Lower threshold for target window monitoring type = 1.
1129	Highest Subindex	6580	0	uint8_t	3	N/A	ro	
1130	Value	6580	1	int32_t	0	Undef	rww	Drive position CL mode command setpoint
1131	Unit	6580	2	uint8_t	33	Undef	ro	DFPC unit
1132	Prefix	6580	3	int8_t	-2	Undef	ro	DFPC prefix
1133	Highest Subindex	6581	0	uint8_t	3	N/A	ro	
1134	Value	6581	1	int32_t	0	Undef	ro	Holds the actual value of the sensor interface instance used for the control algorithm.
Default sensor interface is 4-20mA Sensor Input 1								
1135	Unit	6581	2	uint8_t	33	Undef	ro	DFPC unit
1136	Prefix	6581	3	int8_t	-2	Undef	ro	DFPC prefix
1137	DFPC interface selection	6582	0	uint8_t	23	Undef	rw	This object creates a reference between the controller and the actual value. The parameter specifies the number of the interface, which provides the actual value.
1138	Highest Subindex	6583	0	uint8_t	1	N/A	ro	
1139	Value	6583	1	uint32_t	5	Undef	rw	Proportional gain of a PDT1-controller

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1140	Highest Subindex	6586	0	uint8_t	1	N/A	ro	
1141	Value	6586	1	uint32_t	500	ms	rw	Time delay of a PDT1-controller
1142	Highest Subindex	6590	0	uint8_t	1	N/A	ro	
1143	Value	6590	1	int32_t	0	Undef	ro	Calculated demand from setpoint
1144	Highest Subindex	6592	0	uint8_t	1	N/A	ro	
1145	Value	6592	1	int32_t	120000000	Undef	rww	DFPC reference value (100% of physical capabilities) for direction A. If only one reference value is used, reference A value is valid for both directions.
1146	Highest Subindex	6593	0	uint8_t	1	N/A	ro	
1147	Value	6593	1	int32_t	-120000000	Undef	rww	DFPC reference value (100% of physical capabilities) for direction B. If only one reference value is used, reference A value is valid for both directions.
1148	Highest Subindex	6594	0	uint8_t	1	N/A	ro	
1149	Value	6594	1	int32_t	0	Undef	rww	The hold setpoint is active in the states HOLD and FAULT HOLD
1150	Highest Subindex	65A0	0	uint8_t	1	N/A	ro	
1151	Value	65A0	1	int32_t	120000000	bar/s or cN/s	rww	Upper limit of generated command
1152	Highest Subindex	65A1	0	uint8_t	1	N/A	ro	
1153	Value	65A1	1	int32_t	-120000000	bar/s or cN/s	rww	Lower limit of generated command
1154	DFPC DVG ramp type	65B0	0	int8_t	3	Undef	ro	DFPC ramp Type
1155	Highest Subindex	65B2	0	uint8_t	1	N/A	ro	
1156	Value	65B2	1	uint32_t	100000000	bar/s or cN/s	rww	DFPC ramp Type 3 Positive input accel
1157	Highest Subindex	65B3	0	uint8_t	1	N/A	ro	
1158	Value	65B3	1	uint32_t	100000000	bar/s or cN/s	rww	DFPC ramp Type 3 Negative input accel
1159	Highest Subindex	65B5	0	uint8_t	1	N/A	ro	
1160	Value	65B5	1	uint32_t	100000000	bar/s or cN/s	rww	DFPC ramp Type 3 Positive input decel
1161	Highest Subindex	65B6	0	uint8_t	1	N/A	ro	
1162	Value	65B6	1	uint32_t	100000000	bar/s or cN/s	rww	DFPC ramp Type 3 Negative input decel
1163	Highest Subindex	65D0	0	uint8_t	1	N/A	ro	
1164	Value	65D0	1	int32_t	0	Undef	ro	DFPC deviation. control deviation = demand value - actual value.
1165	DFPC_CM_Type	65D1	0	int8_t	1	Undef	ro	Type of the control monitoring function
1166	Highest Subindex	65D2	0	uint8_t	1	N/A	ro	
1167	Value	65D2	1	uint32_t	10	Undef	rw	After the delay time a control deviation will be shown as a control fault.
1168	Highest Subindex	65D4	0	uint8_t	1	N/A	ro	
1169	Value	65D4	1	int32_t	25000	Undef	rww	Upper threshold for control monitoring type = 1.
1170	Highest Subindex	65D5	0	uint8_t	1	N/A	ro	
1171	Value	65D5	1	int32_t	-25000	Undef	rww	Lower threshold for control monitoring type = 1.
1172	DFPC TWM Type	65F0	0	int8_t	1	Undef	rw	Type of the target window monitoring function
1173	Highest Subindex	65F1	0	uint8_t	1	N/A	ro	
1174	Value	65F1	1	uint32_t	10	Undef	rw	DFPC target window monitoring switch on time
1175	Highest Subindex	65F2	0	uint8_t	1	N/A	ro	
1176	Value	65F2	1	uint32_t	5	Undef	rw	DFPC target window monitoring switch off time
1177	Highest Subindex	65F4	0	uint8_t	1	N/A	ro	
1178	Value	65F4	1	int32_t	20000	Undef	rww	Upper threshold for target window monitoring type = 1.
1179	Highest Subindex	65F5	0	uint8_t	1	N/A	ro	
1180	Value	65F5	1	int32_t	-30000	Undef	rww	Lower threshold for target window monitoring type = 1.
1181	Highest Subindex	6600	0	uint8_t	3	N/A	ro	
1182	Value	6600	1	int32_t	0	Undef	rww	Drive position CL mode command setpoint
1183	Unit	6600	2	uint8_t	1	Undef	ro	DPC unit
1184	Prefix	6600	3	int8_t	-6	Undef	ro	DPC prefix
1185	Highest Subindex	6601	0	uint8_t	3	N/A	ro	
1186	Value	6601	1	int32_t	0	Undef	ro	Holds the actual value of the sensor interface instance used for the control algorithm.

Default sensor interface is 4-20mA Sensor Input 1

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1187	Unit	6601	2	uint8_t	1	Undef	ro	DPC unit
1188	Prefix	6601	3	int8_t	-6	Undef	ro	DPC prefix
1189	DPC interface selection	6602	0	uint8_t	1	Undef	rw	This object creates a reference between the controller and the actual value. The parameter specifies the number of the interface, which provides the actual value.
1190	Highest Subindex	6603	0	uint8_t	1	N/A	ro	
1191	Value	6603	1	uint32_t	1000	Undef	rw	Proportional gain of a PDT1-controller
1192	DPC switched integrator type	6608	0	int8_t	1	Undef	ro	Switched integrator type
1193	Highest Subindex	6609	0	uint8_t	1	N/A	ro	
1194	Value	6609	1	uint32_t	1	Undef	rw	Integration time of the switched integrator type = 1
1195	Highest Subindex	660A	0	uint8_t	1	N/A	ro	
1196	Value	660A	1	uint32_t	10000	Undef	rw	Position window of the switched integrator type = 1
1197	Highest Subindex	660C	0	uint8_t	1	N/A	ro	
1198	Value	660C	1	uint32_t	0	Undef	rw	Velocity feedback of the feedback function
1199	Highest Subindex	660D	0	uint8_t	1	N/A	ro	
1200	Value	660D	1	uint32_t	0	Undef	rw	Acceleration feedback of the feedback function
1201	Highest Subindex	6610	0	uint8_t	1	N/A	ro	
1202	Value	6610	1	int32_t	0	Undef	ro	Calculated demand from setpoint
1203	Highest Subindex	6612	0	uint8_t	1	N/A	ro	
1204	Value	6612	1	int32_t	120000000	Undef	rww	DPC reference value (100% of physical capabilities) for direction A. If only one reference value is used, reference A value is valid for both directions.
1205	Highest Subindex	6613	0	uint8_t	1	N/A	ro	
1206	Value	6613	1	int32_t	-120000000	Undef	rww	DPC reference value (100% of physical capabilities) for direction B. If only one reference value is used, reference A value is valid for both directions.
1207	Highest Subindex	6614	0	uint8_t	1	N/A	ro	
1208	Value	6614	1	int32_t	0	Undef	rww	The hold setpoint is active in the states HOLD and FAULT HOLD
1209	Highest Subindex	6620	0	uint8_t	1	N/A	ro	
1210	Value	6620	1	int32_t	120000000	Undef	rww	Upper limit of generated command
1211	Highest Subindex	6621	0	uint8_t	1	N/A	ro	
1212	Value	6621	1	int32_t	-120000000	Undef	rww	Lower limit of generated command
1213	DPC DVG ramp type	6630	0	int8_t	3	Undef	rw	DPC ramp Type
1214	Highest Subindex	6632	0	uint8_t	1	N/A	ro	
1215	Value	6632	1	uint32_t	100000	um/s	rww	DPC ramp Type 3 Positive input accel
1216	Highest Subindex	6633	0	uint8_t	1	N/A	ro	
1217	Value	6633	1	uint32_t	100000	um/s	rww	DPC ramp Type 3 Negative input accel
1218	Highest Subindex	6635	0	uint8_t	1	N/A	ro	
1219	Value	6635	1	uint32_t	100000	um/s	rww	DPC ramp Type 3 Positive input decel
1220	Highest Subindex	6636	0	uint8_t	1	N/A	ro	
1221	Value	6636	1	uint32_t	100000	um/s	rww	DPC ramp Type 3 Negative input decel
1222	Highest Subindex	6650	0	uint8_t	1	N/A	ro	
1223	Value	6650	1	int32_t	0	Undef	ro	DPC deviation.
control deviation = demand value - actual value.								
1224	DPC CM Type	6651	0	int8_t	1	Undef	ro	Type of the control monitoring function
1225	Highest Subindex	6652	0	uint8_t	1	N/A	ro	
1226	Value	6652	1	uint32_t	10	Undef	rw	After the delay time a control deviation will be shown as a control fault.
1227	Highest Subindex	6654	0	uint8_t	1	N/A	ro	
1228	Value	6654	1	int32_t	25000	Undef	rw	Upper threshold for control monitoring type = 1.
1229	Highest Subindex	6655	0	uint8_t	1	N/A	ro	
1230	Value	6655	1	int32_t	-25000	Undef	rw	Lower threshold for control monitoring type = 1.
1231	DPC_TWM_Type	6670	0	int8_t	1	Undef	ro	Type of the target window monitoring function
1232	Highest Subindex	6671	0	uint8_t	1	N/A	ro	
1233	Value	6671	1	uint32_t	10	Undef	rw	DPC target window monitoring switch on time
1234	Highest Subindex	6672	0	uint8_t	1	N/A	ro	
1235	Value	6672	1	uint32_t	5	Undef	rw	DPC target window monitoring switch off time
1236	Highest Subindex	6674	0	uint8_t	1	N/A	ro	

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1237	Value	6674	1	int32_t	20000	Undef	rww	Upper threshold for target window monitoring type = 1.
1238	Highest Subindex	6675	0	uint8_t	1	N/A	ro	
1239	Value	6675	1	int32_t	-30000	Undef	rww	Lower threshold for target window monitoring type = 1.
1240	Sint 0	A000	0	int8_t	0	Undef	ro	Codesys Network variable
1241	Sint 1	A001	0	int8_t	0	Undef	ro	Codesys Network variable
1242	Sint 2	A002	0	int8_t	0	Undef	ro	Codesys Network variable
1243	Sint 3	A003	0	int8_t	0	Undef	ro	Codesys Network variable
1244	Sint 4	A004	0	int8_t	0	Undef	ro	Codesys Network variable
1245	Sint 5	A005	0	int8_t	0	Undef	ro	Codesys Network variable
1246	Sint 6	A006	0	int8_t	0	Undef	ro	Codesys Network variable
1247	Sint 7	A007	0	int8_t	0	Undef	ro	Codesys Network variable
1248	Sint 8	A008	0	int8_t	0	Undef	ro	Codesys Network variable
1249	Sint 9	A009	0	int8_t	0	Undef	ro	Codesys Network variable
1250	Sint 10	A00A	0	int8_t	0	Undef	ro	Codesys Network variable
1251	Sint 11	A00B	0	int8_t	0	Undef	ro	Codesys Network variable
1252	Sint 12	A00C	0	int8_t	0	Undef	ro	Codesys Network variable
1253	Sint 13	A00D	0	int8_t	0	Undef	ro	Codesys Network variable
1254	Sint 14	A00E	0	int8_t	0	Undef	ro	Codesys Network variable
1255	Sint 15	A00F	0	int8_t	0	Undef	ro	Codesys Network variable
1256	Sint 16	A010	0	int8_t	0	Undef	ro	Codesys Network variable
1257	Sint 17	A011	0	int8_t	0	Undef	ro	Codesys Network variable
1258	Sint 18	A012	0	int8_t	0	Undef	ro	Codesys Network variable
1259	Sint 19	A013	0	int8_t	0	Undef	ro	Codesys Network variable
1260	Sint 20	A014	0	int8_t	0	Undef	ro	Codesys Network variable
1261	Sint 21	A015	0	int8_t	0	Undef	ro	Codesys Network variable
1262	Sint 22	A016	0	int8_t	0	Undef	ro	Codesys Network variable
1263	Sint 23	A017	0	int8_t	0	Undef	ro	Codesys Network variable
1264	Sint 24	A018	0	int8_t	0	Undef	ro	Codesys Network variable
1265	Sint 25	A019	0	int8_t	0	Undef	ro	Codesys Network variable
1266	Sint 26	A01A	0	int8_t	0	Undef	ro	Codesys Network variable
1267	Sint 27	A01B	0	int8_t	0	Undef	ro	Codesys Network variable
1268	Sint 28	A01C	0	int8_t	0	Undef	ro	Codesys Network variable
1269	Sint 29	A01D	0	int8_t	0	Undef	ro	Codesys Network variable
1270	Sint 30	A01E	0	int8_t	0	Undef	ro	Codesys Network variable
1271	Sint 31	A01F	0	int8_t	0	Undef	ro	Codesys Network variable
1272	Byte 0	A040	0	uint8_t	0	Undef	ro	Codesys Network variable
1273	Byte 1	A041	0	uint8_t	0	Undef	ro	Codesys Network variable
1274	Byte 2	A042	0	uint8_t	0	Undef	ro	Codesys Network variable
1275	Byte 3	A043	0	uint8_t	0	Undef	ro	Codesys Network variable
1276	Byte 4	A044	0	uint8_t	0	Undef	ro	Codesys Network variable
1277	Byte 5	A045	0	uint8_t	0	Undef	ro	Codesys Network variable
1278	Byte 6	A046	0	uint8_t	0	Undef	ro	Codesys Network variable
1279	Byte 7	A047	0	uint8_t	0	Undef	ro	Codesys Network variable
1280	Byte 8	A048	0	uint8_t	0	Undef	ro	Codesys Network variable
1281	Byte 9	A049	0	uint8_t	0	Undef	ro	Codesys Network variable
1282	Byte 10	A04A	0	uint8_t	0	Undef	ro	Codesys Network variable
1283	Byte 11	A04B	0	uint8_t	0	Undef	ro	Codesys Network variable
1284	Byte 12	A04C	0	uint8_t	0	Undef	ro	Codesys Network variable
1285	Byte 13	A04D	0	uint8_t	0	Undef	ro	Codesys Network variable
1286	Byte 14	A04E	0	uint8_t	0	Undef	ro	Codesys Network variable
1287	Byte 15	A04F	0	uint8_t	0	Undef	ro	Codesys Network variable
1288	Byte 16	A050	0	uint8_t	0	Undef	ro	Codesys Network variable
1289	Byte 17	A051	0	uint8_t	0	Undef	ro	Codesys Network variable
1290	Byte 18	A052	0	uint8_t	0	Undef	ro	Codesys Network variable
1291	Byte 19	A053	0	uint8_t	0	Undef	ro	Codesys Network variable
1292	Byte 20	A054	0	uint8_t	0	Undef	ro	Codesys Network variable

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1293	Byte 21	A055	0	uint8_t	0	Undef	ro	Codesys Network variable
1294	Byte 22	A056	0	uint8_t	0	Undef	ro	Codesys Network variable
1295	Byte 23	A057	0	uint8_t	0	Undef	ro	Codesys Network variable
1296	Byte 24	A058	0	uint8_t	0	Undef	ro	Codesys Network variable
1297	Byte 25	A059	0	uint8_t	0	Undef	ro	Codesys Network variable
1298	Byte 26	A05A	0	uint8_t	0	Undef	ro	Codesys Network variable
1299	Byte 27	A05B	0	uint8_t	0	Undef	ro	Codesys Network variable
1300	Byte 28	A05C	0	uint8_t	0	Undef	ro	Codesys Network variable
1301	Byte 29	A05D	0	uint8_t	0	Undef	ro	Codesys Network variable
1302	Byte 30	A05E	0	uint8_t	0	Undef	ro	Codesys Network variable
1303	Byte 31	A05F	0	uint8_t	0	Undef	ro	Codesys Network variable
1304	Integer 0	A0C0	0	int16_t	0	Undef	ro	Codesys Network variable
1305	Integer 1	A0C1	0	int16_t	0	Undef	ro	Codesys Network variable
1306	Integer 2	A0C2	0	int16_t	0	Undef	ro	Codesys Network variable
1307	Integer 3	A0C3	0	int16_t	0	Undef	ro	Codesys Network variable
1308	Integer 4	A0C4	0	int16_t	0	Undef	ro	Codesys Network variable
1309	Integer 5	A0C5	0	int16_t	0	Undef	ro	Codesys Network variable
1310	Integer 6	A0C6	0	int16_t	0	Undef	ro	Codesys Network variable
1311	Integer 7	A0C7	0	int16_t	0	Undef	ro	Codesys Network variable
1312	Integer 8	A0C8	0	int16_t	0	Undef	ro	Codesys Network variable
1313	Integer 9	A0C9	0	int16_t	0	Undef	ro	Codesys Network variable
1314	Integer 10	A0CA	0	int16_t	0	Undef	ro	Codesys Network variable
1315	Integer 11	A0CB	0	int16_t	0	Undef	ro	Codesys Network variable
1316	Integer 12	A0CC	0	int16_t	0	Undef	ro	Codesys Network variable
1317	Integer 13	A0CD	0	int16_t	0	Undef	ro	Codesys Network variable
1318	Integer 14	A0CE	0	int16_t	0	Undef	ro	Codesys Network variable
1319	Integer 15	A0CF	0	int16_t	0	Undef	ro	Codesys Network variable
1320	Word 0	A100	0	uint16_t	0	Undef	ro	Codesys Network variable
1321	Word 1	A101	0	uint16_t	0	Undef	ro	Codesys Network variable
1322	Word 2	A102	0	uint16_t	0	Undef	ro	Codesys Network variable
1323	Word 3	A103	0	uint16_t	0	Undef	ro	Codesys Network variable
1324	Word 4	A104	0	uint16_t	0	Undef	ro	Codesys Network variable
1325	Word 5	A105	0	uint16_t	0	Undef	ro	Codesys Network variable
1326	Word 6	A106	0	uint16_t	0	Undef	ro	Codesys Network variable
1327	Word 7	A107	0	uint16_t	0	Undef	ro	Codesys Network variable
1328	Word 8	A108	0	uint16_t	0	Undef	ro	Codesys Network variable
1329	Word 9	A109	0	uint16_t	0	Undef	ro	Codesys Network variable
1330	Word 10	A10A	0	uint16_t	0	Undef	ro	Codesys Network variable
1331	Word 11	A10B	0	uint16_t	0	Undef	ro	Codesys Network variable
1332	Word 12	A10C	0	uint16_t	0	Undef	ro	Codesys Network variable
1333	Word 13	A10D	0	uint16_t	0	Undef	ro	Codesys Network variable
1334	Word 14	A10E	0	uint16_t	0	Undef	ro	Codesys Network variable
1335	Word 15	A10F	0	uint16_t	0	Undef	ro	Codesys Network variable
1336	Dint 0	A1C0	0	int32_t	0	Undef	ro	Codesys Network variable
1337	Dint 1	A1C1	0	int32_t	0	Undef	ro	Codesys Network variable
1338	Dint 2	A1C2	0	int32_t	0	Undef	ro	Codesys Network variable
1339	Dint 3	A1C3	0	int32_t	0	Undef	ro	Codesys Network variable
1340	Dint 4	A1C4	0	int32_t	0	Undef	ro	Codesys Network variable
1341	Dint 5	A1C5	0	int32_t	0	Undef	ro	Codesys Network variable
1342	Dint 6	A1C6	0	int32_t	0	Undef	ro	Codesys Network variable
1343	Dint 7	A1C7	0	int32_t	0	Undef	ro	Codesys Network variable
1344	Dword 0	A200	0	uint32_t	0	Undef	ro	Codesys Network variable
1345	Dword 1	A201	0	uint32_t	0	Undef	ro	Codesys Network variable
1346	Dword 2	A202	0	uint32_t	0	Undef	ro	Codesys Network variable
1347	Dword 3	A203	0	uint32_t	0	Undef	ro	Codesys Network variable
1348	Dword 4	A204	0	uint32_t	0	Undef	ro	Codesys Network variable

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1349	Dword 5	A205	0	uint32_t	0	Undef	ro	Codesys Network variable
1350	Dword 6	A206	0	uint32_t	0	Undef	ro	Codesys Network variable
1351	Dword 7	A207	0	uint32_t	0	Undef	ro	Codesys Network variable
1352	Float 0	A240	0	float	0	Undef	ro	Codesys Network variable
1353	Float 1	A241	0	float	0	Undef	ro	Codesys Network variable
1354	Float 2	A242	0	float	0	Undef	ro	Codesys Network variable
1355	Float 3	A243	0	float	0	Undef	ro	Codesys Network variable
1356	Float 4	A244	0	float	0	Undef	ro	Codesys Network variable
1357	Float 5	A245	0	float	0	Undef	ro	Codesys Network variable
1358	Float 6	A246	0	float	0	Undef	ro	Codesys Network variable
1359	Float 7	A247	0	float	0	Undef	ro	Codesys Network variable
1360	Sint (rw) 0	A480	0	int8_t	0	Undef	rww	Codesys Network variable
1361	Sint (rw) 1	A481	0	int8_t	0	Undef	rww	Codesys Network variable
1362	Sint (rw) 2	A482	0	int8_t	0	Undef	rww	Codesys Network variable
1363	Sint (rw) 3	A483	0	int8_t	0	Undef	rww	Codesys Network variable
1364	Sint (rw) 4	A484	0	int8_t	0	Undef	rww	Codesys Network variable
1365	Sint (rw) 5	A485	0	int8_t	0	Undef	rww	Codesys Network variable
1366	Sint (rw) 6	A486	0	int8_t	0	Undef	rww	Codesys Network variable
1367	Sint (rw) 7	A487	0	int8_t	0	Undef	rww	Codesys Network variable
1368	Sint (rw) 8	A488	0	int8_t	0	Undef	rww	Codesys Network variable
1369	Sint (rw) 9	A489	0	int8_t	0	Undef	rww	Codesys Network variable
1370	Sint (rw) 10	A48A	0	int8_t	0	Undef	rww	Codesys Network variable
1371	Sint (rw) 11	A48B	0	int8_t	0	Undef	rww	Codesys Network variable
1372	Sint (rw) 12	A48C	0	int8_t	0	Undef	rww	Codesys Network variable
1373	Sint (rw) 13	A48D	0	int8_t	0	Undef	rww	Codesys Network variable
1374	Sint (rw) 14	A48E	0	int8_t	0	Undef	rww	Codesys Network variable
1375	Sint (rw) 15	A48F	0	int8_t	0	Undef	rww	Codesys Network variable
1376	Sint (rw) 16	A490	0	int8_t	0	Undef	rww	Codesys Network variable
1377	Sint (rw) 17	A491	0	int8_t	0	Undef	rww	Codesys Network variable
1378	Sint (rw) 18	A492	0	int8_t	0	Undef	rww	Codesys Network variable
1379	Sint (rw) 19	A493	0	int8_t	0	Undef	rww	Codesys Network variable
1380	Sint (rw) 20	A494	0	int8_t	0	Undef	rww	Codesys Network variable
1381	Sint (rw) 21	A495	0	int8_t	0	Undef	rww	Codesys Network variable
1382	Sint (rw) 22	A496	0	int8_t	0	Undef	rww	Codesys Network variable
1383	Sint (rw) 23	A497	0	int8_t	0	Undef	rww	Codesys Network variable
1384	Sint (rw) 24	A498	0	int8_t	0	Undef	rww	Codesys Network variable
1385	Sint (rw) 25	A499	0	int8_t	0	Undef	rww	Codesys Network variable
1386	Sint (rw) 26	A49A	0	int8_t	0	Undef	rww	Codesys Network variable
1387	Sint (rw) 27	A49B	0	int8_t	0	Undef	rww	Codesys Network variable
1388	Sint (rw) 28	A49C	0	int8_t	0	Undef	rww	Codesys Network variable
1389	Sint (rw) 29	A49D	0	int8_t	0	Undef	rww	Codesys Network variable
1390	Sint (rw) 30	A49E	0	int8_t	0	Undef	rww	Codesys Network variable
1391	Sint (rw) 31	A49F	0	int8_t	0	Undef	rww	Codesys Network variable
1392	Byte (rw) 0	A4C0	0	uint8_t	0	Undef	rww	Codesys Network variable
1393	Byte (rw) 1	A4C1	0	uint8_t	0	Undef	rww	Codesys Network variable
1394	Byte (rw) 2	A4C2	0	uint8_t	0	Undef	rww	Codesys Network variable
1395	Byte (rw) 3	A4C3	0	uint8_t	0	Undef	rww	Codesys Network variable
1396	Byte (rw) 4	A4C4	0	uint8_t	0	Undef	rww	Codesys Network variable
1397	Byte (rw) 5	A4C5	0	uint8_t	0	Undef	rww	Codesys Network variable
1398	Byte (rw) 6	A4C6	0	uint8_t	0	Undef	rww	Codesys Network variable
1399	Byte (rw) 7	A4C7	0	uint8_t	0	Undef	rww	Codesys Network variable
1400	Byte (rw) 8	A4C8	0	uint8_t	0	Undef	rww	Codesys Network variable
1401	Byte (rw) 9	A4C9	0	uint8_t	0	Undef	rww	Codesys Network variable
1402	Byte (rw) 10	A4CA	0	uint8_t	0	Undef	rww	Codesys Network variable
1403	Byte (rw) 11	A4CB	0	uint8_t	0	Undef	rww	Codesys Network variable
1404	Byte (rw) 12	A4CC	0	uint8_t	0	Undef	rww	Codesys Network variable

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1405	Byte (rw) 13	A4CD	0	uint8_t	0	Undef	rww	Codesys Network variable
1406	Byte (rw) 14	A4CE	0	uint8_t	0	Undef	rww	Codesys Network variable
1407	Byte (rw) 15	A4CF	0	uint8_t	0	Undef	rww	Codesys Network variable
1408	Byte (rw) 16	A4D0	0	uint8_t	0	Undef	rww	Codesys Network variable
1409	Byte (rw) 17	A4D1	0	uint8_t	0	Undef	rww	Codesys Network variable
1410	Byte (rw) 18	A4D2	0	uint8_t	0	Undef	rww	Codesys Network variable
1411	Byte (rw) 19	A4D3	0	uint8_t	0	Undef	rww	Codesys Network variable
1412	Byte (rw) 20	A4D4	0	uint8_t	0	Undef	rww	Codesys Network variable
1413	Byte (rw) 21	A4D5	0	uint8_t	0	Undef	rww	Codesys Network variable
1414	Byte (rw) 22	A4D6	0	uint8_t	0	Undef	rww	Codesys Network variable
1415	Byte (rw) 23	A4D7	0	uint8_t	0	Undef	rww	Codesys Network variable
1416	Byte (rw) 24	A4D8	0	uint8_t	0	Undef	rww	Codesys Network variable
1417	Byte (rw) 25	A4D9	0	uint8_t	0	Undef	rww	Codesys Network variable
1418	Byte (rw) 26	A4DA	0	uint8_t	0	Undef	rww	Codesys Network variable
1419	Byte (rw) 27	A4DB	0	uint8_t	0	Undef	rww	Codesys Network variable
1420	Byte (rw) 28	A4DC	0	uint8_t	0	Undef	rww	Codesys Network variable
1421	Byte (rw) 29	A4DD	0	uint8_t	0	Undef	rww	Codesys Network variable
1422	Byte (rw) 30	A4DE	0	uint8_t	0	Undef	rww	Codesys Network variable
1423	Byte (rw) 31	A4DF	0	uint8_t	0	Undef	rww	Codesys Network variable
1424	Int (rw) 0	A540	0	int16_t	0	Undef	rww	Codesys Network variable
1425	Int (rw) 1	A541	0	int16_t	0	Undef	rww	Codesys Network variable
1426	Int (rw) 2	A542	0	int16_t	0	Undef	rww	Codesys Network variable
1427	Int (rw) 3	A543	0	int16_t	0	Undef	rww	Codesys Network variable
1428	Int (rw) 4	A544	0	int16_t	0	Undef	rww	Codesys Network variable
1429	Int (rw) 5	A545	0	int16_t	0	Undef	rww	Codesys Network variable
1430	Int (rw) 6	A546	0	int16_t	0	Undef	rww	Codesys Network variable
1431	Int (rw) 7	A547	0	int16_t	0	Undef	rww	Codesys Network variable
1432	Int (rw) 8	A548	0	int16_t	0	Undef	rww	Codesys Network variable
1433	Int (rw) 9	A549	0	int16_t	0	Undef	rww	Codesys Network variable
1434	Int (rw) 10	A54A	0	int16_t	0	Undef	rww	Codesys Network variable
1435	Int (rw) 11	A54B	0	int16_t	0	Undef	rww	Codesys Network variable
1436	Int (rw) 12	A54C	0	int16_t	0	Undef	rww	Codesys Network variable
1437	Int (rw) 13	A54D	0	int16_t	0	Undef	rww	Codesys Network variable
1438	Int (rw) 14	A54E	0	int16_t	0	Undef	rww	Codesys Network variable
1439	Int (rw) 15	A54F	0	int16_t	0	Undef	rww	Codesys Network variable
1440	Word (rw) 0	A580	0	uint16_t	0	Undef	rww	Codesys Network variable
1441	Word (rw) 1	A581	0	uint16_t	0	Undef	rww	Codesys Network variable
1442	Word (rw) 2	A582	0	uint16_t	0	Undef	rww	Codesys Network variable
1443	Word (rw) 3	A583	0	uint16_t	0	Undef	rww	Codesys Network variable
1444	Word (rw) 4	A584	0	uint16_t	0	Undef	rww	Codesys Network variable
1445	Word (rw) 5	A585	0	uint16_t	0	Undef	rww	Codesys Network variable
1446	Word (rw) 6	A586	0	uint16_t	0	Undef	rww	Codesys Network variable
1447	Word (rw) 7	A587	0	uint16_t	0	Undef	rww	Codesys Network variable
1448	Word (rw) 8	A588	0	uint16_t	0	Undef	rww	Codesys Network variable
1449	Word (rw) 9	A589	0	uint16_t	0	Undef	rww	Codesys Network variable
1450	Word (rw) 10	A58A	0	uint16_t	0	Undef	rww	Codesys Network variable
1451	Word (rw) 11	A58B	0	uint16_t	0	Undef	rww	Codesys Network variable
1452	Word (rw) 12	A58C	0	uint16_t	0	Undef	rww	Codesys Network variable
1453	Word (rw) 13	A58D	0	uint16_t	0	Undef	rww	Codesys Network variable
1454	Word (rw) 14	A58E	0	uint16_t	0	Undef	rww	Codesys Network variable
1455	Word (rw) 15	A58F	0	uint16_t	0	Undef	rww	Codesys Network variable
1456	Dint (rw) 0	A640	0	int32_t	0	Undef	rww	Codesys Network variable
1457	Dint (rw) 1	A641	0	int32_t	0	Undef	rww	Codesys Network variable
1458	Dint (rw) 2	A642	0	int32_t	0	Undef	rww	Codesys Network variable
1459	Dint (rw) 3	A643	0	int32_t	0	Undef	rww	Codesys Network variable
1460	Dint (rw) 4	A644	0	int32_t	0	Undef	rww	Codesys Network variable

Appendix - Object Dictionary (Cont...)

Sr. No	Command ID	Index (hex)	SubIndex (hex)	Data Type	Default Value	Unit	Access	Description
1461	Dint (rw) 5	A645	0	int32_t	0	Undef	rww	Codesys Network variable
1462	Dint (rw) 6	A646	0	int32_t	0	Undef	rww	Codesys Network variable
1463	Dint (rw) 7	A647	0	int32_t	0	Undef	rww	Codesys Network variable
1464	Dword (rw) 0	A680	0	uint32_t	0	Undef	rww	Codesys Network variable
1465	Dword (rw) 1	A681	0	uint32_t	0	Undef	rww	Codesys Network variable
1466	Dword (rw) 2	A682	0	uint32_t	0	Undef	rww	Codesys Network variable
1467	Dword (rw) 3	A683	0	uint32_t	0	Undef	rww	Codesys Network variable
1468	Dword (rw) 4	A684	0	uint32_t	0	Undef	rww	Codesys Network variable
1469	Dword (rw) 5	A685	0	uint32_t	0	Undef	rww	Codesys Network variable
1470	Dword (rw) 6	A686	0	uint32_t	0	Undef	rww	Codesys Network variable
1471	Dword (rw) 7	A687	0	uint32_t	0	Undef	rww	Codesys Network variable
1472	Float (rw) 0	A6C0	0	float	0	Undef	rww	Codesys Network variable
1473	Float (rw) 1	A6C1	0	float	0	Undef	rww	Codesys Network variable
1474	Float (rw) 2	A6C2	0	float	0	Undef	rww	Codesys Network variable
1475	Float (rw) 3	A6C3	0	float	0	Undef	rww	Codesys Network variable
1476	Float (rw) 4	A6C4	0	float	0	Undef	rww	Codesys Network variable
1477	Float (rw) 5	A6C5	0	float	0	Undef	rww	Codesys Network variable
1478	Float (rw) 6	A6C6	0	float	0	Undef	rww	Codesys Network variable
1479	Float (rw) 7	A6C7	0	float	0	Undef	rww	Codesys Network variable

Notes

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