BIFFI
tyco flow control

ICON 2000v4
ELECTRIC ACTUATOR

Section 618/42

Operating and configuration

ICON2000v4_DPV1
PROFIBUS DPV1
Module

File : man618-42_2.doc rev. 2

Contents may change without notice

NOTES:

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REVISION LIST

2	24.05.05	Added CERTIFICATION document	C.D.	C.D.
1	9.11.04	Reviewed Usr_Prm string and Slot/Index assignment	C.D.	C.D.
0	11.10.04	Instruction for rev. 4.0 PROFIBUS DPV1 Interface	C.D.	C.D.
Rev.	Date	DESCRIPTION	Prepared	Approved

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1. Introduction

The **ICON2000v4_DPV1** is an electronic module that allows connecting the BIFFI electrical actuator ICON 2000v4 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 RS 485 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 BIFFI electrical actuator ICON 2000v4.

2. Operation and storage

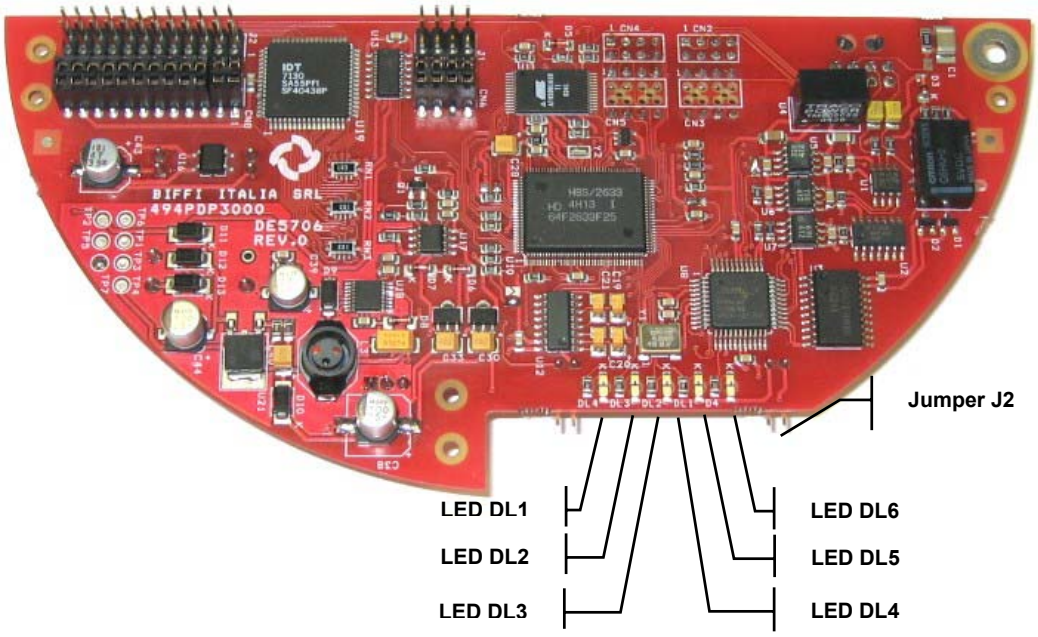
The module is designed to work and to be stored in the same environment of the actuator.

3. Communication features

Communication protocol	: PROFIBUS DP according to EN 50170							
Network topology	: Line (bus) structure. With repeaters tree structures can also be realised							
Transmission medium	: Twisted, screened copper cable according to EN 50 170							
Data rate	: 9.6	19.2	45.45	93.75	187.5	500	1500	**Kbit/sec**
Cable length without repeater	: 1200	1200	1200	1200	1000	400	200	**m**
Approx. cable length with repeater	: 10	10	10	10	6	4	2	**Km**
Station type	: DPV0 and DPV1 slave							
Device number	: 32 devices per segment without repeater (max 126, with repeaters)							
Max repeater number	: 9							
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							

4. ICON2000v4_DPV1 module

The module consists in a single PCB that is installed inside the actuator housing. It is connected to the ICON 2000v4 base card via strip connector. The internal wiring connects the PROFIBUS data lines to the actuator terminal board.



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 (Green)	Slave State:	ON when the interface acts as an Active 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 paragraph 11.2: 'NODE REPORT'.

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 parameterisation, 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 on one bus. 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/sec, the max cable length is 1,200m without repeaters and 10,000 m with 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.

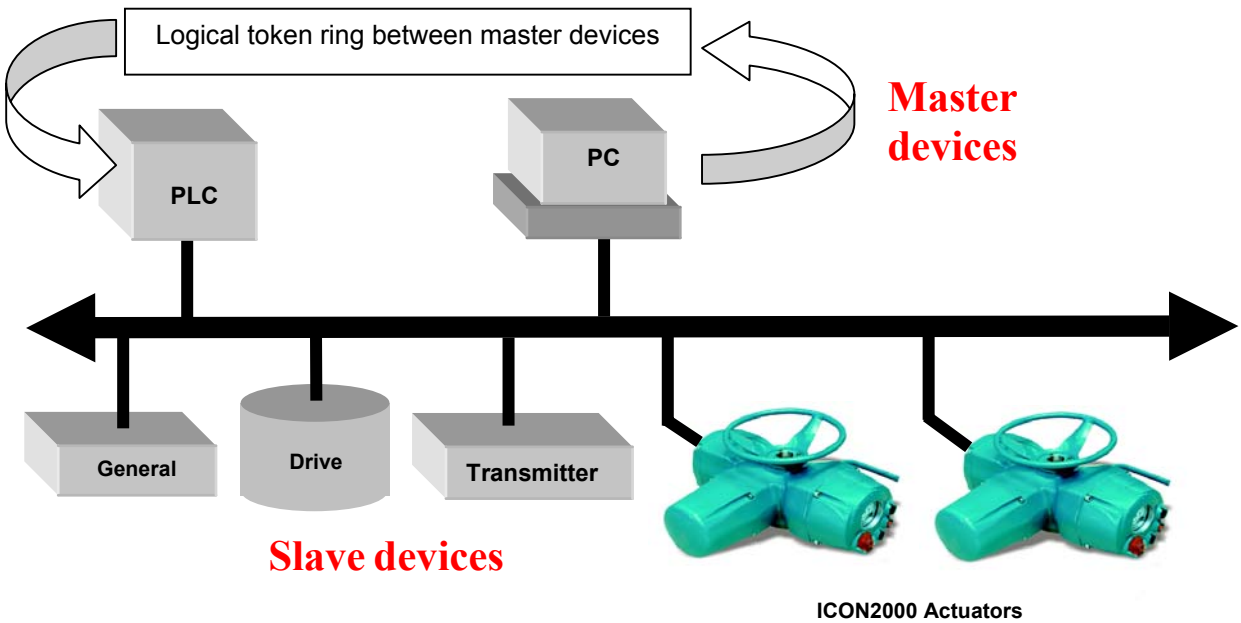
Types of devices:

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): this devices are necessary for commissioning, maintenance and diagnostics.

Slave: field device such transmitters, actuators, drives, etc.

The figure below shows a PROFIBUS DP configuration with two Master devices and different Slave devices.



ICON2000 Actuators

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 9.6kbit/sec to 1.5Mbit/sec 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. Up to nine repeater can be used to extend the number of device up to 126 and to link the individual bus segment and to enlarge the network area. The following table shows the relationship between baud rate, segment length and total bus length.

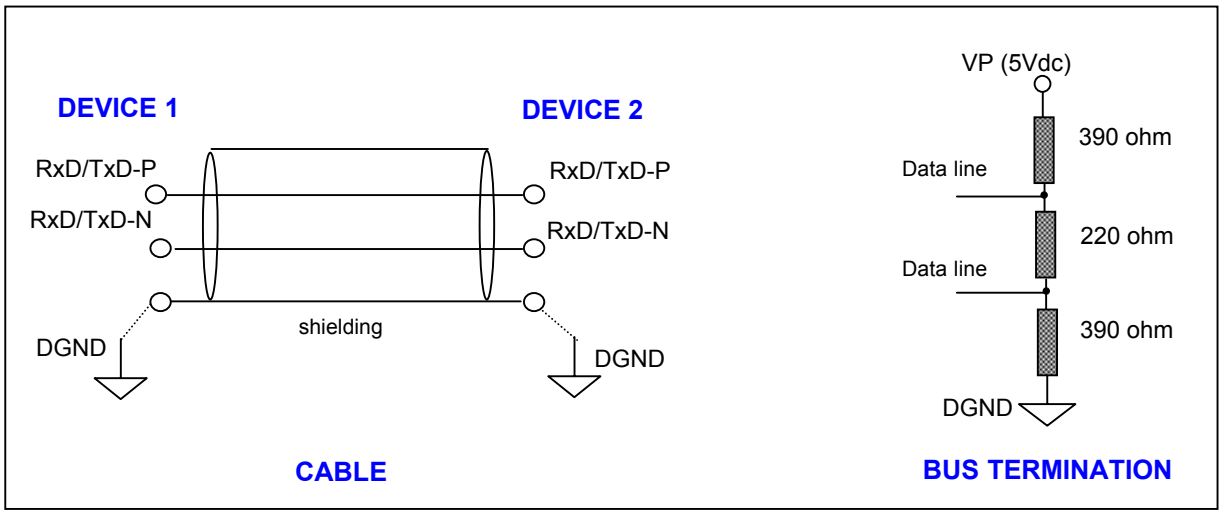
Baud rate	Max. segment length (no repeater)	Max. bus length with 9 repeater
9.6 K	1,200 m	10,000 m
19.2 K	1,200 m	10,000 m
45.45 K	1,200 m	10,000 m
93.75 K	1,200 m	10,000 m
187.5 K	1,200 m	10,000 m
500 K	400 m	10,000 m
1500 K	200 m	10,000 m

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 2 are based on **type A** cable, as specified by the EN 50170, having the following characteristics.

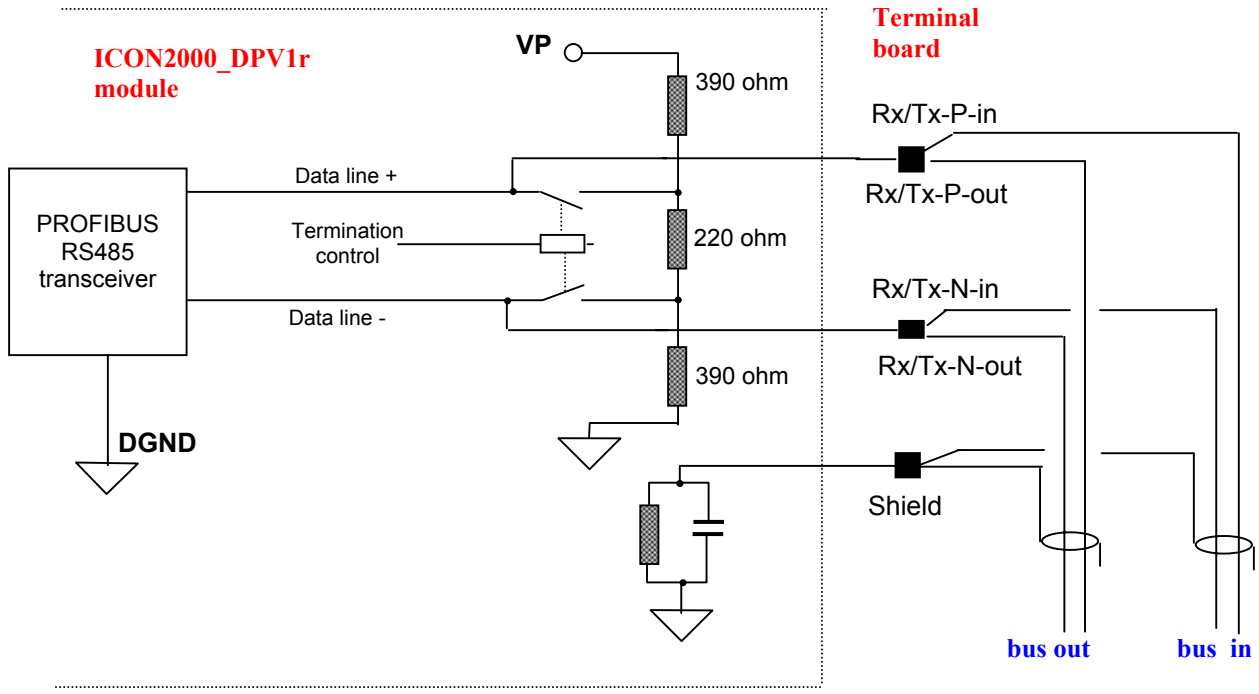
- Impedance from 135 to 165 ohm
- Capacity < 30 pF/m
- Loop resistance 110 ohm/km
- Wire gauge 0.64 mm
- Conductor area > 0.34 mm^2

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

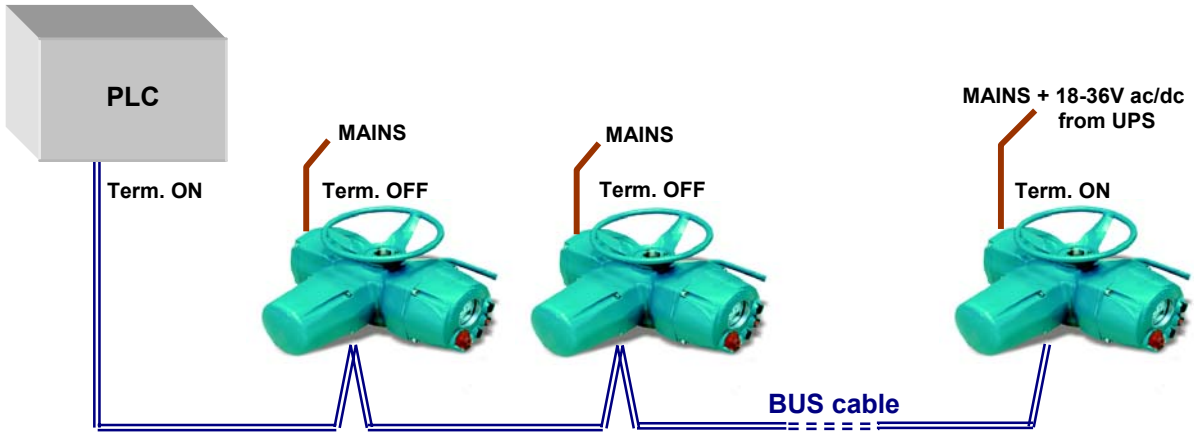
The data lines must not be reversed. Use of shielded cable is mandatory for having high system immunity against electromagnetic disturbs. The shield should be connected to ground on both sides. The data lines should be kept separate from all other cables. It should be laid in separate, conductive and earthed cable trunking. It must be ensured that there are not voltage difference between individual nodes of PROFIBUS DP.



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 Vac/dc generated by safe source that will supply just the actuator electronics and the PROFIBUS termination.
The figure 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.

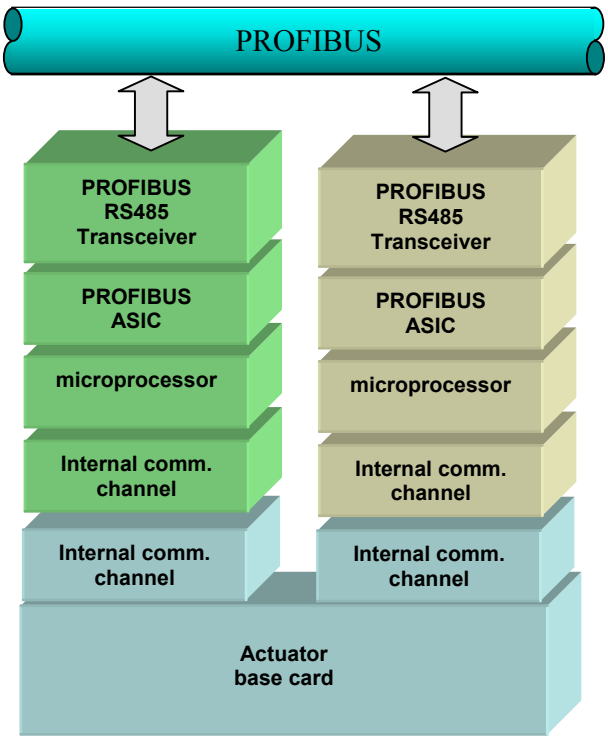


The figure below shows the bus with an actuator at the end of the bus segment. To be sure that the terminations are supplied also if the mains fails, an auxiliary voltage supply generated by an UPS is connected to the actuator to supply the electronics and the termination.



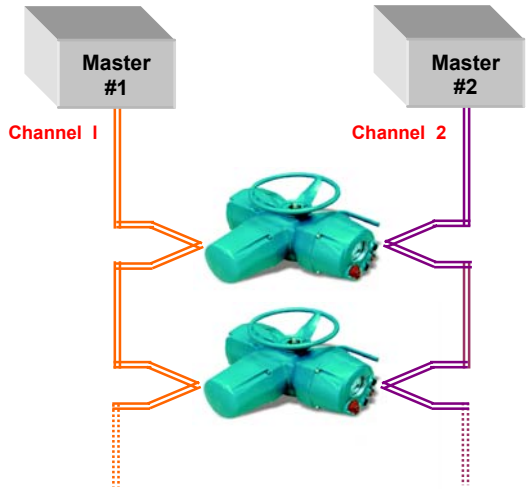
7. Slave Redundancy

The **ICON2000v4_DPV1** is designed to allow the actuator to acts as a redundant slave as described in the PROFIBUS "***Specification Slave Redundancy***" Version 1.1.
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:



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

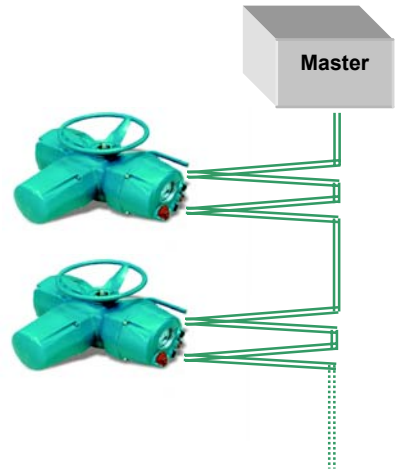
- An internal arbitration defines at the start-up the role of the interfaces.
- The base card tries first to establish a valid communication with the Primary Slave.
- There is always just one Slave (Primary or Backup) with a valid communication with the PROFIBUS line. It is indicated Active Slave.
- 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.



In this lay-out the two interfaces may have the same address because the two interfaces are on different channels.

A synchronisation method must be active between the Master stations to take the information from the Active Slave.

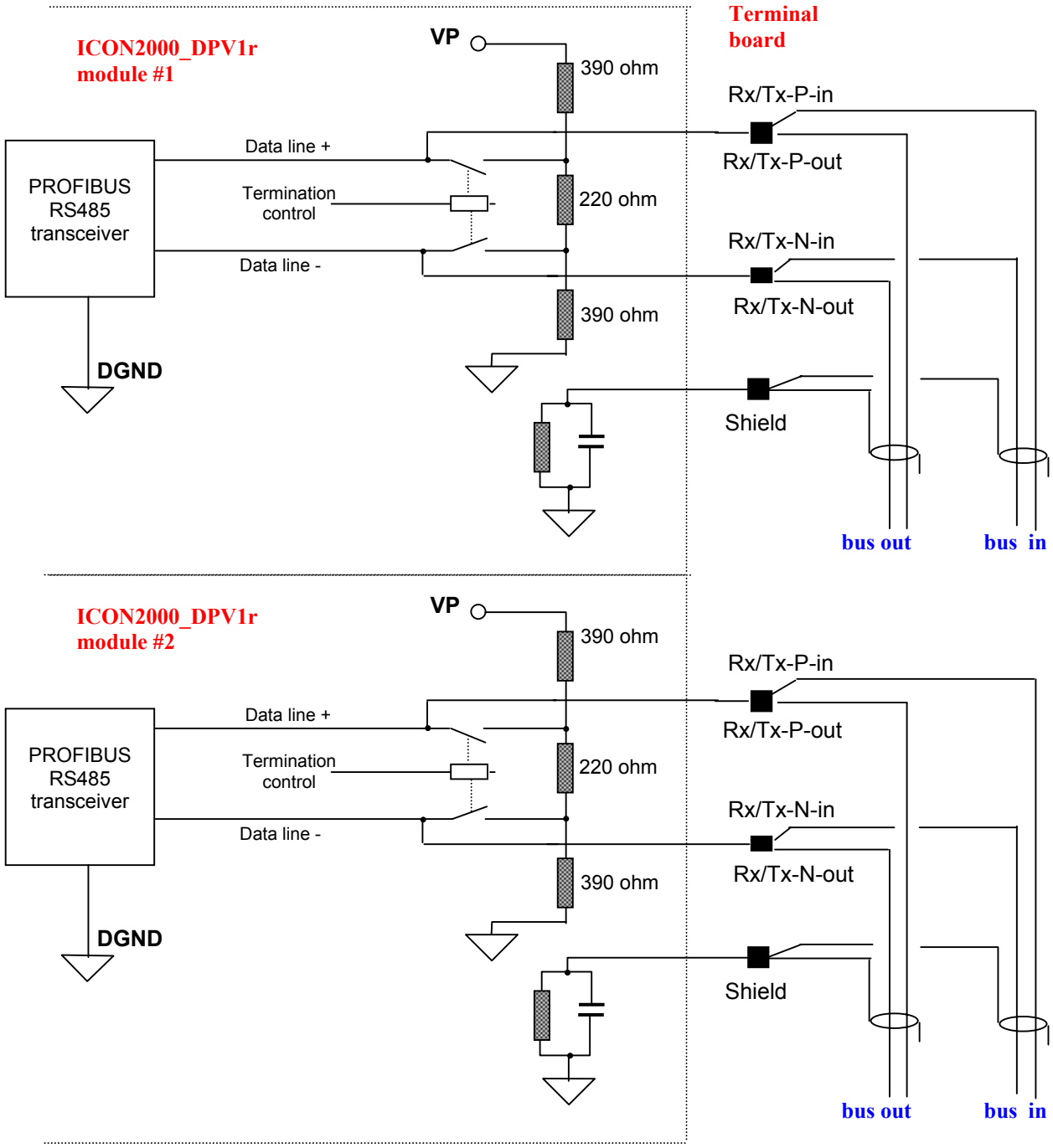
In this lay-out the two interfaces shall have different addresses because the two interfaces are on the same channel.



The very flexible redundancy strategy implemented in the **ICON2000v4_DPV1** module allows also different lay-out 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.

The figure 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.



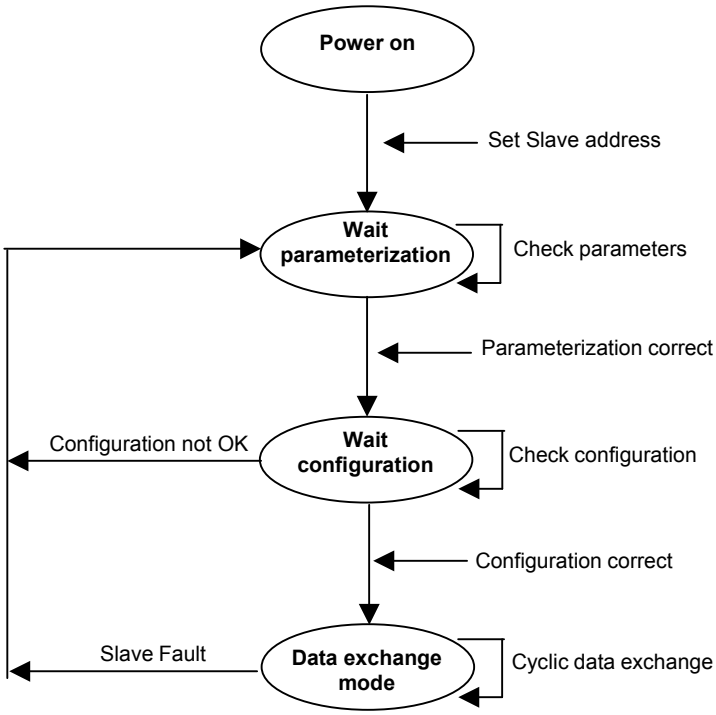
8. ICON2000v4_DPV1 power-up

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 chapter 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**

For example, if module 2 is selected, the output telegram consists in 4 bytes, and the input telegram in 8 bytes.
It is possible to specify if the selected data has to be processed consistently by the PROFIBUS DP-Master. In this way the data will not change during the reading.

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. The following figure shows the state machine of a DP slave:



9. Data exchanged during parameterization

The following data are sent to the **ICON2000v4_DPV1** interface:

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 1	LSB first	LSB first MSB first
4	Fail Safe Action	1 byte	0 1 2 3 4	Off	Off Close Open Stayput Go to position
5	Delay before initiating safe oper.	1 byte	0-255	4	sec
6	Safe Position	1 byte	0-100	50	%
7	Timer Open direction – status	1 byte	0 1	0ff	Off On
8	Timer Open direction – on time	1 byte	2-200	2	sec
9	Timer Open direction – off time	1 byte	1-200	2	sec
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 1	Off	Off 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	sec

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
	Utilisation Rate
Recent Maintenance Info: Slot 2 Index 1	Recent Contactor Cycles
	Recent Motor Run Time
	Recent Time Without Power
	Recent Utilisation 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, also the actuator 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 sec.
maximum 255 sec.
default value: 4 sec.

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 sec.
maximum 200 sec.
default value: 2 sec.

Byte 9 **Timer Open Direction – Off time**

It defines the Off time of the Timer function in opening

Value: minimum 1 sec.
maximum 200 sec.
default value: 2 sec.

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 sec.
maximum 200 sec.
default value: 2 sec.

Byte 14 **Timer Close Direction – Off time**

It defines the Off time of the Timer function in closing

Value: minimum 1 sec.
maximum 200 sec.
default value: 2 sec.

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.

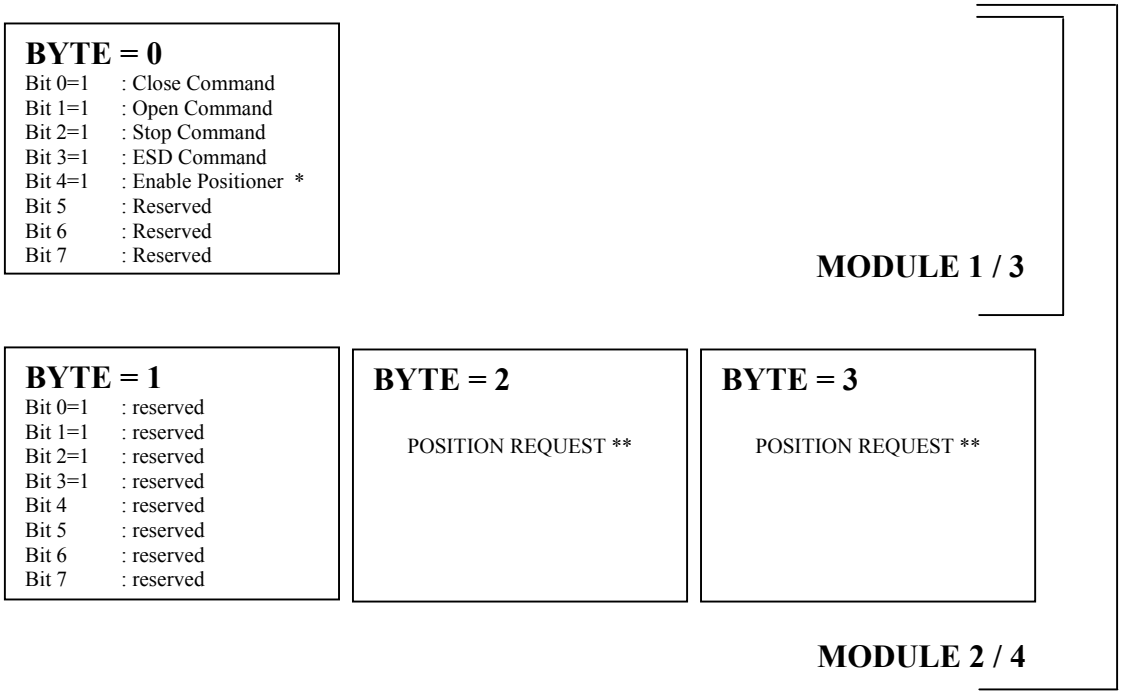
Value: minimum 1 sec.
maximum 255 sec.
default value: 6 sec.

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%)

10.1.2 Input data

BYTE = 0
Bit 0=1 : Close limit
Bit 1=1 : Open limit
Bit 2=1 : Closing
Bit 3=1 : Opening
Bit 4=1 : ESD active
Bit 5=1 : Loc. Sel. on Remote
Bit 6=1 : Loc. Sel. on Local
Bit 7=1 : Loc. Sel. on Off

BYTE = 1
Bit 0=1 : Interlock open active
Bit 1=1 : Interlock close active
Bit 2=1 : Fail safe action
Bit 3=1 : Int. data updated *
Bit 4=1 : Warning
Bit 5=1 : Channel 1 = on
Bit 6=1 : Valid data **
Bit 7=1 : Error flag (= alarm)

MODULE 1 / 3

BYTE = 2
ACTUATOR POSITION §

BYTE = 3
ACTUATOR POSITION §

BYTE = 4
Bit 0=1 : Monitor relay
Bit 1=1 : Motion inhibited
Bit 2=1 : DIN 1
Bit 3=1 : DIN 2
Bit 4=1 : DIN 3
Bit 5=1 : DIN 4
Bit 6=1 : DIN 5
Bit 7=1 : DIN 6

BYTE = 5
Bit 0=1 : Aux_in_open
Bit 1=1 : Aux_in_close
Bit 2=1 : Aux_in_stop
Bit 3=1 : Aux_in_bus-on
Bit 4=1 : HW remote mode
Bit 5=1 : Positioner mode
Bit 6 : reserved
Bit 7 : reserved

BYTE = 6
OUTPUT TORQUE §§

BYTE = 7
OUTPUT TORQUE §§

MODULE 2 / 4

* '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.
§ 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 following condition occurs:

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

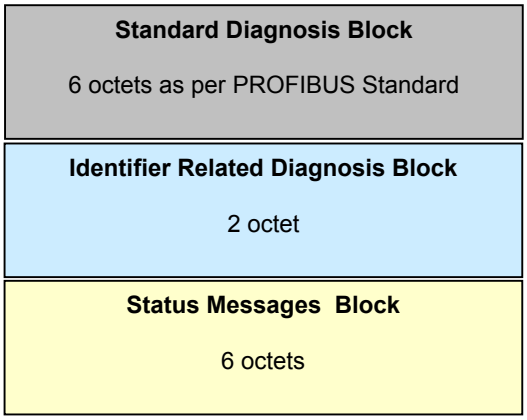
The following settings are supplied by factory:

- 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 Diagnostic message

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

The diagnostic model has the following structure:



As described in the GSD file, the Status Message gives the following indications:

- bit 24: Motor Thermostat
- bit 25: HI-HI Torque in Opening
- bit 26: HI-HI Torque in Closing
- bit 27: Actuator blocked in Opening
- bit 28: Actuator blocked in Closing
- bit 29: HI-HI Temperature
- bit 30: Position Sensor Failure
- bit 31: Speed Sensor Failure
- bit 32: Main Voltage Fault
- bit 33: K1 Contactor Failure
- bit 34: K2 Contactor Failure
- bit 35: Configuration Error
- bit 36: Hardware Error
- bit 37: Low Alkaline Battery
- bit 38: Lost Phase
- bit 39: No response from base card

10.2 ACYCLIC COMMUNICATION DPV1

This paragraph defines the composition of the acyclic communication defined as per PROFIBUS DPV1.

10.2.1 Name plate

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

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

* if the char 'decimal point' (ASCII 0x2e) appears in the Software revision string the actuator is a BIFFI ICON2000; if the char '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	close limit
		1	open limit
		2	moving
		3	monitor relay
		4	selector in local
		5	selector in remote
		6	alarm
		7	warning
1	Byte 1	0	din 1
		1	din 2
		2	din 3
		3	din 4
		4	din 5
		5	din 6
		6	interlock open
		7	interlock close
2	Byte 2	0	fail safe action
		1	opening
		2	clsing
		3	selector in off
		4	ESD active
		5	HW remote mode
		6	positioner mode
		7	motion inhibited
3	Byte 3	0	channel 1 active
		1	aux in open
		2	aux in close
		3	aux in stop
		4	aux in bus on
		5	reserved
		6	reserved
		7	reserved

10.2.3 Maintenance Info

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	sec
6-7	Closing time	2 byte	0-65,535	sec
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	Utilisation 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-20-yy	BCD format
4-7	Recent log date	4 bytes	dd-mm-20-yy	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 Utilisation 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-20-yy	BCDformat
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-20-yy	BCDformat

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-20-yy	BCDformat
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-20-yy	BCDformat

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 Torquenm Thrust lb Thrust kN
1-7	Nominal Torque value	7 byte		string
8-11	Next Maintenance Date	4 byte	dd-mm-20-yy	BCDformat
12-15	Last Maintenance Date	4 byte	dd-mm-20-yy	BCDformat
16-19	Startup Date	4 byte	dd-mm-20-yy	BCDformat

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-20-yy	BCDformat
6-9	Alarm #1: time	4 byte	00-hh-mm-ss	BCDformat
10	Alarm #2: code	1 byte	0-255	
11	Reserved	1 byte		
12-15	Alarm #2: date	4 byte	dd-mm-20-yy	BCDformat
16-19	Alarm #2: time	4 byte	00-hh-mm-ss	BCDformat
20	Alarm #3: code	1 byte	0-255	
21	Reserved	1 byte		
22-25	Alarm #3: date	4 byte	dd-mm-20-yy	BCDformat
26-29	Alarm #3: time	4 byte	00-hh-mm-ss	BCDformat

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-20-yy	BCDformat
6-9	Alarm #4: time	4 byte	00-hh-mm-ss	BCDformat
10	Alarm #5: code	1 byte	0-255	
11	Reserved	1 byte		
11-15	Alarm #5: date	4 byte	dd-mm-20-yy	BCDformat
16-19	Alarm #5: time	4 byte	00-hh-mm-ss	BCDformat

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-20-yy	BCDformat
6-9	Warning #1: time	4 byte	00-hh-mm-ss	BCDformat
10	Warning #2: code	1 byte	0-255	
11	Reserved	1 byte		
11-15	Warning #2: date	4 byte	dd-mm-20-yy	BCDformat
16-19	Warning #2: time	4 byte	00-hh-mm-ss	BCDformat
20	Warning #3: code	1 byte	0-255	
21	Reserved	1 byte		
22-15	Warning #3: date	4 byte	dd-mm-20-yy	BCDformat
26-29	Warning #3: time	4 byte	00-hh-mm-ss	BCDformat

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-20-yy	BCDformat
6-9	Warning #4: time	4 byte	00-hh-mm-ss	BCDformat
10	Warning #5: code	1 byte	0-255	
11	Reserved	1 byte		
12-15	Warning #5: date	4 byte	dd-mm-20-yy	BCDformat
16-19	Warning #5: time	4 byte	00-hh-mm-ss	BCDformat

10.2.5 Maintenance Commands

Slot 4, Index 0, length 1 byte: maintenance information.

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.

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

Slot 4, Index 2, length 4 byte: maintenance information.

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

Slot 4, Index 3, length 4 byte: maintenance information.

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

Slot 4, Index 4, length 8 byte: Date and Time

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

11. Data at local operator interface

Here below are described the facilities available by the **view** and **setup menu** of ICON 2000v4.

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. Here below is the list of the available conditions:

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

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 lay-out 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 lay-out 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 Active Slave.

The following indication are reported:

- **CARD REPORT**: by this routine it is possible to shows the 64 characters identification string relevant to the Active Slave interface card.

- **STATUS 0** this information are get from the Active Slave PROFIBUS module.

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** this information are get from the Active Slave PROFIBUS module.

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** this information are get from the Active Slave PROFIBUS module.

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 info*

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 char. display .

12. GSD file

```
; GSD-File  for ICON2000v4    BIFFI ITALIA srl
; Author: C.Doglio
; Date:  27.10.04
; File: ICON0937.GSD    rev.0.0
;=============================================================
;
#Profibus_DP
;
; Prm-Text-Def-List:
;
;Text definition 1
PrmText=1
Text(0)="LSB first"
Text(1)="MSB first"
EndPrmText
;
;Text definition 2
PrmText=2
Text(0)="Off"
Text(1)="Close"
Text(2)="Open"
Text(3)="Stayput"
Text(4)="Go to position"
EndPrmText
;
;Text definition 3
PrmText=3
Text(0)="Off"
Text(1)="On"
EndPrmText
;
; Ext-User-Prm-Data-Def-List:
;
ExtUserPrmData=1 "Storage Format"
Unsigned8 0 0-1
Prm_Text_Ref=1
EndExtUserPrmData
ExtUserPrmData=2 "Fail safe action"
Unsigned8 0 0-4
Prm_Text_Ref=2
EndExtUserPrmData
ExtUserPrmData=3 "Fail safe delay"
Unsigned8 4 0-255
EndExtUserPrmData
ExtUserPrmData=4 "Safe position"
Unsigned8 50 0-100
EndExtUserPrmData
ExtUserPrmData=5 "Timer Opening"
Unsigned8 0 0-1
Prm_Text_Ref=3
EndExtUserPrmData
ExtUserPrmData=6 "Timer Closing"
Unsigned8 0 0-1
Prm_Text_Ref=3
EndExtUserPrmData
ExtUserPrmData=7 "Timer On time"
Unsigned8 2 2-200
EndExtUserPrmData
ExtUserPrmData=8 "Timer Off time"
Unsigned8 2 1-200
EndExtUserPrmData
ExtUserPrmData=9 "Timer OP-start"
Unsigned8 0 0-100
EndExtUserPrmData
ExtUserPrmData=10 "Timer OP-stop"
Unsigned8 100 0-100
EndExtUserPrmData
ExtUserPrmData=11 "Timer CL-start"
Unsigned8 100 0-100
EndExtUserPrmData
ExtUserPrmData=12 "Timer CL-stop"
```

```
Unsigned8 0 0-100
EndExtUserPrmData
ExtUserPrmData=13 "Dead band"
Unsigned8 10 1-255
EndExtUserPrmData
ExtUserPrmData=14 "Motion Inhibit"
Unsigned8 6 1-255
EndExtUserPrmData
;
; Unit definition list:
;
GSD_Revision=4
;
Vendor_Name="BIFFI ITALIA srl"
Model_Name="ICON2000v4 DPv1"
Revision="Release 4.0"
Ident_Number=0x0937
Protocol_Ident=0
Station_Type=0
Hardware_Release="Hardware Release DE5706 rev.0.1"
Software_Release="Software Release SW=4.01"
;
9.6_supp=1
19.2_supp=1
45.45_supp=1
93.75_supp=1
187.5_supp=1
500_supp=1
1.5M_supp=1
;
MaxTsdr_9.6=60
MaxTsdr_19.2=60
MaxTsdr_45.45=60
MaxTsdr_93.75=60
MaxTsdr_187.5=60
MaxTsdr_500=100
MaxTsdr_1.5M=150
;
Implementation_Type="SPC3"
Bitmap_Device="IC0937_R"
Bitmap_Diag="IC0937_D"
Bitmap_SF="IC0937_C"
;
; Slave-Specification:
;
Freeze_Mode_supp=1
Sync_Mode_supp=1
Auto_Baud_supp=1
Set_Slave_Add_supp=0
Min_Slave_Intervall=1
Max_Diag_Data_Len=16
Slave_Family=0
Fail_Safe=1
;
; UserPrmData: Length and Preset:
;
User_Prm_Data_Len=20
User_Prm_Data=0x00,0x00,0x00,\ ;Reserved DPV1
0x00,  \                       ;3- Storage Format
0x00,  \                       ;4 -Fail Safe action
0x0a,  \                       ;5 -Delay before Fail Safe
0x32,  \                       ;6 -Safe position
0x00,  \                       ;7 -Timer OP
0x0a,  \                       ;8 -Timer on time
0x05,  \                       ;9 -Timer off time
0x5a,  \                       ;10-Timer start pos
0x64,  \                       ;11-Timer stop pos
0x00,  \                       ;12-Timer CL
0x02,  \                       ;13-Timer on time
0x01,  \                       ;14-Timer off time
0x0a,  \                       ;15-Timer start pos
0x00,  \                       ;16-Timer stop pos
0x00,  \                       ;17-Reserved
0x0f,  \                       ;18-Dead band
0x05                           ;19-Motion Inhibit
;
```

```
Max_User_Prm_Data_Len=20
;
Ext_User_Prm_Data_Const(0)=0
Ext_User_Prm_Data_Const(1)=0
Ext_User_Prm_Data_Const(2)=0
Ext_User_Prm_Data_Ref(3)=1
Ext_User_Prm_Data_Ref(4)=2
Ext_User_Prm_Data_Ref(5)=3
Ext_User_Prm_Data_Ref(6)=4
Ext_User_Prm_Data_Ref(7)=5
Ext_User_Prm_Data_Ref(8)=7
Ext_User_Prm_Data_Ref(9)=8
Ext_User_Prm_Data_Ref(10)=9
Ext_User_Prm_Data_Ref(11)=10
Ext_User_Prm_Data_Ref(12)=6
Ext_User_Prm_Data_Ref(13)=7
Ext_User_Prm_Data_Ref(14)=8
Ext_User_Prm_Data_Ref(15)=11
Ext_User_Prm_Data_Ref(16)=12
Ext_User_Prm_Data_Const(17)=0
Ext_User_Prm_Data_Ref(18)=13
Ext_User_Prm_Data_Ref(19)=14
;
;
Modular_Station=1
Max_Module=1
Max_Input_Len=8
Max_Output_Len=4
Max_Data_Len=12
;
; Slave-Specification:
;
DPV1_Slave=1
;
C1_Read_Write_supp=0
C2_Read_Write_supp=1
C2_Max_Data_Len=240
C2_Response_Timeout=100
C2_Read_Write_required=0
C2_Max_Count_Channels=3
Max_Initiate_PDU_Length=72
Diagnostic_Alarm_supp=0
Process_Alarm_supp=0
Pull_Plug_Alarm_supp=0
Status_Alarm_supp=0
Update_Alarm_supp=0
Manufacturer_Specific_Alarm_supp=0
Extra_Alarm_SAP_supp=0
Alarm_Sequence_Mode_Count=0
Alarm_Type_Mode_supp=0
Diagnostic_Alarm_required=0
Process_Alarm_required=0
Pull_Plug_Alarm_required=0
Status_Alarm_required=0
Update_Alarm_required=0
Manufacturer_Specific_Alarm_required=0
DPV1_Data_Types=0
WD_Base_1ms_supp=1
Check_Cfg_Mode=0
;
;Device related Diagnosis
;
Unit_Diag_Bit(24)="Motor Thermostat"
Unit_Diag_Bit(25)="HI-HI Torque in Opening"
Unit_Diag_Bit(26)="HI-HI Torque in Closing"
Unit_Diag_Bit(27)="Actuator blocked in Opening"
Unit_Diag_Bit(28)="Actuator blocked in Closing"
Unit_Diag_Bit(29)="HI-HI Temperature"
Unit_Diag_Bit(30)="Postition Sensor Failure"
Unit_Diag_Bit(31)="Speed Sensor Failure"
Unit_Diag_Bit(32)="Main Voltage Fault"
Unit_Diag_Bit(33)="K1 Contactor Failure"
Unit_Diag_Bit(34)="K2 Contactor Failure"
Unit_Diag_Bit(35)="Configuration Error"
Unit_Diag_Bit(36)="Hardware Error"
Unit_Diag_Bit(37)="Low Alkaline Battery"
```

```
Unit_Diag_Bit(38)="Lost Phase"
Unit_Diag_Bit(39)="No response from base card"
;
; Module Definition List
;
Module="Mod.1: 1 B.Out, 2 B.In" 0x11,0x20
1
EndModule
Module="Mod.2: 4 B.Out, 8 B.In" 0x17,0x23
2
EndModule
Module="Mod.3: 1 B.Out, 2 B.In - Cons." 0x91,0x20
3
EndModule
Module="Mod.4: 4 B.Out, 8 B.In - Cons." 0x97,0xa3
4
EndModule
```

13. PROFIBUS CERTIFICATE

Certificate

PROFIBUS Nutzerorganisation e.V. grants to

Biffi Italia srl
Loc. Caselle S. Pietro, I-29017 Fiorenzuola d'Arda - Piacenza
the Certificate No.: **Z01071** for the following product:

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

This certificate confirms that the device has successfully passed the conformance tests for PROFIBUS DP Slave devices.

The tests were executed in accordance with "Test Specifications for PROFIBUS DP Slaves, Version 2.0, February 2000" of April 2000 at PROFIBUS Center Nederland which is an authorized test laboratory of PROFIBUS Nutzerorganisation. The detailed test procedure and the test results are recorded in the inspection report PCN052-DPS-01.

This certificate is granted according to the PNO guideline for testing and certification (PRZ) dated August 1, 1999 and is valid for 3 years, i.e. until May 12, 2008.

Karlsruhe, May 24, 2005

.....
(Official in Charge)

Board of PROFIBUS Nutzerorganisation e. V.

(Klaus-Peter Lindner)

(Prof. K. Bender)