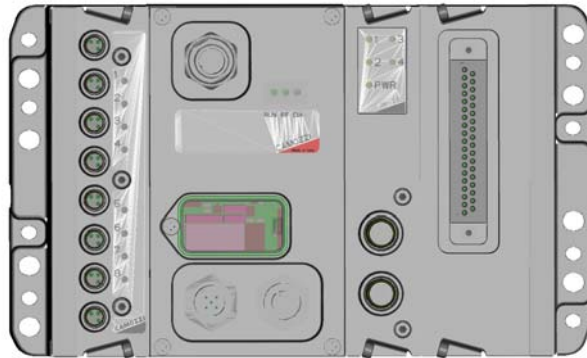# CP2 Series
Electric functioning manual

PROFIBUS-DP Fieldbus Node

Conforming to normative
IEC 61158/61784

SAFETY INSTRUCTIONS

To use this product safely, basic knowledge of pneumatic equipment, including materials, piping, electrical system and mechanism, is required (ISO 4414 *1 JIS B 8370 *2).

We do not bear any responsibility for accidents caused by any person without such knowledge or arising from improper operation.

This since this product is used in a vast range of applications and therefore not possible for us to have full knowledge in all of them. Depending on operating conditions, the product may fail to operate to maximum performance, or cause an accident. Thus, before placing an order, examine whether the product meets your application, requirements, and how to properly use it.

This product incorporates many functions and mechanisms to ensure safety. However, improper operation could result in an accident. To prevent such accidents please **read this operation manual carefully for proper operation.**

Please observe the cautions on handling described in this manual, as well as the following instructions: Additionally, the caution is classified into the following three groups, "CAUTION", "WARNING", and "DANGER", in order to identify the degree of the danger it presents and possible hazard.

⚠ DANGER: Failure to pay attention to DANGER notices in extreme conditions may cause a situation that results in serious injury or loss of life.

⚠ WARNING: Failure to pay attention to WARNING notices may result in serious injury or loss of life.

⚠ CAUTION: Failure to pay attention to CAUTION notices may result in injury or equipment damage.

    *1)   ISO 4414 :   Pneumatic fluid power ••• Recommendations for the application of equipment to transmission and control systems.

    *2)   JIS B 8370:   General rule for pneumatic systems

Normative

Safety
CEI EN 61131-2
CEI EN 61010-1

EMC
CEI EN 61000-6-2
CEI EN 61000-6-4

RoHS
2002/95/CE

Disposal

Dispose of the packing and device in accordance with the currently applicable regulations in your country

Contents:

1. CP2 SERIES SYSTEM OVERALL DESCRIPTION

The CP2 series system allows piloting and handling the actuation of outputs according to impulses received through the external Profibus-DP bus and to transfer back to the external bus the information diagnostically provided for by system and the digital inputs.

The system is made up by an Initial Module (Profibus-DP slave device) communicating with a Profibus-DP Master through bus up to 12 Mb/s (speed automatic research).

On the right hand side of the initial module is possible to connect some "Output SPI modules" and some "Adapter SPI modules"; with this kind of modules will be possible to connect directly to the island some valves series. In any case this modules will be powered directly from the initial module.

On the left hand side of the only initial module is possible to connect some "Input SPI modules" that will be powered directly from the initial module.

1.1 Example of the CP2 Series system

BUS Profibus-DP
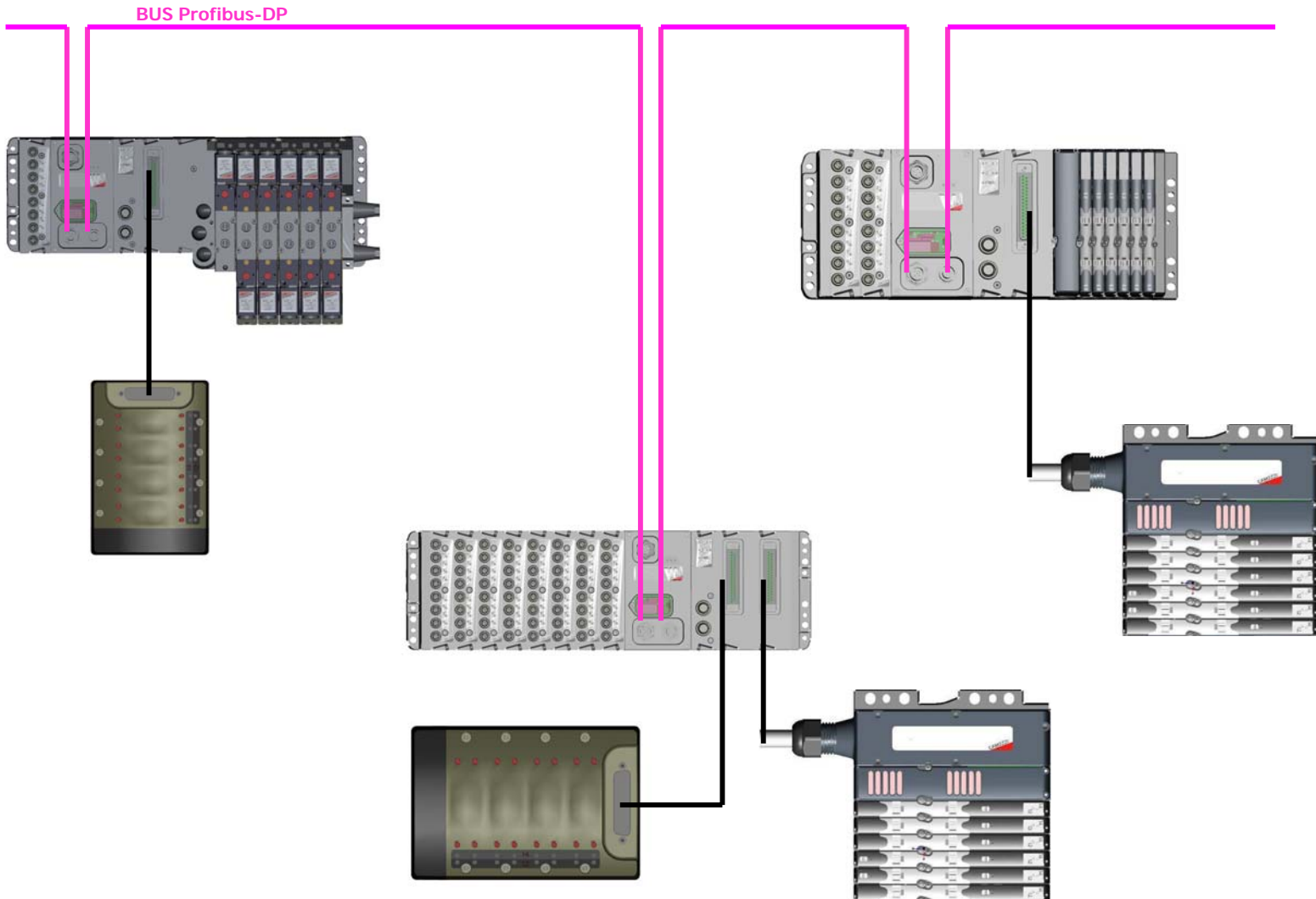
In the figure is represented an example of the CP2 Series constituted by:

- ❏ Initial Module with a Digital IN Modules, a Generic Output Module, a Sub-D 37 poles Module, a Series 3 Plug-IN Adapter Module and a Series 3 Plug-IN valves Island. To the Sub-D 37 poles Module is linked a Series Y Multipolar valves island.

- ❏ Initial Module with 8 Digital IN Modules, a Generic Output Module, two Sub-D 37 poles Module. To the Sub-D 37 poles Modules is linked a Series Y Multipolar valves island and a Series H Multipolar valves island.

- ❏ Initial Module with 2 Digital IN Modules, a Generic Output Module, a Sub-D 37 poles Module, a Series H Adapter Module and a Series H valves Island. To the Sub-D 37 poles Module is linked a Series H Multipolar valves island.

The initial modules are connected to the Profibus serial.

2. MODULES DESCRIPTION:

Contents:

2.1 General technical characteristics:

POWER SUPPLY VOLTAGE:		24 V DC
MAXIMUM ABSORPTION:	Output	3,0 A (limited by fuse)
	Input + Logical	1,5 A (limited by fuse)
	Total	3,5 A
PROTECTION DEGREE:		IP65
FUNCTIONING TEMPERATURE:		0 ÷ 50 °C
RELATIVE HUMIDITY:		30 ÷ 90 % @ 25 °C 30 ÷ 50 % @ 50 °C
OUTPUT MAXIMUM NUMBER:	SPI	64
INPUT MAXIMUM NUMBER:	SPI	64

2.2 CP2 Series initial module

2.2.1 Characteristics e functionalities

The CP2 Series initial module has the following characteristics:
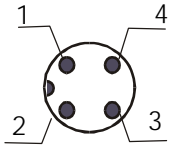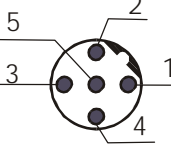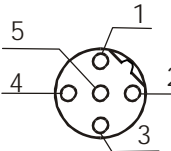
- ❑ it communicates through Profibus protocol with the Master Profibus-DP
- ❑ it communicates through RS 232 with an external PC to updated the FW on the initial module itself
- ❑ it handles through an SPI sub-serial a maximum of 64 outputs
- ❑ it receives the power supply for the output from a 24 Vdc source with an earth connection (of Vcc power)
- ❑ it handles through an SPI sub-serial a maximum of 64 digital inputs
- ❑ it receives the power supply for the electronics and the inputs from a 24 Vdc source with an earth connection (of Vcc logic)

2.2.2 Connecting and signaling elements of the CP2 Series initial module
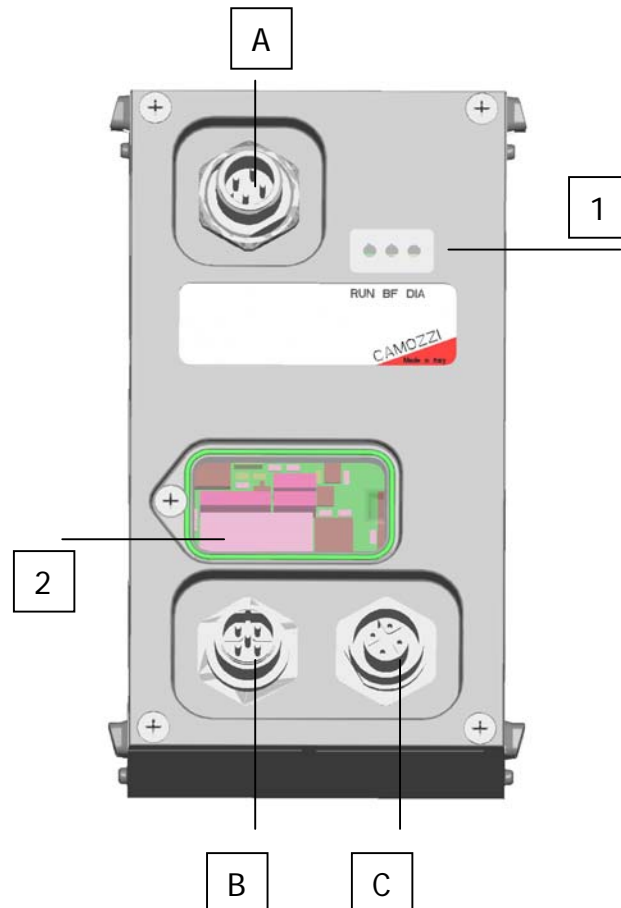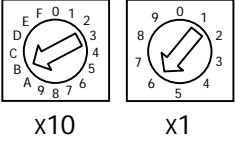
- ❑ 1: LED BUS state
- ❑ 2: Rotary switches for setting up the Profibus address
- ❑ A: Power supply connector (M12 Male 4 poles)
- ❑ B: Connector to link the bus input to the node (M12 B Male 5 poles)
- ❑ C: Connector to link the bus output from the node (M12 B Female 5 poles)

2.2.3 Pinout connectors CP2 Series Initial Modules

Connection	Type of connector	Drawing	Pinout
POWER SUPPLY (A)	M12 Male 4 poles		1: L24V Logics 2: P24V Output 3: GND (voltage reference on pins 1 and 2) 4: Earth
BUS IN (B)	M12B Male 5 poles		1: 2P5 (VP, 5V voltage supplied by external card) 2: A-Line (RxD/TxD-N, Line A of the Profibus line, cable green thread) 3: 2M (DGND, Reference of the 5V voltage supplied on pin 1) 4: B-Line (RxD/TxD-P, Line B of the Profibus line, cable red thread) 5: Earth (Connect this pin to the Profibus cable shield)
BUS OUT (C)	M12B Female 5 poles		1: 2P5 (VP, 5V Voltage supplied by the external card) 2: A-Line (RxD/TxD-N, Line A of the Profibus line, cable green thread 3: 2M (DGND, Reference of the 5V voltage supplied on pin 1) 4: B-Line (RxD/TxD-P, Line B of the Profibus line, cable red thread) 5: Earth (Connect this to the Profibus cable shield)

2.2.4 Initial module rotary switch setting up for Profibus address:

By intervening on the rotary switches under the cover, the node Profibus address must be set up.

Couple of rotating selectors	Drawing	Meaning:
Bus Address: the Profibus address on the CP2 Series island is set by using the selectors under the transparent cover.		The rotary switch on the right indicates the units, the rotary switch on the left indicates the tens of the address to set up. A hexadecimal rotary switch is used for the tens, in this way it is possible to set-up up to 127 profibus addresses A = 10; B = 11; C = 12; D, E, F = not used The rotary switches shown in the figure are set up on the 116 (B6) Profibus address

2.3 DIGITAL IN SPI module

2.3.1 Characteristics of the DIGITAL IN SPI module

The DIGITAL IN SPI modules have the following characteristics:
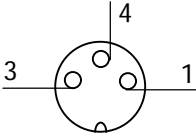
❑ connection through SPI to the left of the initial module and to the successive intermediate modules
❑ 8 digital inputs for module with an M8 female 3 poles connector for each input
❑ yellow signalling led for each input
❑ maximum number of connectable modules 8 (up to reaching 64 SPI digital inputs)
❑ powered from the 24V logics of the CP2 Series node
❑ protection against short circuit to groups of 4 inputs

2.3.2 Connecting and signaling elements of the DIGITAL IN SPI module
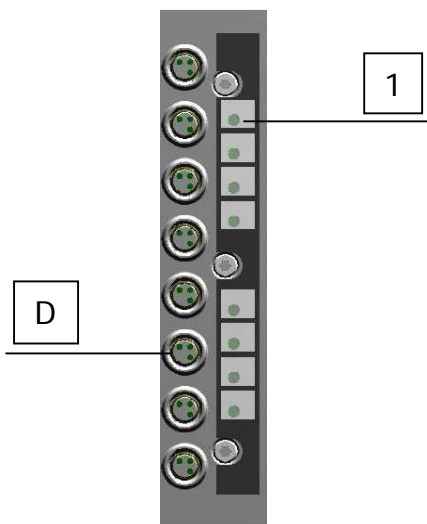
❑ 1: Yellow signally led for each input

❑ D: M8 female 3 poles connector for inputs connecting

2.3.3 Pinout M8 connectors of the DIGITAL IN SPI module

Connection	Type of connector	Drawing	Pinout
Digital input (D)	M8 Female 3 poles		1: VCC 3: GND 4: INPUT

2.3.4 Connection example of the DIGITAL IN SPI modules

If you use a 2 wired sensor (es. CSH-221), link the brown cable to pin 1 (VCC) and the blue cable to pin 4 (INPUT); if you use a 3 wired sensor (es. CSH-223), link the brown cable to pin 1 (VCC), the blue cable to pin 3 (GND) and the black cable to pin 4 (INPUT); if you use a sensor with M8 connector (es. CSH-263), connect it to the D connector.

2.3.5 Accessory of the DIGITAL IN SPI module

Description	Code
M8 PLUG	CS-DFTP

2.4 GENERIC DIGITAL OUTPUT SPI module

2.4.1 Characteristics of the GENERIC DIGITAL OUTPUT SPI module

The GENERIC DIGITAL OUTPUT SPI module have the following characteristics:

- ❑ connection through SPI to the right of the initial module or to the right of an output SPI module
- ❑ 4 digital outputs PNP 24V for module with an M12 female 5 poles connector for two output
- ❑ provides on every connector a 24V voltage for to power external device
- ❑ yellow signaling led for each output
- ❑ green signaling led for power supply presence
- ❑ powered from the 24V power of the initial module
- ❑ Only one 900 mA protection (4 outputs and 2 power supply) against short circuit. The protection against short circuit is automatically reset
- ❑ protection against overload voltage on the single output (clamping diode)

2.4.2 Connecting and signaling elements of the GENERIC DIGITAL OUTPUT SPI module
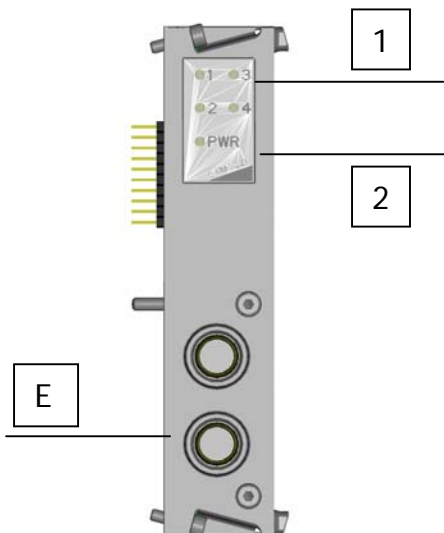
- ❑ 1: Yellow signally led for each output
- ❑ 2: green signaling led for power supply presence
- ❑ E: M12 female 5 poles connector for to connect two output

2.4.3 Pinout M12 connectors of the GENERIC DIGITAL OUTPUT SPI module

Connection	Type of connector	Drawing	Pinout
Digital Output (E)	M12 Female 5 poles		1: P24V (24V power supply provided to external devices) 2: Out X+1 (second output) 3: GND (negative reference for pin 1, 2 e 4) 4: Out X (first output) 5: Earth (Connect this pin to the cable screen)

2.4.4 Connection example of the GENERIC DIGITAL OUTPUT SPI module

For vacuum compact ejector VEC-20A2-VD, link the brown cable (V+) to the pin 1 (P24V), the green cable (Aspiration Command) to the pin 2 (Out X+1), the gray cable (V-) to the pin 3 (GND), the yellow cable (Blow down Command) to the pin 4 (Out X).

2.4.5 Accessory of the GENERIC DIGITAL OUTPUT SPI module

Description	Code
M12 PLUG	CS-LFTP
CONNECTOR DUO M12 5 POLES MALE STRAIGHT	CS-LD05HF
CONNECTOR DUO M12 5 POLES MALE 90°	CS-LH05HF
CONNECTOR M12 5 POLES MALE STRAIGHT	CS-LM05HC

2.5 SUB-D 37 POLES DIGITAL OUTPUT SPI module

2.5.1 Characteristics of the SUB-D 37 POLES DIGITAL OUTPUT SPI module

The SUB-D 37 POLES DIGITAL OUT SPI module have the following characteristics:

- ❑ connection through SPI to the right of the initial module or to the right of an output SPI module
- ❑ from 8 to 32 digital outputs PNP 24V for module with a Sub-D female 37 poles connector
- ❑ powered from the 24V power of the initial node
- ❑ 1A protection against short circuit every 8 output. The protection against short circuit is automatically reset
- ❑ protection against overload voltage on the single output (clamping diode)

2.5.2 Connecting and signaling elements of the SUB-D 37 POLES DIGITAL OUTPUT SPI module
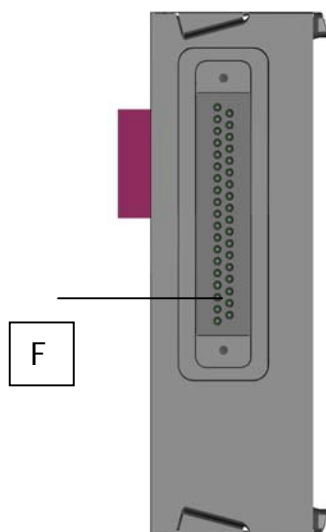
- ❑ F: Sub-D female 37 poles connector for to connect the outputs

2.5.3 Pinout SUB-D 37 poles connectors of the SUB-D 37 POLES DIGITAL OUTPUT SPI module

Connection	Type of connector	Pinout
Digital Output (F)	Sub-D female 37 poles	1: Output n° 1 2: Output n° 2 .... 32: Output n° 32 33: Not Connected from 34 to 37: GND (negative reference for the outputs)

2.5.4 Configuration of the actived output number on the SUB-D 37 POLES DIGITAL OUTPUT SPI module

It's possible to select the actived output number on every single module by 4 jumper on the right side of the module. Follow the 4 possible configurations:

Jumper Configuration	Actived output
	Output from 1 to 8.
	Output from 1 to 16.
	Output from 1 to 24.
	Output from 1 to 32.

2.5.5 Protection against short circuit on the SUB-D 37 POLES DIGITAL OUTPUT SPI module

Every module have 4 short circuit protections. Every protection restrict the maximum current to 1A total for the 8 output protected. Follow the output covered from every protection:

Protection circuit	Protected output
1	1, 2, 3, 4, 5, 6, 31, 32.
2	7, 8, 9, 10, 11, 12, 29, 30.
3	13, 14, 15, 16, 17, 18, 27, 28.
4	19, 20, 21, 22, 23, 24, 25, 26.

2.5.6 Connection example of the SUB-D 37 POLES DIGITAL OUTPUT SPI module

If you want to link a valves island **Series Y 4 places**, you must activate by jumper the output from 1 to 8 and use the accessory G4X1-G9W1 or G4X-G9W.

If you want to link a valves island **Series Y 8 places**, you must activate by jumper the output from 1 to 16 and use the accessory G4X1-G9W1 or G4X-G9W.

If you want to link a valves island **Series 3 Plug-In**, you must activate by jumper the necessary amount of output (you must to consider that every valve place required always two output) and use the accessory G4X1-G9W1 or G4X-G9W.

If you want to link a valves island **Series H**, you must activate by jumper the necessary amount of output and use the accessory G4X1-H-G9W1 (maximum 22 output), G9X1-H-G9W1 (maximum 32 output), G4X1-H-G9W (maximum 22 output), G9X1-H-G9W (maximum 32 output).

2.5.7 Accessory of the SUB-D 37 POLES DIGITAL OUTPUT SPI module

Description	Code
Cabling with 90° Sub-D 25 poles and Sub-D 37 poles	G4X1-G9W1
Cabling with 90° Sub-D 37 poles and Sub-D 37 poles	G9X1-G9W1
Cabling with straight Sub-D 25 poles and Sub-D 37 poles	G4X-G9W
Cabling with straight Sub-D 37 poles and Sub-D 37 poles	G9X-G9W
Cabling with Series H 25 poles and Sub-D 37 poles 90°	G4X1-H-G9W1
Cabling with Series H 37 poles and Sub-D 37 poles 90°	G9X1-H-G9W1
Cabling with Series H 25 poles and Sub-D 37 poles straight	G4X1-H-G9W
Cabling with Series H 37 poles and Sub-D 37 poles straight	G9X1-H-G9W

2.6 H SERIES ADAPTER SPI module

2.6.1 Characteristics of the H SERIES ADAPTER SPI module

The H SERIES ADAPTER SPI module have the following characteristics:
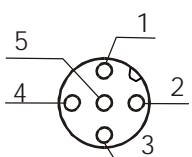
- ❑ connection through SPI to the right of the initial module or to the right of an output SPI module
- ❑ allows to connect directly a serial valve island H Series
- ❑ powered from the 24V power of the initial module
- ❑ no protection (protection against short circuit and protection against overload voltage are present on the intermediate module of H Series)

2.7 3 PLUG-IN SERIES ADAPTER SPI module

2.7.1 Characteristics of the 3 PLUG-IN SERIES ADAPTER SPI module

The 3 PLUG-IN SERIES ADAPTER SPI module have the following characteristics:

- ❑ connection through SPI to the right of the initial module or to the right of an output SPI module
- ❑ allows to connect directly a valve island 3 PLUG-IN Series with maximum 9 valves (monostable and/or bistable with maximum 18 coils)
- ❑ powered from the 24V power of the initial node
- ❑ 1A protection against short circuit every 6 output. The protection against short circuit is automatically reset
- ❑ protection against overload voltage on the single output (clamping diode)

3. INSTALLATION

The CP2 Series electrical installation is carried out by following step by step the instruction listed hereunder that are also detailed in the following chapters:

❏ CP2 Series System configuration through the rotating selectors
❏ Connection to Fieldbus Profibus
❏ Power supply connection to the initial module

Contents:

3.1 CP2 Series System Configuration through rotary switches.

After having assembled the mechanical parts making up the CP2 Series it is necessary to proceed to the system configuration by using the rotary switches on the initial module.

3.1.1 Setting up Profibus address

The Profibus address, that is indispensable for the CP2 Series and bus Profibus correct functioning, is set by using the initial module rotary switches (see par. 2.2.4)
To set the address are used:

- ❑ A decimal rotary switch (0..9) for the unit

- ❑ An hexadecimal rotary switch (0..F) for the tens. So it is possible set the tens up to 12 and select 127 Profibus Address. The letters of hexadecimal rotary switch corresponds to the following number:

A	**10**
B	**11**
C	**12**
D	Not Used
E	Not Used
F	Not Used

3.2 Fieldbus Profibus connection

3.2.1 Profibus cable characteristics

For the CP2 Series connection to bus Profibus use the screened duplex cable conforming to Profibus specifications:

Surge impedance:	125......165 Ω	(3........20 MHz)
Capacitance per unit length:	< 30 nF/Km	
Loop resistance:	< 110 Ω/km	
Core diameter:	> 0,64 mm	
Core cross-section:	> 0,34 mmq	

3.2.2 Profibus line baud -rate and length

The maximum length of the Profibus line depends on the baud-rate (transmission speed) used.
The CP2 Series initial module automatically checks its transmission speed on one of the baud-rates indicated in the table:

Baud rate (Kbaud)	Segment maximum length (m)
9,6	1200
19,2	1200
45,45	1200
93,75	1200
187,5	1000
500	400
1500	200
3000	100
6000	100
12000	100

In case it were necessary to exceed the maximum length allowed, it would be necessary to insert some signal repeaters in the line.

3.2.3 Fieldbus interface

For the connection to the bus Profibus, the CP2 Series initial module have two M12 revert-Key circular connectors, one male connector for the connection of the input bus to the node (BUS-IN, connector B of the initial module) and a female connectors for the connection to the output bus from the node (BUS-OUT, connector C of the initial module)

For the connection to the bus Profibus Camozzi puts at disposal the following M12B connectors to be wired up on the profibus cable:

Connector's function	Description	Commercial code
BUS IN	Connector to be wired up on the Profibus, cable M12B (revert-key) female 5 poles	CS-MF05HC
BUS OUT	Connector to be wired up on profibus, M12B (revert-key) male 5 poles	CS-MM05HC

For the connectors Pinout please refer to paragraph "2.2.3 Table with the Pinout of the initial module connectors".

3.2.4 Profibus termination

In case in which the valves island were the last node of the Profibus line, it's necessary assemble on initial module the resistance for the termination of the bus: for the CP2 Series valves island is provided the connector "cod. CS-MQ05H0" that it already has internally the resistances necessary. It must be assembly on the connector BUS OUT (C).

The resistances' connection scheme that constitute the termination prescribed by the profibus normative, the numbers refer to the connector BUS OUT (C) pin.
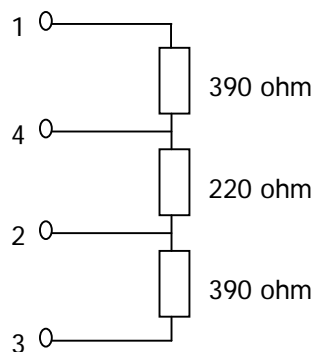
3.3 Power supply

The CP2 Series system nominal voltage is 24 Vdc -15%/+20% (in according with CEI EN 61131-2). If the outputs connected to the initial module required tolerance more hard about voltage, the tolerance about the power supply for the outputs must to respect these tolerance. If the inputs connected to the initial module required tolerance more hard about voltage, the tolerance about the logical power supply must to respect these tolerance
For example, if you connect some valves H Series, the tolerance about output voltage must to be ±10%. If you connect some sensors Series CSH with a power range 10-30V (-58%/+25%), , the tolerance about logical voltage remain -15%/+20%.

Is necessary to connect the logical voltage (pin 1), otherwise the initial module will be turn off.
For a correct working of the system is necessary to connect the initial module to the logical voltage (pin 1), to the power voltage (pin2), to the GND (pin 3) and to Earth (pin 4).

3.3.1 Signaling absence of voltage power or lower than the limit as set

The CP2 Series initial module is able to monitor the presence and the level of output power supply voltage.
In case of a total power supply failure the RUN green led would flash and the DIA red led would permanently switch-on on the initial module.

In case the output voltage were lower than the set minimum level (see par 4.4.1 System parameters, cap 5 Diagnostic) then the initial module inhibits the sending of controls to the outputs connected and the error is signalled through the permanent switching on of the RUN green led and of the DIA red led.

Both the errors are signalled not only through a particular behaviour of the led but also through the "diagnostics byte" and the "Profibus diagnostics". (see chapter 5 Diagnostics).

3.3.2 Feeding cable and formula to determine initial module feeding cable lengths

A voltage drop generates on the power supply cables of a group of valves that depends on the load. This ensures that both the power supply of logic and of output do not fall within the allowed tolerance.

If the cable section for output power supply and for logic power supply is the same, it is possible to apply the following formula to determine its length:

To calculate the power supply cables length it is first necessary to calculate:

□ The logics + Input maximum absorption (I1), the output maximum absorption (I2) (valves on the initial module + valves on the expansions)
□ The minimum voltage set on the supplier during functioning (Vmin), taking into account that it depends on the load connected and that the voltage could be subjected to oscillations

The resulting values must be reported in the formula hereunder that is explained by the electrical diagram and in the example reported hereunder s.

Electric diagram that substitutes an CP2 Series node:
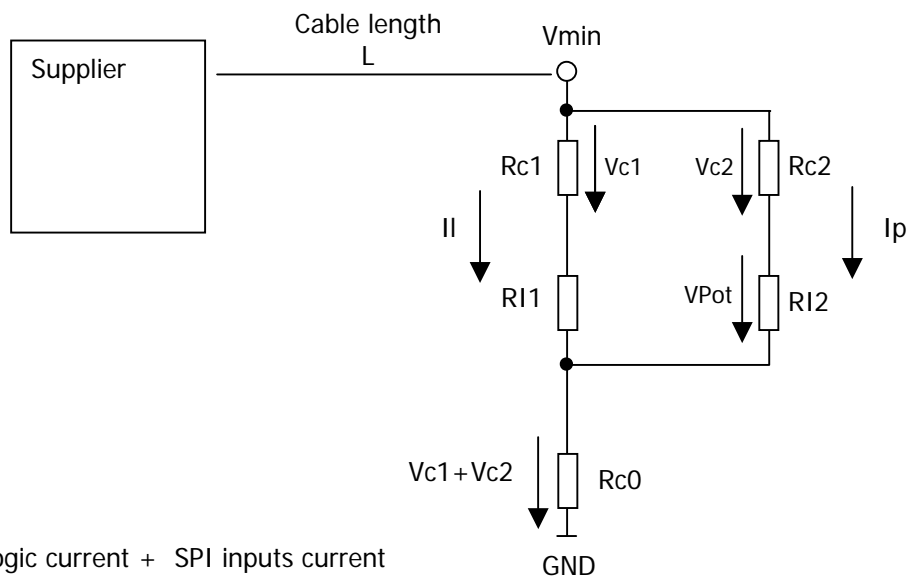
□ Il = Logic current + SPI inputs current
□ Ip = Output current (electro-pilots)
□ Rc1 + Rc2 = Cables resistance in input
□ Rc0 = Resistance of the common
□ L = Cable length

Formula to calculate the cables length:

$$L \leq \frac{[(V\min - Vp\min) \times S \times Kcu]}{(2Ip + Il)}$$

Meaning of the terms:

- ❑ Vp min: minimum voltage that must arrive at the output
- ❑ V min: expected minimum voltage that the supplier can supply
- ❑ Il: current for the logics and the sensors
- ❑ Ip: current for the outputs
- ❑ S: cables section
- ❑ K: cables conductance   (copper conductance Kcu = 56 m/(mm² * Ω))

Example:

Vmin = 24 V
Vp min = 21.6 V
Il = 1 A
Ip = 1 A (40 Series H electro-pilots)
S = 0,75 mm²
Kcu = 56 m/(mm² * Ω)

$$L \leq \frac{[(24 - 21,6) \times 0,75 \times 56]}{(2 + 1)} = 33,6m$$

3.3.3 Fuses

The CP2 Series Initial Module is provided of fuses under the cover to avoid damage to the electronic board:

- ❑ 1,5 A SMT Fuse: protection for the logic power supply circuit and SPI input (the fuse fixes the maximum current for SPI input)

- ❑ 3 A SMT Fuse: protection for the output power supply circuit

4. PLC CONFIGURATION, PARAMETERISATION AND START UP

Contents:

4.1 General information

This chapter deals with the CP2 Series valves island configuration for the connection to a PLC (in our example Siemens).
For a correct outcome of the HW configuration operations it is necessary to have set the Profibus address (see par 3.1.1) on initial module through the rotary switch.

The outputs numbering (constituted by the loads connected to the right of the initial module) goes from the left towards the right, it starts on the initial module.

The SPI inputs numbering (connected to the left of the initial module) goes from right to left.

In the following chapter, therefore, will be described:

- ❑ GSD file with CP2 Series modules available for HW Profibus configuration
- ❑ Configuration example with S7 Siemens
- ❑ Parameterisation with S7 Siemens
- ❑ Start up

CONTROL FUNCTIONS:

The CP2 Series supports FREEZE and SYNC function modalities in conformity to the Profibus specifications.

- ❑ The Freeze control: all the inputs of the CP2 Series system are frozen. CP2 Series sends a constant picture to the master of all the inputs. With every actuation of the Freeze control the inputs picture is updated and sent to the master.
- ❑ SYNC control: all the CP2 Series system outputs are frozen. The CP2 Series does no longer react to any possible outputs list variations at master level. The Sync control sends a complete picture of the outputs every time is actuated.

4.2 GSD File

In order to carry out the CP2 Series configuration with a programmer/PC it is necessary to arrange the relative permanent archive of the unit (GSD). Over and above the slave characteristic data (ID Number, revision, etc...) the GSD file contains the modules identifications that are used for the HW of the PLC configuration.

The GSD CP2 Series can be downloaded from the internet web site Camozzi (http://www.camozzi.com/).

In order to carry out CP2 Series HW Profibus configuration it is necessary to arrange one of the following files:

- ❑ CP2_0B10.GSD

- ❑ CP2_0B10.GSI (Italian version)

For the graphic representation of the CP2 Series in the configuration file it is possible to find the following icon files to the above-mentioned internet page:

- ❑ SerieCX2.bmp: Normal functioning conditions

- ❑ CP2E.bmp: Error conditions

4.2.1 Modules that can be handled in the HW Profibus configuration device

The following modules used in the programmer/PC are described in GSD file to build up the CP2 Series HW configuration

Module description	Abbreviations	Byte occupied in PLC memory	Profibus identifying
CP2 Series initial module with Profibus Diagnosis	Initial CP2 Series DIA Profibus	-	0 / 00$_h$
CP2 Series initial module with diagnosis Byte	Initial CP2 Series with DIA	1 byte of inputs	8DI / 10$_h$
8 digital outputs module	8 outputs	1 byte of outputs	8DO / 20$_h$
8 SPI digital inputs module	8 SPI inputs	1 byte of inputs	8DI / 10$_h$

4.3 Configuration example with S7 Siemens configuration device

The HW configuration examples, carried out with Siemens STEP7 software will be highlighted in the next paragraphs.
Configuration device used: Configuration device HW STEP7 Version 5.3 (the description is valid for the previous versions as well)

4.3.1 Preliminary operations

1. Copy the GSD file in the folder .\SIEMENS\STEP7\S7DATA\GSD of the PC programmer
The GSD files can be:
- ❏ manually inserted in the folder by using the programmer/PC handling resources
- ❏ automatically inserted when HW configuration is carried out through STEP7 using the control in the menu [Options] [Install GSD file...]

The CP2 Series Profibus Node will therefore, be available with all its modules in the HW catalogue of the configuration device in the folder: Profibus DP\Additional field devices\valves\Camozzi Valves

2. Copy the icons relative to the CP2 Series node in the folder ..\SIEMENS\STEP7\S7DATA\NSBMP The icon files can be:
- ❏ manually inserted in the folder by using the handling resource of the Programmer/PC
- ❏ automatically inserted when the HW configuration is carried out through the STEP7 by using the control in the menu [Options] [Install GSD file...]

Control [Install GSD file] in the [options] menu of the HW configuration that allows to insert GSD file in the HW catalogue

CP2 Series Node position of its modules inside the HW catalogue after having loaded the GSD file (Profibus\Additional field devices/ Valves \CAMOZZI VALVES)
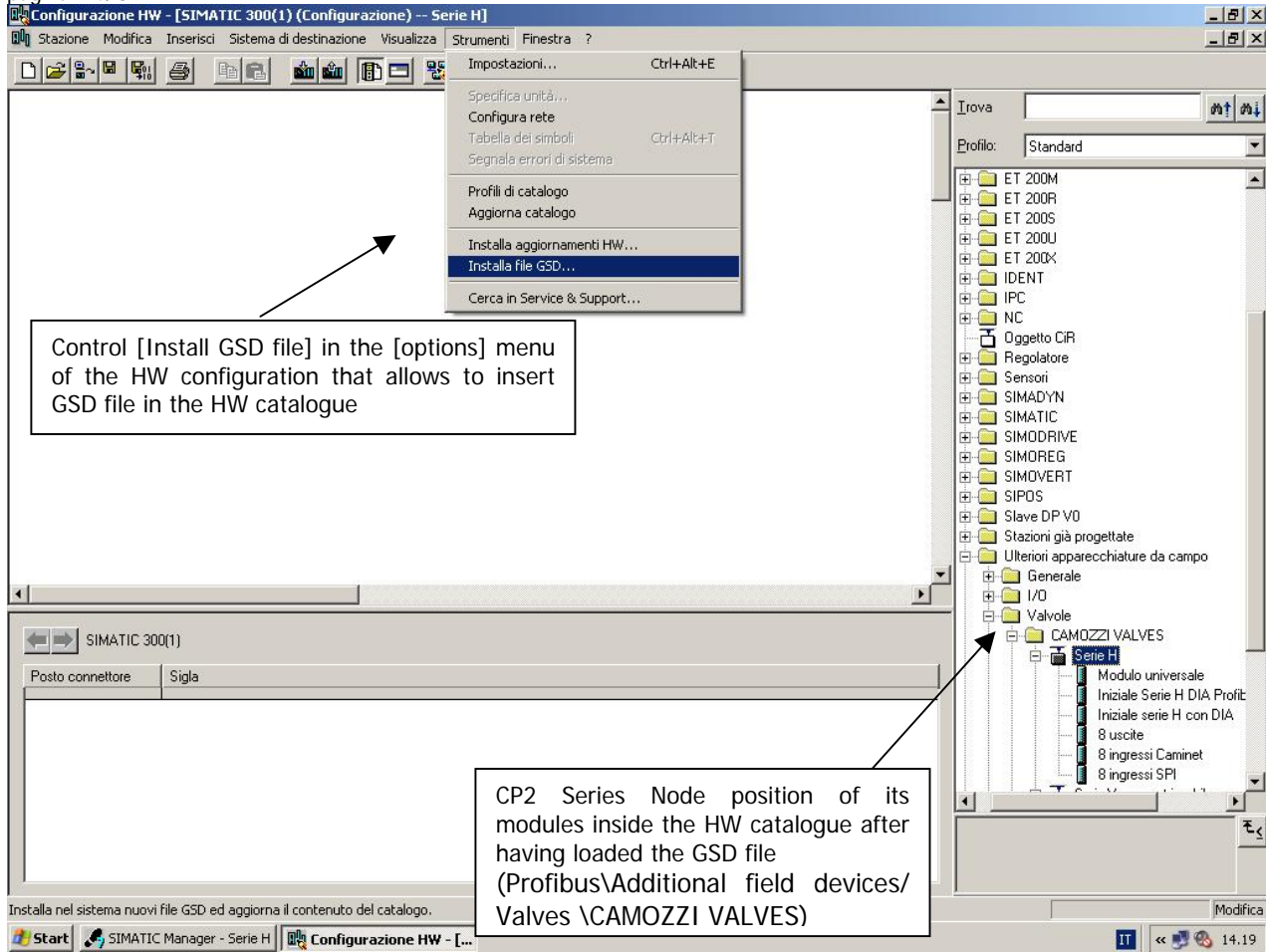
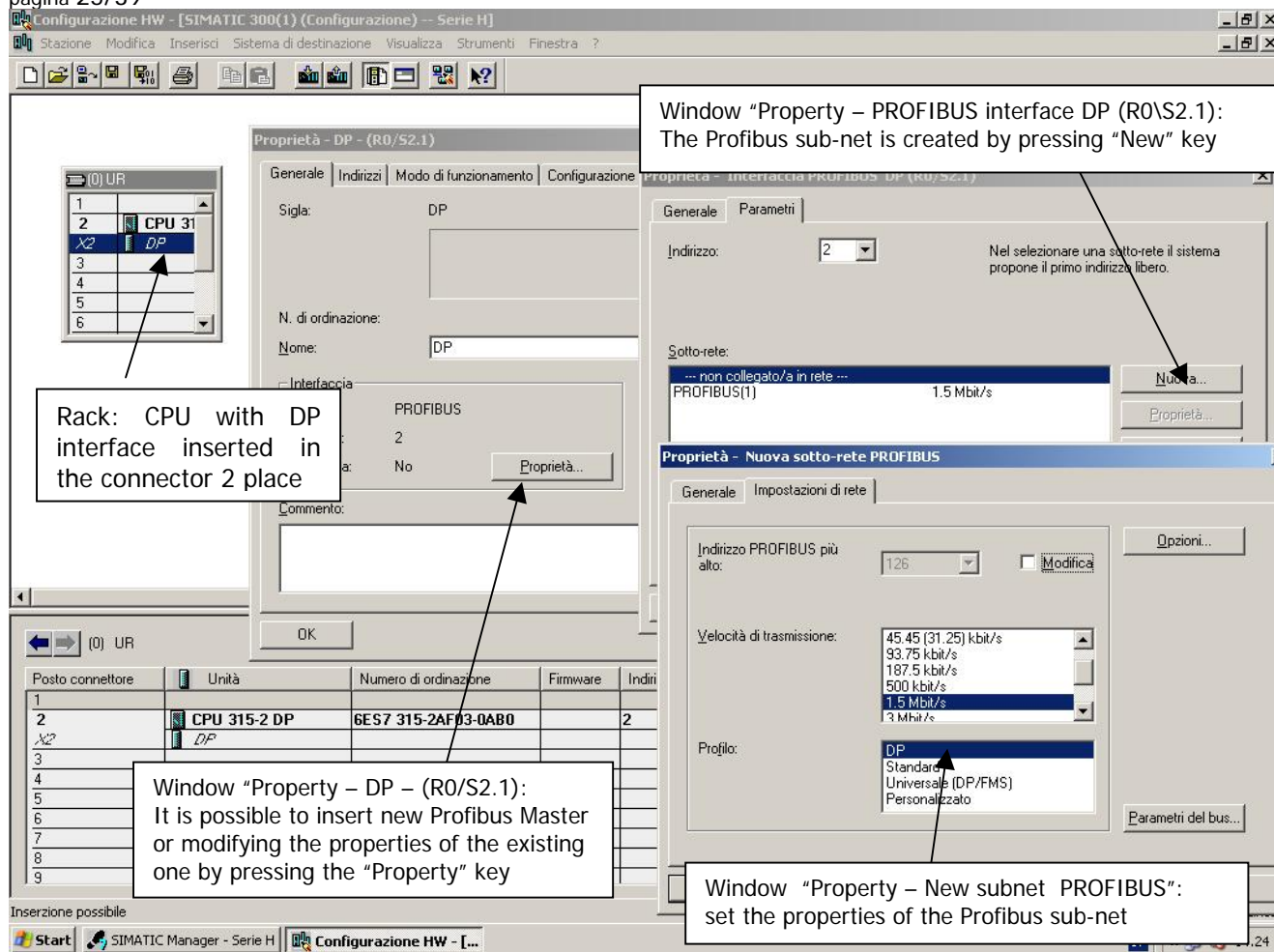In our example SIMATIC 300 components will be used.

3. Insert the fundamental components constituting the PLC in Hw configuration window by taking and dragging them from the HW catalogue. The following are the components:
- ❑ Rack (Profiled guide) to be inserted anywhere into the HW configuration window
- ❑ CPU with DP master to be inserted in the slot 2 of the Rack

4. Add a Master DP system:
- ❑ When the CPU is dragged with DP master to the Rack's slot 2, the window "Property – PROFIBUS interface DP (R0/S2.1)" opens automatically. Assign, therefore, to the PLC a Profibus address (it is suggested to leave the default addresses proposed by the configuration device) and create a "sub-net" by pressing the "New" key in the window. Set the characteristics of the Profibus net (speed, profile DP) in the window "Property – New sub-net PROFIBUS" that will automatically.
- ❑ In case the Master DP System were not automatically inserted with the insertion of the CPU, or in case it were necessary to modify the Profibus sub-net properties, double press on "X2-DP" module in the Rack, the window "Property – DP – (R0/S2.1)" will open, press the key "Property" so that the "Property – PROFIBUS interface DP (R0/S2.1)"" window will open and repeat the operations described under the previous point

The Master DP system is visualized with a line connected to the Rack that represents the profibus cable to which the nodes will have eventually be connected.

Window "Property – PROFIBUS interface DP (R0\S2.1):
The Profibus sub-net is created by pressing "New" key

Rack: CPU with DP interface inserted in the connector 2 place

Window "Property – DP – (R0/S2.1):
It is possible to insert new Profibus Master or modifying the properties of the existing one by pressing the "Property" key

Window "Property – New subnet PROFIBUS":
set the properties of the Profibus sub-net

4.3.2 Selection of the CP2 Series from HW catalogue and addressing

1. If the HW catalogue were not open, open it by clicking on the corresponding icon key or by using the control [Catalogue] in the menu [View] of the HW configuration

2. Expand the HW catalogue until the CP2 Series is not reached that is found in the route "Profibus\Additional field devices\Valves\CAMOZZI VALVES". This is valid only if the GSD file has been inserted

3. Select the CP2 Series node and drag it up to the line that represents the DP master System, until the pointer line does not pass from "forbid signal" to a "+" sign and the node will add itself to the Profibus net. The "Property – PROFIBUS interface Series CP2 " window will automatically open where in the parameters it is necessary to assign the same Profibus address that was set with the CP2 Series initial module rotary switch (see par 3.1.1)
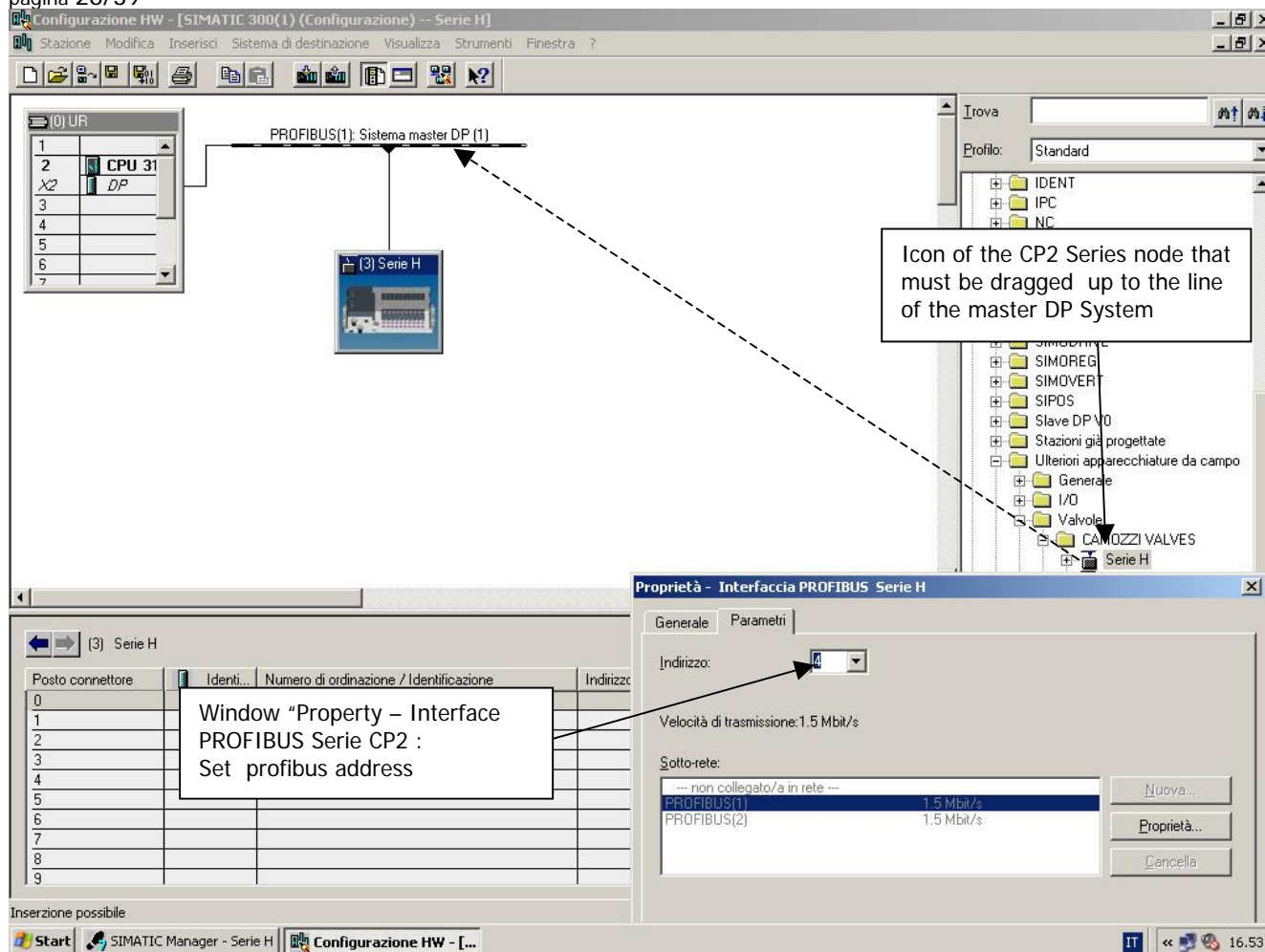
4.3.3 CP2 Series node configuration

After having inserted the CP2 Series node in HW configuration it is necessary to configure it by assigning to it the initial module, the outputs and the inputs that actually constitute the CP2 Series.

1. Open the HW catalogue by pressing the corresponding icon key or by using the control [Catalogue] min the menu [Wiew] in the HW configuration
2. Expand inside the HW catalogue the CP2 Series so that the modules to be used to configure the node are visualized in the HW configuration "Profibus\Additional field devices\Valves\CAMOZZI VALVES":

- ❑ Initial CP2 Series DIA Profibus
- ❑ Initial CP2 Series with DIA
- ❑ 8 outputs
- ❑ 8 SPI inputs

3. Select the CP2 Series node to be configured by clicking it in order let the node configuration table to appear in the lower part of the screen.
4. Drag the required initial module (with Profibus diagnostics or with diagnostics byte) at slot "0" of the configuration table
5. Drag the inputs and outputs modules to the successive slots
6. Should it be necessary to modify the address of the I/O bytes, double click on the configuration table line in way to make "Properties – DP Slave" window to appear, assign the address to the single inputs and outputs and confirm by pressing OK

The operation of inserting and of assigning the address will have to be repeated until the actual number of inputs and outputs present in the CP2 Series has not been reached, connected eventually, to the initial module.

Suggestion: It is possible to insert without following any precise order the outputs and inputs modules and to assign them the address wanted. It is advisable however, for e better clarity to keep the outputs and the SPI inputs grouped together and assign their addresses in succession.

3. Select the CP2 Series module to configure

6. double click on the configuration table line in a way make the "Property slave DP", window to appear, assign the address to the single input and outputs bytes and confirm by pressing OK

4. Drag the initial module to Connector 0 place

5. Drag the I/O modules to the successive connector's

2. Espandere il catalogo per visualizzare i moduli di configurazione della Serie H

CAUTION: it's possible to configure only modules with 8 output, so will be necessary to configure more output than necessary (for example, the GENERIC OUTPUT SPI DIGITAL OUTPUT modules have 4 output): this outputs configurated but not used will be lost or the will remain for a future integration of the system. This aspect is not present with the inputs modules that are multiples of 8.

CAUTION: Unless at least one initial module is inserted in node configuration or if more than is inserted, the PLC will remain in BF and the profibus diagnostics will signal that the node must be parameterized again. The same thing takes place in case more than 8 SPI inputs modules are configured (64 SPI inputs). (see par 5.4.2 Profibus diagnostics: CP2 Series HW Configuration Error)

4.3.4 CP2 Series node configuration example: with inputs, outputs grouped and addresses orderly
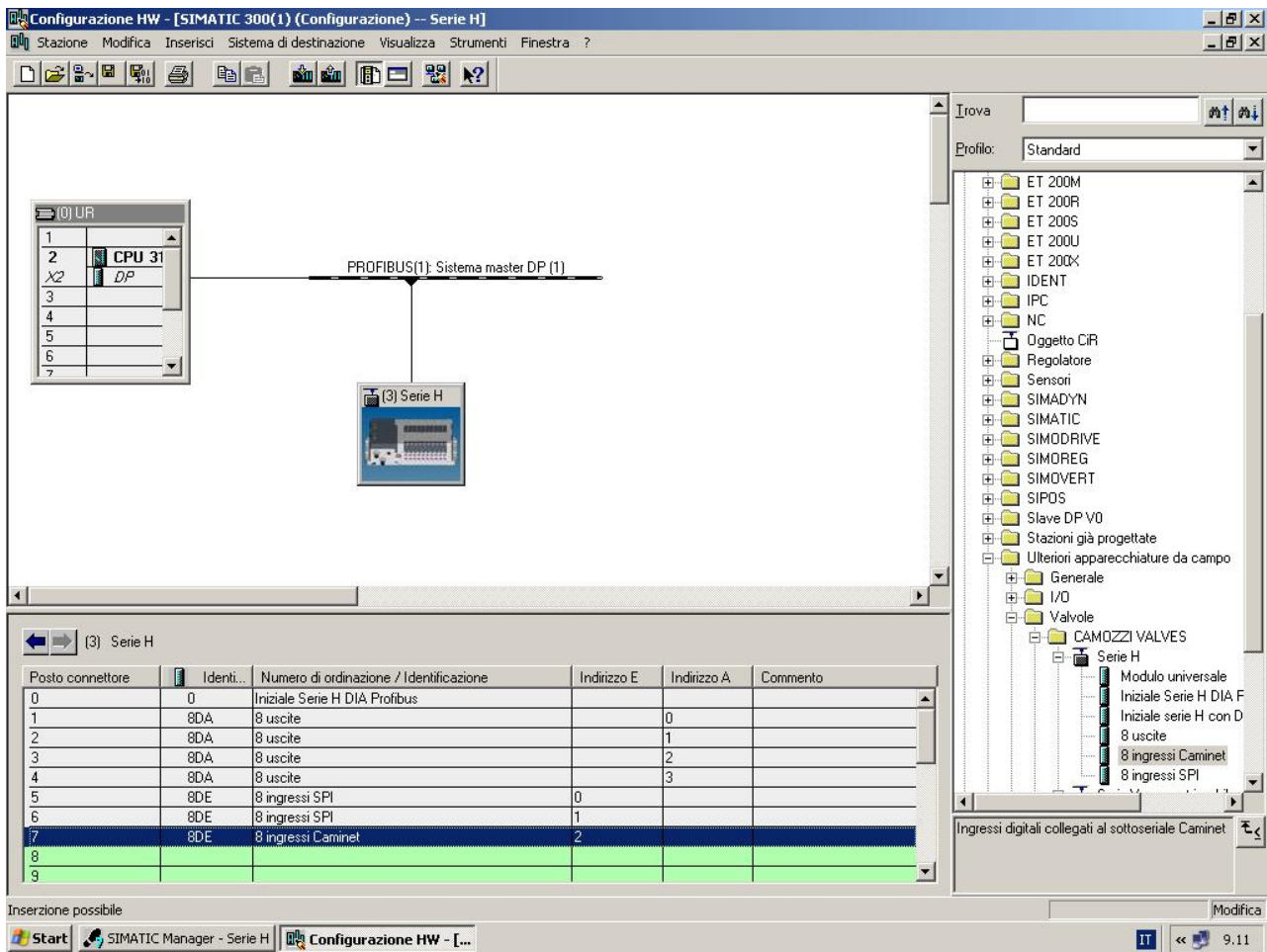
In the picture is represented the configuration of an CP2 Series system with 32 outputs (4 bytes) and 16 inputs (2 bytes). The modules have been inserted by taking them from the HW catalogue on the right and by dragging them to the node configuration table to the various slots. The initial module with profibus diagnosis has been used, which, therefore, that does not occupy inputs in the PLC memory, and inputs and outputs modules have been inserted grouped and in order.

❑ The outputs coming from the Master Profibus-DP and directed to the Initial Module form 4 bytes (32 outputs) arranged as it follows:

| Output PLC (A...)	Byte 0								Byte 1								Byte 2								Byte 3							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output CP2 Series (load)	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25

As an example: bit 0 of byte 0 corresponds to output 1 (A0.0)
                        bit 2 of byte 1 corresponds to output 11 (A1.2)
                        bit 0 of byte 3 corresponds to output 25 (A3.0)

❑ The SPI inputs for the Master Profibus form 2 bytes (16 input) arranged as it follows:

Input PLC (E...)	Byte 0								Byte 1							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input Serie CP2	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

As an example: bit 0 of byte 0 corresponds to digital input 1 (E0.0)
                   bit 4 of byte 1 corresponds to digital input 13 (E1.4)

4.3.5 CP2 Series node configuration example with inputs and outputs mixed and with addresses not in order
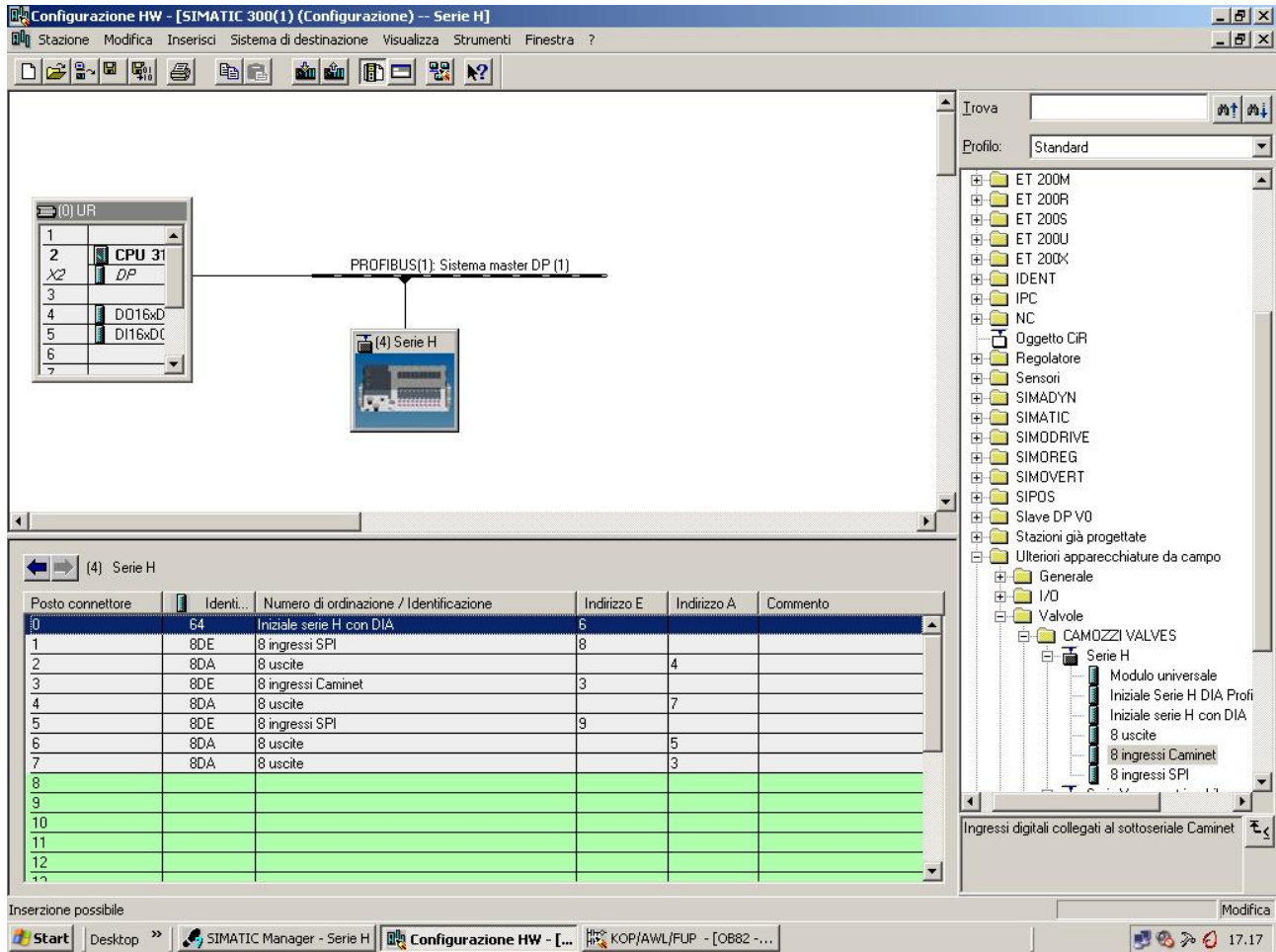
In the picture is represented the configuration of a CP2 Series system with 32 outputs (4 bytes) and 16 inputs (2 bytes). The modules have been inserted having been taken from the HW catalogue to the right and dragging them to the various connectors places in the node configuration table. The initial module with diagnosis byte has been used, which, therefore, occupies one byte of inputs in the PLC memory. The inputs and outputs modules have been inserted and addressed according to client's wishes without following any precise order.

❑ The outputs coming from the Master Profibus-DP and directed to the Initial Module form 4 bytes (32 outputs) arranged as it follows:

Output PLC (A...)	Byte 4								Byte 7								Byte 5								Byte 3							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Output CP2 Series (load)	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9	24	23	22	21	20	19	18	17	32	31	30	29	28	27	26	25

As an example: bit 0 of byte 4 corresponds to output 1 (A4.0)
                   bit 2 of byte 7 corresponds to output 11 (A7.2)
                   bit 6 of byte 5 corresponds to output 23 (A5.6)

❑ The SPI inputs for the l Master Profibus form 2 bytes (16 inputs) arranged as it follows:

Input PLC (E...)	Byte 8								Byte 9							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Input CP2 Series	8	7	6	5	4	3	2	1	16	15	14	13	12	11	10	9

As an example: bit 0 of byte 8 corresponds to SPI 1 (E8.0) digital input
bit 4 of byte 9 corresponds to SPI 13 (E9.4) digital input

❑ The inputs of diagnosis byte of the initial module for the Master Profibus form 1 byte (8 inputs) arranged as it follows:

Input PLC (E...)	Byte 6							
	7	6	5	4	3	2	1	0
Diagnostics Input CP2 Series	8	7	6	5	4	3	2	1

As an example : bit 0 of byte 6 corresponds to diagnosis input 1 (E6.0)
bit 2 of byte 6 corresponds to diagnosis input 3 (E6.2)

4.4 Parameterization

The CP2 Series Profibus gives the possibility of setting some parameters of the initial modules at the time of the HW configuration with the "Parameterization".
The parameters can be of system or of single module: the parameters of system are general parameters of the CP2 Series, whereas the parameters of modules refer to a single module (i.e., to the initial with DIA profibus) that constitutes the system and it is used for node configuration.

4.4.1 System parameters

❑ **Minimum value of power feeding voltage settable:** it is possible to set the minimum voltage value that must arrive at the electro-pilots. The settable values are 19V, 20 V and 21 V and if the voltage on the valves diminishes under the set value the valves island gets into error and it will signal it (see chapter 5 Diagnostics). It must be borne in mind when setting this value that the valves piloting circuit inserts at full voltage load a voltage drop of approximately 1 V, therefore, if the minimum value of voltage is set at 20 V the valves island will get into error when on the connector M12 4 poles the power supply voltage drops below 21 V.

⚠ **CAUTION: the minimum voltage power feeding is set to default at 19 V (it means that the valve gets into error when the feeding voltage drops below 20 V).**

Setting the system parameters

1. Double click on the icon representing the CP2 Series node connected to master profibus line in such a way as to make the "Properties DP slave" window to appear
2. Select "Parameter Assignement" in such a way as to make the "Station parameters" to appear and open the menu to visualize the "Device-specific parameters".
3. Open the "Device-specific parameters" menu and click on square of the column "Value" of the parameter to modify
4. A drop down menu will appear with the value settable for the chosen parameter
5. Set the value and confirm by pressing "OK"

4.4.2 Modules parameters

❑ **ON/OFF Profibus extended diagnostics on the initial module with DIA Profibus:** The intervention in case of any problems of the profibus diagnostics always puts the PLC system into (SF) error (see chapter 5 Diagnosis). Should it be necessary to use the node without any diagnostics signal it would be possible to use the "Initial module with DIA Profibus" and deactivate at the time of the configuration the profibus extended diagnostics.

⚠ **CAUTION: the Profibus extended diagnostics is in default in the initial module with DIA Profibus.**

Setting the modules parameters

1. In the configuration table double click on the line of the module to parameterize and the "Properties - DP slave" window will open.
2. Select "Parameterise folder" in such a way as to make the Station parameters to appear and open the menu to visualize the apparatus parameters".
3. Open the "Apparatus parameters" menu and click on square of the column "Value" of the parameter to modify
4. A drop down menu will appear with the settable values for the chosen parameter
5. Set the value and confirm pressing "OK"
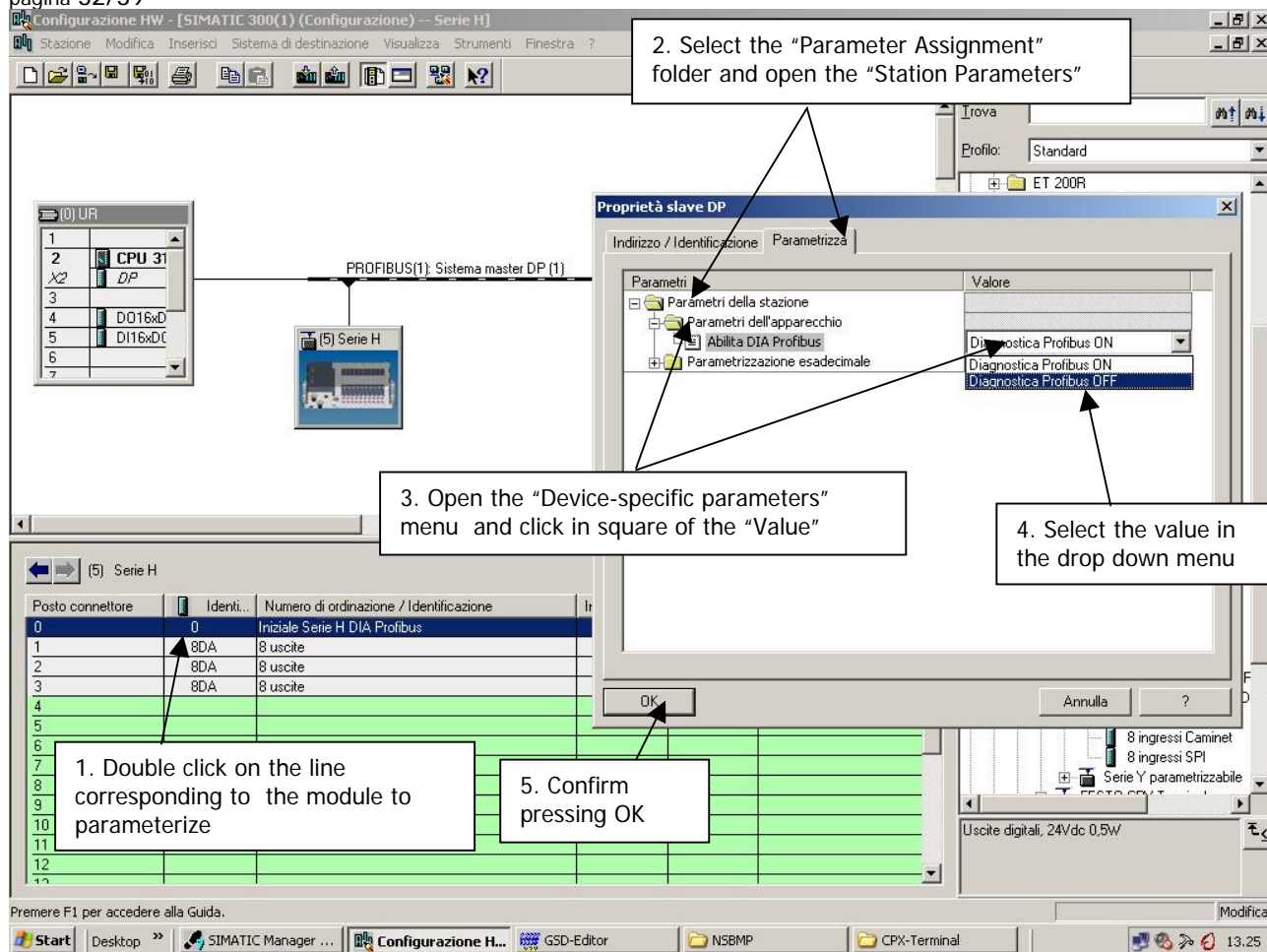
4.5 Starting up the CP2 Series node

To install the System Profibus CP2 Series, remove the packaging and follow the operations listed hereunder in their sequence referring to what has been reported in the previous pages:

1. Set the rotary switch of the initial module

2. Connect the CP2 Series initial module to the Profibus net through the bus-in (B) connectors and the bus-out (C) connectors and, if necessary, the Profibus termination resistance.

3. Connect the power supply cable (24 Vdc ± 10%) to connector (A) of the initial module, verifying that both the logic voltage and the output voltage one have been connected.

Having completed the connections id possible to supply voltage to the system in way that the master starts the configuration procedure.

If the island has been correctly configured only the "RUN" fixed green led will remain on

Suggestion: if the plant/machine where the CP2 Series is mounted will allow it, verify first the CP2 Series functioning without supplying compressed air in a way to avoid any accidental reactions.

5. DIAGNOSTICS

Contents:

5.1 Diagnostics possibilities

The CP2 Series is fitted with 3 types of diagnostics with which it is possible to find not only standard bus field errors, but also errors that could cause an incorrect system functioning.

The CP2 Series system put at disposal the following types of diagnostics:

- ❑ Diagnostics with leds: always present

- ❑ Diagnostics with an input byte: selectionable by using in the HW configuration the initial module with DIA byte.

- ❑ Diagnostics through Profibus: selectionable by using, in the HW configuration, the initial module with DIA Profibus. The Profibus extended diagnostics can also be disabled through the parameterisation in such a way as to have a CP2 Series node with only the diagnostics through the led

Over and above the field bus standard errors, the following are the errors that can be found:

- ❑ Vcc outputs voltage absent: The CP2 Series system signals if there is an outputs power supply failure that must supplier the outputs

- ❑ Vcc outputs power supply lower than the set limit: The CP2 Series signals if the outputs voltage goes below the set value (see par 4.4.1 System parameters)

CAUTION: Upon switching on, the CP2 Series does not highlight the outputs power supply error, (absent or being below the set limit)
The errors are found only after the outputs power supply has been correctly supplied to the initial module.

5.2 Diagnostics with led (Trouble Shooting)

This diagnostics system is always present on the CP2 Series independently from the initial module that is configured.


Legend:
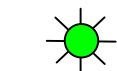
Fixed led on   Flashing Led   Led off

Power Supply: Led RUN and DIA

LED COMBINATION			PROBLEM	PROBLEM SOLUTION
RUN Green	**BF** Red	**DIA** Red		
Fixed on	Off	Off	No errors present, both power supply voltages (logics and outputs) are in	-
Off	Off	Off	The logics power supply voltage is not present	Check the supplier connector. Check the 1,5 A fuse under the cover. It could be broken because of an excessive SPI input's current
Fixed on	Off	Fixed on	The outputs (valves) power supply voltage is below the set limit	Verify on the supplier connector the power voltage value by referring to what was set with parameterization.
Flash.	Off	Fixed on	The output (valves) power supply voltage is absent.	Check the supplier connector verifying that the outputs power supply voltage arrives. Check the 3 A fuse under the cover, it could be broken because of an excessive output's current

Bus: Led BF

LED COMBINATION			PROBLEM	PROBLEM SOLUTION
RUN Green	**BF** Red	**DIA** Red		
Fixed on	Off	Off	No error present, the connection to the bus it's OK	-
Fixed on	Fixed on	Off	Connection anomaly to bus Profibus, possible causes: 1. Incorrect profibus node address 2. Physical interruption of the profibus net (broken cable) or connector's wiring error 3. HW configuration error	1. Check the correspondence between the address set on the initial module and the HW configuration in the PLC 2. Check that the profibus cable is not interrupted, verify that the cable are correctly wired in the connector and that they have not been inverted by mistake 3. Check the HW configuration in the plc, verify that at least one initial module, and no others, has been inserted. Verify also that no more than 64 inputs have been inserted

5.3 Initial module with Diagnosis Byte

By selecting at the time of the HW configuration the initial module with diagnostics byte, other inputs are analogously configured, 8 bit of inputs that allow to visualize the existing errors. If all the bits of the diagnostics show a zero logic value, then it means that there are no errors. The address of the inputs bytes can be freely sectioned at the time of the configuration (see par 4.3.3 Node CP2 Series Configuration).

BITS OF THE DIAGNOSTICS INPUTS	ERROR
0	Vcc output voltage absent
1	Vcc output voltage lower than the set limit
2	-
3	-
4	-
5	-
6	-
7	-

By using the module with diagnostics inputs bytes, in case of errors the CP2 Series island is blocked while the PLC continues to function correctly.

5.4 Profibus extended diagnostics

5.4.1 The initial modules with Profibus extended diagnostics

The CP2 Series, over and above the Profibus standard diagnostics, that provides, as an example the parameterization errors, has available also a Profibus extended diagnostics referred to the unit that allows finding errors previously listed and visualized.

The Profibus extended diagnostics can be selected by configuring in the HW configuration table the initial module with DIA Profibus (See par 4.3.3 CP2 Series configuration node).

It is possible to disconnect the extended diagnostics with the parameterization of the module (see par 4.4.2 Modules parameters) in a way of obtaining an CP2 Series that has only the diagnostics through the led and that, in case of error, it doesn't ever block the PLC.

With the Profibus extended diagnostics it is possible to handle the same errors visualisable through the led and through the diagnostics inputs bytes and, therefore:

- ❑ Output voltage absent
- ❑ Output voltage lower than set limit

Visualization of errors of the profibus extended diagnostics with S7:

1. Enter into the HW S7 configuration and select CP2 Series node by clicking once on the icon
2. In the "PLC" menu choose "Module information"
3. In the "Module information" window, select the "DP slave diagnostics" folder
4. Read the diagnostics messages according to the existing errors the following messages will appear:

- ❑ Vcc absent
- ❑ Vcc lower than set limit

In the example is visualized the error Vcc lower than set limit
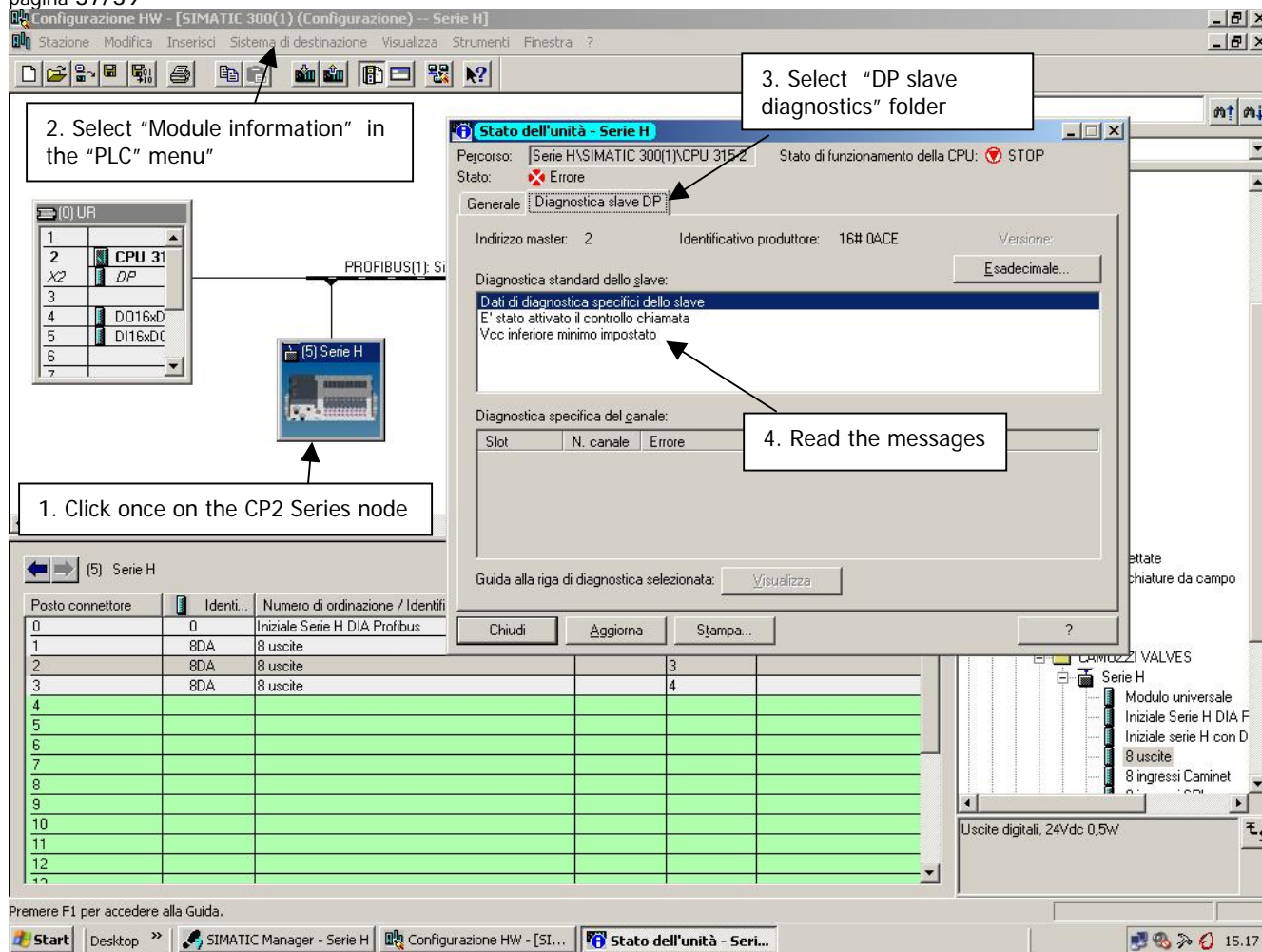
5.4.2 Profibus diagnostics: CP2 Series HW configuration error

The signaling of the CP2 Series HW configuration error need to avoid accidental configuration error of the system that it could be caused some problem. This error is find through the exam of the single module's parameter, in fact the Profibus diagnostics reports a parameterization error, it can be visualized over and above the diagnostics with led also with Profibus diagnostics referred to the HW configuration unit.

The configuration errors in the CP2 Series system takes place when the following are inserted in the configuration table:

- ❑ No initial module
- ❑ More than one initial module
- ❑ More than 64 SPI inputs

In presence of configuration error both the CP2 Series and the PLC get into error and the BF red led flashes.

Visualization of CP2 Series HW configuration error with S7

1. Enter into the HW S7 configuration and select the CP2 Series node by clicking once on the icon

2. In the "PLC" menu choose "Module information"

3. The "Module information" window will appear, select the "DP slave diagnostics" folder

4. Read the diagnostics messages referring to the configuration error, the following messages will appear:

❑ DP slave is not ready to exchange data
❑ Wrong parameters telegram
❑ DP slave must be parameterised

In the example have been inserted by mistake two initial modules in the CP2 Series configuration table, signed with a red circle:

5.4.3 Adjustment of the PLC behaviour in presence of error condition

When the Profibus diagnostics is actuated the PLC commutes from the "RUN" state to "STOP" state.
If it is whished that the PLC continues to remain in the RUN state also in presence of errors then it would be necessary to process:

❑ OB82: Reaction to diagnostics information relative to the unit. Allows avoiding that the PLC gets into "STOP" in presence of a diagnostics error

❑ SFC13: Allows to visualize and manage the Profibus diagnostic in the PLC programme.

❑ OB86: Reaction to fault of a Slave-DP. Allows avoiding that the PLC gets in "STOP" when a slave is damaged and is disconnected from the Profibus net.

6. ACCESSORIES

CS-LF04HB   CONNECTOR M12 4 POLE FEMALE (FOR POWER SUPPLY)
CS-MF05HC   CONNECTOR M12B 5 POLE FEMALE (FOR BUS-IN PROFIBUS)
CS-MM05HC   CONNETTOR M12B 5 POLE MALE (FOR BUS-OUT PROFIBUS)
CS-MQ05H0   CONNECTOR M12B 5 POLE MALE+TERMINAL RESISTANCE (FOR PROFIBUS)