Installation, Operation and Maintenance Manual
VCIOM-17023-EN Rev. 7
February 2022

Bettis XTE3000

PROFIBUS DPV1 Module

BETTIS™

EMERSON™

Revision Details

Revision	Date	Description	Prepared	Checked	Approved
7	February 2022	Migration to new template			

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Section 1: Introduction

The ICON2000v4_DPV1 is an electronic module that allows connecting the Bettis electrical actuator XTE3000 to a PROFIBUS DP network. The module has its microprocessor and a program stored internally controls it, it works as a pure bus interface and does not affect the actuator control integrity. It is installed inside the actuator housing and takes the electrical power from the actuator power supply module. The RS485 interface is located on the module board. The PROFIBUS network is fully isolated from the actuator electronics.

The ICON2000v4_DPV1 is designed to support PROFIBUS redundant communication by installing two electronic modules on the same Bettis electrical actuator XTE3000.

Section 2: Operation and Storage

The module is designed to work and to be stored in the same environment of the actuator.

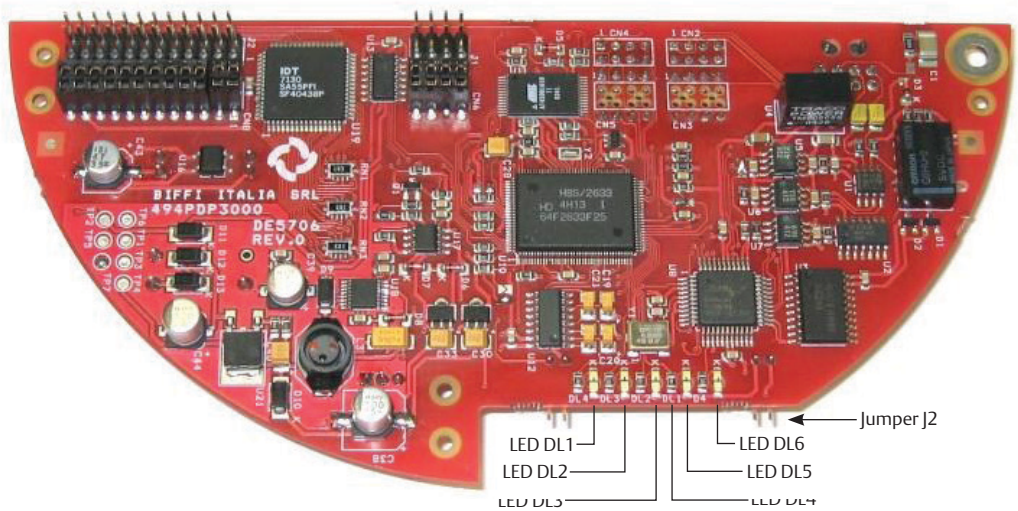
Section 3: Communication Features

Communication protocol	: PROFIBUS DP according to EN 50170							
Network topology	: Line (bus) structure. With repeaters tree structures can also be realized							
Transmission medium	: Twisted, screened copper cable according to EN 50170							
Data rate	: 9.6	19.2	45.45	93.75	187.5	500	1500	Kbit/second
Cable length without repeater	: 1200	1200	1200	1200	1000	400	200	m
Station type	: DPV0 and DPV1 slave							
Device number	: 32 devices per segment without repeater (max 126, with repeaters)							
Bus access	: Token-passing between masters and polling for slaves							
Electrical power	: Actuator powered (as option: auxiliary external voltage supply)							
Bus termination	: Configurable on board via local operator interface of actuator							
Temperature	: -40 °C, +85 °C							
Fieldbus redundancy	: Two independent communication interfaces							
EMC protections	: EN 50081-2 and EN 50082-2							
Types of operation	: Cyclic data exchange, Sync mode, Freeze mode, Fail-safe mode							
Baud rate	: Automatic recognition							
Addressing	: Configurable via local operator interface							

Section 4: ICON2000v4_DPV1 Module

The module consists in a single PCB that is installed inside the actuator housing. It is connected to the XTE3000 base card via strip connector. The internal wiring connects the PROFIBUS data lines to the actuator terminal board.

Figure 1



4.1 On Board Indication

Five LEDs are mounted on the ICON2000v4_DPV1 to give the following indications for Field service. LEDs indications are active only when jumper JP2 is closed.

DL1 (Red) Data Area Empty:	ON when Data Area on interface card is not yet loaded. BLINK when Data Area is being read from base card. OFF when Data Area is completely loaded.
DL2 (Red) Base comm:	ON when the communication between the base card and the interface is not working properly. OFF when the communication between the base card and the interface is correct.
DL3 (Orange) Slave State:	ON when the interface acts as an Primary Slave (i.e. it is the interface with a valid communication with the Master). BLINK when the interface acts as a Backup Slave and it is ready (only for redundant configuration). OFF when the interface is not communicating with any Master.
DL4 (Green) Termination:	ON when the on bard PROFIBUS termination has been inserted. OFF when the on bard PROFIBUS termination has not been inserted.
DL5 (Green) PROFIBUS:	ON when PROFIBUS communication has been established and the interface has entered in DATA_EX state.
DL6 (Green) Power:	ON when the interface is correctly powered.

More indications are given on local operator interface as described in Section 11.2, Node Report.

Section 5: PROFIBUS DP Description

PROFIBUS is a vendor-independent, open field bus standard used in a wide range of application in process automation. Vendor independence and openness are ensured by the international standards EN 50170 and EN 50254. The DP communication profile is designed for data exchange at the field level. The central controllers (as PLC) communicate via serial connection with field devices (as sensors and actuators). Data exchange is mainly cyclic. The central controller (called Master) cyclically reads the input information from the field devices (called Slaves) and cyclically writes the output information to the slaves. In addition, PROFIBUS DP provides communication services for parameterization, alarm handling and monitoring of intelligent field devices. The maximum number of Master and Slave devices in a bus segment is 32 without repeaters. With repeaters, the number can be extended to 126. The maximum cable length depends on the speed of transmission. Higher is the speed, shorter is the length. For instance, with baud rate 93.75 kb/s, the max cable length is 1,200 m without repeaters.

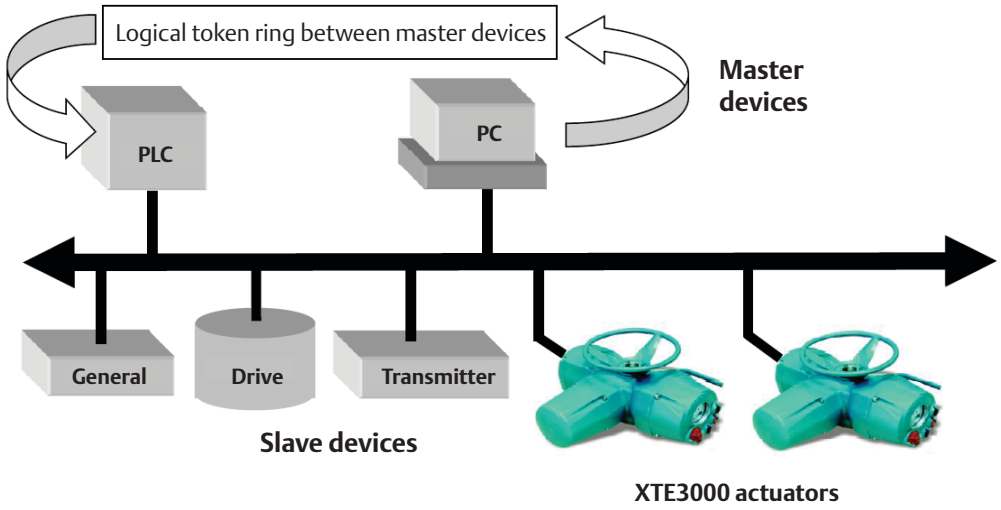
Mono-master or multi-master system configuration can be provided. Bus access is controlled by token passing procedure between masters and master-slave procedure (polling) between master and slaves.

Types of devices:

DP Master Class 1 (DPM 1):	This is the central controller that cyclically exchange information with the field devices. Typical devices are PLC or PC.
DP Master Class 2 (DPM 2):	These devices are necessary for commissioning, maintenance and diagnostics.
Slave:	Field device such transmitters, actuators, drives, etc.

Figure 2 below shows a PROFIBUS DP configuration with two Master devices and different Slave devices.

Figure 2



Section 6: RS485 Transmission Mode

The ICON2000v4_DPV1 module uses a half duplex, multidrop, serial communication line RS485. The module communicates with the Masters via its RS485 interface and the transmission media consists in a shielded twisted pair cable. Transmission speed from 9.6 kbit/s to 1.5 Mbit/s are available. One unique transmission speed is allowed for all devices on the bus when the system works.

All devices are connected in a bus structure. Up to 32 station (Master and Slaves) can be connected in one segment without repeaters. Repeaters can be used to extend the number of device up to 126 and to enlarge the network area. Table 1 shows the relationship between baud rate and segment length.

Table 1.

Baud Rate	Maximum segment length (no repeater)
9.6 K	1200 m
19.2 K	1200 m
45.45 K	1200 m
93.75 K	1000 m
187.5 K	1000 m
500 K	400 m
1500 K	200 m

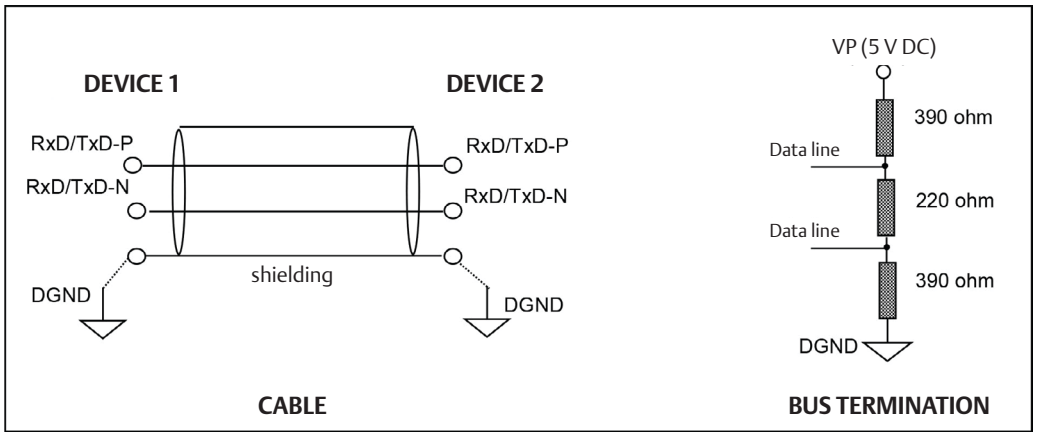
The bus must be terminated by an active bus terminator at the beginning and at the end of each segment. Only two terminations in one bus segment must be provided. To ensure error-free operation, both bus terminators must be powered. The maximum cable length depends on the transmission speed. Cable lengths indicated in Table 1 are based on type A cable, as specified by the EN 50170, having the following characteristics.

- Impedance from 135 to 165 ohm
- Capacity < 30 pF/m
- Loop resistance 110 ohm/km
- Wire gauge 0.64 mm
- Conductor area > 0.34 mm^2

The use of cable of previously used type B is not recommended.

The data lines must not be reversed. Use of shielded cable is mandatory for having high system immunity against electromagnetic disturbs. The shield should be connected to ground on both sides. The data lines should be kept separate from all other cables. It should be laid in separate, conductive and earthed cable trunking. It must be ensured that there are no voltage difference between individual nodes of PROFIBUS DP.

Figure 3



The ICON2000v4_DPV1 module takes its electrical supply from the actuator power supply module. The RS485 bus transceiver is isolated from the actuator electronics. Also, the voltage supply of the bus termination is isolated. The ICON2000v4_DPV1 module is equipped with on-board bus termination that should be used when the actuator is at the beginning or at the end of the bus segment and if there is no external termination. The bus termination can be switched on the data lines by means of a link, configurable via local operator interface.

Since the bus termination is a crucial component to ensure error-free operation, it is important that termination remains powered also when the actuator supply has left. If the internal termination are used, it is suggested to connect to the actuator also an auxiliary 18/36 V AC/DC generated by safe source that will supply just the actuator electronics and the PROFIBUS termination.

Figure 4 below shows the wiring in case of not redundant connection. The termination must be linked to the data lines only if the actuator is at the beginning or at the end of the bus segment.

Figure 4

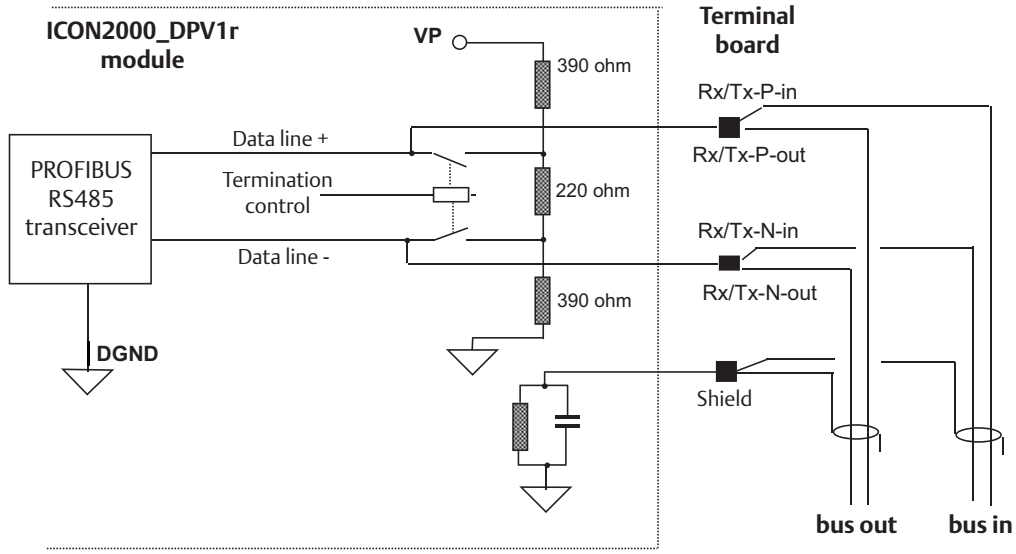
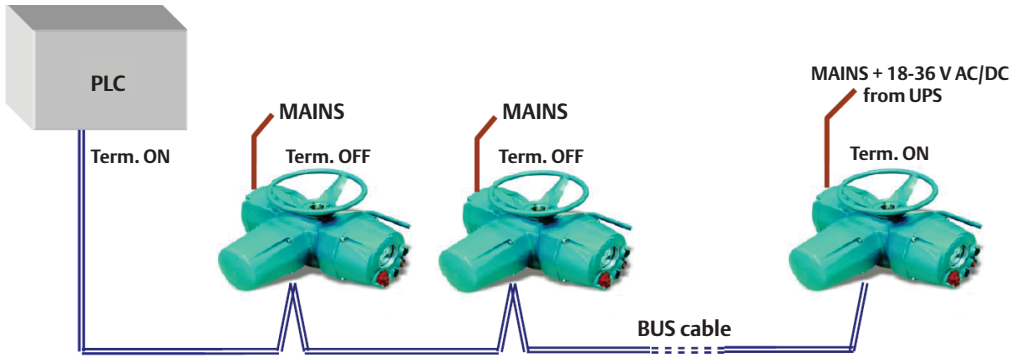


Figure 5 below shows the bus with an actuator at the end of the bus segment. Ensure that the terminations are supplied. Also, if the mains fails, an auxiliary voltage supply generated by an UPS is connected to the actuator to supply the electronics and the termination.

Figure 5

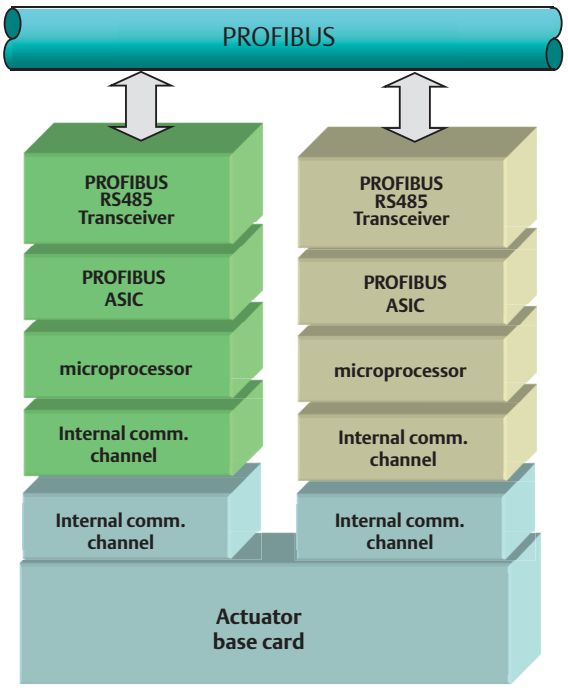


Section 7: Slave Redundancy

The ICON2000v4_DPV1 is designed to allow the actuator to acts as a redundant slave as described in this section.

To achieve the Slave Redundancy, two ICON2000v4_DPV1 modules are mounted in the actuator: in this way the actuator is equipped with a full redundant communication interface as specified by the PROFIBUS Guideline. The schematic of the Redundant Slave is as follow:

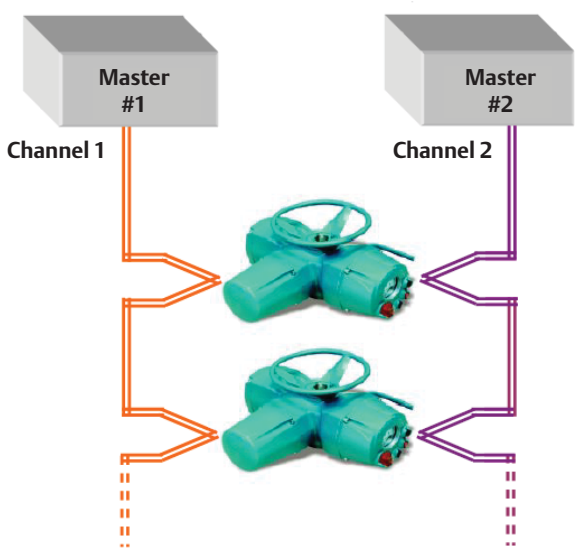
Figure 6



The two interfaces are indicated as Primary Slave and Backup Slave. The following simple rules define the redundancy strategy:

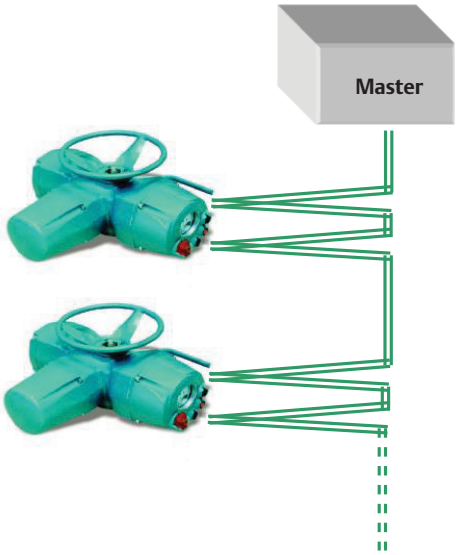
- An internal arbitration defines the role of the interfaces during the start-up.
- The base card tries first to establish a valid communication with the Primary Slave.
- There is always just one Slave (Primary or Backup) with a valid communication with the PROFIBUS line. It is indicated Active Slave.
- Both Slaves can answer to PROFIBUS interrogation: only the Active Slave has valid data and this condition is indicated by a specific bit in the cyclic communication.
- Both Slaves receive the commands from Master but the base card can execute only the commands from the Active Slave.
- When the Primary Slave stops to work or its interface does not sense any PROFIBUS communication, the base card enables the Backup Slave that becomes Active.
- After the Primary Slave fails, the PROFIBUS communication continues via the current Active Slave. A maintenance service is necessary to restore the Primary Slave.
- The PROFIBUS slave addresses are assigned for each interface from the Local Operator Interface of the actuator and the addressing is depending on the redundant system structures that has been selected.

Figure 7



In this layout, the two interfaces may have the same address because the two interfaces are on different channels. A synchronization method must be active between the Master stations to take the information from the Active Slave.

Figure 8

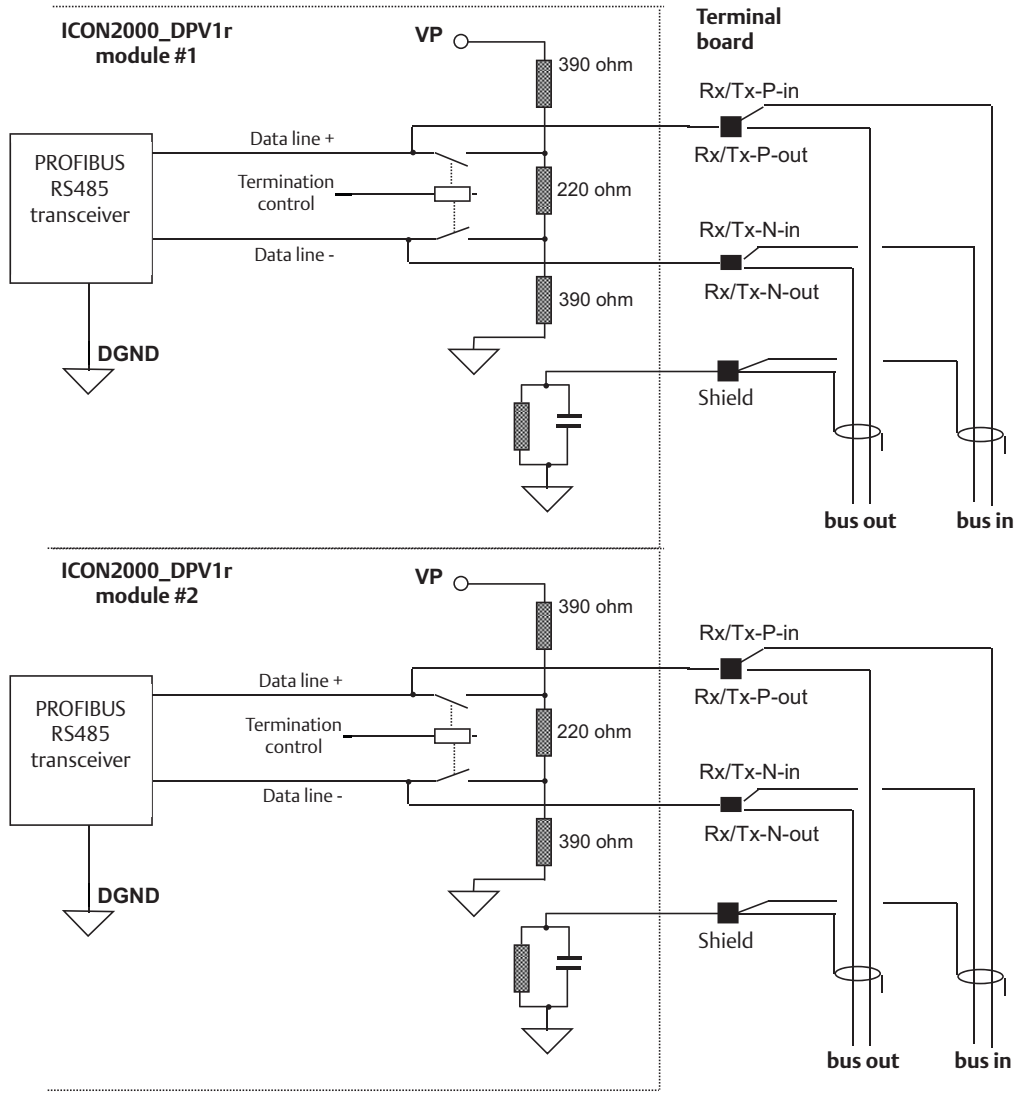


In this layout, the two interfaces shall have different addresses because the two interfaces are on the same channel.

The very flexible redundancy strategy implemented in the ICON2000v4_DPV1 module allows also different layout that the Master station can drive. The bus terminations can be switched on each data lines by means of two links, configurable via local operator interface.

Figure 9 below shows the wiring necessary in case of redundant slave. The termination must be linked to the data lines only if the actuator is at the beginning or at the end of the bus segment.

Figure 9



Section 8: ICON2000v4_DPV1 Power-Up

On power-up, the module checks the baud rate and then it waits for the “parameterization” telegram from the Master. The parameterization message contains user information needed for actuator operation and listed in the Section 9: ‘Data exchanged during parameterization‘.

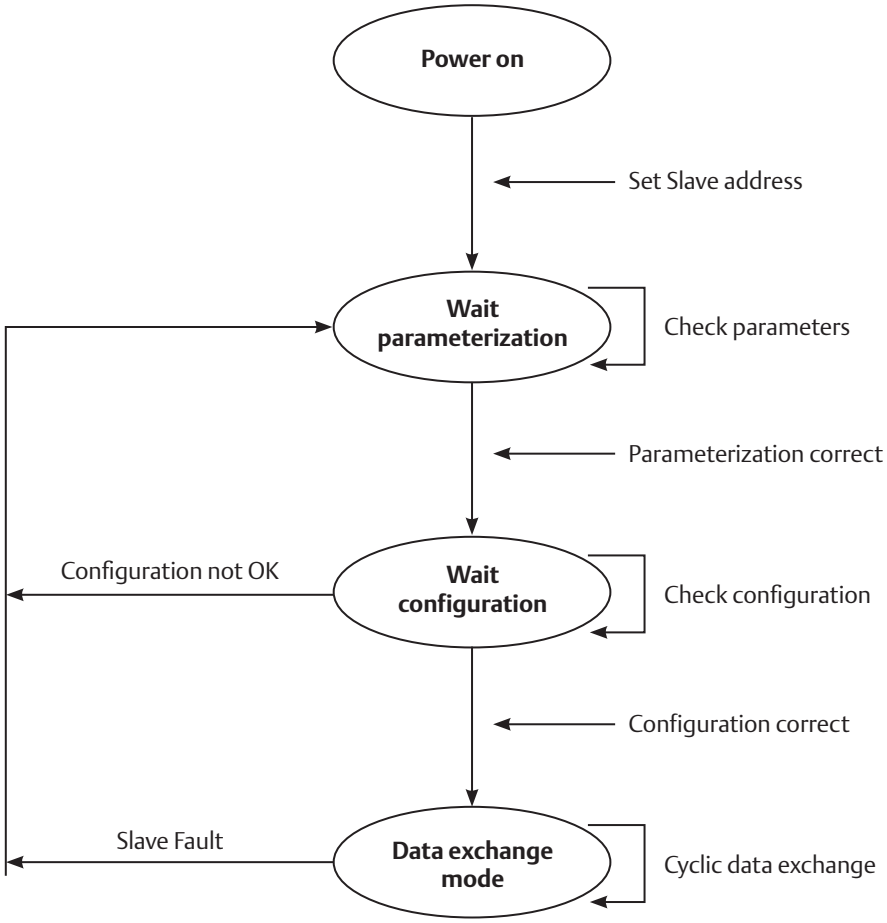
After that, the module waits for the “configuration” telegram from Master. The configuration message contains the number of input and output bytes reserved in the memory of the Master device for each slave. Only the number of bytes determined in the configuration is transmitted between Master and Slave. This information is called “module”. The ICON2000v4_DPV1 board implements the following modules:

- Module 1 : 1 byte output; 2 bytes input
- Module 2 : 4 byte output; 8 bytes input
- Module 3 : 1 byte output; 2 bytes input - **Consistent**
- Module 4 : 4 byte output; 8 bytes input - **Consistent**

Consistent is an attribute that specify the capability of the module to maintains data consistency over the entire data length. In this way, the data will not change during the reading by the PROFIBUS DP-Master. For example, if module 2 is selected, the output telegram consists in 4 bytes and the input telegram in 8 bytes.

When parameters and configuration are correct, the module enters in “data exchange mode” and starts with normal operation. The Master cyclically sends commands to the Slave and read its status. Figure 10 shows the state machine of a DP slave:

Figure 10



Section 9: Data Exchanged During Parameterization

The following data are sent to the ICON2000v4_DPV1 interface:

Table 2.

Byte	Name	Type	Range	Default	EU
0	Reserved DP V1	1 byte	-	-	-
1	Reserved DP V1	1 byte	-	-	-
2	Reserved DP V1	1 byte	-	-	-
3	Storage Format	1 byte	0	LSB first	LSB first
			1		MSB first
4	Fail-safe Action	1 byte	0	Off	Off
			1		Close
			2		Open
			3		Stayput
			4		Go to position
5	Delay before initiating safe operation	1 byte	0-255	4	seconds
6	Safe Position	1 byte	0-100	50	%
7	Timer Open direction – status	1 byte	0	0ff	Off
			1		On
8	Timer Open direction – on time	1 byte	2-200	2	seconds
9	Timer Open direction – off time	1 byte	1-200	2	seconds
10	Timer Open direction – start position	1 byte	0-100	0	%
11	Timer Open direction – stop position	1 byte	0-100	100	%
12	Timer Close direction – status	1 byte	0	Off	Off
			1		On
13	Timer Close direction – on time	1 byte	2-200	2	sec
14	Timer Close direction – off time	1 byte	1-200	2	sec
15	Timer Close direction – start position	1 byte	0-100	100	%
16	Timer Close direction – stop position	1 byte	0-100	0	%
17	Reserved	1 byte	-	-	-
18	Dead band	1 byte	1-255	10	tenth of %
19	Motion inhibit	1 byte	1-255	6	seconds

It should be noted that every time the PROFIBUS communication is established, the parameterization string will be sent to the device, writing the parameters to the set up values. The values in parameterization string shall be modified at the Master station.

Byte 0-2 **Reserved for DPV1**

Byte 3 **Storage format**
It defines the format of the variables that are transmitted on 2 or 4 bytes.
The setting of this parameter affects the format of the following data:

- Output Data (if Module 2 is selected) Position Request
- Input Data (if Module 2 is selected) Actuator Position, Output Torque
- General Maintenance Info Slot 2 Index 0 Actuator Position, Output Torque, Opening Time, Closing Time, Contactor Cycles, Motor Run Time, Time Without Power, Utilization Rate
- Recent Maintenance Info Slot 2 Index 1 Recent Contactor Cycles, Recent Motor Run Time, Recent Time Without Power, Recent Utilization Rate
- Value 0: LSB byte is transmitted first (default setting) 1: MSB byte is transmitted first

Byte 4 **Fail-safe action**
It defines the action of the actuator in case of loss of the bus signal. The action takes place only if the local selector is on REMOTE position and if the bus is operating. When the bus signal restores, the actuator also restores at its normal functioning.

— Value 0: Off - disable (default setting)
1: Close
2: Open
3: Stayput
4: Go to position indicated in the parameter 'Safe position'

Byte 5 **Delay before initiating fail-safe operation**
It defines the delay before execute the programmed Safe Action.

— Value minimum: 0 second
maximum: 255 seconds
default value: 4 seconds

Byte 6 **Safe position**
It defines the Safe position when 'Safe Action: go to position' is selected.

— Value minimum: 0 %
maximum: 100%
default value: 50%

Byte 7 **Timer Open Direction - Status**
It enables the Timer function in Open direction.

— Value 0: Off - disable (default setting)
1: On

Byte 8 **Timer Open Direction – On time**
It defines the On time of the Timer function in opening.

— Value minimum: 2 seconds
maximum: 200 seconds
default value: 2 seconds

Byte 9 **Timer Open Direction – Off time**
It defines the Off time of the Timer function in opening.

— Value minimum: 1 second
maximum: 200 seconds
default value: 2 seconds

Byte 10 **Timer Open Direction – Start position**
It defines the start position of the Timer function in opening.

— Value minimum: 0 %
maximum: 100%
default value: 0%

Byte 11 **Timer Open Direction – Stop position**
It defines the stop position of the Timer function in opening.

— Value minimum: 100 %
maximum: 0%
default value: 100%

Byte 12 **Timer Close Direction - Status**
It enables the Timer function in close direction.

— Value 0: Off - disable (default setting)
1: On

Byte 13 **Timer Close Direction – On time**
It defines the On time of the Timer function in closing.

— Value minimum: 2 seconds
maximum: 200 seconds
default value: 2 seconds

Byte 14 **Timer Close Direction – Off time**
It defines the Off time of the Timer function in closing.

— Value minimum: 1 second
maximum: 200 seconds
default value: 2 seconds

Byte 15 **Timer Close Direction – Start position**
It defines the start position of the Timer function in closing.

— Value minimum: 100 %
maximum: 0%
default value: 100%

Byte 16 **Timer Close Direction – Stop position**
It defines the stop position of the Timer function in closing.

— Value minimum: 0 %
maximum: 100%
default value: 0%

Byte 17 **Reserved**

Byte 18 **Dead band**
It defines in tenth of % the Dead band of the positioning function available on the modulating actuator. The movement is inhibited until the difference between current position and requested position (position error) is lower than Dead band.

— Value	minimum:	1	0.1%
	maximum:	255	22.5%
	default value:	10	1.0%

Byte 19 **Motion inhibit time**
It defines the minimum delay between two cycles of the motor when the actuator is in modulating service. It allows to adjust the number of start per hour of the electric motor.

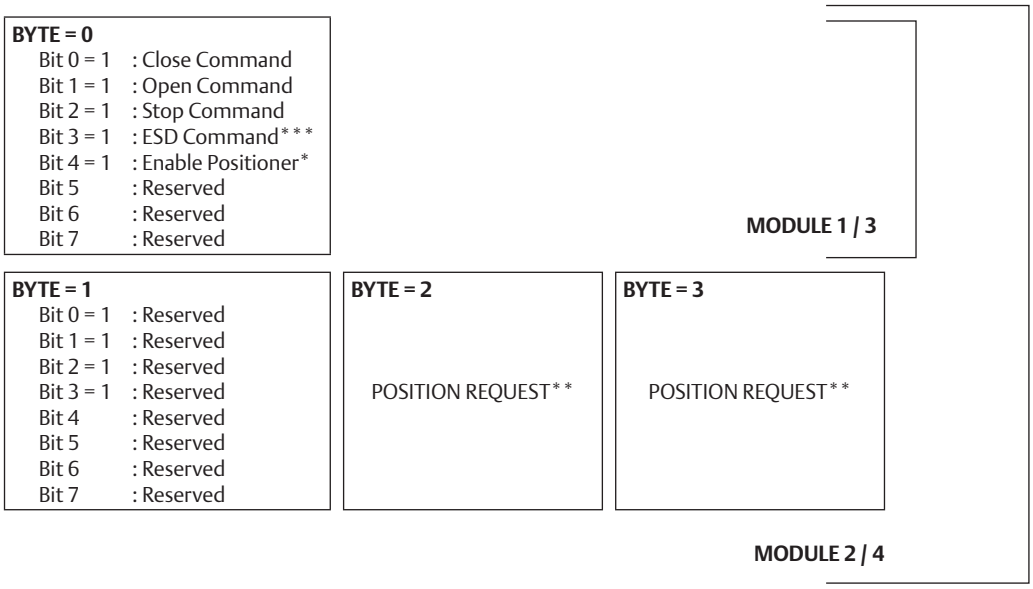
— Value minimum: 1 second
maximum: 255 seconds
default value: 6 seconds

Section 10: Data Exchange Mode

The following paragraph describes the input and output messages of ICON2000v4_DPV1 interface when working in “data exchange mode” for “cyclic data” and “acyclic data”. In all cases, it is called “input signal” a data flowing from actuator to bus, vice-versa it is called “output signal” a data flowing from bus to slave.

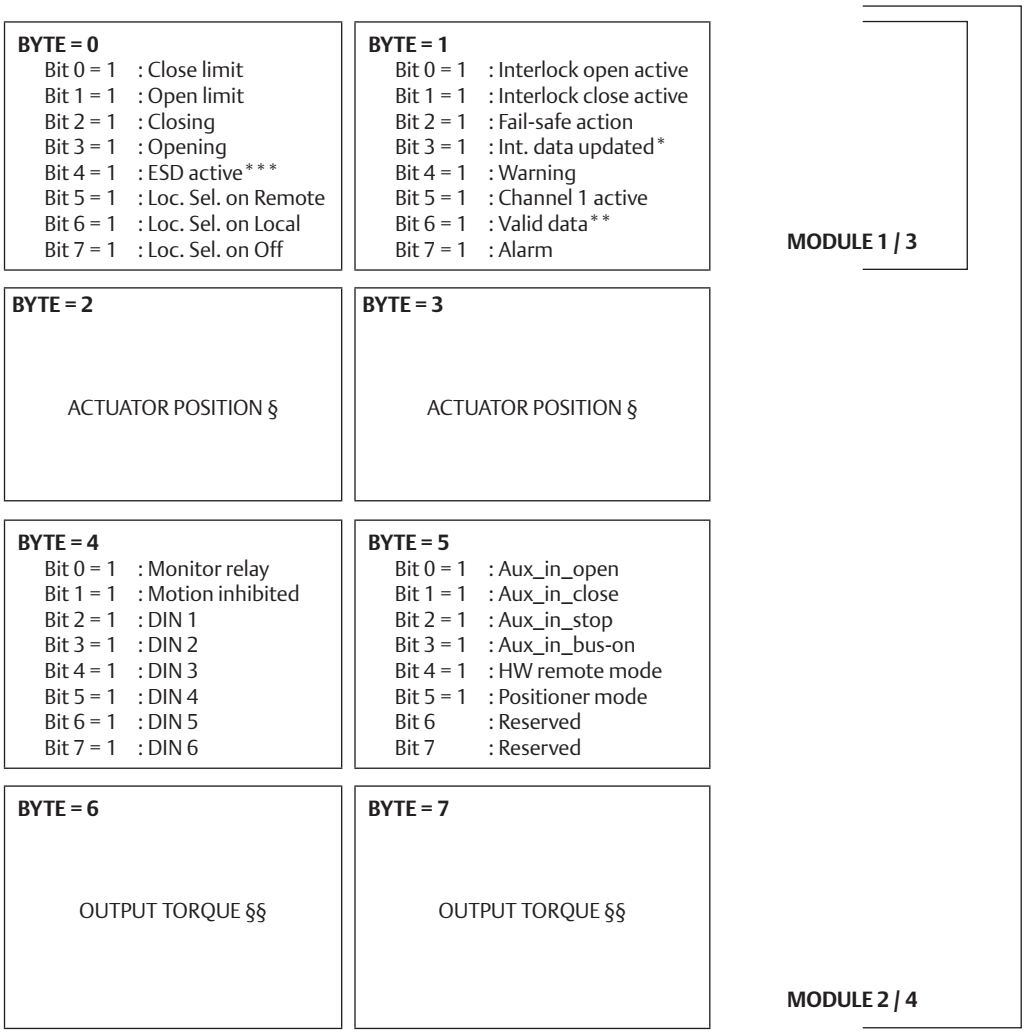
10.1 Cyclic Communications DPV0

10.1.1 Output Data



* In case of module 1: Reserved
** Position request: Integer 16 bits (value 0 = 0%; value 1000 = 100.0%)
*** See Appendix C: Note for Base card FW 7.00

10.1.2 Input Data



* 'Internal data updated' is set to 1 when the Active Slave has updated its internal data area and the acyclic communications can read updated values.

** 'Valid data' is set to 1 when the PROFIBUS interface is the Active Slave and the cyclic communications contains valid data.

*** See Appendix B: Note for Base card FW 7.00.

§ Position: Integer 16 bits (value 0 = 0%; value 1000 = 100.0%)

§§ Torque: Integer 16 bits (OP: value 0 = 0%; value –100 = 100% - CL: value 0 = 0%; value +100 = 100%)

DIN setting

Via local operator interface of actuator, the DIN bits can be individually set to 1 if one of the conditions occurs:

- open limit
- closed limit
- position >=xx%
- position <=xx%
- opening
- motor running
- blinker
- mid-travel position
- local selected
- remote selected
- local stop active
- ESD signal on
- manual operation
- motor over-temperature
- high-high torque
- high-high torque in OP
- high-high torque in CL
- valve jammed
- valve jammed in OP
- valve jammed in CL
- low alkaline battery (if present)
- mid travel alarm in OP or CL

The following settings are supplied by factory:

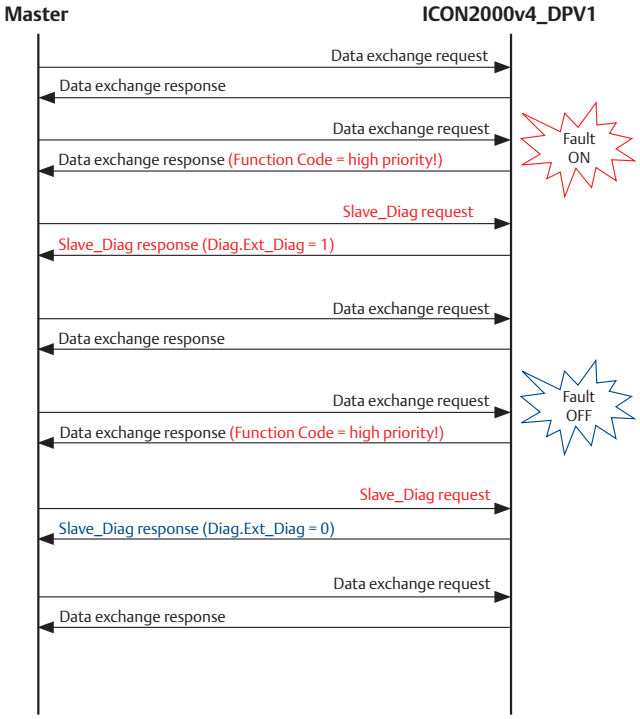
- DIN 1: mid-travel position
- DIN 2: local stop active
- DIN 3: motor over-temperature (motor thermostat alarm)
- DIN 4: over-torque (hi-hi torque alarm)
- DIN 5: valve jammed alarm
- DIN 6: mid-travel alarm in OP/CL

10.1.3 Diagnosis Message

The ICON2000v4_DPV1 interface manages the diagnosis indication coming from the actuator as stated by the PROFIBUS DP V1 standard.

When the ICON2000v4_DPV1 interface needs to notify a fault to the master while in data exchange mode, it changes the function code in its response message to “high priority”. During the next regular bus cycle, the master in turn send a “Slave_Diag” request that is answered with a “Slave_Diag” response. The availability of XTE specific diagnosis information is notified by Dia.Ext_Diag flag set to 1. Once the master was able to catch the diagnosis information, it returns to the standard cyclic data exchange mode. To notify the termination of the diagnosis incident, the ICON2000v4_DPV1 interface send a “high priority” response. The master answers with a “Slave_Diag” request that is followed by a “Slave_Diag” response with Dia.Ext_Diag flag set to 0.

Figure 11

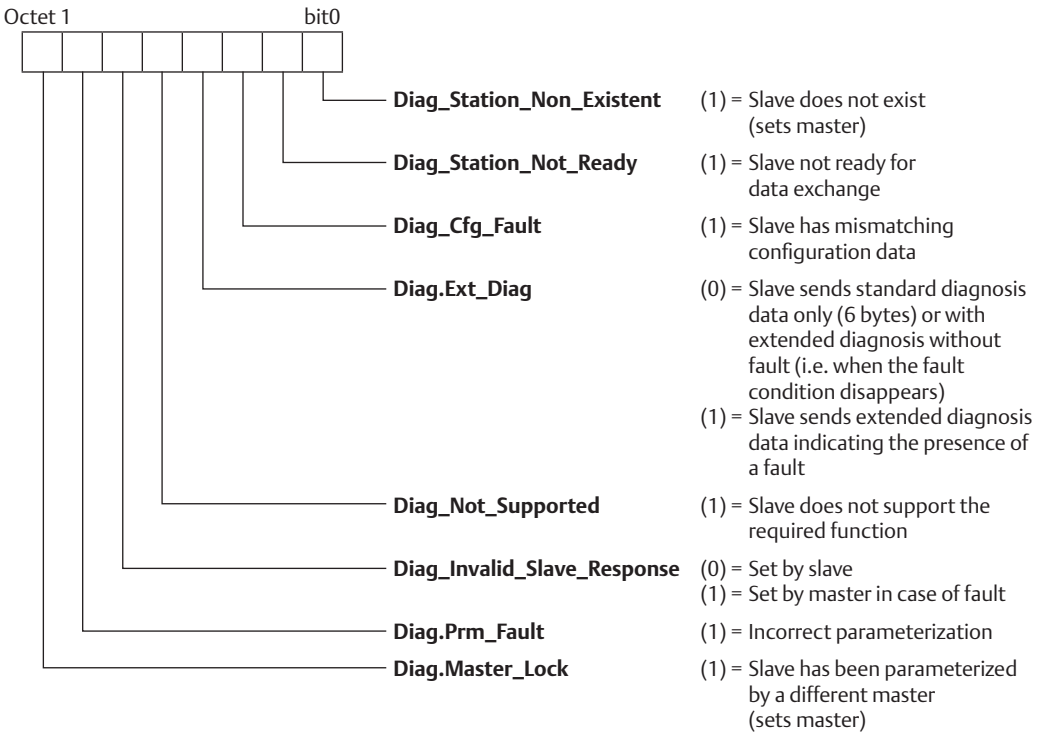


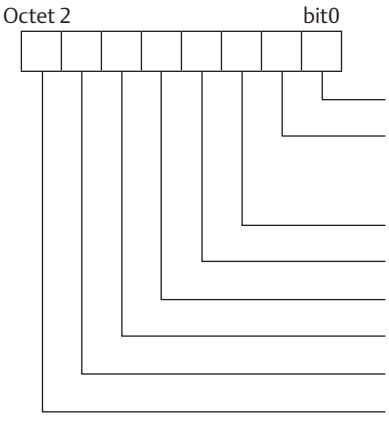
The diagnose message implemented by ICON2000v4_DPV1 has the following structure:

Figure 12

MSB	LSB
Octet 1	**Standard Diagnosis Block** 6 octets
Octet 2	
Octet 3	
Octet 4	
Octet 5	
Octet 6	
Type IRD, length	**Identifier Related Diagnosis Block** 2 octets
0 0 0 0 a a a a	
Type DRD, Length	**Device Related Diagnosis Block** **Status Messages** 6 octets
Identifier, Status_Type	
Slot_Number	
Status_Specifier	
d d d d d d d d	
d d d d d d d d	

10.1.3.1 Standard Diagnosis Block





(1) = Slave has to be reparameterized

(1) = During start-up phase, slave not able to provide valid diagnosis data

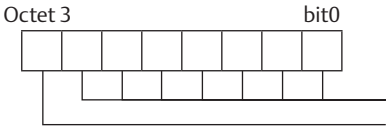
(1) = Fixed at 1

(1) = Threshold monitoring activated

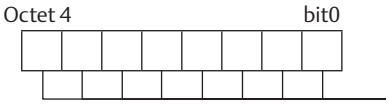
(1) = FREEZE command received

(1) = SYNC command received

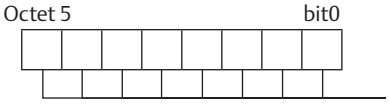
(1) = Diagnosis deactivated (sets master)



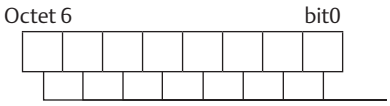
(1) = Slave has more diagnosis data than fit into the buffer



Address of the master that has parameterized the slave. 0xFF when slave not parameterized yet.

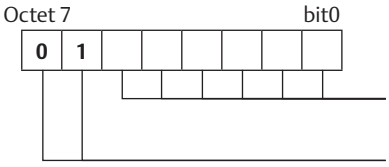


High byte of the slave's ident number. ICON2000v4_DPV1 report 0x09



Low byte of the slave's ident number. ICON2000v4_DPV1 report 0x37

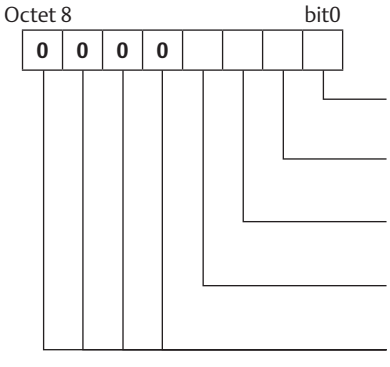
10.1.3.2 Identifier Related Diagnosis Block



Header: ICON2000v4_DPV1 report 0x42

Block_Length — Number of octets of this block including this header

Selection — (01) = Identifier Related Diagnostic



Identifier_Diagnosis_Data_Array

Identifier_Diagnosis_Entry_1 — (0) = Module 1 has no diagnosis data
(1) = Module 1 has diagnosis data

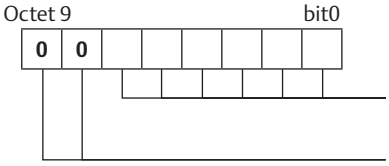
Identifier_Diagnosis_Entry_2 — (0) = Module 2 has no diagnosis data
(1) = Module 2 has diagnosis data

Identifier_Diagnosis_Entry_3 — (0) = Module 3 has no diagnosis data
(1) = Module 3 has diagnosis data

Identifier_Diagnosis_Entry_4 — (0) = Module 4 has no diagnosis data
(1) = Module 4 has diagnosis data

Padding bits

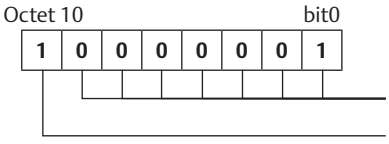
10.1.3.3 Device Related Diagnosis Block



Header: ICON2000v4_DPV1 report 0x06

Block_Length — Number of octets of this block including this header

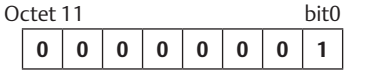
Selection — (00) = Device Related Diagnostic



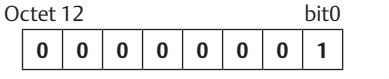
Status: ICON2000v4_DPV1 report 0x81

Status_Type — (1) = Status_Message

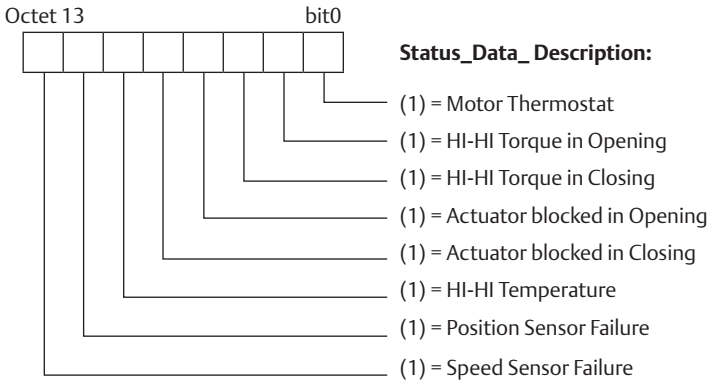
Identifier — (0) = Status

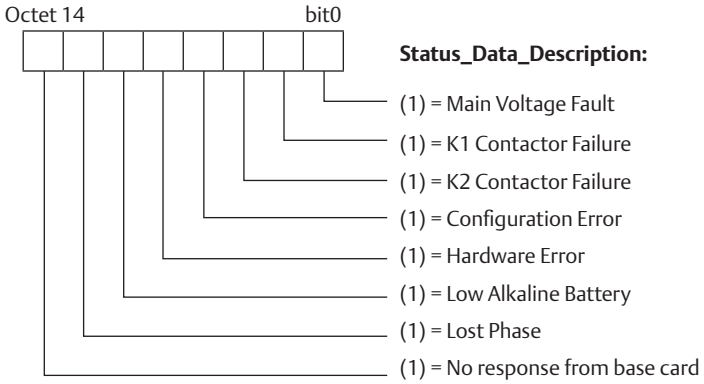


Slot_Number: ICON2000v4_DPV1 report 0x00



Status_Specifier: ICON2000v4_DPV1 report 0x00





The meaning of every diagnosis event listed in the extended diagnosis block is documented in GSD file, where each bit corresponds a specific text to describe the device related diagnosis.

A full PROFIBUS DP Master compliant should be able to show directly the correspondent text in the event of a diagnostic incident.

10.2 Acyclic Communication DPV1

This section explains the composition of the acyclic communication defined as per PROFIBUS DPV1. These information can be reached by PROFIBUS class 2 Master with MS2 services. For this purpose and graphical interface, device specific DTM and EDD interface are available for most of host systems.

10.2.1 Nameplate

Slot 0, Index 0, length 26 byte: Actuator type

Byte	Name	Dim	Range	EU
0 - 15	Actuator Type	16 byte	Bettis XTE3000 Biffi F01 2000	Bettis XTE3000 Biffi F01 2000
16 - 25	Software revision*	10 byte	-	String ##

NOTES:

* If the character 'decimal point' (ASCII 0x2e) appears in the Software revision string, the actuator is a Bettis XTE3000; if the character 'comma' (ASCII 0x2c) appears, the actuator is a Biffi F01 2000.

The Software revision string is made up of the base software revision and PROFIBUS interface revision with this format:

SW rev. base (4 byte) – obj. #5	blank	blank	SW rev. interface (4 byte)

Slot 0, Index 1, length 28 byte: Actuator Serial number

Byte	Name	Dim	Range	EU
0 - 27	Serial number	28 byte	-	String

Slot 0, Index 2, length 28 byte: Valve Tag name

Byte	Name	Dim	Range	EU
0 - 27	Valve Tag name	28 byte	-	String

10.2.2 General Data

Slot 1, Index 0, length 4 byte: General data about current working condition

Byte	Name	bit	Description
0	Byte 0	0 1 2 3 4 5 6 7	Close limit Open limit Moving Monitor relay Selector in local Selector in remote Alarm Warning
1	Byte 1	0 1 2 3 4 5 6 7	DIN 1 DIN 2 DIN 3 DIN 4 DIN 5 DIN 6 Interlock open Interlock close
2	Byte 2	0 1 2 3 4 5 6 7	Fail-safe action Opening Closing Selector in off ESD active HW remote mode Positioner mode Motion inhibited
3	Byte 3	0 1 2 3 4 5 6 7	Channel 1 active Aux. in open Aux. in close Aux. in stop Aux. in bus on Reserved Reserved Reserved

10.2.3 Maintenance Information

Slot 2, Index 0, length 22 byte: General maintenance information

Byte	Name	Dim	Range	EU
0 - 1	Actuator position	2 byte	0 - 1000	-
2 - 3	Output torque	2 byte	-100,+100	-
4 - 5	Opening time	2 byte	0 - 65, 535	Seconds
6 - 7	Closing time	2 byte	0 - 65, 535	Seconds
8 - 11	Contactor cycles	4 byte	0 - 4, 294, 967, 295	Unit
12 - 15	Motor Run Time	4 byte	0 - 4, 294, 967, 295	Hours
16 - 19	Time Without Power	4 byte	0 - 4, 294, 967, 295	Hours
20 - 21	Utilization Rate	2 byte	0 - 65, 535	%

Slot 2, Index 1, length 22 byte: Recent maintenance information

Byte	Name	Dim	Range	EU
0 - 3	Test Date	4 bytes	dd-mm-20yy	BCD format
4 - 7	Recent log date	4 bytes	dd-mm-20yy	BCD format
8 - 11	Recent Contactor Cycles	4 bytes	0 - 4, 294, 967, 295	Unit
12 - 13	Recent motor Run Time	4 bytes	0 - 4, 294, 967, 295	Hours
14 - 17	Recent Time Without Power	4 bytes	0 - 4, 294, 967, 295	Hours
18 - 21	Recent Utilization Rate	2 bytes	0 - 65, 535	%

Slot 2, Index 2, length 20 byte: Torque profile

Byte	Name	Dim	Range	EU
0	Reserved	1 byte	-	-
1	Opening Break out	1 byte	0 - 255	%
2	Reserved	1 byte	-	-
3	Opening Peak	1 byte	0 - 255	%
4	Reserved	1 byte	-	-
5	Opening Ending	1 byte	0 - 255	%
6 - 9	Date Opening	4 byte	dd-mm-20yy	BCD format
10	Reserved	1 byte	-	-
11	Closing Break out	1 byte	0 - 255	%
12	Reserved	1 byte	-	-
13	Closing Peak	1 byte	0 - 255	%
14	Reserved	1 byte	-	-
15	Closing Ending	1 byte	0 - 255	%
16 - 19	Date Closing	4 byte	dd-mm-20yy	BCD format

Slot 2, Index 3, length 20 byte: Reference torque profile

Byte	Name	Dim	Range	EU
0	Reserved	1 byte	-	-
1	Ref. Opening Break out	1 byte	0 - 255	%
2	Reserved	1 byte	-	-
3	Ref. Opening Peak	1 byte	0 - 255	%
4	Reserved	1 byte	-	-
5	Ref. Opening Ending	1 byte	0 - 255	%
6 - 9	Date Ref. Opening	4 byte	dd-mm-20yy	BCD format
10	Reserved	1 byte	-	-
11	Ref. Closing Break out	1 byte	0 - 255	%
12	Reserved	1 byte	-	-
13	Ref. Closing Peak	1 byte	0 - 255	%
14	Reserved	1 byte	-	-
15	Ref. Closing Ending	1 byte	0 - 255	%
16 - 19	Date Ref. Closing	4 byte	dd-mm-20yy	BCD format

Slot 2, Index 4, length 20 byte: Nominal torque and maintenance date

Byte	Name	Dim	Range	EU
0	Nominal Torque EU	1 byte	0 1 2 3	Torque lbf Torque Nm Thrust lb Thrust kN
1 - 7	Nominal Torque value	7 byte	-	string
8 - 11	Next Maintenance Date	4 byte	dd-mm-20yy	BCD format
12 - 15	Last Maintenance Date	4 byte	dd-mm-20yy	BCD format
16 - 19	Start-up Date	4 byte	dd-mm-20yy	BCD format

10.2.4 Alarm and Warning Log

Slot 3, Index 0, length 30 byte: Alarm log: the first three records

Byte	Name	Dim	Range	EU
0	Alarm #1: Code	1 byte	0 - 255	-
1	Reserved	1 byte	-	-
2 - 5	Alarm #1: Date	4 byte	dd-mm-20yy	BCD format
6 - 9	Alarm #1: Time	4 byte	00-hh-mm-ss	BCD format
10	Alarm #2: Code	1 byte	0 - 255	-
11	Reserved	1 byte	-	-
12 - 15	Alarm #2: Date	4 byte	dd-mm-20yy	BCD format
16 - 19	Alarm #2: Time	4 byte	00-hh-mm-ss	BCD format
20	Alarm #3: Code	1 byte	0 - 255	-
21	Reserved	1 byte	-	-
22 - 25	Alarm #3: Date	4 byte	dd-mm-20yy	BCD format
26 - 29	Alarm #3: Time	4 byte	00-hh-mm-ss	BCD format

Slot 3, Index 1, length 20 byte: Alarm log: the last two records

Byte	Name	Dim	Range	EU
0	Alarm #4: Code	1 byte	0 - 255	-
1	Reserved	1 byte	-	-
2 - 5	Alarm #4: Date	4 byte	dd-mm-20yy	BCD format
6 - 9	Alarm #4: Time	4 byte	00-hh-mm-ss	BCD format
10	Alarm #5: Code	1 byte	0 - 255	-
11	Reserved	1 byte	-	-
11 - 15	Alarm #5: Date	4 byte	dd-mm-20yy	BCD format
16 - 19	Alarm #5: Time	4 byte	00-hh-mm-ss	BCD format

Slot 3, Index 2, length 30 byte: Warning log: the first three records

Byte	Name	Dim	Range	EU
0	Warning #1: Code	1 byte	0 - 255	-
1	Reserved	1 byte	-	-
2 - 5	Warning #1: Date	4 byte	dd-mm-20yy	BCD format
6 - 9	Warning #1: Time	4 byte	00-hh-mm-ss	BCD format
10	Warning #2: Code	1 byte	0 - 255	-
11	Reserved	1 byte	-	-
11 - 15	Warning #2: Date	4 byte	dd-mm-20yy	BCD format
16 - 19	Warning #2: Time	4 byte	00-hh-mm-ss	BCD format
20	Warning #3: Code	1 byte	0 - 255	-
21	Reserved	1 byte	-	-
22 - 15	Warning #3: Date	4 byte	dd-mm-20yy	BCD format
26 - 29	Warning #3: Time	4 byte	00-hh-mm-ss	BCD format

Slot 3, Index 3, length 20 byte: Warning log: the last two records

Byte	Name	Dim	Range	EU
0	Warning #4: Code	1 byte	0 - 255	-
1	Reserved	1 byte	-	-
2 - 5	Warning #4: Date	4 byte	dd-mm-20yy	BCD format
6 - 9	Warning #4: Time	4 byte	00-hh-mm-ss	BCD format
10	Warning #5: Code	1 byte	0 - 255	-
11	Reserved	1 byte	-	-
12 - 15	Warning #5: Date	4 byte	dd-mm-20yy	BCD format
16 - 19	Warning #5: Time	4 byte	00-hh-mm-ss	BCD format

10.2.5 Maintenance Commands

Slot 4, Index 0, length 1 byte: Maintenance information (Only Write)

Byte	Name	Dim	Range	EU
0	Maintenance command	1 byte	bit0 = 1 bit1 = 1	Clear Recent Data Log Set Torque Reference

Slot 4, Index 1, length 4 byte: Maintenance information (Read and Write)

Byte	Name	Dim	Range	EU
0 - 3	Next Maintenance Date	4 byte	dd-mm-20yy	BCD format

Slot 4, Index 2, length 4 byte: Maintenance information (Read and Write)

Byte	Name	Dim	Range	EU
0 - 3	Last Maintenance Date	4 byte	dd-mm-20yy	BCD format

Slot 4, Index 3, length 4 byte: Maintenance information (Read and Write)

Byte	Name	Dim	Range	EU
0 - 3	Startup Date	4 byte	dd-mm-20yy	BCD format

Slot 4, Index 4, length 8 byte: Date and Time (Only Write)

Byte	Name	Dim	Range	EU
0 - 3	Current Date	4 bytes	dd-mm-20yy	BCD format
4 - 7	Current Time	4 bytes	00-hh-mm-ss	BCD format

Section 11: Data at Local Operator Interface

Below are the description of the facilities available by the view and setup menu of XTE3000.

11.1 Bus Control

DIN 1 - DIN 6

- By this routine, it is possible to choose the condition that sets the status of bits DIN1 - 6 of byte 4 when module 2 has been selected. See Table 3 for the list of the available conditions:

Table 3.

STATUS		ALARM	
• open limit • closed limit • position >= xx % • position <= xx % • closing • opening • motor running	• blinker • mid-travel position • local selected • remote selected • local stop active • ESD signal on • manual operation	• motor over-temperature • over-torque • over-torque in OP • over-torque in CL • valve jammed • warnings	• valve jammed in OP • valve jammed in CL • low alkaline battery (if present) • mid travel alarm in CL/OP

The following setting is supplied as standard:

- DIN 1: mid-travel position
- DIN 2: local stop active
- DIN 3: motor over-temperature (motor thermostat alarm)
- DIN 4: over-torque (HI-HI torque alarm)
- DIN 5: valve jammed alarm
- DIN 6: mid-travel alarm in OP/CL

NODE

- By this function, it is possible to enter the PROFIBUS slave node address of the Primary Slave. The available address range is from 1 to 126. The address must be selected according to the PROFIBUS network layout where the actuator is inserted.

NODE-B

- By this function, it is possible to enter the PROFIBUS slave node address of the Backup Slave. The available address range is from 1 to 126. The address must be selected according to the PROFIBUS network layout where the actuator is inserted.

TERMIN 1

- Status: by this routine, the internal termination of the Primary Slave can be connected to the bus line (ON / OFF). Set “TERMIN 1 = ON” only if the actuator is at the beginning or at the end of the PROFIBUS line.

TERMIN 2

- Status: by this routine, the internal termination of the Backup Slave can be connected to the bus line (ON / OFF). Set “TERMIN 2 = ON” only if the actuator is at the beginning or at the end of the PROFIBUS line.

MODE

- By this routine, the redundant or not redundant slave is selected. Set “MODE = CH1” if a not redundant slave is used: in this case only the Primary Slave will be present. The option AUTO has to be set when a redundant slave is used.

Configuration procedure:

- Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions “entering the set-up mode”. When the message of display is “SET-UP MODE OK?” press YES. Press YES to select “ACTUATOR SET-UP” menu, press NO to scroll the list of available routines and then press YES to select BUS CONTROL.
- Press YES if the condition linked to DIN 1 is correct, or press NO to change, then press YES.
- Repeat the previous step for DIN 2, DIN 3 - DIN 6
- Press YES if the configured value of the node address (NODE) is correct (from 1 to 126), or press NO to change, then press YES.
- Press YES if the configured value of the node address (NODE-B) is correct (from 1 to 126), or press NO to change, then press YES.
- Press YES if the configured status of termination 1 (TERMIN 1) is correct (ON / OFF), or press NO to change, then press YES.
- Press YES if the configured status of termination 2 (TERMIN 2) is correct (ON / OFF), or press NO to change, then press YES.
- Press YES if the configured MODE is correct (CH1, CH2, AUTO), or press NO to change, then press YES.

View procedure:

- Move the local selector to OFF and then press simultaneously OPEN and STOP. Select the language and then enter the password according to the instructions “entering the view mode”. When the message of display is “VIEW MODE OK?” press YES. Press YES to select “ACTUATOR SET-UP” menu, press NO to scroll the list of available routines and then press YES to select BUS CONTROL.
- Press YES to scroll the list of BUS CONTROL parameters.

11.2 Node Report

The following procedure allows seeing the most significant info relevant to the bus data transmission of the actual Active Slave.

The following indication are reported:

CARD REPORT

- By this routine, it is possible to show the 64 characters identification string relevant to the Active Slave interface card.

STATUS 0

- These informations are from the Active Slave PROFIBUS module.

Table 4.

b7	b6	b5	b4	b3	b2	b1	b0	Description
-	-	-	-	-	-	X	-	Status of the Active Slave 1 = active
X	-	-	-	-	-	-	-	Status of the Primary Slave 1 = active
-	X	-	-	-	-	-	-	Status of the Backup Slave 1 = active
-	-	X	X	-	-	-	-	Status of the Internal Data Area 0 0 = Data Area empty 0 1 = Data Area being read from base card 1 0 = Data Area completely transferred

STATUS 1

- These informations are from the Active Slave PROFIBUS module.

Table 5.

b7	b6	b5	b4	b3	b2	b1	b0	Description
-	-	-	-	X	X	X	X	Reserved
-	-	X	X	-	-	-	-	DP state 00 = 'Wait_Prm' state 01 = 'Wait_Cfg' state 10 = 'DATA_EX' state
X	X	-	-	-	-	-	-	Watchdog State 00 = 'Baud_Search' state 01 = 'Baud_Control' state 10 = 'DP_Control' state

STATUS 2

- These informations are from the Active Slave PROFIBUS module.

Table 6.

b7	b6	b5	b4	b3	b2	b1	b0	Description
-	-	-	-	X	X	X	X	Baud rate of PROFIBUS communications: 0000 = 12 Mbaud 0001 = 6 Mbaud 0010 = 3 Mbaud 0011 = 1.5 Mbaud 0100 = 500 Kbaud 0101 = 187.5 Kbaud 0110 = 93.75 Kbaud 0111 = 45.45 Kbaud 1000 = 19.2 Kbaud 1001 = 9.6 KBaud
X	X	X	X	-	-	-	-	Current MODULE selected for PROFIBUS cyclic communications 0000 = No module selected 0001 = 1 Byte output, 2 Bytes input 0010 = 4 Bytes output, 8 Bytes input

STATUS 3

- Reserved

NODE RESET

- By this routine, it is possible to force a reset to the PROFIBUS interfaces connected to the base card restoring the conditions defined in the BUS CONTROL menu.

View procedure:

- Move the local selector to OFF or REMOTE and then press YES until the display shows NODE REPORT. Press NO to exit or press YES to scroll the list of transmission information.

11.3 Bus Signal Failure Indication

In case of loss of bus signal, a warning is generated. It is signalled by the flashing of the relevant ALARM / WARNING LED and by indication on the local 2 lines / 16 character display.

Appendix A: PROFIBUS Certificate

Certificate

PROFIBUS Nutzerorganisation e.V. grants to

Biffi Italia srl
Loc. Caselle S. Pietro 420, 29017 Fiorenzuola d'Arda - Piacenza

the Certificate No.: **Z01071** for the PROFIBUS Slave:

Model Name: **ICON2000V4 DPV1**
Revision: **HW: 0.1; SW: 4.01**
GSD: **ICON0937.gsd, Rel. 4.0; GSD_Rev. 4**

This certificate confirms that the product has successfully passed the certification tests with the following scope:

☑ DP-V0	MS0, Sync, Freeze, Fail_safe
☑ DP-V1	MS2
☑ Physical Layer	RS485

Test Report Number: **PCN052-DPS-01**
Authorized Test Laboratory: **PROCENTEC, Wateringen, The Netherlands**

The tests were executed in accordance with the following documents:
"Test Specifications for PROFIBUS DP Slaves, Version 2.0 from February 2000".
This certificate is granted according to the document "Framework for testing and certification of PROFIBUS products".
For all products that are placed in circulation by May 12, 2011 the certificate is valid for life.

(Official in Charge)

Board of PROFIBUS Nutzerorganisation e. V.

(K.-P. Lindner) (Prof. K. Bender)

Appendix B: Note for Base Card FW 7.00

This appendix explains the ESD command functionality introduced with base card Firmware version 7.00.

The revision of base card can be checked with acyclic data; Nameplate Slot 0, index 0, byte 16 - 25 “SW_VERSION”.

If revision of base card is less than 7.00, this appendix is not relevant.

The ESD command and status (issued with the output data byte 0, bit 3 and cyclic input data byte 0, bit 4) can assume the meaning of PST signal, based on type of actuator and setting of “ESD INPUT MODE” parameter.

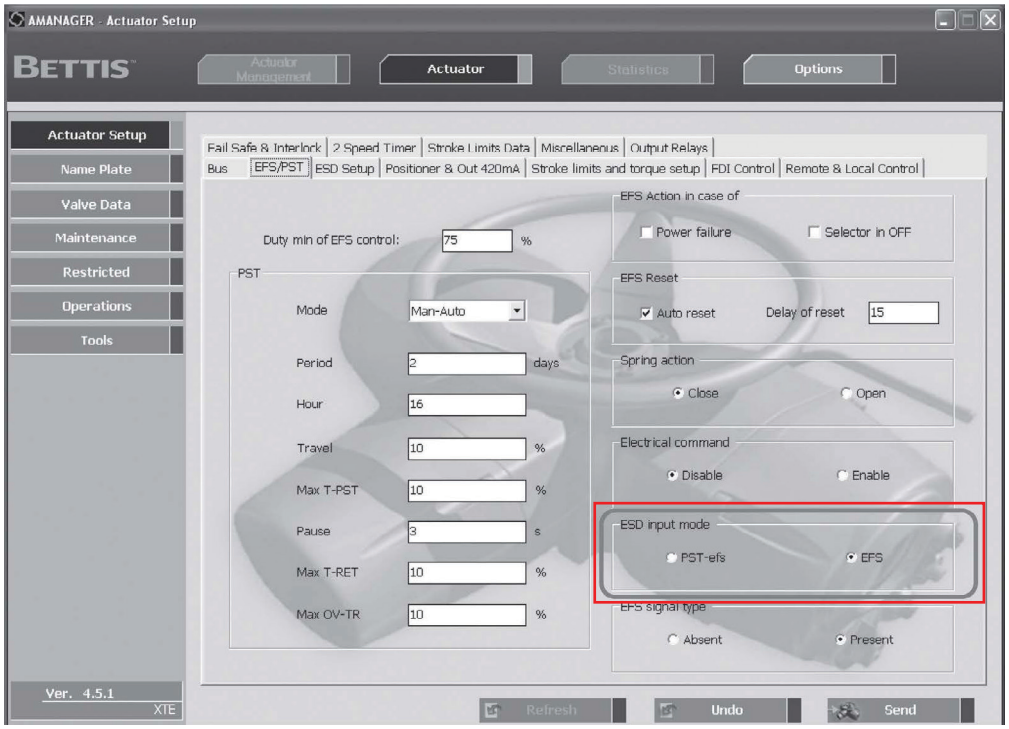
Table B-1 explicit its functionality.

Table B-1

Actuator Model	ESD Input Mode Parameter	ESD Command (CH 53) Functionality	ESD Status (CH 18) Functionality
XTE	PST-efs	Electrical ESD	ESD in Progress
XTE	EFS	Electrical ESD	ESD in Progress
EFS	PST-efs	PST	PST in Progress
EFS	EFS	Spring ESD	ESD in Progress

The ESD input mode parameter can be set on “Actuator Setup” menu of local control or DCMlink software (see Figure B-1).

Figure B-1



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