GEFRAN

GFX4/GFXTERMO4/GFX4-IR PROFIBUS

MANUAL FOR CONFIGURATION AND INSTALLATION IN PROFIBUS NETWORKS

Software version: **1.2x**

code: **80405E - 05-2014 - ENGLISH**

INDEX

1 • INTRODUCTION

The “GFX4” series of temperature control modules with **PROFIBUS-DP**, Fieldbus interface provides rapid integration of a large number of compact control units to control temperature and the heating device (up to 1984 zones) on modern automation systems (PLCs, Supervision Systems, etc.) interconnected by means of communication networks and protocols defined by the EN50170 “**PROFIBUS**” standard.

This guide does not describe the “PROFIBUS” Fieldbus: we assume that the user is familiar with it, and that he will refer to the standard or to the official site managed by P.N.O. (Profibus Network Organization): www.profibus.com for updates.

We also assume that the user is familiar with the technical characteristics of GEFLEX products. Such characteristics are described in the user manuals enclosed with the product, or may be downloaded from the GEFRAN S.P.A. website: www.gefran.com.

1.1 • WARNINGS

• This guide applies to GEFRAN series GFX4, GFXTERMO4 and GFX4-IR instruments. For simplicity, the generic term “GFX4” will be used for all of these in this guide unless otherwise specified.

• The FW 01.20 version introduces new functions selectable with DipSwitch “S7” and linked to specific “.GSD” files. With Dip Switch “ON” (default), the operating mode is called “BRIDGE” and is compatible with all previous FW versions; with Dip Switch “OFF,” the operating mode is called “HIGH PERFORMANCE,” and is not compatible with previous versions. Instruments with the new FW version and DipSwitch “ON” can be replaced in systems configured with previous GSD files.

Vice versa, instruments with previous FW versions cannot function with more recent GSD files:

COMPATIBILITY TABLE OF FW VERSIONS AND GSD FILES FOR GFX4,GFXTERMO4,GFX4-IR-PROFI “BRIDGE”

n.	FW “GFX4-PROFI”		GSD “GFX40A41”		LIBRERIE STEP7 “GEFRAN”		“PROFIBUS” MANUAL	
	VERSION	DATE	VERSION	DATE	VERSION	DATE	VERSION	DATE
1	01.00	21/03/2006	01	17/05/2006	01	24/03/2006	80405	04/06
2	01.01	18/10/2006	02	26/09/2006	01	24/03/2006	80405	04/06
3	01.02	21/12/2006	02	26/09/2006	01	24/03/2006	80405A	02/07
4	01.10	01/08/2008	03	01/08/2008	01	24/03/2006	80405B	10/08
			04	26/03/2009	01	24/03/2006	80405B	10/08
5	01.20	01/10/2011	05	25/07/2011	02	01/10/2011	80405C	04/12
6	01.22	31/08/2012	05	01/07/2011	02.00	21/06/2013	80405E	05/14

N.B.: The FW 01.20 version in “BRIDGE” mode is totally compatible with the previous version and can also use STEP7 libraries in version 1.

COMPATIBILITY TABLE OF FW VERSIONS AND GSD FILES FOR GFX4,GFXTERMO4-PROFI “HIGH PERFORMANCE”

n.	FW “GFX4-PROFI”		GSD “GFX40A41”		LIBRERIE STEP7 “GEFRAN”		“PROFIBUS” MANUAL	
	VERSION	DATE	VERSION	DATE	VERSION	DATE	VERSION	DATE
1	01.20	01/10/2011	01	02/11/2011	02	01/10/2011	80405C	04/12
2	01.22	31/08/2012	02	25/09/2013	02.00	21/06/2013	80405E	05/14

COMPATIBILITY TABLE OF FW VERSIONS AND GSD FILES FOR GFX4IR-PROFI “HIGH PERFORMANCE”

n.	FW “GFX4-PROFI”		GSD “GFIH0D75”		LIBRERIE STEP7 “GEFRAN”		“PROFIBUS” MANUAL	
	VERSION	DATE	VERSION	DATE	VERSION	DATE	VERSION	DATE
1	01.20	01/10/2011	01	01/02/2012	2	01/10/2011	80405C	04/12
2	01.22	31/08/2012	01	01/02/2012	2.00	21/06/2013	80405E	05/14

• Sequence of preliminary operations (described in “INSTALLATION” chapter):

1. In the PLC SW development phase, configure the Profibus network by selecting the device described by the specific GSD file.
2. Select Dip Switches “S7” on all of the instruments connected to the same Profibus node via Modbus sub network, in the same position, compatible with the GSD file configured at point 1.
3. Select the Rotary Switches for the node address in the required position. Remember that each GFX4 instrument, connected to the same Profibus node via Modbus subnetwork must have an address increased by 4 units compared to the previous GFX4.
4. If other instruments are connected via Modbus subnetwork in addition to the GFX4 PROFIBUS, you have to run the “AUTONODE” sequence at the first power-on.

2 • MAIN TECHNICAL CHARACTERISTICS

The GFX4-PROFI module installs inside GFX4 products and expands their communication by providing them with the PROFIBUS DP protocol. The main characteristics are:

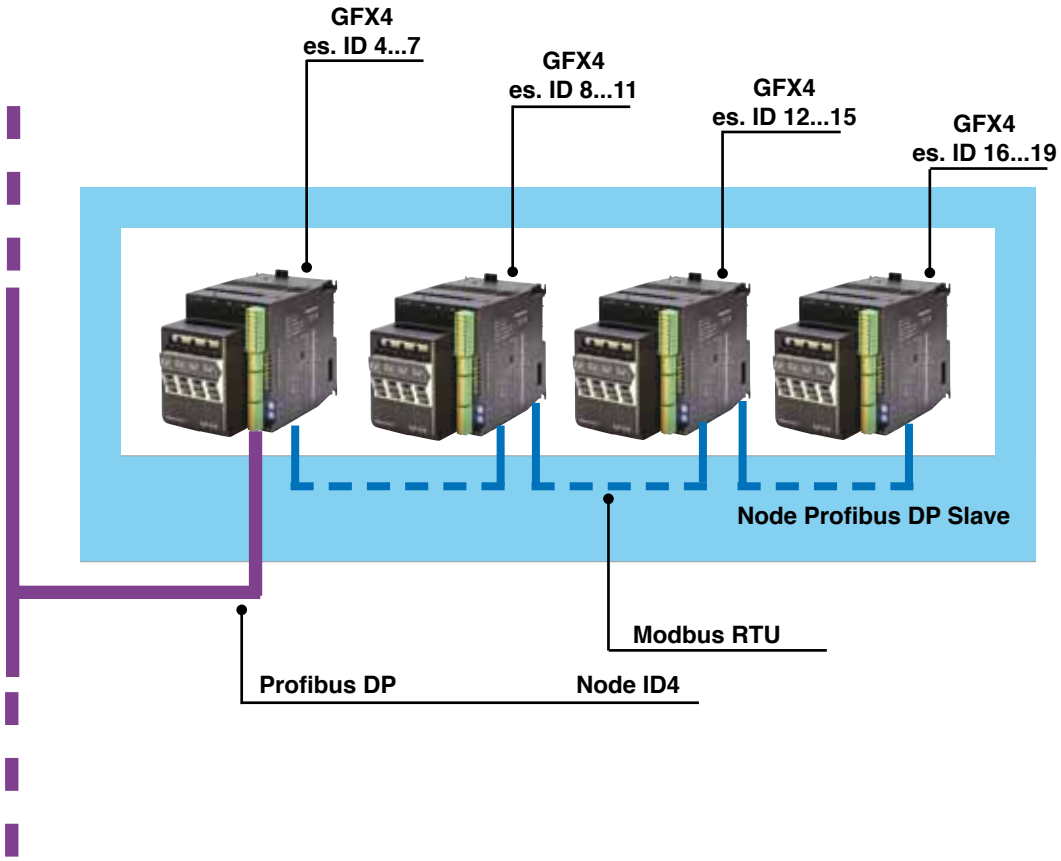
- Two communication channels:
- the first channel is a serial port with PROFIBUS DP slave protocol and connects to a Profibus Master.
- the second channel is a serial port with Modbus RTU protocol and lets you connect other GEFRAN instruments, in addition to the GFX4 on which the module is installed, for a total of sixteen temperature control zones
- Maximum number of temperature control zones manageable by PROFIBUS Master: 1984 (124 nodes x16 zones).
- Serial port RS485 galvanically isolated from power supply.
- Profibus DP Slave functions even if control side goes into fault.
- Selection of module operating mode via dip switch “S7” on GFX4: “BRIDGE” (compatible with all previous FW versions FW), for management of temperature control zones configured with other GEFRAN instruments, and “HIGH PERFORMANCE”, which manages only zones configured with instruments on the GFX4, optimizing Process Data update times.
- PROFIBUS address selection via HW or SW.

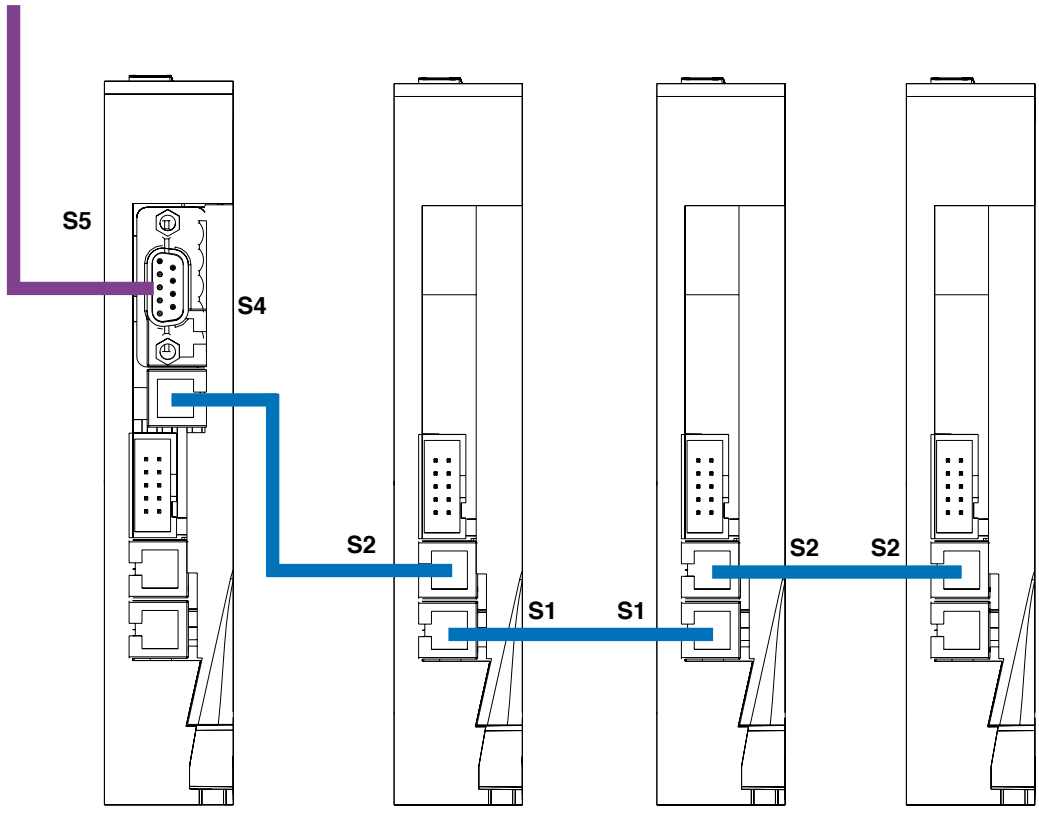
The node address is assigned with the two rotary switches (1…99) on the product hosting the module or with a software message.

The network Master (typically a PLC) recognizes the slave node by means of this address. The slave node recognized by the Master is made up of the GFX4/GFXTERMO4/GFX4-IR product which hosts the module and the other instruments connected on the Modbus serial port.

The GFX4-PROFI module can be installed on request when ordering the above-mentioned products or can be installed afterwards.

2.1 • CONNECTION DIAGRAM





Porta PROFIBUS	
Protocol	Profibus DP V0 (slave)
Function	Connects GFX4 to a Profibus DP Master device
Baud rate	Autosynchronization (9.6 ... 12000 kBit/s)
Connector	9 pin D-Type
Address	HW: 1...99 set with rotary switches in GFX4/GFXTERMO4 SW: 1...124 via specific SW message
I/O dimensions	Input/Output: depends on configuration min. I/O: 47 bytes in “BRIDGE” mode or 39 bytes in “HIGH PERFORMANCE” mode for 4 zones max. I/O: 167 bytes in “BRIDGE” mode or 231 bytes in “HIGH PERFORMANCE” mode for 16 zones
Msg. supports	Data_Exchange, Slave_Diag, Set_Prm, Chk_Cfg, Get_Cfg, Global_Control, Set-Slave-Add
GSD files	GFX40A41.gsd for GFX4/GFXTERMO4 /GFX4-IR in “BRIDGE” mode, GFH0D74.gsd for GFX4/GFXTERMO4 in “HIGH PERFORMANCE” mode and GFIH0D75.gsd for GFX4-IR in “HIGH PERFORMANCE” mode
Diagnostics	
GREEN led	
OFF	No communication with PROFIBUS Master
Flashing	1000msec = “AUTOMATIC BAUDRATE RESEARCH” state
“ “	“ 250msec = “WAIT FOR PARAMETERIZATION” state
“ “	“ 50msec = “WAIT FOR CONFIGURATION” state
ON	Steady = “DATA EXCHANGE” state
YELLOW led	
OFF	“DATA EXCHANGE” state
ON	Steady = other operative states
RED led	
OFF	No communication error
Flashing	1000msec = “State not possible” error
“ “	“ 250msec = “DP_State not possible” error
“ “	“ 50msec = “WD_State not possible” error
ON	Steady = board fault
Modbus Port	
Protocol	ModBus RTU (master) RS485 serial
Function	Connects GFX4 to ModBus RTU network
Baud rate	19200
Connector	RJ10 4-4

Functional libraries of common PLCs are provided to simplify the configuration and installation of GFX4 modules.

2.3 • PROCESS DATA UPDATE TIMES

Process Data transferred between GFX4-PROFI and the PROFIBUS Master PLC via PROFIBUS network are updated by means of periodic reads/writes by the Modbus subnetwork. Therefore, regardless of PROFIBUS network communication speed, the actual update of these variables depends on the number of zones connected in Modbus and on the selected operative mode.

In “BRIDGE” mode in read, 5 variables are updated in each temperature control zone: the first 2 (non-configurable) at an interval of 150msec each variable per zone, and the next 3 (user-configurable) at an interval of 450msec each variable per zone.

GFX4-PROFIBUS ‘BRIDGE’

No ZONES	TOTAL VARIABLES	DATA 1 (STATUS_S)	DATA 2 (PV)	DATA 3 (SPA)	DATA 4 (INTA)	DATA 5 (OUP)
4	20	0,60 sec	0,60 sec	1,80 sec	1,80 sec	1,80 sec
8	40	1,20 sec	1,20 sec	3,60 sec	3,60 sec	3,60 sec
12	60	1,80 sec	1,80 sec	5,40 sec	5,40 sec	5,40 sec
16	80	2,40 sec	2,40 sec	7,20 sec	7,20 sec	7,20 sec

If all 3 configurable variables are not needed for each zone, you can define them “No Data” to increase the update frequency of read data (see specific chapter).

In “HIGH PERFORMANCE” mode in read, 16 or 32 variables are updated (user-configurable) for each GFX4, i.e., every 4 zones, with much shorter times:

GFX4-PROFIBUS ‘HIGH PERFORMANCE’

No ZONE	TOTAL VARIABLES	GFX4-1	GFX4-2	GFX4-3	GFX4-4	t
4	16	16 WORDS	-	-	-	50msec
	32	32 WORDS	-	-	-	100msec
8	32	16 WORDS	16 WORDS	-	-	100msec
	64	32 WORDS	32 WORDS	-	-	200msec
12	48	16 WORDS	16 WORDS	16 WORDS	-	150msec
	96	32 WORDS	32 WORDS	32 WORDS	-	300msec
16	64	16 WORDS	16 WORDS	16 WORDS	16 WORDS	200msec
	112	28 WORDS	28 WORDS	28 WORDS	28 WORDS	400msec

Write cycles enter the read data scan cycle only when the data has been changed. The update of data in read is slowed by an acquisition cycle.

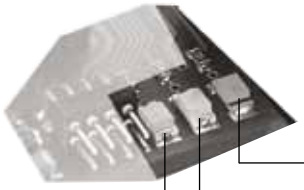
3 • INSTALLATION

See the **USER MANUAL** for GFX4 instruments, code 80395x, enclosed with the products, for a complete description of installation procedures and general electrical connections.

3.1 ELECTRICAL CONNECTIONS TO PROFIBUS NETWORK

S5 female connector

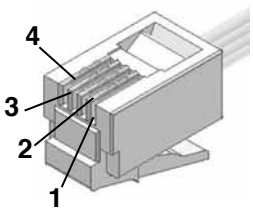
S4 female connector

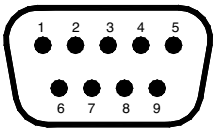
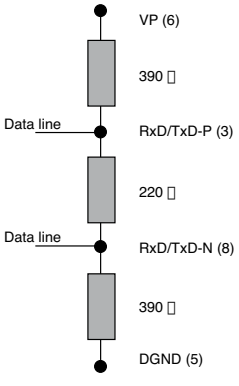


Yellow Led

Red Led

Green Led

S4 connector RJ10 4-4 pin	Nr. Pin	Name	Description	Note
	1	GND1 (**)	-	(**) Connect the GND signal among Modbus devices with a line distance > 100 m.
	2	Rx/Tx+	Data reception/transmission (A)	
	3	Rx/Tx-	Data reception/transmission (B)	
	4	+V (reserved)	-	
Cable type: flat telephone cable for pin 4-4 conductor 28AWG				

S5 connector D-SUB 9 pin male	Nr. Pin	Name	Description	Note
 	1	SHIELD	EMC protection	Connect the terminal resistances as shown in the figure. 
	2	M24V	Output voltage - 24V	
	3	RxD/TxD-P	Data reception/transmission (B)	
	4	n.c.	n.c.	
	5	DGND	Vp mass	
	6	VP	Positive power supply +5V	
	7	P24V	Output voltage +24V	
	8	RxD/TxD-N	Data reception/transmission (A)	
	9	n.c.	n.c.	
Cable type: shielded 1 pair 22AWG conforming to PROFIBUS				

When the GFX4 is the last node of the PROFIBUS network, you have to connect a 220ohm 1/4W termination resistor between the two “RxD/TxD-P” and “RxD/TxD-N” signals and two 390ohm 1/4W resistors to polarize the line between the “VP” signal with “RxD/TxD-P” and between the “DGND” signal with “RxD/TxD-N”.

In accordance with standard EN50170, to guarantee correct communication between PROFIBUS devices up to 12 Mbaud, the shielded cable must have special characteristics:

PARAMETER	TYPE “A” CABLE
Impedance in Ω	135...165
Capacity in pF/m	< 60
Loop resistance in Ω/Km	< 110
Core diameter in mm	> 0,64
Core section in mm^2	> 0,34 (AWG22)

By using cables with these characteristics, you can obtain the following line length:

Baudrate in Kbit/sec	9,6	19,2	45,45	93,75	187,5	500	1500	3000	6000	12000
Max length in metres	1200	1200	1200	1200	1000	400	200	100	100	100

GEFRAN S.p.A. supplies PROFIBUS-approved cables and connection systems as accessories for GFX4 instruments.

3.2 CONFIGURATION OF PROFIBUS NETWORK

The Profibus address can be set in hardware or software mode.

Every product with a Profibus DP interface can be connected to other Geflex products via the Modbus RTU.

3.2.1 Modbus RTU subnetwork

Set dip switch “S7” on all GFX4s to “ON” for “BRIDGE” mode and to “OFF” in “HIGH PERFORMANCE” mode.

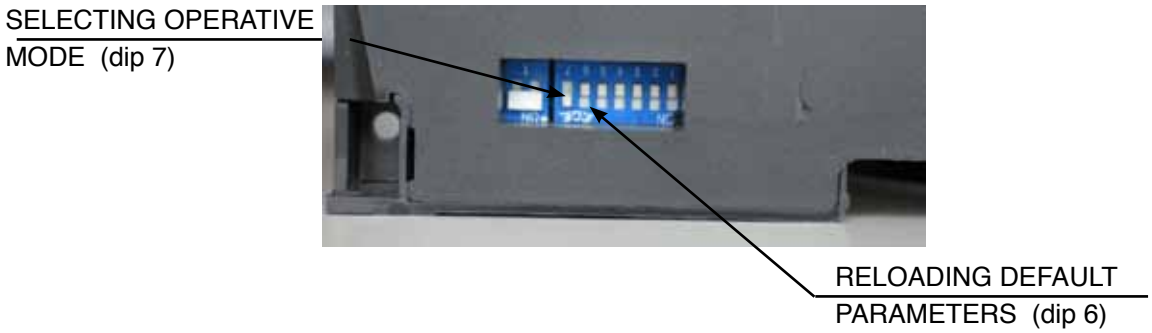
In “BRIDGE” mode, the GFX4 Profibus DP interface can be connected, by means of the Modbus RTU subnetwork, to three other GFX4, or to twelve 5A...120A GEFLEX slaves, or to a combination of GFX4 and GEFLEX slaves to control a maximum of 16 temperature control zones for each Profibus DP node.

In “HIGH PERFORMANCE” mode, the GFX4 can only be connected to another 3 instruments of the same type (GFX4/GFXTERMO4 or GFX4-IR) for a total of 16 temperature control zones.

The added GFX4 addresses must have an offset of 4 units (for example, if the GFX4-PROFIBUS has address 10, the following zones will be 14, 18 and 22).

The added GEFLEX Slave addresses must have an offset of 4 units for the first one connected and of one unit for the others (for example, if the GFX4-PROFIBUS has address 10, the first GEFLEX slave will be 14 and the following ones will be 15, 16, 17, etc.).

You have to activate the “AUTONODE” procedure to assign the node address to the GEFLEX Slaves.



3.2.2 Address configuration via hardware

The hexadecimal rotary switches on the GFX4 indicate the node address of the PROFIBUS network acquired when the instrument is switched on. GFX4 is factory-supplied with the rotary switches in position “00”.

The customer must assign the correct position, considering that only 01 to 09 are valid.

The rotary switch assigns the ID address from the point of view of the Profibus DP and the first address of the Modbus RTU subnetwork at the same time.

The other rotary switch positions refer to special functions described in the section on “Installation of the serial network” in the GFX4 USER MANUAL.

3.2.3 Address configuration via software

By means of a telegram (see paragraph 4.1), you can assign the node address (1...124), deactivating the rotary-switch on the GFX4 (which no longer has significance for the Profibus network), while it maintains its function for the Modbus subnetwork.

To restore the rotary-switch function, transmit node address 125: the node address is immediately re-assigned through the rotary-switch.

Thanks to this characteristic, you can expand the number of temperature control zones with a Profibus network up to a maximum of 124x16= 1984.

Note: Make sure the Profibus Master hardware supports transmission of the above-described message.

Example of software configuration:

1. Rotary-Switch “x10” in position 1 and “x1” in position 0.
   Profibus network mode is 10. Modbus network mode is 10.

2. Address 2 transmitted to GFX4 via software.
   Profibus network mode is 2. Modbus network mode is 10.

3. Rotary-Switch “x10” in position 4 and “x1” position 0.
   Any change in the rotary-switch has significance only for the Modbus subnetwork.
   Profibus network mode is 2. Modbus network mode is 40.

4. Address 125 transmitted to GFX4 via software.
   The rotary-switch resumes setting the Profibus and Modbus network node.
   Profibus network mode is 40. Modbus network mode is 40.

3.2.4 AutoNode procedure

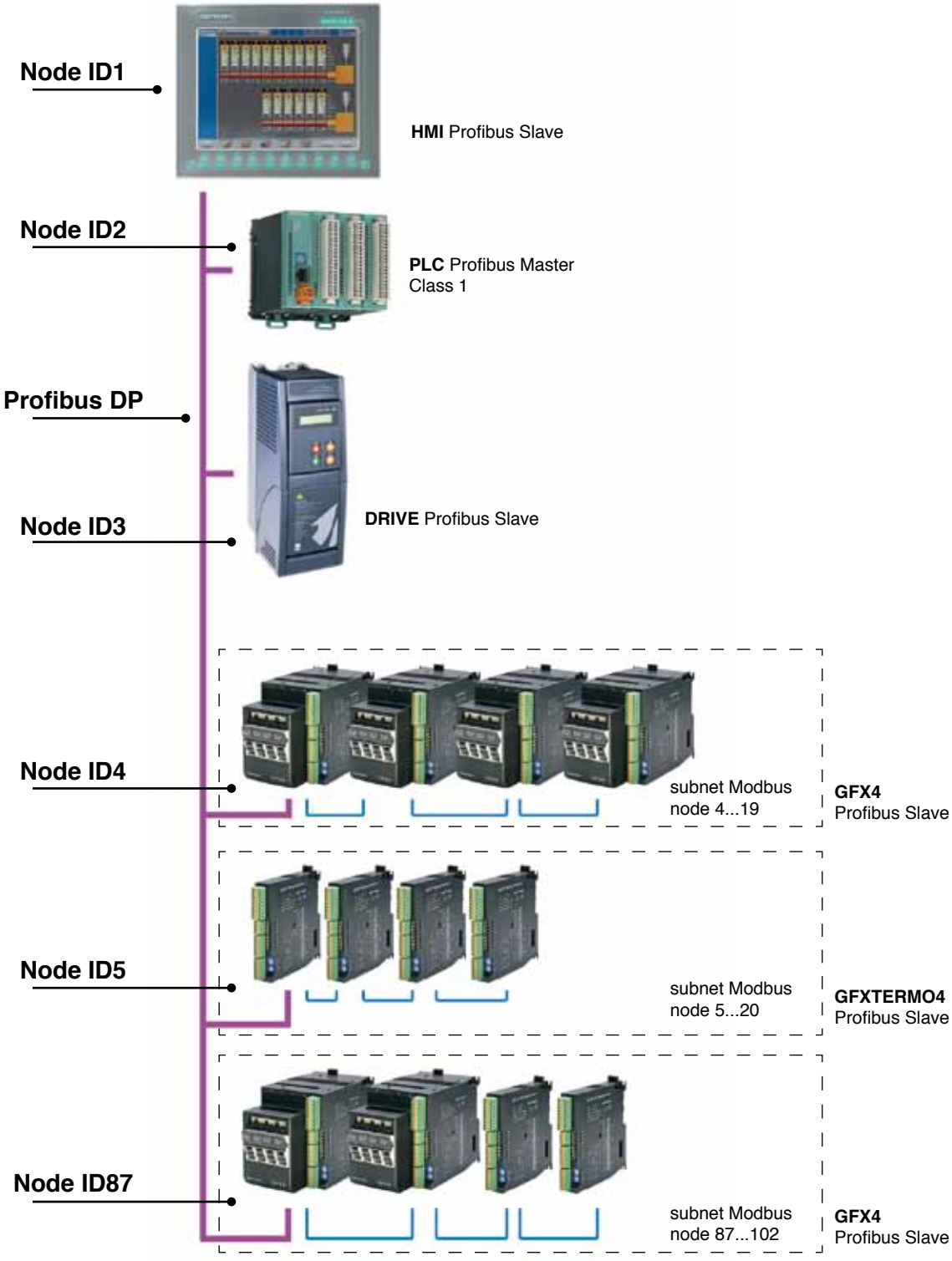
The “AUTONODE” procedure must be activated after assigning the PROFIBUS address node in order to configure the GFX4-PROFI module with the number of temperature control zones managed by the instruments connected to the MODBUS subnetwork.

- Make sure that the GFX4-PROFI module is correctly connected to the instruments by means of MODBUS subnetwork and that all instruments are powered and working.
- Turn ROTARY-SWITCHES “x10” to position A and “x1” to position 0..
- The “RN” and “ER” LEDs on the GFX4 start flashing at high frequency for 10 seconds.
- When flashing returns to normal working frequency, turn the ROTARY-SWITCHES back to the position relative to the node address.
- After running the AutoNode / Address procedures, restart the Profibus Master node.
- Check that parameter bAU.2 is set to 4.
- The GFX4-PROFI module automatically self-configures to Profibus master speed.

You can check the Baudrate of the Profibus network by connecting to the second MODBUS RTU serial port of the GFX4 via PC and “GF-Express” SW or via GFX-OP terminal and reading the content of variable “BaUF”:

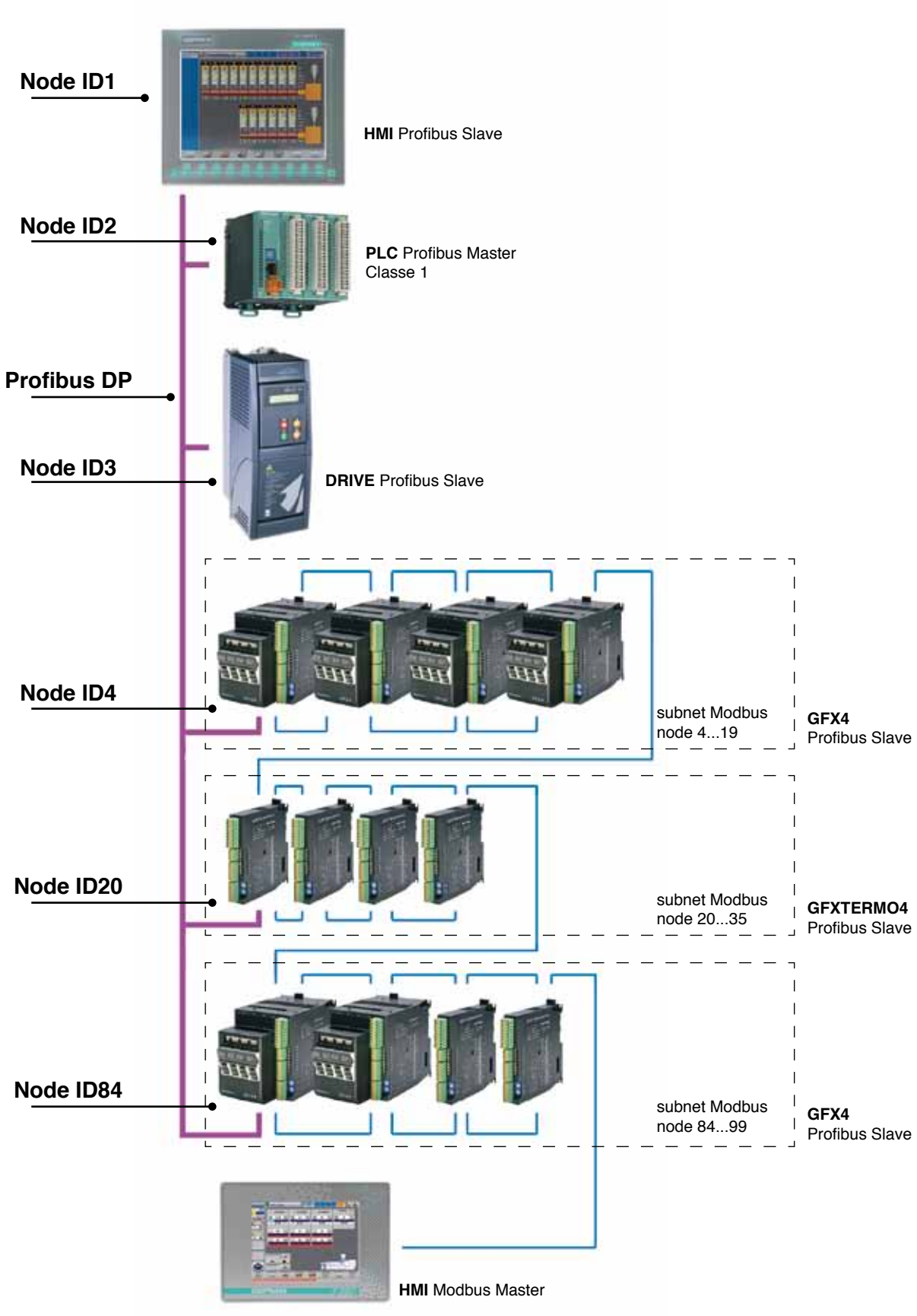
BAUF	BAUDRATE
0	12,00 MBIT/S
1	6,00 MBIT/S
2	3,00 MBIT/S
3	1,50 MBIT/S
4	500,00 KBIT/S
5	187,50 KBIT/S
6	93,75 KBIT/S
7	45,45 KBIT/S
8	19,20 KBIT/S
9	9,60 KBIT/S

3.3 EXAMPLE OF PROFIBUS NETWORK WITH HARDWARE ADDRESS SELECTION



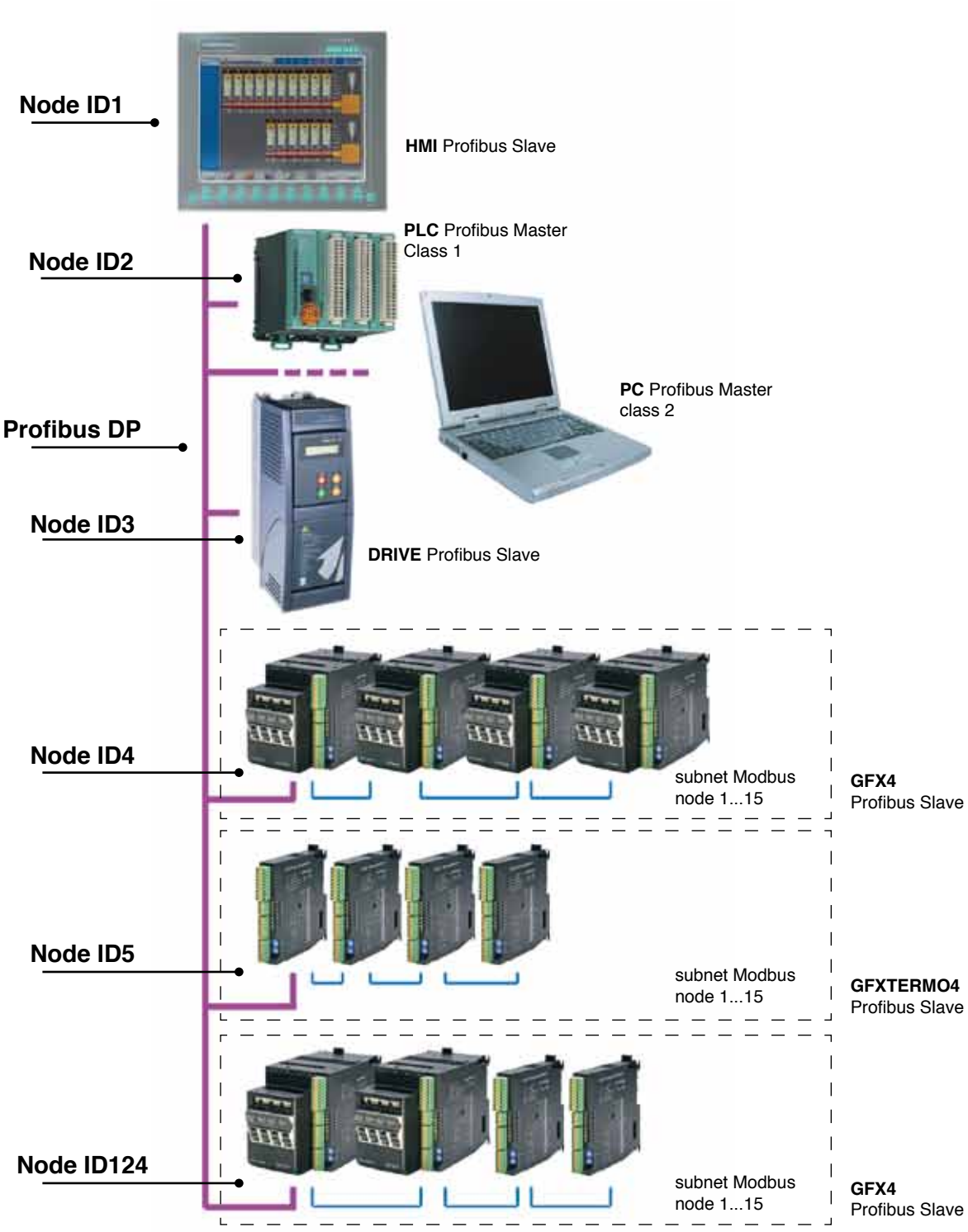
- Max. number of GFX4 PROFIBUS nodes: 87
- Max. number of temperature control zones: 87*16 = 1392
- MODBUS network common only for groups of 4 GFX4

3.4 EXAMPLE OF PROFIBUS NETWORK WITH HARDWARE ADDRESS SELECTION AND USE OF SECOND MODBUS NETWORK



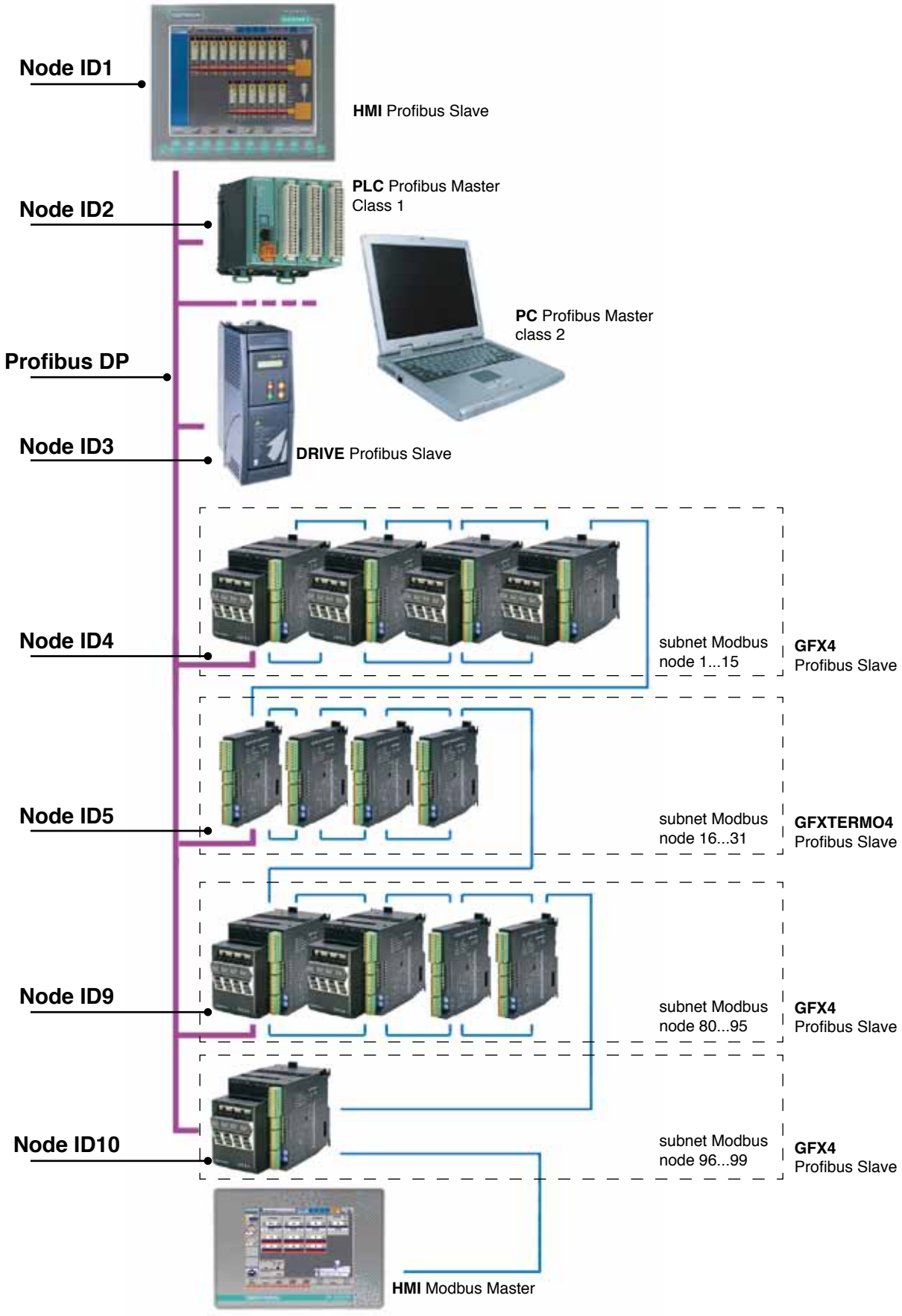
- Max. number of GFX4 PROFIBUS nodes: 6
- Max. number of temperature control zones: 6*16 = 96
- MODBUS network common for 24 GFX4

3.5 EXAMPLE OF PROFIBUS NETWORK WITH SOFTWARE ADDRESS SELECTION



- Max. number of GFX4 PROFIBUS nodes: 121
- Max. number of temperature control zones: 121*16 = 1936
- MODBUS network common only for groups of 4 GFX4
- The rotary switch is used to identify the MODBUS devices

3.6 EXAMPLE OF PROFIBUS NETWORK WITH SOFTWARE ADDRESS SELECTION AND USE OF SECOND MODBUS NETWORK



- Max. number of GFX4 PROFIBUS nodes: 7
- Max. number of temperature control zones: (6*16) + 4 = 100
- MODBUS network common for 25 GFX4
- The rotary switch is used to identify the MODBUS devices

4 • PROFIBUS-DP GFX4-PROFIBUS “BRIDGE” DATA STRUCTURE

The data exchange structure managed by the GFX4 instruments is based on the number of devices connected via local bus to each MODBUS.

Therefore, the “Configuration Telegram” (SAP 62) has to contain the exact configuration (number of bytes, format, consistency) of the data exchanged during the “DATA EXCHANGE” (SAP DEFAULT) operating state.

By means of an area of 7 consistent bytes, always present, called Parametric Data, the Master device on the PROFIBUS network (PLC or Supervisor) can access any parameter of all the GFX4 instruments connected to the node.

By means of a second area of 10 bytes for each zone connected to the GFX4-PROFIBUS node (min. 40 bytes, max. 160 bytes), called Process Data, you can quickly acquire the value of 5 variables for each temperature control unit (for example, instrument **STATUS, PV** (process variable), **SPA** (active setpoint), **IntA** (ammeter input value), **OuP** (control output value), etc.).

With the “Parameterization Telegram” (SAP 61), the user can select the read variables to be attributed to the Process Data based on the application.

When the PROFIBUS Master requests diagnostics from the GFX4 by means of the “Diagnostics Data Request Telegram” (SAP 60), a 16-word area is transmitted, corresponding to one word for each zone present on the GFX4-PROFIBUS node.

4.1 NODE ADDRESS CHANGE TELEGRAM (SAP 55)

Class 2 Profibus Masters can change Slave addresses via the “Set_Slave_Add” function.

BYTE	DESCRIPTION	VALUE (hex)
1	New address	n
2	ID number (high byte)	0A
3	ID number (low byte)	41
4	Enable (00)\ Disable (01) additional changes	00

4.2 CONFIGURATION TELEGRAM (SAP 62)

The PROFIBUS Master sends this to all Slave nodes before entering “DATA EXCHANGE” status; in case of incorrect configuration, the GFX4 refuses communication with the Master.

BYTE	DESCRIPTION	VALUE (hex)
1	7 consistent bytes	B6
2	5 input/output words GFX4-1 zone 1	74
3	5 input/output words GFX4-1 zone 2	74
4	5 input/output words GFX4-1 zone 3	74
5	5 input/output words GFX4-1 zone 4	74
6 (*)	5 input/output words GFX4-2 zone 5	74
≈	≈	≈
17 (*)	5 input/output words GFX4-4 zone 16	74

(*) Bytes present based on selected configuration.

4.3 PARAMETERIZATION TELEGRAM (SAP 61)

Before entering “DATA EXCHANGE” status, the PROFIBUS Master uses this protocol to identify itself with the GFX4 and specify its operating mode. See the attached file **GFX40A41.gsd** for standard PROFIBUS parameterizations; the implementations introduced for the GFX4 by byte 8 let the user define which variables to read in the Process Data for all zones in that GFX4-PROFIBUS node.

BYTE	DESCRIPTION	DEFAULT	VALUE (hex)
1 ≈ 7	Conforming to standard EN50170		
8	Reserved		00
9	Process Data 1 (MSB)	Process Variable PV	00
10	Process Data 1 (LSB)		00
11	Process Data 2 (MSB)	Active setpoint SPA	00
12	Process Data 2 (LSB)		01
13	Process Data 3 (MSB)	Ammeter input IntA	00
14	Process Data 3 (LSB)		E3
15	Process Data 4 (MSB)	Control output value OuP	00
16	Process Data 4 (LSB)		02
17	Error Behaviour	None	00
18	Startup delay (MSB)	3 sec	0B
19	Startup delay (LSB)		B8

If some Process Data are not used, the value FFFF hex can be assigned to increase efficiency of communications.

“Process Data 1” can assume 4 values:

DESCRIPTION	VALUE	
	(hex)	(dec)
PV value	0000	0
PV value without diagnosis	8000	32768
No variable requested	FFFF	65535
No variable without diagnosis	7FFF	32767

Refer to paragraph 4.4 for further explanations.

“Process Data 2, 3, 4” are fully settable and correspond to the MODBUS address of the corresponding variable, shown in the **USER MANUAL** for GFX4 devices, code 80395x, enclosed with the products.

- Error Behaviour

1. When developing application SW on the PROFIBUS Master PLC, you can select the operative state that the GFX4s must assume in case of interrupted PROFIBUS communication between the PLC and the GFX4 PROFI bridge.
   The new “Error Behavior” parameter has been added to the GSD file v.03, visible in the Slave properties when creating the Hardware Configuration, with the following options:
   0 = None Operative state does not change (default for compatibility with previous versions)
   1 = Switching Off Switches to “SW OFF” (OFF)
   2 = Manual Mode Switches to “Manual” (MAN)
   3 = Setpoint SP2 Switches to setpoint 2 (SP2) (activates only if parameter “hd.1” = 1)
   This setting is transferred by the PROFIBUS Master PLC to the GFX4-PROFI via “Parameterization Telegram.”

2. At “Power-ON” all of the GFX4s connected to the GFX4-PROFI bridge assume the operative state (ON/OFF, MAN/AUTO, SP1/SP2) that they had at the previous “Power-OFF.”

3. When the PLC and the GFX4-PROFI enter correctly into communication (PROFIBUS “DATA EXCHANGE” state), the PLC variable “PROCESS DATA OUTPUT 0” lets you change the operative state of the GFX4s.

4. In case of interrupted communication (for example, PLC in “STOP” or broken PROFIBUS cable), all of the GFX4s assume the selected operative state, as described at point 1.

5. If communication is restored without switching off the GFX4s, they all return to the operative state described at point 3.

6. If the GFX4s are switched off while they are in an “Error” condition, they will remain in this state at the next “Power-On,” as described at point 3, until communication with the PLC is restored (see point 3).

- Startup delay

The “Startup delay (msec)” parameter has also been added to the GSD file v.03. It indicates the delay from the start of PROFIBUS communication (PROFIBUS “DATA EXCHANGE” state) to updating of GFX4 Modbus variables, and prevents the delay in updating of PLC peripheral variables from transferring incorrect values to the GFX4s.

It can be set from 0msec to 10000msec (default: 3sec).

4.4 DIAGNOSTICS DATA REQUEST TELEGRAM (SAP 60)

When the PROFIBUS Master requests diagnostics information from GFX4-PROFIBUS, it responds with 6 standard information bytes and 33 specific bytes for all GFX4 instruments connected to the PROFIBUS node.

BYTE	DESCRIPTION	VALUE (hex)
1 ≈ 6	Conforming to standard EN50170	
7	External diagnostics length	21
8	Diagnostics GFX4-1 zone 1 (MSB)	00
9	Diagnostics GFX4-1 zone 1 (LSB)	00
10	Diagnostics GFX4-1 zone 2 (MSB)	00
11	Diagnostics GFX4-1 zone 2 (LSB)	00
12	Diagnostics GFX4-1 zone 3 (MSB)	00
13	Diagnostics GFX4-1 zone 3 (LSB)	00
≈	≈	≈
38	Diagnostics GFX4-1 zone 16 (MSB)	00
39	Diagnostics GFX4-1 zone 16 (LSB)	00

The diagnostics word for each GFX4 can assume the following values :

◊ no alarm, the value is 0000hex.

◊ GFX4 does not respond, the value is 1F9Fhex.

◊ presence of alarm, each assumes the significance of the table below

BYTE	BIT	DESCRIPTION
MSB	0	Alarm AL1
	1	Alarm AL2
	2	Alarm AL3
	3	Alarm AL4
	4	Alarm ALHB
	5	Reserved
	6	Reserved
	7	Reserved
LSB	0	Presence of Alarms: AL1 or AL2 or AL3 or AL4 or ALHB
	1	Alarm “Input signal Lo”
	2	Alarm “Input signal Hi”
	3	Alarm “Probe Input Err”
	4	Alarm “Probe Input Sbr”
	5	Reserved
	6	Reserved
	7	Alarm LBA

Diagnostic note:
If a GFX4 does not respond, the corresponding diagnostic word assumes value 1F9Fhex and the relative status word is forced to FFFFhex

With the “Process Data 1” variable, you can activate/deactivate alarms diagnosis as shown in the table below:

PROCESS DATA 1		POSSIBLE DIAGNOSTICS VALUES		
0000	PV value	0000	1F9F	See Alarms table
8000	PV value without diagnosis	0000	1F9F	-
FFFF	No variable requested	0000	1F9F	See Alarms table
7FFF	No variable without request	0000	1F9F	-

Example:

“Process Data 1” equals “0000” hex , the diagnostic word can assume values:

◊ “0000” hex (no alarm)

◊ “1F9F” hex (GFX4 does not respond)

◊ bit della “Alarms Table”

“Process Data 1” equals “8000” hex , the diagnostic word can assume values:

◊ “0000” hex (no alarm)

◊ “1F9F” hex (GFX4 does not respond)

Note on configuration of “Process Data 1”:
Since the diagnostics data are also available in the “Process Data 0” variable (see paragraph 4.5.5), we recommend that you use “Process Data 1” values equal to “8000”hex or “7FFF”hex.

4.5 DATA EXCHANGE (SAP DEFAULT)

After checking the correct configuration and parameterization of the GFX4-PROFIBUS by means of the telegrams seen above, the PROFIBUS Master activates the “DATA EXCHANGE” protocol in which it cyclically sends some output bytes to and reads some input bytes from the PROFIBUS Slaves.

The number of I/O bytes depends on the number of instruments connected via MODBUS subnetwork: an area of 7 bytes (always present in all configurations), represents “Parametric Data,” while the “Process Data” area varies from a minimum of 40 bytes to a maximum of 160 bytes, divided into blocks of 10 bytes for each zone controlled by the GFX4-PROFIBUS node.

DATA OUTPUT (from PROFIBUS Master to Slave)																											
PARAMETRIC DATA “REQUEST”							**PROCESS DATA GFX4 zone 1**										≈	**PROCESS DATA GFX4 zone 16**									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	≈	158	159	160	161	162	163	164	165	166	167

DATA INPUT (from PROFIBUS Slave to Master)																											
PARAMETRIC DATA “RESPONSE”							**PROCESS DATA GFX4 zone 1**										≈	**PROCESS DATA GFX4 zone 16**									
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	≈	158	159	160	161	162	163	164	165	166	167

“Parametric Data” are “consistent” data that let you read or write any MODBUS variable, either in bit format or in word format, present in the GFX4 devices connected to the PROFIBUS node.

PARAMETRIC DATA		
BYTE	**PARAMETER**	**DESCRIPTION**
1	TRG	TRIGGER BYTE: must be incremented by 1 with each new Request. The Response will be correct only when value is equal.
2	ADD SLAVE	MODBUS address of GFX4 present on PROFIBUS node
3	FC	Function code to specify procedure: Bit/Word Read/Write
4	DATO 1	Depends on FUNCTION CODE
5	DATO 2	Depends on FUNCTION CODE
6	DATO 3	Depends on FUNCTION CODE
7	DATO 4	Depends on FUNCTION CODE

4.5.1 Parametric data: reading a Bit

Request bytes

TRG	**ADD SLAVE**	**FC**	**ADD MSB**	**ADD LSB**	**NB MSB**	**NB LSB**
Trigger	Address Slave	1 or 2	Address of Bit to read	Address of Bit to read	Number of bit to read. (always 00)	Number of bit to read. (always 01)

Reply bytes

TRG	**ADD SLAVE**	**FC**	**NB**	**BIT**	**#**	**#**
Reply to trigger set	Confirm Slave address	Confirm op. code (1 or 2)	Number of bytes read (always 1)	Bit value: 0 or FF	Empty	Empty

4.5.2 Parametric data: reading a word

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	NW MSB	NW LSB
Trigger	Slave Address	3 or 4	Address of word to read	Address of word to read	Number of word to read (always 00)	Number of word to read (always 01)

Reply bytes

TRG	ADD SLAVE	FC	NB	W MSB	W LSB	#
Reply to trigger set	Confirm Slave address	Confirm procedure code	Number of bytes read (always 2)	Msb word value	Lsb word value	Empty

4.5.3 Parametric data: writing a bit

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	BIT	00
Trigger	Slave Address	5	Address of Bit to write	Address of Bit to write	Value of bit to write (00 or FF)	Always 00

Reply bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	BIT	00
Reply to trigger set	Confirm Slave address	Confirm procedure code	Bit address written	Bit address written	Value of bit written (00 or FF)	Always 00

4.5.4 Parametric data: writing a word

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	W MSB	W LSB
Trigger	Slave Address	6	Address of word to write	Address of word to write	Value of word to write	Value of word to write

Reply bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	W MSB	W LSB
Reply to trigger set	Confirm Slave address	Confirm procedure code	Address of word written	Address of word written	Msb value of word written	Lsb value of word written

In case of error, 80 hex plus the request procedure code will be returned in place of the procedure code. The error code will be shown in the CODE field.

Reply bytes

TRG	ADD SLAVE	FC	CODE	#	#	#
Reply to trigger set	Confirm Slave address	Procedure code + 80hex	Error code	Empty	Empty	Empty

4.5.5 Error codes

1 = Illegal function	6 = Slave device busy
2 = Illegal data address	9 = Illegal number data
3 = Illegal data value	10 = Read only data

4.5.6 Process Data Input

The Process Data area immediately gives the value of some important variables for each GFX4 connected to the same PROFIBUS node.

PROCESS DATA		
BYTE	**PARAMETER**	**DESCRIPTION**
1	Process Data 0 (MSB)	Instrument Status **STATUS_S**
2	Process Data 0 (LSB)	
3	Process Data 1 (MSB)	Process Variable **PV**
4	Process Data 1 (LSB)	
5	Process Data 2 (MSB)	Active setpoint **SPA**
6	Process Data 2 (LSB)	
7	Process Data 3 (MSB)	Ammeter input **IntA**
8	Process Data 3 (LSB)	
9	Process Data 4 (MSB)	Control output value **OuP**
10	Process Data 4 (LSB)	

Process Data Input 2, 3 and 4, are freely programmable by the user with the Parameterization Telegram described above.

Process Data 0 gives the corresponding operative state according to the following table:

BYTE	BIT	DESCRIPTION
MSB	0	Alarm AL1
	1	Alarm AL2
	2	Alarm AL3
	3	Alarm AL4
	4	Alarm ALHB
	5	Activate / Deactivate Software (OFF = Active, ON = Inactive)
	6	Automatic / Manual (OFF = Automatic, ON = Manual)
	7	Enable Local / Remote Setpoint (OFF = Local, ON = Remote)
LSB	0	Presence of Alarms: AL1 or AL2 or AL3 or AL4 or ALHB
	1	Alarm “Input signal Lo”
	2	Alarm “Input signal Hi”
	3	Alarm “Probe Input Err”
	4	Alarm “Probe Input Sbr”
	5	GFX4 in heating
	6	GFX4 in cooling
	7	Alarm LBA

4.5.7 Process Data Output

The “PROCESS DATA OUTPUT” area lets you immediately write the value of some significant variables for each GFX4 connected to the same PROFIBUS node.

PROCESS DATA OUTPUT		
BYTE	**PARAMETER**	**DESCRIPTION**
1	Process Data 0 (MSB)	Instrument Status **STATUS_W**
2	Process Data 0 (LSB)	
3	Process Data 1 (MSB)	Local SetPoint _**SP**
4	Process Data 1 (LSB)	
5	Process Data 2 (MSB)	---------
6	Process Data 2 (LSB)	
7	Process Data 3 (MSB)	---------
8	Process Data 3 (LSB)	
9	Process Data 4 (MSB)	---------
10	Process Data 4 (LSB)	

Process Data Output 2, 3 and 4 are freely programmable by the user with the Parameterization Telegram described above.

Process Data 0 gives the corresponding operative state according to the following table:

BYTE	BIT	DESCRIPTION
MSB	0	---------
	1	---------
	2	---------
	3	---------
	4	---------
	5	---------
	6	---------
	7	---------
LSB	0	---------
	1	Select SP1\SP2
	2	Selftuning (0 = OFF; 1 = ON)
	3	Software (0 = ON; 1 = OFF)
	4	Automatic = 0; Manual = 1
	5	Autotuning (0 = OFF; 1 = ON)
	6	Local = 0; Remote = 1
	7	

4.6 USING GFX4-PROFIBUS “BRIDGE” WITH SIEMENS STEP7

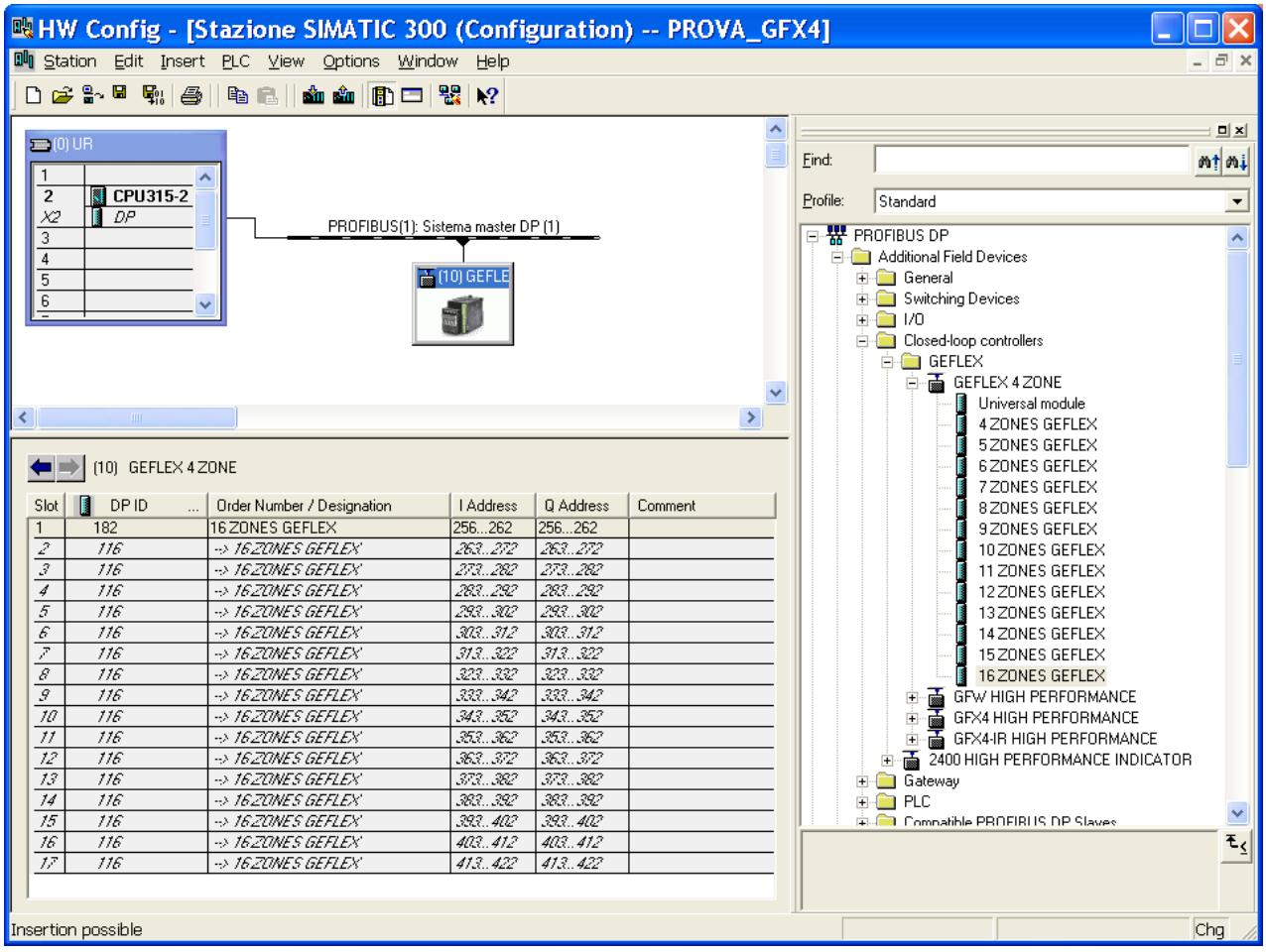
4.6.1 Configuration

The GFX40A41.gsd file contains the information needed to manage a rack of GFX4 devices as Slaves in PROFIBUS DP.

This file must be installed in SIEMENS Step7 programming environment in order to insert the GFX4 PROFIBUS devices in the PROFIBUS network hardware configuration.

We define “rack” as a PROFIBUS node composed of a GFX4 PROFIBUS connected with GEFLEX MODBUS Slaves or GFX4 MODBUS Slaves.

1. Open the hardware configuration for the project
2. Select Station/Close on the menu
3. Select Tools/Install new GSD file
4. In the window that appears, look for the file on the device where it is saved (Floppy or Hard Disk)
5. Press Open.
6. The item “4 ZONES GEFLEX” has now been added to the catalog. To find it, expand the item “Profibus,” expand the file “Other field devices,” expand “Controller,” expand “GEFLEX.”
7. Reopen the configuration of the project station
8. Drag the 4 ZONES GEFLEX icon with the mouse and drop it on the line of the Profibus bus of the project. A new Profibus slave will be created.
9. Assign the PROFIBUS node to the new slave. The PROFIBUS node must be consistent with the one set with the rotary switches on the GFX4.
10. Select an element from the GEFLEX section of the catalog according to the composition of your rack. Drag it to the empty PROFIBUS node for the GEFLEX slave just created. The elements making up the rack and the dedicated memory areas will appear automatically.



The first 7 bytes in read and the first 7 bytes in write (ID 182) are called “Consistent;” in the figure, they correspond to addresses PEB 256 ... PEB 262; PAB 256 ... PAB 262 and represent the “**Parametric data**” which, controlled via the “OPGEFLEX” Function Block, lets you read or write any variable on the GFX4MODBUS map.

5 words corresponding to Process Data are assigned to each subsequent connector on the rack (ID 116). In the figure, they correspond to addresses PEW 263 .. PEW 272 for the first zone, PEW 273 .. PEW 282 for the second zone, etc.

Note:

Always check that the Hardware configurator has assigned contiguous memory addresses for all the rack zones. In case of “holes” or jumps, manually assign the first address to a zone known to be free. The E addresses (inputs) must be the same as the A addresses (output).

During GFX4 hardware configuration, it is useful to reserve the memory area for a maximum of 16 usable zones for each rack.

Example:

The most common case is when you want to add a GFX4 to an already-configured rack in the system.

To do this, you have to delete the configured rack and enter the new one (for example, in the figure for the GFX4 “BRIDGE” we have to replace “4 Zones Geflex” with “5 Zones Geflex”).

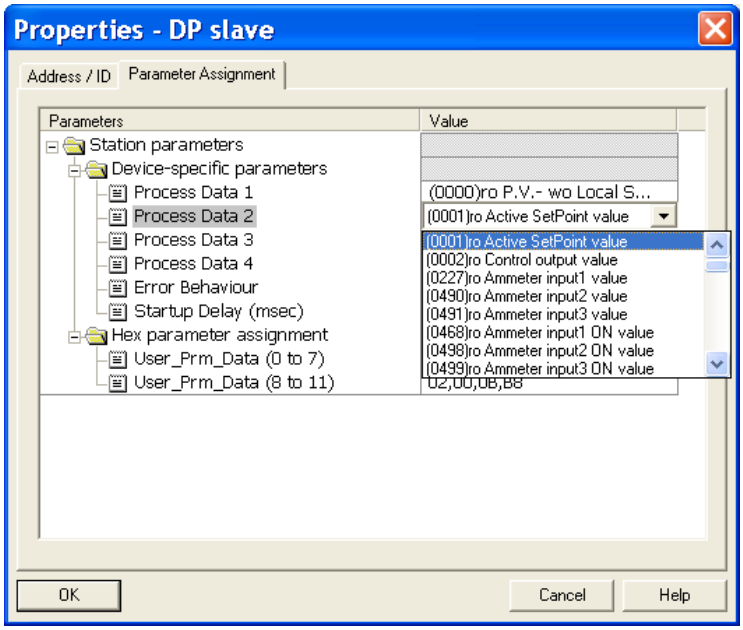
If there are other configured Profibus slaves, i.e. with assigned memory areas, the system will distribute the memory of the newly inserted rack by mapping the first 4 zones of the rack and the common area (consistent) in the same original addresses and the added GFX4 (zone 5) in a free area immediately following the one of the other configured slaves.

In this way we create a discontinuity in the memory area that prevents the FC2 “CFG-GFX4” from distributing the area bytes in the assigned data block.

To avoid this problem, when positioning the new rack, manually edit the address of the first memory byte assigned by double clicking the object and assigning it (for example) the address of the first free byte after all the other configured slaves.

4.6.2 Parameterization

On the hardware configuration page, by selecting the properties of the DP slave, you can also select the Process Data preferred by the user:



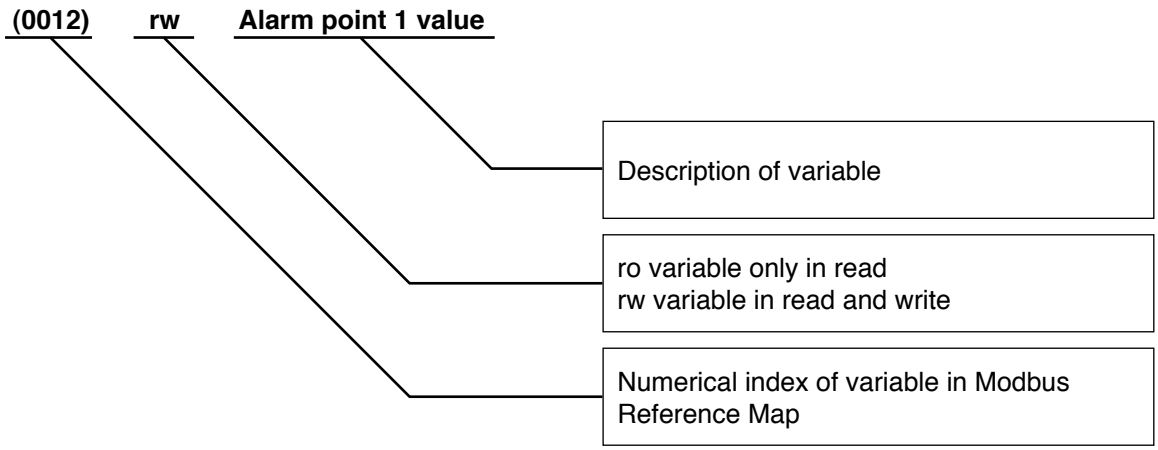
As explained above, there are 5 words available for reading (PROCESS DATA INPUT), and 5 words available for writing (PROCESS DATA OUTPUT).

The first read word is fixed (STATUS_S) and is cyclically updated, while words 1, 2, 3, 4 are configurable based on the selection made (see figure).

The first two write words are fixed (word 0 = STATUS_W; word 1 =_SP), while words 2, 3, 4 are configurable based on the selection made (see figure).

The IN parameters to be read/written are selected via parametric data.

The selectable Process Data supply the following information:



Example:

Process Data 1 = (0000) Process Value
Process Data 2 = (0012) rw Alarm point 1 value
Process Data 3 = (0002) ro Control output value
Process Data 4 = (0053) rw Alarm HB point 1 value

The PROCESS DATA INPUT transparently becomes:

PROCESS DATA INPUT			
BYTE	**PARAMETER**	**DESCRIPTION**	
1	Process Data 0 (MSB)	Instrument Status **STATUS_S**	
2	Process Data 0 (LSB)		
3	Process Data 1 (MSB)	Process Variable **PV**	*(0000) Process Value*
4	Process Data 1 (LSB)		
5	Process Data 2 (MSB)	Alarm point 1 **AL.1**	*(0012) rw Alarm point 1 value*
6	Process Data 2 (LSB)		
7	Process Data 3 (MSB)	Control output value **OuP**	*(0002) ro Control output value*
8	Process Data 3 (LSB)		
9	Process Data 4 (MSB)	Alarm point **A.HB**	*(0053) rw Alarm HB point 1 value*
10	Process Data 4 (LSB)		

The PROCESS DATA OUTPUT transparently becomes:

PROCESS DATA OUTPUT			
BYTE	**PARAMETER**	**DESCRIPTION**	
1	Process Data 0 (MSB)	Instrument status **STATUS_W**	
2	Process Data 0 (LSB)		
3	Process Data 1 (MSB)	Local SetPoint **_SP**	
4	Process Data 1 (LSB)		
5	Process Data 2 (MSB)	Alarm point 1 **AL.1**	*(0012) rw Alarm point 1 value*
6	Process Data 2 (LSB)		
7	Process Data 3 (MSB)	-----	
8	Process Data 3 (LSB)		
9	Process Data 4 (MSB)	Alarm point **A.HB**	*(0053) rw Alarm HB point 1 value*
10	Process Data 4 (LSB)		

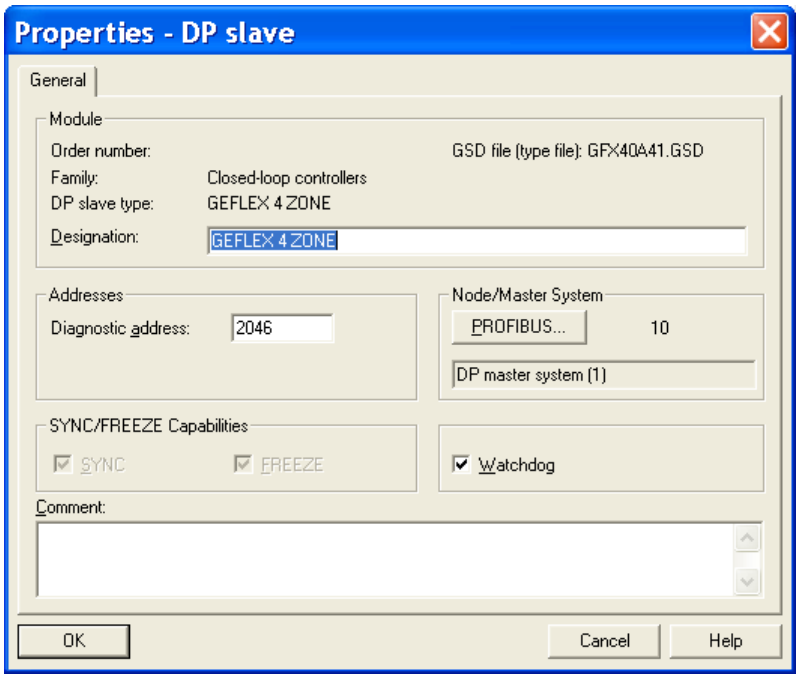
These data are cyclically entered in the data block assigned by use of the FC2 CFG-GFX4 (see Chapter 8).

Note:

INPUT AREA data are cyclically read by the GFX4s, while OUTPUT AREA data are written in the GFX4s only if the data are changed.

4.6.3 Standard slave diagnostics area

On the “HW Configuration” page, click on the GFX4 “Slave Properties” to identify the standard slave diagnostics area.



This area is legible with SFC 13 “DPNRM_DG.” See the Siemens Step 7 manual for operating instructions.

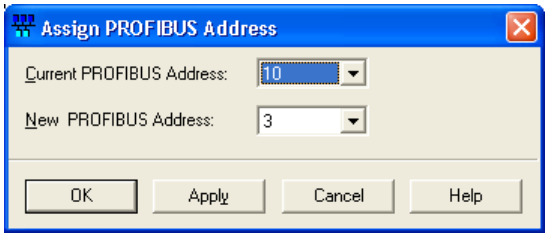
In addition to standard bytes, the slave provides extended diagnostic data with a word for GFX4, for a total of 20 bytes (10 words).

4.6.4 Changing node address

On the “SIMATIC Manager” home page, select the “PROFIBUS” function on the “PLC” menu to access the “Assign Profibus address” command, which lets you change the Profibus Slave address.

Check that the hardware installed for communication with the Profibus Master supports this function.

If you are uncertain of your network configuration, connect one Slave at a time and change their address.



Current PROFIBUS address:

Use this field to select one of the existing nodes.

New PROFIBUS address:

The new address is assigned to the above-selected node by means of this field

Address “125” resets the assignment of the node address by reading the rotary switch.

Note:

Connect the work station (PC or PG) cable directly to the GFX4 to which the address is assigned, without connection to the PLC PROFIBUS MASTER.

5 • PROFIBUS-DP GFX4-PROFIBUS “HIGH PERFORMANCE” DATA STRUCTURE

The data exchange structure managed by the GFX4 instruments is based on the number of devices connected via local bus to each MODBUS.

Therefore, the “Configuration Telegram” (SAP 62) has to contain the exact configuration (number of bytes, format, consistency) of the data exchanged during the “DATA EXCHANGE” (SAP DEFAULT) operating state.

By means of an area of 7 consistent bytes, always present, called Parametric Data, the Master device on the PROFIBUS network (PLC or Supervisor) can access any parameter of all the GFX4 instruments connected to the node.

By means of a second area (min. 32 bytes, max. 224 bytes), called Process Data, you can quickly acquire the value of 16 or 112 variables in read and write on the Modbus map of the devices.

With the “Parameterization Telegram” (SAP 61), the user can select the variables to attribute to the Process Data based on the application.

When the PROFIBUS Master requests diagnostics from the GFX4 by means of the “Diagnostics Data Request Telegram” (SAP 60), a 4-word area is transmitted, corresponding to one word for each GFX4 present on the GFX4-PROFIBUS node.

5.1 NODE ADDRESS CHANGE TELEGRAM (SAP 55)

Class 2 Profibus Masters can change Slave addresses via the “Set_Slave_Add” function.

BYTE	DESCRIPTION	VALUE (HEX)
1	New address	N
2	ID number (high byte)	0D
3	ID number (low byte)	74
4	Enable (00)\ Disable (01) additional changes	00

5.2 CONFIGURATION TELEGRAM (SAP 62)

The PROFIBUS Master sends this to all Slave nodes before entering “DATA EXCHANGE” status; in case of incorrect configuration, the GFX4 refuses communication with the Master.

There are eight possible configurations:

BYTE	**DESCRIPTION** (16 WORDS I/O FOR 1 GFX4)	VALUE (HEX)
1	7 consistent bytes	B6
2	16 input/output words zones 1-4	74

BYTE	**DESCRIPTION** (32 WORDS I/O FOR 1 GFX4)	VALUE (HEX)
1	7 consistent bytes	B6
2	16 input/output words zones 1-4	74
3	16 input/output words zones 1-4	74

BYTE	**DESCRIPTION** (16 WORDS I/O FOR 2 GFX4)	VALUE (HEX)
1	7 consistent bytes	B6
2	16 input/output words zones 1-4	74
3	16 input/output words zones 5-8	74

BYTE	**DESCRIPTION** (32 WORDS I/O FOR 2 GFX4)	VALUE (HEX)
1	7 consistent bytes	B6
2	16 input/output words zones 1-4	74
3	16 input/output words zones 1-4	74
4	16 input/output words zones 5-8	74
5	16 input/output words zones 5-8	74

BYTE	DESCRIPTION (16 WORDS I/O FOR 3 GFX4)	VALUE (HEX)
1	7 consistent bytes	B6
2	16 input/output words zones 1-4	74
3	16 input/output words zones 5-8	74
4	16 input/output words zones 9-12	74

BYTE	DESCRIPTION (32 WORDS I/O FOR 3 GFX4)	VALUE (HEX)
1	7 consistent bytes	B6
2	16 input/output words zones 1-4	74
3	16 input/output words zones 1-4	74
4	16 input/output words zones 5-8	74
5	16 input/output words zones 5-8	74
6	16 input/output words zones 9-12	74
7	16 input/output words zones 9-12	74

BYTE	DESCRIPTION (16 WORDS I/O FOR 4 GFX4)	VALUE (HEX)
1	7 consistent bytes	B6
2	16 input/output words zones 1-4	74
3	16 input/output words zones 5-8	74
4	16 input/output words zones 9-12	74
5	16 input/output words zones 13-16	74

BYTE	DESCRIPTION (32 WORDS I/O FOR 4 GFX4)	VALUE (HEX)
1	7 consistent bytes	B6
2	14 input/output words zones 1-4	7D
3	14 input/output words zones 1-4	7D
4	14 input/output words zones 5-8	7D
5	14 input/output words zones 5-8	7D
6	14 input/output words zones 9-12	7D
7	14 input/output words zones 9-12	7D
8	14 input/output words zonese 13-16	7D
9	14 input/output words zones 13-16	7D

5.3 PARAMETERIZATION TELEGRAM (SAP 61)

Before entering “DATA EXCHANGE” status, the PROFIBUS Master uses this protocol to identify itself with the GFX4 and specify its operating mode.

Part of the telegram consists of fixed data defined by the PROFIBUS standard (10 bytes) and part consists of data of variable length (minimum 70 bytes, maximum 134 bytes), because each module uses a different number of bytes based on the number of words to be transferred for each GFX4.

On the table, “**A**” indicates parameterization data for modules with 16 I/O words, and “**B**” indicates modules with 28 or 32 I/O words.

The telegram is composed by the Hardware Configuration Software of the PROFIBUS Master, which reads the information contained in the “**GSD**” file.

BYTE	BYTE	DESCRIPTION	DEFAULT	VALUE(HEX)
A	B			
1 ≈ 7	1 ≈ 7	CONFORMING TO STANDARD EN50170		
8	8	RESERVED		00
9	9	B		00
10	10	RESERVED		00
11	11	GSD VERSION		01
12	12	DATA TYPE	-	-
13	13	ERROR BEHAVIOUR	NONE	00
14	14	STARTUP DELAY (MSB)	3 SEC	0B
15	15	STARTUP DELAY (LSB)		B8
16	16	SWAP BYTES	NO	00
17	17	PROCESS DATA INPUT 1 MSB	CONTROLLER STATUS_S1	05
18	18	PROCESS DATA INPUT 1 LSB		D3
19	19	PROCESS DATA INPUT 2 MSB	CONTROLLER STATUS_S2	09
20	20	PROCESS DATA INPUT 2 LSB		D3
21	21	PROCESS DATA INPUT 3 MSB	CONTROLLER STATUS_S3	11
22	22	PROCESS DATA INPUT 3 LSB		D3
23	23	PROCESS DATA INPUT 4 MSB	CONTROLLER STATUS_S4	21
24	24	PROCESS DATA INPUT 4 LSB		D3
25	25	PROCESS DATA INPUT 5 MSB	P.V.1	04
26	26	PROCESS DATA INPUT 5 LSB		00
27	27	PROCESS DATA INPUT 6 MSB	P.V.2	08
28	28	PROCESS DATA INPUT 6 LSB		00
29	29	PROCESS DATA INPUT 7 MSB	P.V.3	10
30	30	PROCESS DATA INPUT 7 LSB		00
31	31	PROCESS DATA INPUT 8 MSB	P.V.4	20
32	32	PROCESS DATA INPUT 8 LSB		00
33	33	PROCESS DATA INPUT 9 MSB	ACTIVE SETPOINT VALUE 1	04
34	34	PROCESS DATA INPUT 9 LSB		01
35	35	PROCESS DATA INPUT 10 MSB	ACTIVE SETPOINT VALUE 2	08
36	36	PROCESS DATA INPUT 10 LSB		01
37	37	PROCESS DATA INPUT 11 MSB	ACTIVE SETPOINT VALUE 3	10
38	38	PROCESS DATA INPUT 11 LSB		01
39	39	PROCESS DATA INPUT 12 MSB	ACTIVE SETPOINT VALUE 4	20
40	40	PROCESS DATA INPUT 12 LSB		01
41	41	PROCESS DATA INPUT 13 MSB	AMMETER INPUT1 VALUE 1	05
42	42	PROCESS DATA INPUT 13 LSB		D4
43	43	PROCESS DATA INPUT 14 MSB	AMMETER INPUT1 VALUE 2	09
44	44	PROCESS DATA INPUT 14 LSB		D4
45	45	PROCESS DATA INPUT 15 MSB	AMMETER INPUT1 VALUE 3	11

BYTE	BYTE	DESCRIPTION	DEFAULT	VALUE (HEX)
A	B			
46	46	PROCESS DATA INPUT 15 LSB		D4
47	47	PROCESS DATA INPUT 16 MSB	AMMETER INPUT1 VALUE 4	21
48	48	PROCESS DATA INPUT 16 LSB		D4
-	49	PROCESS DATA INPUT 17 MSB	CONTROL OUTPUT VALUE 1	04
-	50	PROCESS DATA INPUT 17 LSB		02
-	51	PROCESS DATA INPUT 18 MSB	CONTROL OUTPUT VALUE 2	08
-	52	PROCESS DATA INPUT 18 LSB		02
-	53	PROCESS DATA INPUT 19 MSB	CONTROL OUTPUT VALUE 3	10
-	54	PROCESS DATA INPUT 19 LSB		02
-	55	PROCESS DATA INPUT 20 MSB	CONTROL OUTPUT VALUE 4	20
-	56	PROCESS DATA INPUT 20 LSB		02
-	57	PROCESS DATA INPUT 21 MSB	DIGITAL INPUT STATUS 1	05
-	58	PROCESS DATA INPUT 21 LSB		3D
-	59	PROCESS DATA INPUT 22 MSB	DIGITAL INPUT STATUS 2	09
-	60	PROCESS DATA INPUT 22 LSB		3D
-	61	PROCESS DATA INPUT 23 MSB	DIGITAL INPUT STATUS 3	11
-	62	PROCESS DATA INPUT 23 LSB		3D
-	63	PROCESS DATA INPUT 24 MSB	DIGITAL INPUT STATUS 4	21
-	64	PROCESS DATA INPUT 24 LSB		3D
-	65	PROCESS DATA INPUT 25 MSB	SELF/AUTOTUNING STATUS 1	05
-	66	PROCESS DATA INPUT 25 LSB		28
-	67	PROCESS DATA INPUT 26 MSB	SELF/AUTOTUNING STATUS 2	09
-	68	PROCESS DATA INPUT 26 LSB		28
-	69	PROCESS DATA INPUT 27 MSB	SELF/AUTOTUNING STATUS 3	11
-	70	PROCESS DATA INPUT 27 LSB		28
-	71	PROCESS DATA INPUT 28 MSB	SELF/AUTOTUNING STATUS 4	21
-	72	PROCESS DATA INPUT 28 LSB		28
-	73	PROCESS DATA INPUT 29 MSB	INSTRUMENT STATUS 1	05
-	74	PROCESS DATA INPUT 29 LSB	(NOT VALID FOR 28 WORDS)	D5
-	75	PROCESS DATA INPUT 30 MSB	INSTRUMENT STATUS 2	09
-	76	PROCESS DATA INPUT 30 LSB	(NOT VALID FOR 28 WORDS)	D5
-	77	PROCESS DATA INPUT 31 MSB	INSTRUMENT STATUS 3	11
-	78	PROCESS DATA INPUT 31 LSB	(NOT VALID FOR 28 WORDS)	D5
-	79	PROCESS DATA INPUT 32 MSB	INSTRUMENT STATUS 4	21
-	80	PROCESS DATA INPUT 32 LSB	(NOT VALID FOR 28 WORDS)	D5
49	81	PROCESS DATA OUTPUT 1 MSB	CONTROLLER STATUS_W 1	05
50	82	PROCESS DATA OUTPUT 1 LSB		31
51	83	PROCESS DATA OUTPUT 2 MSB	CONTROLLER STATUS_W 2	09
52	84	PROCESS DATA OUTPUT 2 LSB		31
53	85	PROCESS DATA OUTPUT 3 MSB	CONTROLLER STATUS_W 3	11
54	86	PROCESS DATA OUTPUT 3 LSB		31
55	87	PROCESS DATA OUTPUT 4 MSB	CONTROLLER STATUS_W 4	21
56	88	PROCESS DATA OUTPUT 4 LSB		31
57	89	PROCESS DATA OUTPUT 5 MSB	LOCAL SETPOINT VALUE 1	04

BYTE	BYTE	DESCRIPTION	DEFAULT	VALUE (HEX)
A	B			
58	90	PROCESS DATA OUTPUT 5 LSB		8A
59	91	PROCESS DATA OUTPUT 6 MSB	LOCAL SETPOINT VALUE 2	08
60	92	PROCESS DATA OUTPUT 6 LSB		8A
61	93	PROCESS DATA OUTPUT 7 MSB	LOCAL SETPOINT VALUE 3	10
62	94	PROCESS DATA OUTPUT 7 LSB		8A
63	95	PROCESS DATA OUTPUT 8 MSB	LOCAL SETPOINT VALUE 4	20
64	96	PROCESS DATA OUTPUT 8 LSB		8A
65	97	PROCESS DATA OUTPUT 9 MSB	CONTROL OUTPUT VALUE 1	04
66	98	PROCESS DATA OUTPUT 9 LSB		FC
67	99	PROCESS DATA OUTPUT 10 MSB	CONTROL OUTPUT VALUE 2	08
68	100	PROCESS DATA OUTPUT 10 LSB		FC
69	101	PROCESS DATA OUTPUT 11 MSB	CONTROL OUTPUT VALUE 3	10
70	102	PROCESS DATA OUTPUT 11 LSB		FC
71	103	PROCESS DATA OUTPUT 12 MSB	CONTROL OUTPUT VALUE 4	20
72	104	PROCESS DATA OUTPUT 12 LSB		FC
73	105	PROCESS DATA OUTPUT 13 MSB	ALARM POINT 1 VALUE 1	04
74	106	PROCESS DATA OUTPUT 13 LSB		0C
75	107	PROCESS DATA OUTPUT 14 MSB	ALARM POINT 1 VALUE 2	08
76	108	PROCESS DATA OUTPUT 14 LSB		0C
77	109	PROCESS DATA OUTPUT 15 MSB	ALARM POINT 1 VALUE 3	10
78	110	PROCESS DATA OUTPUT 15 LSB		0C
79	111	PROCESS DATA OUTPUT 16 MSB	ALARM POINT 1 VALUE 4	20
80	112	PROCESS DATA OUTPUT 16 LSB		0C
-	113	PROCESS DATA OUTPUT 17 MSB	ALARM POINT 2 VALUE 1	04
-	114	PROCESS DATA OUTPUT 17 LSB		0D
-	115	PROCESS DATA OUTPUT 18 MSB	ALARM POINT 2 VALUE 2	08
-	116	PROCESS DATA OUTPUT 18 LSB		0D
-	117	PROCESS DATA OUTPUT 19 MSB	ALARM POINT 2 VALUE 3	10
-	118	PROCESS DATA OUTPUT 19 LSB		0D
-	119	PROCESS DATA OUTPUT 20 MSB	ALARM POINT 2 VALUE 4	20
-	120	PROCESS DATA OUTPUT 20 LSB		0D
-	121	PROCESS DATA OUTPUT 21 MSB	ALARM POINT 3 VALUE 1	04
-	122	PROCESS DATA OUTPUT 21 LSB		0E
-	123	PROCESS DATA OUTPUT 22 MSB	ALARM POINT 3 VALUE 2	08
-	124	PROCESS DATA OUTPUT 22 LSB		0E
-	125	PROCESS DATA OUTPUT 23 MSB	ALARM POINT 3 VALUE 3	10
-	126	PROCESS DATA OUTPUT 23 LSB		0E
-	127	PROCESS DATA OUTPUT 24 MSB	ALARM POINT 3 VALUE 4	20
-	128	PROCESS DATA OUTPUT 24 LSB		0E
-	129	PROCESS DATA OUTPUT 25 MSB	ALARM POINT 4 VALUE 1	04
-	130	PROCESS DATA OUTPUT 25 LSB		3A
-	131	PROCESS DATA OUTPUT 26 MSB	ALARM POINT 4 VALUE 2	08
-	132	PROCESS DATA OUTPUT 26 LSB		3A
-	133	PROCESS DATA OUTPUT 27 MSB	ALARM POINT 4 VALUE 3	10
-	134	PROCESS DATA OUTPUT 27 LSB		3A
-	135	PROCESS DATA OUTPUT 28 MSB	ALARM POINT 4 VALUE 4	20

BYTE	BYTE	DESCRIPTION	DEFAULT	VALUE (HEX)
A	B			
-	136	PROCESS DATA OUTPUT 28 LSB		3A
-	137	PROCESS DATA OUTPUT 29 MSB	ALARM HB INPUT1 VALUE 1	04
-	138	PROCESS DATA OUTPUT 29 LSB	(NOT VALID FOR 28 WORDS)	37
-	139	PROCESS DATA OUTPUT 30 MSB	ALARM HB INPUT1 VALUE 2	08
-	140	PROCESS DATA OUTPUT 30 LSB	(NOT VALID FOR 28 WORDS)	37
-	141	PROCESS DATA OUTPUT 31 MSB	ALARM HB INPUT1 VALUE 3	10
-	142	PROCESS DATA OUTPUT 31 LSB	(NOT VALID FOR 28 WORDS)	37
-	143	PROCESS DATA OUTPUT 32 MSB	ALARM HB INPUT1 VALUE 4	20
-	144	PROCESS DATA OUTPUT 32 LSB	(NOT VALID FOR 28 WORDS)	37

The “**GSD Version**” value is fixed in the GSD file and cannot be changed. The FW uses it to identify the GSD file version used by the PLC application SW used to configure the board to guarantee functional compatibility.

“**Data Type**” defines how many temperature control zones and how many Process Data variables to use for that Profibus node. It has to match the number read by the FW during initialization of the MODBUS network, otherwise Profibus communication will not be activated.

“**Error Behavior**” defines how the temperature controllers must behave in case of interruption of Profibus communication (see previous paragraph).

“**Startup Delay**” is the delay (in msec) after which Output Process Data actually start to transmit to the temperature controllers after switching to “DATA EXCHANGE” status (see previous paragraph).

The “**Swap bytes**” parameter lets you reverse the position of the MSB byte with LSB in the Process Data to facilitate the interpretation of values by different PLCs (YES=SIEMENS STEP7).

“**Process Data Input**” and “Process Data Output..” configure which temperature controller variables you want to communicate to the PLC with the “Data Exchange Telegram” (SAP DEFAULT)

5.4 DIAGNOSTICS DATA REQUEST TELEGRAM (SAP 60)

When the PROFIBUS Master requests diagnostics information from GFX4-PROFIBUS, it responds with 6 standard information bytes and 9 specific bytes for all GFX4 instruments connected to the PROFIBUS node.

BYTE	DESCRIPTION	VALUE (HEX)
1 ≈ 6	CONFORMING TO STANDARD EN50170	-
7	LENGTH OF EXTERNAL DIAGNOSTICS	9
8	MSB EXTERNAL DIAGNOSTICS GFX4 1	XX
9	LSB EXTERNAL DIAGNOSTICS GFX4 1	XX
10	MSB EXTERNAL DIAGNOSTICS GFX4 2	XX
11	LSB EXTERNAL DIAGNOSTICS GFX4 2	XX
12	MSB EXTERNAL DIAGNOSTICS GFX4 3	XX
13	LSB EXTERNAL DIAGNOSTICS GFX4 3	XX
14	MSB EXTERNAL DIAGNOSTICS GFX4 4	XX
15	LSB EXTERNAL DIAGNOSTICS GFX4 4	XX

In which :

XX	TEXT	DESCRIPTION
00	-	NO ACTIVE ALARM
01	DEVICE “N” TIMEOUT	NO MODBUS COMMUNICATION WITH GFX4
02	DEVICE “N” UNKNOWN	DEVICE UNKNOWN
04	DEVICE “N” SETTING	INCORRECT GFX4 DIP SWITCH
08	DEVICE “N” WRITE ERROR	INCORRECT WRITTEN VALUE

N.B. :
The specific diagnostics for each zone (Active alarms, probe fault, HB, etc.) has to be managed by the PLC by reading the Modbus “Instrumentation Status 1” variables via FB “OPGEFLEX” for the Parametric Data, or by selecting such variables in the Process Data via initial configuration.

5.5 DATA EXCHANGE (SAP DEFAULT)

After checking the correct configuration and parameterization of the GFX4-PROFIBUS by means of the telegrams seen above, the PROFIBUS Master activates the “DATA EXCHANGE” protocol in which it cyclically sends some output bytes to and reads some input bytes from the PROFIBUS Slaves.

The number of I/O bytes depends on the number of instruments connected via MODBUS subnetwork: an area of 7 bytes (always present in all configurations), represents “**Parametric Data**,” while the “**Process Data**” area varies from a minimum of 32 bytes to a maximum of 224 bytes, divided into blocks of 32, 56, or 64 bytes (based on the selected configuration) for each GFX4 zone controlled by the GFX4-PROFIBUS node.

OUTPUT DATA (from PROFIBUS Master to Slave)

PARAMETRIC DATA “REQUEST”							PROCESS DATA																			
							GFX4 - 1								≈	GFX4 - 4										
							WORD 1		*WORD 2*		*WORD 3*		*WORD 4*			*WORD 109*		*WORD 110*		*WORD 111*		*WORD 112*				
							LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB		LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB			
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	≈	**224**	**225**	**226**	**227**	**228**	**229**	**230**	**231**			

INPUT DATA (from PROFIBUS Slave to Master)

PARAMETRIC DATA “REPLY”							PROCESS DATA																			
							GFX4 - 1								≈	GFX4 - 4										
							WORD 1		*WORD 2*		*WORD 3*		*WORD 4*			*WORD 109*		*WORD 110*		*WORD 111*		*WORD 112*				
							LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB		LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB			
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	≈	**224**	**225**	**226**	**227**	**228**	**229**	**230**	**231**			

“Parametric Data” are “consistent” data that let you read or write any MODBUS variable, either in bit format or in word format, present in the GFX4 devices connected to the PROFIBUS node.

PARAMETRIC DATA

BYTE	PARAMETER	DESCRIPTION
1	TRG	TRIGGER BYTE: must be incremented by 1 with each new Request. The Response will be correct only when value is equal.
2	ADD SLAVE	MODBUS ADDRESS OF GFX4 PRESENT ON PROFIBUS NODE
3	FC	FUNCTION CODE TO SPECIFY PROCEDURE: BIT/WORD READ/WRITE
4	DATO 1	DEPENDS ON FUNCTION CODE
5	DATO 2	DEPENDS ON FUNCTION CODE
6	DATO 3	DEPENDS ON FUNCTION CODE
7	DATO 4	DEPENDS ON FUNCTION CODE

5.5.1 Parametric data: reading a Bit

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	NB MSB	NB LSB
Trigger	Slave Address	1 or 2	Address of Bit to read	Address of Bit to read	Number of bit to read. (always 00)	Number of bit to read. (always 01)

Reply bytes

TRG	ADD SLAVE	FC	NB	BIT	#	#
Reply to trigger set	Confirm Slave address	Confirm op. code (1 or 2	Number of bytes read (always 1)	Bit value: 0 o FF	Empty	Empty

5.5.2 Parametric data: reading a word

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	NW MSB	NW LSB
Trigger	Slave Address	3 or 4	Address of word to read	Address of word to read	Number of word to read (always 00)	Number of word to read (always 01)

Reply bytes

TRG	ADD SLAVE	FC	NB	W MSB	W LSB	#
Reply to trigger set	Confirm Slave address	Confirm procedure code	Number of bytes read (always 2)	Msb word value	Lsb word value	Empty

5.5.3 Parametric data: writing a bit

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	BIT	00
Trigger	Slave Address	5	Address of Bit to write	Address of Bit to write	Value of bit to write (00 or FF)	Always 00

Reply bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB Bit	BIT	00
Reply to trigger set	Confirm Slave address	Confirm procedure code	address written	address written	Value of bit written (00 or FF)	Always 00

5.5.4 Parametric data: writing a word

Request bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	W MSB	W LSB
Trigger	Slave Address	6	Address of word to write	Address of word to write	Value of word to write.	Value of word to write.

Reply bytes

TRG	ADD SLAVE	FC	ADD MSB	ADD LSB	W MSB	W LSB
Reply to trigger set	Confirm Slave address	Confirm procedure code	Address of word written	Address of word written	Msb value of word written	Lsb value of word written

In case of error, 80 hex plus the request procedure code will be returned in place of the procedure code.
The error code will be shown in the CODE field.

Reply bytes

TRG	ADD SLAVE	FC	CODE	#	#	#
Reply to trigger set	Confirm Slave address	Procedure code + 80hex	Error code	Empty	Empty	Empty

5.5.5 Error codes

1 = Illegal function	3 = Illegal data value	9 = Illegal number data
2 = Illegal data address	6 = Slave device busy	10 = Read only data

5.5.6 Process data

As described above, the Process Data in this mode represent the MODBUS variables configured via Parameterization Telegram. Each configured GFX4/GFXTERMO4/GFX4-IR occupies 16, 24, or 32 words of the Process Data area, based on the selection made.
On the table, "**A**" indicates Process Data for modules with 16 I/O words, "**B**" indicates modules with 28 I/O words, and "**C**" indicates modules with 32 I/O words.

BYTES	BYTES	BYTES	PROCESS DATA INPUT	PROCESS DATA OUTPUT
A	B	C		
1	1	1	PROCESS DATA INPUT 1 MSB - GFX4 1	PROCESS DATA OUTPUT 1 MSB - GFX4 1
2	2	2	PROCESS DATA INPUT 1 LSB - GFX4 1	PROCESS DATA OUTPUT 1 LSB - GFX4 1
≈	≈	≈	≈	≈
31	31	31	PROCESS DATA INPUT 16 MSB - GFX4 1	PROCESS DATA OUTPUT 16 MSB - GFX4 1
32	32	32	PROCESS DATA INPUT 16 LSB - GFX4 1	PROCESS DATA OUTPUT 16 LSB - GFX4 1
-	33	33	PROCESS DATA INPUT 17 MSB - GFX4 1	PROCESS DATA OUTPUT 17 MSB - GFX4 1
-	34	34	PROCESS DATA INPUT 17 LSB - GFX4 1	PROCESS DATA OUTPUT 17 LSB - GFX4 1
≈	≈	≈	≈	≈
-	55	55	PROCESS DATA INPUT 28 MSB - GFX4 1	PROCESS DATA OUTPUT 28 MSB - GFX4 1
-	56	56	PROCESS DATA INPUT 28 LSB - GFX4 1	PROCESS DATA OUTPUT 28 LSB - GFX4 1
-	-	57	PROCESS DATA INPUT 29 MSB - GFX4 1	PROCESS DATA OUTPUT 29 MSB - GFX4 1
-	-	58	PROCESS DATA INPUT 29 LSB - GFX4 1	PROCESS DATA OUTPUT 29 LSB - GFX4 1
≈	≈	≈	≈	≈
-	-	63	PROCESS DATA INPUT 32 MSB - GFX4 1	PROCESS DATA OUTPUT 32 MSB - GFX4 1
-	-	64	PROCESS DATA INPUT 32 LSB - GFX4 1	PROCESS DATA OUTPUT 32 LSB - GFX4 1
33	57	65	PROCESS DATA INPUT 1 MSB - GFX4 2	PROCESS DATA OUTPUT 1 MSB - GFX4 2
34	58	66	PROCESS DATA INPUT 1 LSB - GFX4 2	PROCESS DATA OUTPUT 1 LSB - GFX4 2
≈	≈	≈	≈	≈
63	87	95	PROCESS DATA INPUT 16 MSB - GFX4 2	PROCESS DATA OUTPUT 16 MSB - GFX4 2
64	88	96	PROCESS DATA INPUT 16 LSB - GFX4 2	PROCESS DATA OUTPUT 16 LSB - GFX4 2
-	89	97	PROCESS DATA INPUT 17 MSB - GFX4 2	PROCESS DATA OUTPUT 17 MSB - GFX4 2
-	90	98	PROCESS DATA INPUT 17 LSB - GFX4 2	PROCESS DATA OUTPUT 17 LSB - GFX4 2
≈	≈	≈	≈	≈
-	111	119	PROCESS DATA INPUT 28 MSB - GFX4 2	PROCESS DATA OUTPUT 28 MSB - GFX4 2
-	112	120	PROCESS DATA INPUT 28 LSB - GFX4 2	PROCESS DATA OUTPUT 28 LSB - GFX4 2
-	-	121	PROCESS DATA INPUT 29 MSB - GFX4 2	PROCESS DATA OUTPUT 29 MSB - GFX4 2
-	-	122	PROCESS DATA INPUT 29 LSB - GFX4 2	PROCESS DATA OUTPUT 29 LSB - GFX4 2
≈	≈	≈	≈	≈
-	-	127	PROCESS DATA INPUT 32 MSB - GFX4 2	PROCESS DATA OUTPUT 32 MSB - GFX4 2
-	-	128	PROCESS DATA INPUT 32 LSB - GFX4 2	PROCESS DATA OUTPUT 32 LSB - GFX4 2
65	113	129	PROCESS DATA INPUT 1 MSB - GFX4 3	PROCESS DATA OUTPUT 1 MSB - GFX4 3
66	114	130	PROCESS DATA INPUT 1 LSB - GFX4 3	PROCESS DATA OUTPUT 1 LSB - GFX4 3
≈	≈	≈	≈	≈
95	143	159	PROCESS DATA INPUT 16 MSB - GFX4 3	PROCESS DATA OUTPUT 16 MSB - GFX4 3
96	144	160	PROCESS DATA INPUT 16 LSB - GFX4 3	PROCESS DATA OUTPUT 16 LSB - GFX4 3
-	145	161	PROCESS DATA INPUT 17 MSB - GFX4 3	PROCESS DATA OUTPUT 17 MSB - GFX4 3
-	146	162	PROCESS DATA INPUT 17 LSB - GFX4 3	PROCESS DATA OUTPUT 17 LSB - GFX4 3
≈	≈	≈	≈	≈
-	167	183	PROCESS DATA INPUT 28 MSB - GFX4 3	PROCESS DATA OUTPUT 28 MSB - GFX4 3
-	168	184	PROCESS DATA INPUT 28 LSB - GFX4 3	PROCESS DATA OUTPUT 28 LSB - GFX4 3

BYTES	BYTES	BYTES	PROCESS DATA INPUT	PROCESS DATA OUTPUT
A	B	C		
-	-	185	PROCESS DATA INPUT 29 MSB - GFX4 3	PROCESS DATA OUTPUT 29 MSB - GFX4 3
-	-	186	PROCESS DATA INPUT 29 LSB - GFX4 3	PROCESS DATA OUTPUT 29 LSB - GFX4 3
≈	≈	≈	≈	≈
-	-	191	PROCESS DATA INPUT 32 MSB - GFX4 3	PROCESS DATA OUTPUT 32 MSB - GFX4 3
-	-	192	PROCESS DATA INPUT 32 LSB - GFX4 3	PROCESS DATA OUTPUT 32 LSB - GFX4 3
97	169	-	PROCESS DATA INPUT 1 MSB - GFX4 4	PROCESS DATA OUTPUT 1 MSB - GFX4 4
98	170	-	PROCESS DATA INPUT 1 LSB - GFX4 4	PROCESS DATA OUTPUT 1 LSB - GFX4 4
≈	≈	≈	≈	≈
127	199	-	PROCESS DATA INPUT 16 MSB - GFX4 4	PROCESS DATA OUTPUT 16 MSB - GFX4 4
128	200	-	PROCESS DATA INPUT 16 LSB - GFX4 4	PROCESS DATA OUTPUT 16 LSB - GFX4 4
-	201	-	PROCESS DATA INPUT 17 MSB - GFX4 4	PROCESS DATA OUTPUT 17 MSB - GFX4 4
-	202	-	PROCESS DATA INPUT 17 LSB - GFX4 4	PROCESS DATA OUTPUT 17 LSB - GFX4 4
≈	≈	≈	≈	≈
-	223	-	PROCESS DATA INPUT 28 MSB - GFX4 4	PROCESS DATA OUTPUT 28 MSB - GFX4 4
-	224	-	PROCESS DATA INPUT 28 LSB - GFX4 4	PROCESS DATA OUTPUT 28 LSB - GFX4 4

5.6 USING GFX4-PROFIBUS “HIGH PERFORMANCE” WITH SIEMENS STEP7

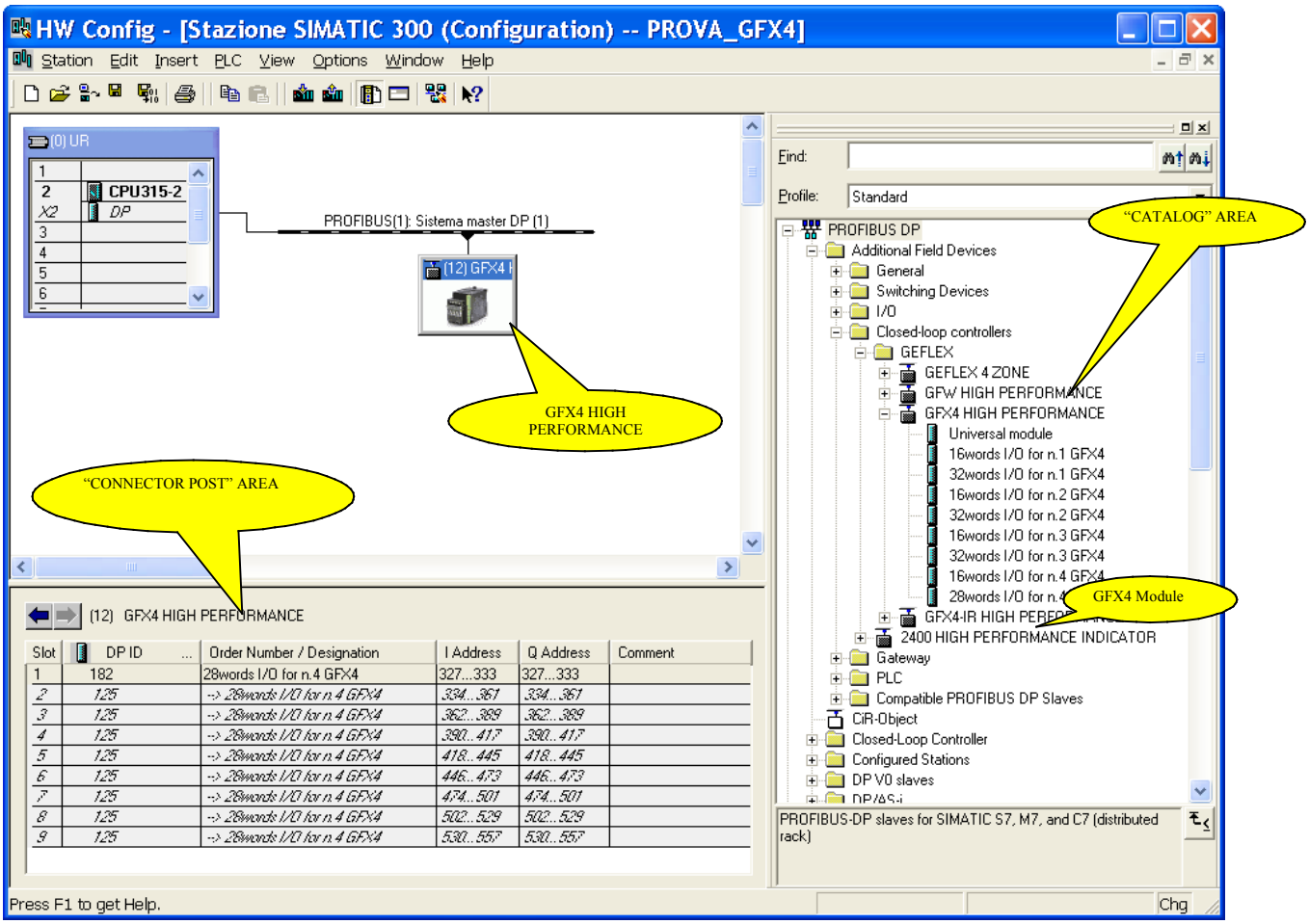
5.6.1 Configuration

The “.GSD” files contain the information needed to manage a rack of GFX4/GFXTERMO4 /GFX4-IR as Slaves in PROFIBUS DP.

These files must be installed in SIEMENS Step7 programming environment in order to insert the GFX4 PROFIBUS devices in the PROFIBUS network hardware configuration.

We define “rack” as a PROFIBUS node composed of a GFX4 PROFIBUS connected with GFX4 MODBUS Slaves.

1. Open the hardware configuration for the project
2. Select Station/Close on the menu
3. Select Tools/Install new GSD file
4. In the window that appears, look for the file on the device where it is saved (Floppy or Hard Disk)
5. Press Open.
6. The item “**GFX4 HIGH PERFORMANCE**” has now been added to the catalog if you have installed the ”GFXH0D74.gsd” file, or the item “**GFX4-IR HIGH PERFORMANCE**” if you have installed the”GFXH0D75.gsd” file. To find it, expand the folder “Profibus,” then expand “Other field devices,” then “Controller,” then “GEFLEX.”
7. Reopen the configuration of the project station
8. Drag the device icon with the mouse and drop it on the line of the PROFIBUS bus of the project. A new Profibus Slave will be created.
9. Assign the PROFIBUS node to the new slave. The PROFIBUS node must be consistent with the one set with the rotary switches on the GFX4.
10. Based on the number of temperature control zones connected to the same GFX4-PROFIBUS node, drag the GFX4 Module with the number of words required to the “Connector Post” area of the device. The peripheral memory areas used by the device for Process Data exchange will be assigned automatically.



The first 7 I/O bytes (ID 182) are called “Consistent;” in the figure, they correspond to addresses PEB 256 ... PEB 262; PAB 256 ... PAB 262 and represent “Parametric data.”

The next 224 bytes (PEB263..PEB486 and PAB263..PAB294) represent “Process Data,” divided into 56 bytes per zone (addresses PEW 263 .. PEW 318 for the first zone, PEW 319 .. PEW 374 for the second zone; etc.).

Note:

Always check that the Hardware configurator has assigned contiguous memory addresses for all the rack zones. In case of “holes” or jumps, manually assign the first address to a zone known to be free.

The E addresses (inputs) must be the same as the A addresses (output).

During GFX4 hardware configuration, it is useful to reserve the memory area for a maximum of 16 usable zones for each rack.

Example:

The most common case is when you want to add a GFX4 to an already-configured rack.

To do this, you have to delete the configured rack and enter the new one (for example we have to replace “16 I/O words for 1 GFX4” with “16 I/O words for 2 GFX4”.

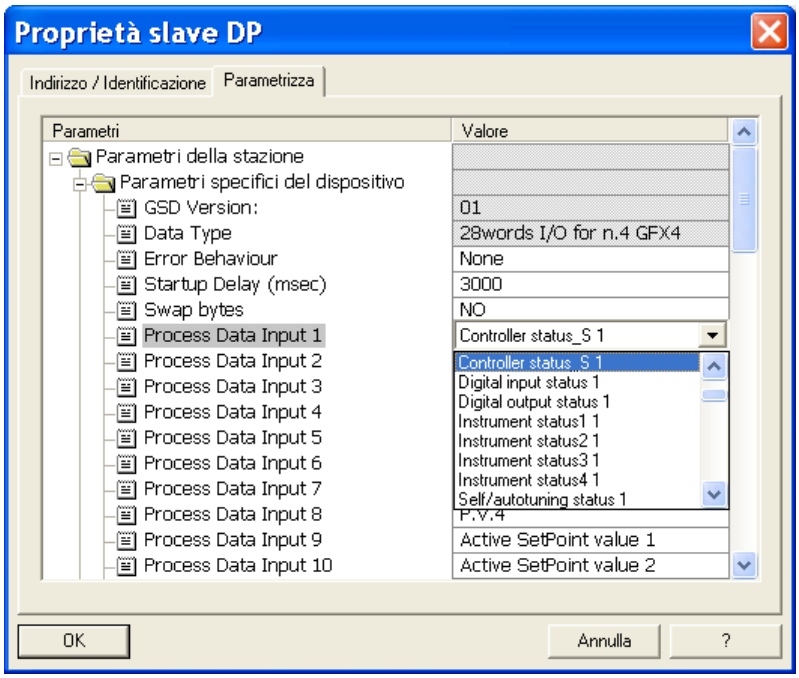
If there are other configured Profibus slaves, i.e. with assigned memory areas, the system will distribute the memory of the newly inserted rack by mapping the first 4 zones of the rack and the common area (consistent) in the same original addresses and the added GFX4 in a free area immediately following the one of the other configured slaves.

In this way we create a discontinuity in the memory area that prevents the FC3 “CFG-GFX4-HP” from distributing the area bytes in the assigned data block..

To avoid this problem, when positioning the new rack, manually edit the address of the first memory byte assigned by double clicking the object and assigning it (for example) the address of the first free byte after all the other configured slaves.

5.6.2 Parameterization

On the hardware configuration page, by selecting the properties of the DP slave, you can also select the Process Data preferred by the user.



As seen above, you can assign a Modbus Memory Map variable on the pull-down menu to each of the 16, 28, or 32 input and output words available for each device. This configuration applies to the Process Data of each GFX4 connected via Modbus subnetwork.

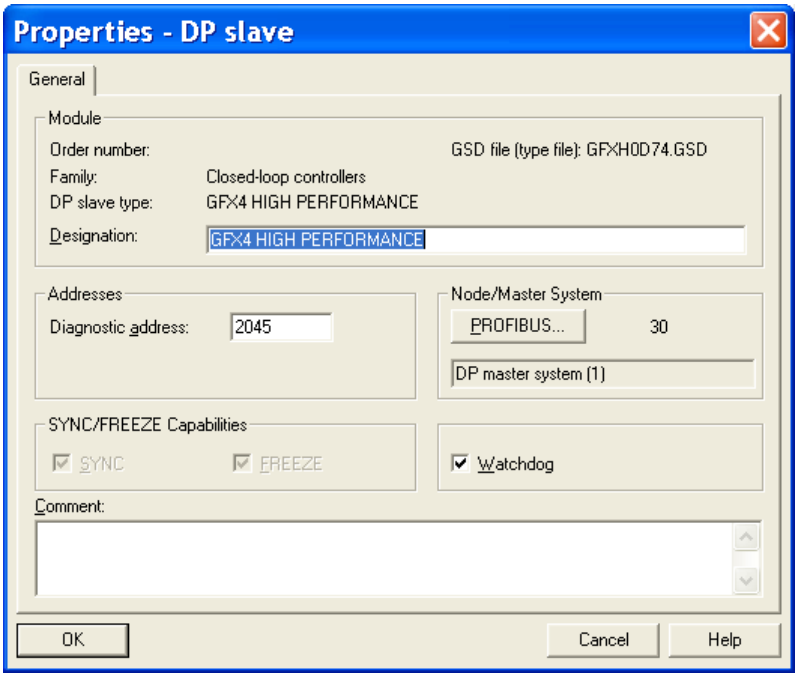
These data are cyclically entered in the data block assigned by use of the FC3 CFG-GFX4-HP (see Chapter 8).

Note:

INPUT AREA data are cyclically read by the GFX4s, while OUTPUT AREA data are written only if the data are changed.

5.6.3 Standard slave diagnostics area

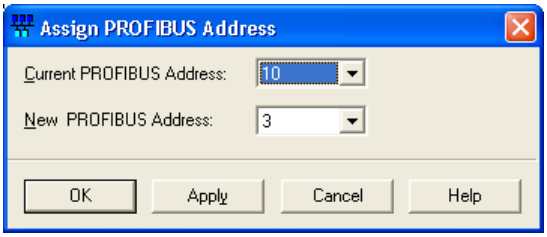
Click on “Slave Properties” to identify the standard slave diagnostics area.



This area is legible with SFC 13 “DPNRM_DG.” See the Siemens Step 7 manual for operating instructions.
In addition to standard bytes, the slave provides extended diagnostic data with a word for GFX4, for a total of 16 bytes (8 words).

5.6.4 Changing node address

On the “SIMATIC Manager” home page, select the “PROFIBUS” function on the “PLC” menu to access the “Assign Profibus address” command, which lets you change the Profibus Slave address.
Check that the hardware installed for communication with the Profibus Master supports this function.
If you are uncertain of your network configuration, connect one Slave at a time and change their address.



Current PROFIBUS address:
Use this field to select one of the existing nodes.

New PROFIBUS address:
The new address is assigned to the above-selected node by means of this field.

Address “125” resets the assignment of the node address by reading the rotary switch

Note:
Connect the work station (PC or PG) cable directly to the GFX4 to which the address is assigned, without connection to the PLC PROFIBUS MASTER.

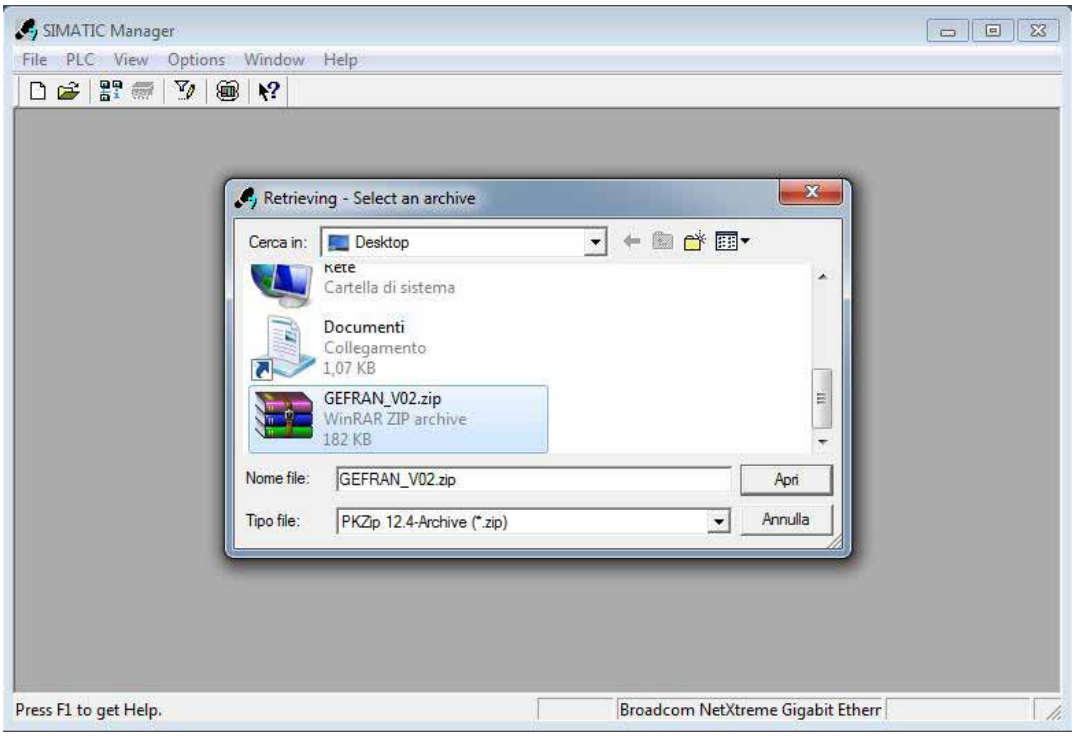
6 • LIBRARIES

6.1 INSTALLATION

GEFRAN S.p.A. supplies a series of library files to facilitate the installation and management of process data for GEFLEX and GFX4 products in SIEMENS STEP7 environment.

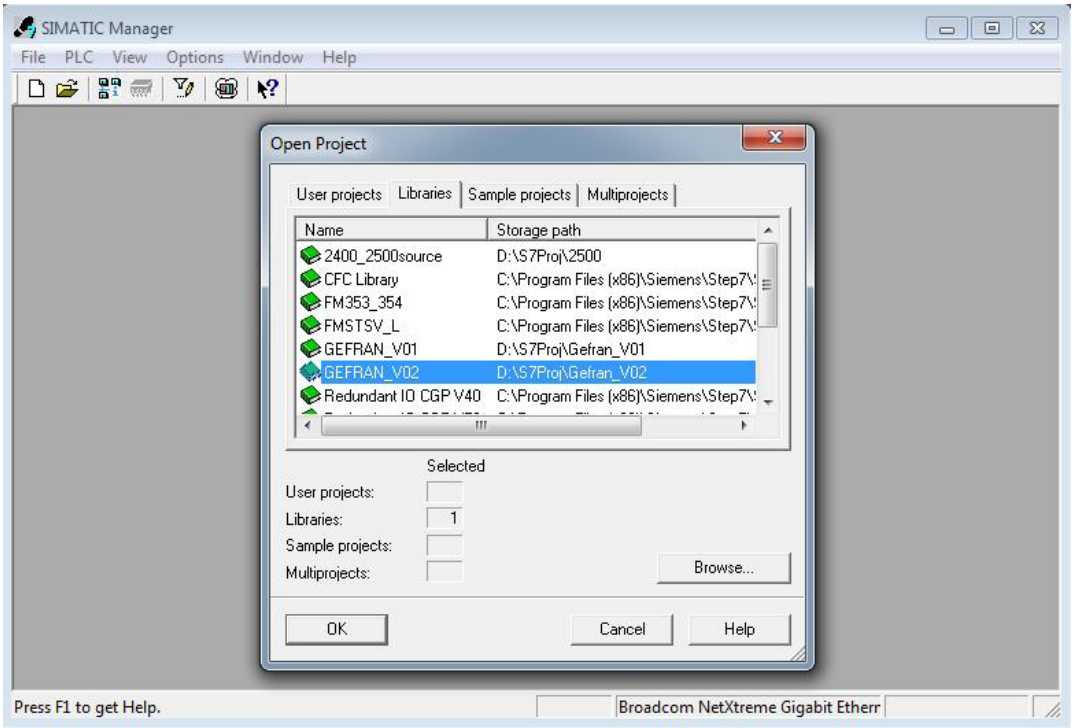
These libraries are contained in a compressed file (Gefran.zip) on the CD enclosed with the products or downloadable from www.gefran.it .

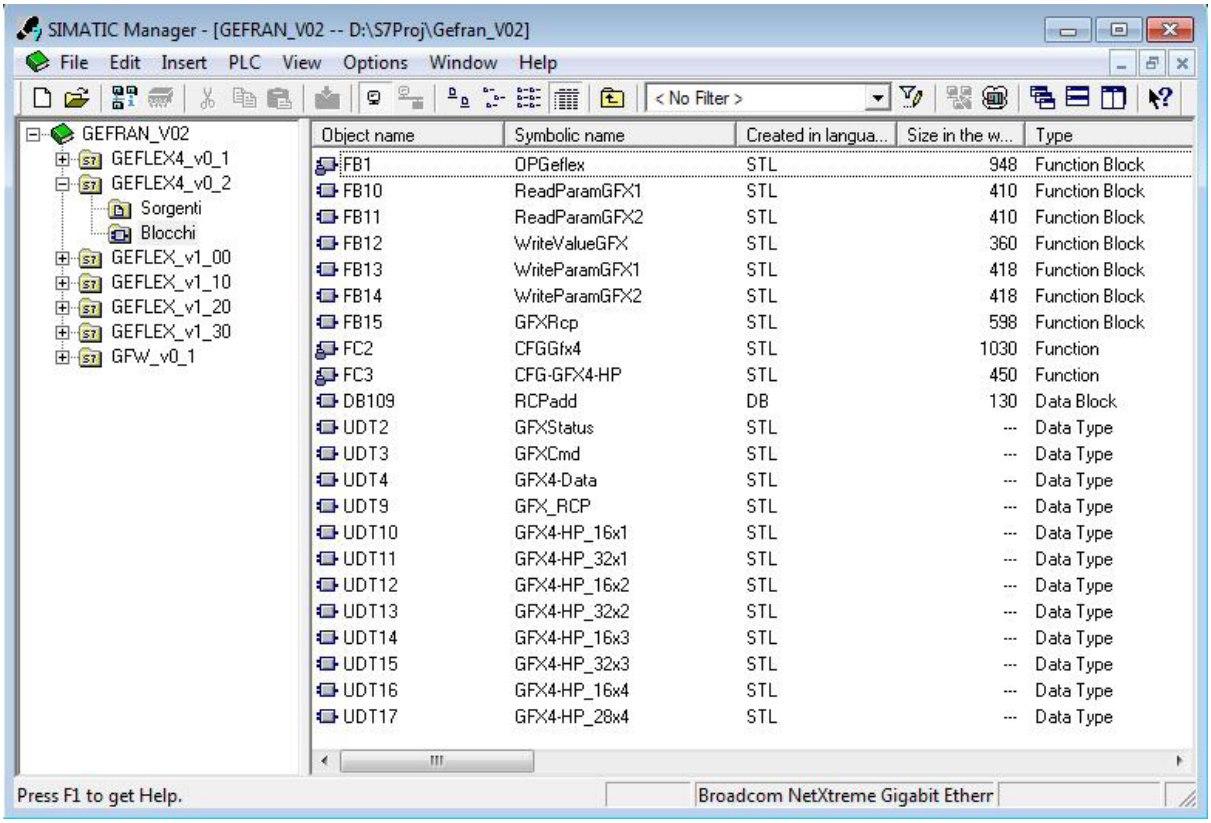
After launching “SIMATIC Manager,” select the “Retrieve” command on the “File” pull-down menu and open the “Gefran.zip” file from the folder to which it was copied.



Then select the destination folder in “..STEP7/S7Proj.”

When file extraction is done, select “Open project” on the “File” pull-down menu and open the “Libraries” folder to see the “GEFRAN” library, with contains the historical file of libraries for GEFLEX devices and for GEFLEX4 (GFX4/GFX4-IR).





The version that manages GFX4 in both “BRIDGE” and “HIGH PERFORMANCE” is “GEFLEX4_v0_2.” It contains Function Blocks, Data Blocks, and Functions:

OBJECT	MODE	DESCRIPTION
FB1	BOTH	FUNCTION BLOCK TO MANAGE GFX4 PARAMETERS
FB10	BOTH	FUNCTION BLOCK TO READ A PARAMETER OF MULTIPLE GFX4 IN A DB
FB11	BOTH	FUNCTION BLOCK TO READ A PARAMETER OF MULTIPLE GFX4 IN MULTIPLE DB
FB12	BOTH	FUNCTION BLOCK TO WRITE A PARAMETER OF MULTIPLE GFX4 FROM A DB
FB14	BOTH	FUNCTION BLOCK TO WRITE A PARAMETER OF MULTIPLE GFX4 FROM MULTIPLE DB
FB15	BOTH	FUNCTION BLOCK TO MANAGE GFX4 PARAMETER RECIPES
FC2	BRIDGE	MANAGEMENT OF GFX4 PROCESS DATA AREA
FC3	HIGH PERFORMANCE	MANAGEMENT OF GFX4 PROCESS DATA AREA
UDT2	BRIDGE	DATA TYPE FOR READING GFX4 DIAGNOSTICS BIT
UDT3	BRIDGE	DATA TYPE FOR WRITING OPERATIVE COMMANDS TO GFX4
UDT4	BRIDGE	DATA TYPE FOR MANAGING GFX4 PROCESS DATA
UDT9	BOTH	DATA TYPE FOR RECIPE MANAGEMENT WITH FB15
UDT10	HIGH PERFORMANCE	DATA TYPE FOR MANAGING GFX4 PROCESS DATA 16 WORDS FOR 1 GFX4
UDT11	HIGH PERFORMANCE	DATA TYPE FOR MANAGING GFX4 PROCESS DATA 32WORDS FOR 1 GFX4
UDT12	HIGH PERFORMANCE	DATA TYPE FOR MANAGING GFX4 PROCESS DATA 16WORDS FOR 2 GFX4
UDT13	HIGH PERFORMANCE	DATA TYPE FOR MANAGING GFX4 PROCESS DATA 32WORDS FOR 2 GFX4
UDT14	HIGH PERFORMANCE	DATA TYPE FOR MANAGING GFX4 PROCESS DATA 16WORDS FOR 3 GFX4
UDT15	HIGH PERFORMANCE	DATA TYPE FOR MANAGING GFX4 PROCESS DATA 32WORDS FOR 3 GFX4
UDT16	HIGH PERFORMANCE	DATA TYPE FOR MANAGING GFX4 PROCESS DATA 16WORDS FOR 4 GFX4
UDT17	HIGH PERFORMANCE	DATA TYPE FOR MANAGING GFX4 PROCESS DATA 28WORDS FOR 4 GFX4
DB109	BOTH	EXAMPLE OF DATA BLOCK FOR MANAGING RECIPES FROM UDT9

N.B. :
Insert OB82 (even if empty) in the project to manage peripheral diagnostics.
The GFX4 uses standard Profibus slave diagnostics; without OB82, if diagnostics messages are present, the CPU will stop.

6.2 DATA TYPES

6.2.1 UDT2 “GFXStatus” (USER DATA TYPE) “BRIDGE” mode only

The UDT creates the “DBx” data block, in which the Status word of the GFX4s expressed in bits is read.

ADDRESS	NAME	DESCRIPTION
DBX.DBX0.0	AL1	ALARM AL1 ACTIVE
DBX.DBX0.1	AL2	ALARM AL2 ACTIVE
DBX.DBX0.2	AL3	ALARM AL3 ACTIVE
DBX.DBX0.3	AL4	ALARM AL4 ACTIVE
DBX.DBX0.4	ALHB	ALARM ALHB ACTIVE
DBX.DBX0.5	OFF	OFF STATUS ACTIVE
DBX.DBX0.6	MAN	MAN STATUS ACTIVE
DBX.DBX0.7	REM	REM SETPOINT ACTIVE
DBX.DBX1.0	ALL	AL1, AL2, AL3, AL4 OR ALHB ACTIVE
DBX.DBX1.1	ALLO	ALARM PROBE INPUT LOW ACTIVE
DBX.DBX1.2	ALHI	ALARM PROBE INPUT HI ACTIVE
DBX.DBX1.3	ALERR	ALARM PROBE INPUT ERR ACTIVE
DBX.DBX1.4	ALSBR	ALARM PROBE INPUT SBR ACTIVE
DBX.DBX1.5	HEATING	HEATING ACTIVE
DBX.DBX1.6	COOLING	COOLING ACTIVE
DBX.DBX1.7	ALLBA	ALARM LBA ACTIVE

6.2.2 UDT3 “GFXCmd” (USER DATA TYPE) “BRIDGE” mode only

You can write the GFX4 Command word expressed in bits in the resulting “DBx” data block.

ADDRESS	NAME	DESCRIPTION
DBX.DBX0.0	RESERVED00	RESERVED
DBX.DBX0.1	RESERVED01	RESERVED
DBX.DBX0.2	RESERVED02	RESERVED
DBX.DBX0.3	RESERVED03	RESERVED
DBX.DBX0.4	RESERVED04	RESERVED
DBX.DBX0.5	RESERVED05	RESERVED
DBX.DBX0.6	RESERVED06	RESERVED
DBX.DBX0.7	RESERVED07	RESERVED
DBX.DBX1.0	RESERVED08	RESERVED
DBX.DBX1.1	SP2	SP2 ACTIVATION COMMAND
DBX.DBX1.2	SELFTUNING	START SELFTUNING COMMAND
DBX.DBX1.3	OFF	OFF MODE COMMAND
DBX.DBX1.4	MAN	MAN MODE COMMAND
DBX.DBX1.5	AUTOTUNING	START AUTOTUNING COMMAND
DBX.DBX1.6	REM	REM SETPOINT COMMAND
DBX.DBX1.7	RESERVED09	RESERVED

6.2.3 UDT4 “GFX4_Data” (USER DATA TYPE) “BRIDGE” mode only

The resulting “DBx” data block will contain the entire Process Data exchange area of a rack of GFX4s. We advise you to create the data block by naming it with the same node number assigned to the rack of GFX4s.

The resulting data block will have this composition:

ADDRESS	NAME	DESCRIPTION
DBX.DBB0	Trigger	TRIGGER (RESERVED)
DBX.DBB0	Cont	COUNTER (RESERVED)
DBX.DBB2 .. .. DBX.DBB8	ParamByte1 …. ParamByte7	PARAMETRIC DATA REQUEST
DBX.DBB9 .. .. DBX.DBB15	StatusByte1 …. StatusByte7	PARAMETRIC DATA REPLY
DBX.DBW16	ParamWriteDiag	WRITE ERROR WORD IN CONSISTENCY AREA (SFC15, DPWR_DAT)
DBX.DBW18	Statusreaddiag	READ ERROR WORD IN CONSISTENCY AREA (SFC14, DPRD_DAT)
DBX.DBW20 .. .. DBX.DBW28	Geflex01r …. Geflex01ReadW4	PROCESS DATA INPUT ZONE 1
DBX.DBW28	Geflex01ReadW4	PROCESS DATA INPUT ZONE 16
DBX.DBW30 .. .. DBX.DBW38	Geflex02r …. Geflex02ReadW4	PROCESS DATA INPUT ZONE 2
≈		≈
DBX.DBW170 .. .. DBX.DBW178	Geflex16r …. Geflex16ReadW4	PROCESS DATA INPUT ZONE 16
DBX.DBW180 .. .. DBX.DBW188	Geflex01w …. Geflex01WriteW4	PROCESS DATA OUTPUT ZONE 1
DBX.DBW190 .. .. DBX.DBW198	Geflex02w …. Geflex02WriteW4	PROCESS DATA OUTPUT ZONE 2
≈		≈
DBX.DBW330 .. .. DBX.DBW338	Geflex16w …. Geflex16WriteW4	PROCESS DATA OUTPUT ZONE 16

6.2.4 UDT9 “GFXRcp” (USER DATA TYPE) valid for both modes

The resulting “DBx” data block contains the recipe name and the list of MODBUS addresses corresponding to the GFX4 variables to be saved.

ADDRESS	NAME	DESCRIPTION	VALUE
DBX.DBB0 … DBX.DBB9	RCP_Name	RCPNAME	“ “
DBX.DBW10	tYP	PROBE/INPUT TYPE (400)	400
DBX.DBW12	HiS	MAX INPUT (402)	402
DBX.DBW 14	LoS	MAX INPUT (401)	401
DBX.DBW 16	HStA	MAX LIMIT TA (405)	405
DBX.DBW 18	Ctr	CONTROL TYPE (180)	180
DBX.DBW 20	HpH	MAX POWER HEATING % (42)	42
DBX.DBW 22	HpL	MIN POWER HEATING % (254)	254
DBX.DBW 24	CME	COOLING MEDIUM (513)	513
DBX.DBW 26	CPH	MAX POWER COOLING % (43)	43
DBX.DBW 28	CpL	MIN POWER COOLING % (255)	255
DBX.DBW 30	LoL	MIN SETPOINT (25)	25
DBX.DBW 32	HiL	MAX SETPOINT (26)	26
DBX.DBW 34	DIG	DIGITAL INPUT FUNCTION (140)	140
DBX.DBW 36	rL1	OUT 1 FUNCTION (160)	160
DBX.DBW 38	RL2	OUT 2 FUNCTION (163)	163
DBX.DBW 40	RL3	OUT 3 FUNCTION (166)	166
DBX.DBW 42	RL4	OUT 4 FUNCTION (170)	170
DBX.DBW 44	RL5	OUT 5 FUNCTION (171)	171
DBX.DBW 46	RL6	OUT 6 FUNCTION (172)	172
DBX.DBW 48	CT1	CYCLE TIME FOR OUT 1 (152)	152
DBX.DBW 50	CT2	CYCLE TIME FOR OUT 2 (159)	159
DBX.DBW 52	ALN	ALARMS ENABLING (195)	195
DBX.DBW 54	A1R	ALARM 1 REFERENCE (215)	215
DBX.DBW 56	A2R	ALARM 2 REFERENCE (216)	216
DBX.DBW 58	A3R	ALARM 3 REFERENCE (217)	217
DBX.DBW 60	A4R	ALARM 4 REFERENCE (218)	218
DBX.DBW 62	A1T	ALARM 1 TYPE (406)	406
DBX.DBW 64	A2T	ALARM 2 TYPE (407)	407
DBX.DBW 66	A3T	ALARM 3 TYPE (408)	408
DBX.DBW 68	A4T	ALARM 4 TYPE (409)	409
DBX.DBW 70	HBF	ALARM HB (57)	57
DBX.DBW 72	HY1	ALARM 1 HYSTERESIS (27)	27
DBX.DBW 74	HY2	ALARM 2 HYSTERESIS (30)	30
DBX.DBW 76	HY3	ALARM 3 HYSTERESIS (53)	53
DBX.DBW 78	HY4	ALARM 4 HYSTERESIS (59)	59
DBX.DBW 80	HBT	DELAY TIME FOR ALARM HB (56)	56
DBX.DBW 82	LBT	DELAY TIME FOR ALARM LBA (44)	44
DBX.DBW 84	OUTPWR	MANUAL OUTPUT POWER (252)	252
DBX.DBW 86	SPARE2		0
DBX.DBW 88	SPARE3		0
DBX.DBW 90	SPARE4		0
DBX.DBW 92	SPARE5		0
DBX.DBW 94	SPARE6		0
DBX.DBW 96	SPARE7		0
DBX.DBW 98	SPARE8		0
DBX.DBW 100	SPARE9		0
DBX.DBW 102	SPARE10		0

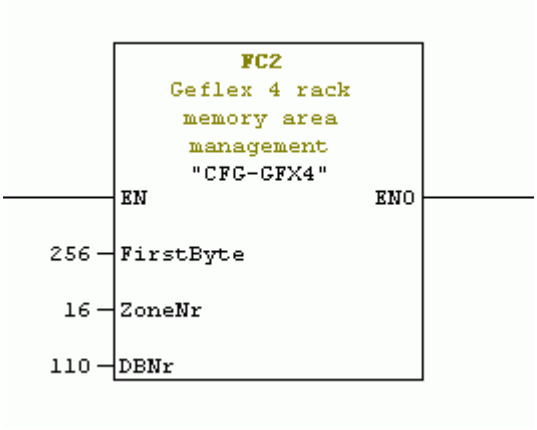
6.2.5 UDT10..UDT17 “GFX4-HP_nnxn” (USER DATA TYPE) “HIGH PERFORMANCE” mode only

Use the “User Data Type” corresponding to the selection made in HW configuration; the “DBx” data block will have a different composition based on the selection. For example, the following table shows the block corresponding to UDT17 “GFX4-HP_28x4”:

ADDRESS	NAME	DESCRIPTION
DBX.DBB0	Trigger	(RESERVED)
DBX.DBB0	Cont	(RESERVED)
DBX.DBB2 .. .. DBX.DBB8	ParamByte1 …. ParamByte7	PARAMETRIC DATA REQUEST
DBX.DBB9 .. .. DBX.DBB15	StatusByte1 …. StatusByte7	PARAMETRIC DATA REPLY
DBX.DBW16	ParamWriteDiag	WRITE ERROR WORD IN CONSISTENCY AREA (SFC15, DPWR_DAT)
DBX.DBW18	StatusReadDiag	READ ERROR WORD IN CONSISTENCY AREA (SFC14, DPRD_DAT)
DBX.DBW20 .. .. DBX.DBW74	GFX4_01_Read_W01 …. GFX4_01_Read_W28	PROCESS DATA INPUT GFX4 N. 1
DBX.DBW76 .. .. DBX.DBW130	GFX4_02_Read_W01 …. GFX4_02_Read_W28	PROCESS DATA INPUT GFX4 N. 2
DBX.DBW132 .. .. DBX.DBW186	GFX4_03_Read_W01 …. GFX4_03_Read_W28	PROCESS DATA INPUT GFX4 N. 3
DBX.DBW188 .. .. DBX.DBW242	GFX4_04_READ_W01 …. GFX4_04_READ_W28	PROCESS DATA INPUT GFX4 N. 4
DBX.DBW244 .. .. DBX.DBW298	GFX4_01_Write_W01 …. GFX4_01_ Write _W28	PROCESS DATA OUTPUT GFX4 N. 1
DBX.DBW300 .. .. DBX.DBW354	GFX4_02_ Write _W01 …. GFX4_02_ Write _W28	PROCESS DATA OUTPUT GFX4 N. 2
DBX.DBW356 .. .. DBX.DBW410	GFX4_03_ Write _W01 …. GFX4_03_ Write _W28	PROCESS DATA OUTPUT GFX4 N. 3
DBX.DBW412 .. .. DBX.DBW466	GFX4_04_ WRITE _W01 …. GFX4_04_ WRITE _W28	PROCESS DATA OUTPUT GFX4 N. 4

6.3.1 FC2 “CFG-GFX4” (FUNCTION CALL) BRIDGE” mode only

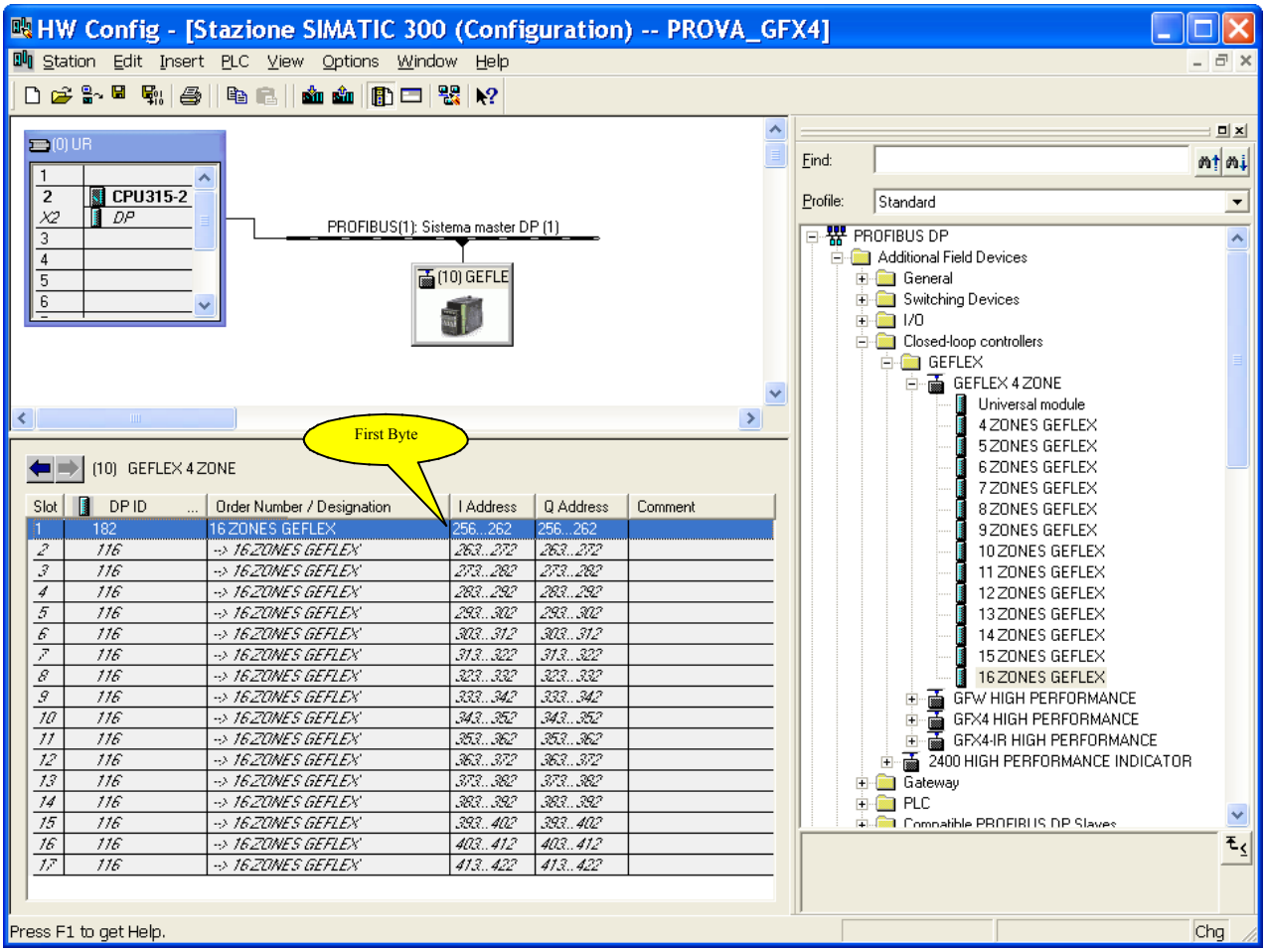
This function provides the entire process data exchange area between PLC and GFX4 in the data block created with the UDT4 described above.



FC2 is called in OB1 without conditions so that each scan will update the data.

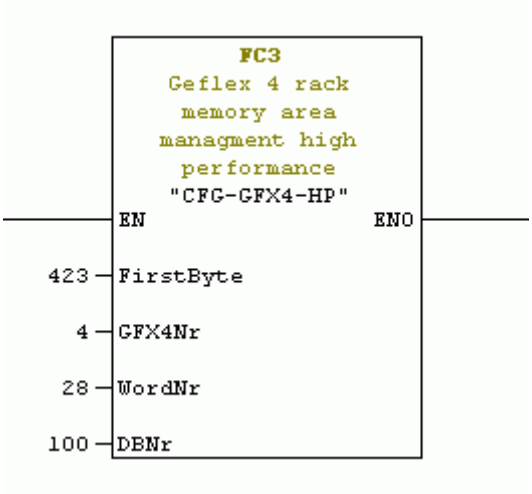
Three input parameters are required:

1. FirstByte : (INT) the first memory address assigned to the GFX4 rack in HW configuration
2. ZoneNr : (INT) total number of zones on the rack at the node being configured (4 to 16)
3. DBNr : (INT) number of data blocks created with ’UDT to contain entire data exchange area



6.3.2 FC3 “CFG-GFX4-HP” (FUNCTION CALL) “HIGH PERFORMANCE” mode only

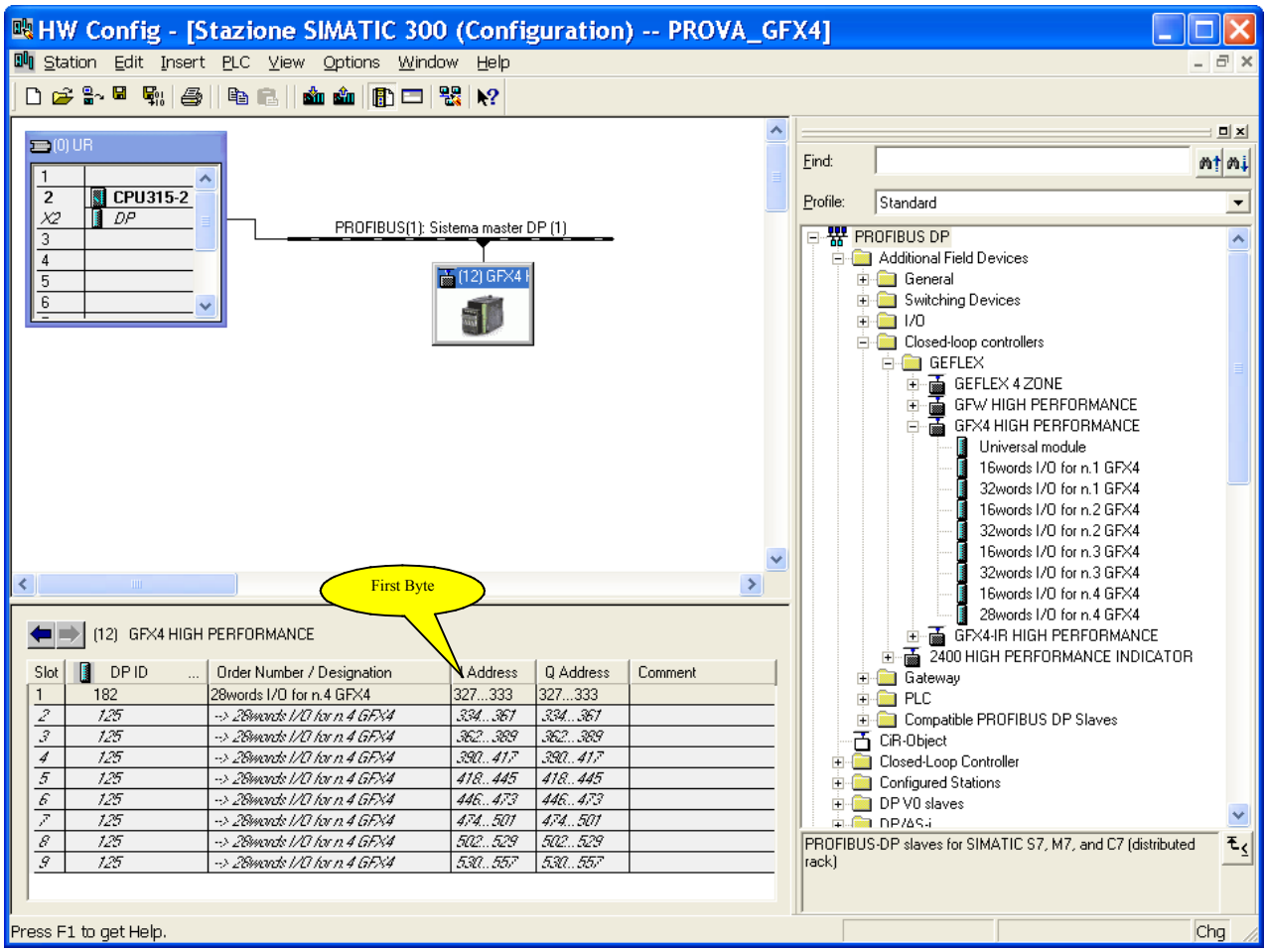
This function provides the entire process data exchange area between PLC and GFX4 in the data block created with the UDT17 described above.



FC3 is called in OB1 without conditions so that each scan will update the data.

Four input parameters are required:

1. FirstByte : (INT) first memory address assigned to the GFX4 rack in HW configuration.
2. GFX4Nr : (INT) total number of GFX4s configured on node (1 to 4).
3. WordNr : (INT) number of process words configured for each node (16, 28 or 32)
4. DBNr : (INT) number of data blocks created with UDT to contain entire data exchange area



6.4 FUNCTION BLOCKS

All Function Blocks require a freely assignable instance DB. They must be called only on request and kept active until the job is done.

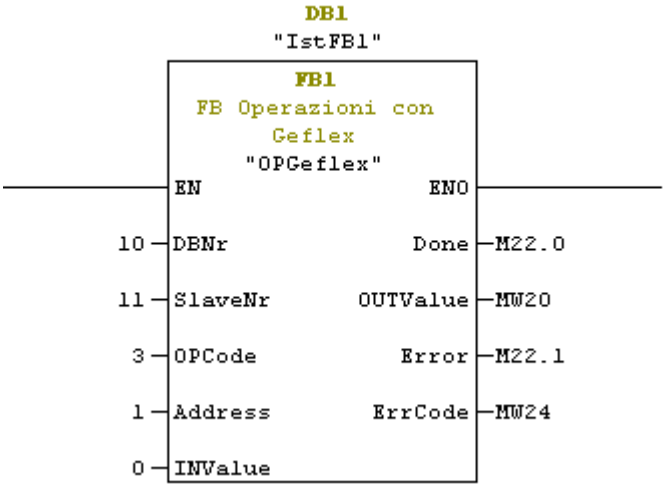
Typically, you set a Bit that enables the branch (EN) and is reset with the rising edge of the “Done” bit.

6.4.1 FB1 “OPGeflex” (FUNCTION BLOCK) valid for both modes

This controls fundamental Parametric Data jobs for configuring GFX4s.

There are 4 jobs:

1. Bit read (op. code 1)
2. Word read (op. code 3)
3. Bit write (op. code 5)
4. Word write (op. code 6)



The block requires 5 input parameters and replies with 4 output parameters.

Input parameters:

1. DBNr (INT) data block number assigned to the rack containing the GFX4 to be interrogated or controlled.

2. SlaveNr (INT): MODBUS address of the slave to be operated. For example, if the rack of GFX4s has address PROFIBUS 10, the MODBUS address of the GFX4s that form it will be: 10 for the first zone, 11 for the second, 12 for the third, and so on until the last zone, the sixteenth, which will have address 25 (see the GFX4 manual for assigning MODBUS nodes)
3. OPCode (INT): job code that tells the function if you want to read or write a word or a bit.
   The job codes are:
   • Bit read Job Code: 1
   • Word read Job Code: 3
   • Bit write Job Code: 5
   • Word write Job Code: 6
4. Address (INT): address of word or bit to be read or written (see GFX4 for identification of MODBUS addresses of words and bits))
5. INValue (INT): value to be written in the selected word or bit. Obviously, when writing a bit, only values 1 and 0 are allowed. This parameter is ignored in read jobs.

Output parameters:

- Done (BOOL): value is 1 when read job is done
- OUTValue (INT): value read in specified word or bit. In write jobs, 1 is written if action ends correctly or 0 if it ends with an error
- Error (BOOL): value is 1 when job ends with an error .
- ErrCode (INT): error code:
    - 1 Illegal function
    - 2 Illegal data address
    - 3 Illegal data value
    - 6 Slave device busy
    - 9 Illegal number data
    - 10 Read only data
    - 20 Timeout Communication
    - 21 Input value error

"Active Setpoint" is read in the image shown above (word 1 in "BRIDGE" mode) in the second zone of the GFX4 on the Rack at PROFIBUS node 10, configured in "BRIDGE" mode.

The DB assigned to node 10, created with the appropriate UDT, specified at first input parameter "DBNr," is DB 10.

The MODBUS address of the GFX4 to be interrogated is 11.

The job code is 3: "word read."

The address of the word to be read is 1.

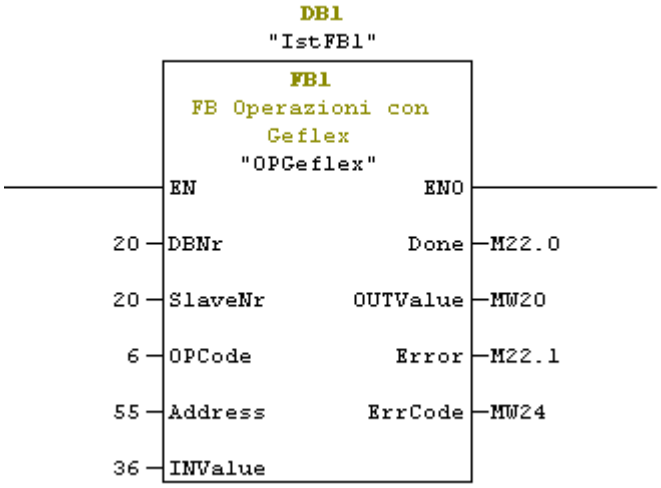
The INValue parameter for this job is indifferent.

When bit M22.0 assigned to the "Done" flag goes to 1, the value of the active setpoint will be in word MW20, assigned to the output parameter OUTValue.

The request is reset only when the "Done" flag goes to 1.

In case of errors, bit M22.1 would have gone to 1 and the error code would have been given in word MW24.

For example, if instead you want to write with value 36 of HB Alarm Point (word 55 in "BRIDGE" mode) of the first GFX4 on the Rack at PROFIBUS node 20, you have to create the function:



Where DB20 is assigned to the node.

The MODBUS address of the GFX4 to be interrogated is 20.

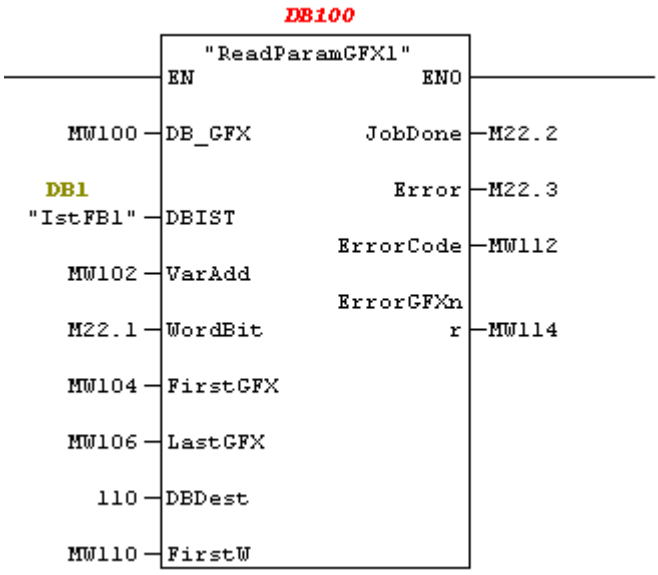
The code for a word write job is 6.

The word containing the HB alarm point has address 55 and the required point is 36.

When bit M22.0 goes to 1, the job is done and you see 1 in word MW20 if the job ends correctly; otherwise, you see 0 and the error code in word MW24.

6.4.2 FB10 “ReadParamGFX1”

Reads the value of a MODBUS map parameter contained in multiple consecutive GFX4s on the same rack and stores read values in a DB starting from a selected word for a number of consecutive words equal to the number of GFX4s interrogated.



Input parameters:

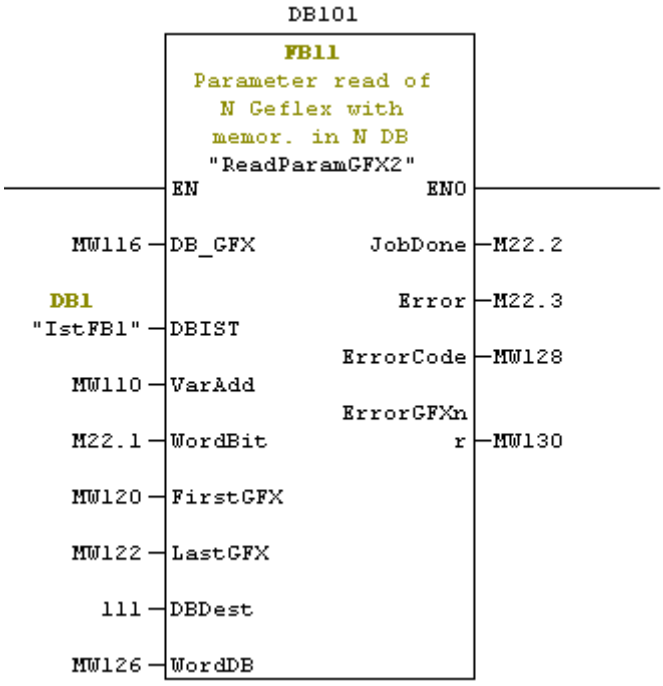
- DB_GFX (INT): indicates the number (only the number in figures or an INT variable that contains the value) of the DB assigned to the GFX4 rack to be worked on.
- DBIST (BLOCK_DB): indicates the name (use the symbolic name of the DB or the full indication “DBxx”) of the instance DB of the FB1 “OPGeflex” assigned to this rack of GFX4..
- VarAdd (INT): the address of the parameter to be read.
- Word/Bit (BOOL): indicates if the parameter to be read is a bit or a word: Word = 0, Bit = 1.
- FirstGFX (INT): the address of the first GFX4 on the rack to be interrogated.
- LastGFX (INT): the address of the last GFX4 on the rack to be interrogated.
- DBDest (INT): the number of the previously created destination DB, i.e., the DB where the function will store the read values.
- FirstW (INT): the address of the first word of the destination DB, starting from which the values will be stored.

Output parameters:

- JobDone (BOOL): value is 1 when read job is done
- Error (BOOL): value is 1 when there is an error during the read job.
- ErrorCode (INT): error code (in case of error)
  - 1 Illegal function
  - 2 Illegal data address
  - 3 Illegal data value
  - 6 Slave device busy
  - 9 Illegal number data
  - 10 Read only data
  - 20 Timeout Communication
  - 21 Input value error
- ErrorGFXnr (INT): number of instrument that caused the error (in case of error).

6.4.3 FB11 “ReadParamGFX2”

Reads the value of a MODBUS map parameter contained in multiple consecutive GFX4s on the same rack and stores the read values in the same number of selected words of multiple consecutive DBs starting from the one indicated.



Input parameters:

- DB_GFX (INT): indicates the number (only the number in figures or an INT variable that contains the value) of the DB assigned to the GFX4 rack to be worked on.
- DBIST (BLOCK_DB): indicates the name (use the symbolic name of the DB or the full indication “DBxx”) of the instance DB of the FB1 “OPGeflex” assigned to this rack of GFX4..
- VarAdd (INT): the address of the parameter to be read.
- Word/Bit (BOOL): indicates if the parameter to be read is a bit or a word: Word = 0, Bit = 1.
- FirstGFX (INT): the address of the first GFX4 on the rack to be interrogated.
- LastGFX (INT): the address of the last GFX4 on the rack to be interrogated.
- DBDest (INT): the number of the first destination DB, where the function will store the first value read. The total number of DBs to be created equals the number of GFX4s to be interrogated.
- WordDB (INT): the address of the word of the destination DBs where the value will be stored.

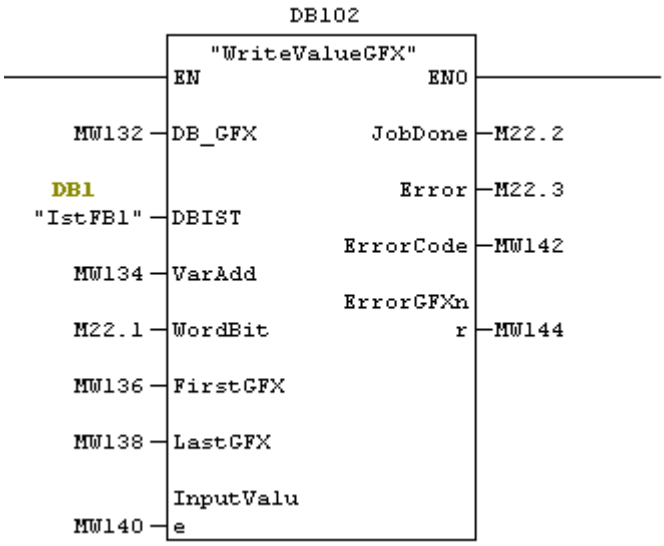
Output parameters:

- JobDone (BOOL): value is 1 when read job is done
- Error (BOOL): value is 1 when there is an error during the read job.
- ErrorCode (INT): error code (in case of error)
  1 Illegal function
  2 Illegal data address
  3 Illegal data value
  6 Slave device busy
  9 Illegal number data
  10 Read only data
  20 Timeout Communication
  21 Input value error

- ErrorGFXnr (INT): number of instrument that caused the error (in case of error)..

6.4.4 FB12 “WriteValueGFX”

Writes an immediate value of a MODBUS map parameter on multiple consecutive GFX4s on the same rack.



Input parameters:

- DB_GFX (INT): indicates the number (only the number in figures or an INT variable that contains the value) of the DB assigned to the GFX4 rack to be worked on.
- DBIST (BLOCK_DB): indicates the name (use the symbolic name of the DB or the full indication “DBxx”) of the instance DB of the FB1 “OPGeflex” assigned to this rack of GFX4.
- VarAdd (INT): the address of the parameter to be written.
- Word/Bit (BOOL): indicates if the parameter to be read is a bit or a word: Word = 0, Bit = 1.
- FirstGFX (INT): the address of the first GFX4 on the rack to be interrogated.
- LastGFX (INT): the address of the last GFX4 on the rack to be interrogated.
- InputValue (INT): the value to be written in the above-mentioned parameter of the selected GFX4s.

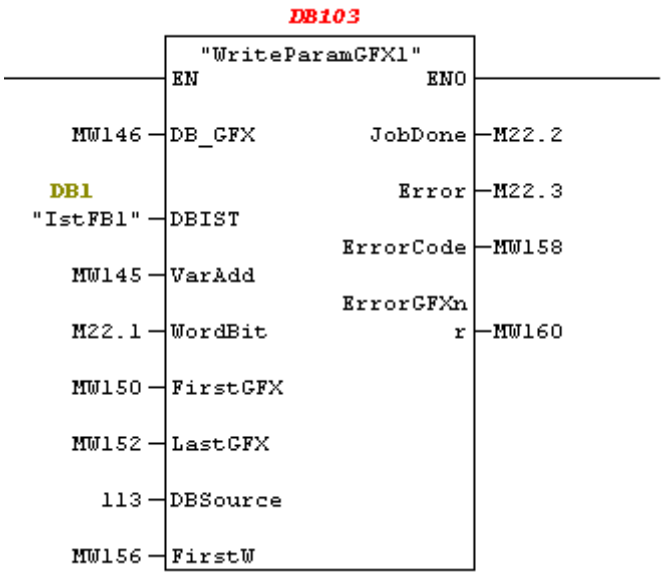
Output parameters:

- JobDone (BOOL): value is 1 when read job is done
- Error (BOOL): value is 1 when there is an error during the read job.
- ErrorCode (INT): error code (in case of error)
  1 Illegal function
  2 Illegal data address
  3 Illegal data value
  6 Slave device busy
  9 Illegal number data
  10 Read only data
  20 Timeout Communication
  21 Input value error

- ErrorGFXnr (INT): number of instrument that caused the error (in case of error).

6.4.5 FB13 “WriteParamGFX1”

Writes the value of a MODBUS map parameter on multiple consecutive GFX4s on the same rack, stored in a source DB starting from a specified word.



Input parameters:

- DB_GFX (INT): indicates the number (only the number in figures or an INT variable that contains the value) of the DB assigned to the GFX4 rack to be worked on.
- DBIST (BLOCK_DB): indicates the name (use the symbolic name of the DB or the full indication “DBxx”) of the instance DB of the FB1 “OPGeflex” assigned to this rack of GFX4.
- VarAdd (INT): the address of the parameter to be written.
- Word/Bit (BOOL): indicates if the parameter to be read is a bit or a word: Word = 0, Bit = 1.
- FirstGFX (INT): the address of the first GFX4 on the rack to be interrogated.
- LastGFX (INT): the address of the last GFX4 on the rack to be interrogated.
- DBSource (INT): the number of the source DB containing the values to be written in the selected parameter.
- FirstW (INT): the number of the first word of the source DB starting from which you find the values to be written in the selected GFX4s.

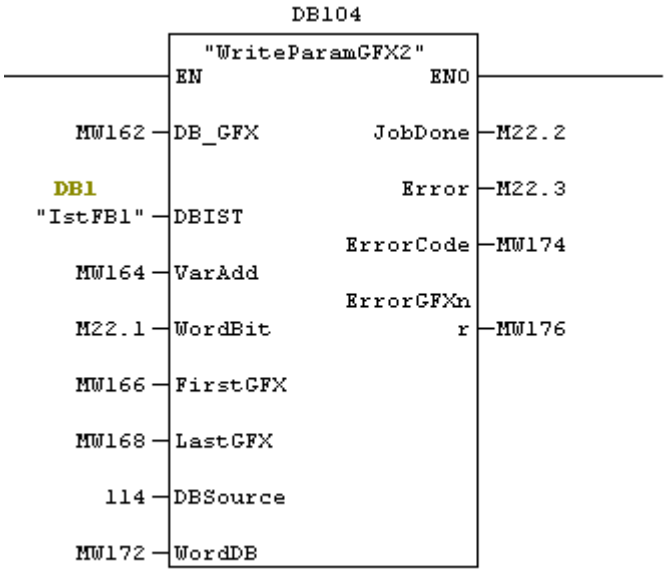
Output parameters:

- JobDone (BOOL): value is 1 when read job is done
- Error (BOOL): value is 1 when there is an error during the read job.
- ErrorCode (INT): error code (in case of error)
  1 Illegal function
  2 Illegal data address
  3 Illegal data value
  6 Slave device busy
  9 Illegal number data
  10 Read only data
  20 Timeout Communication
  21 Input value error

- ErrorGFXnr (INT): number of instrument that caused the error (in case of error).

6.4.6 FB14 “WriteParamGFX2”

Writes the value of a MODBUS map parameter on multiple consecutive GFX4s on the same rack, stored in an equal number of selected words of multiple DBs starting from the specified source.



Input parameters:

- DB_GFX (INT): indicates the number (only the number in figures or an INT variable that contains the value) of the DB assigned to the GFX4 rack to be worked on.
- DBIST (BLOCK_DB): indicates the name (use the symbolic name of the DB or the full indication “DBxx”) of the instance DB of the FB1 “OPGeflex” assigned to this rack of GFX4.
- VarAdd (INT): the address of the parameter to be written.
- Word/Bit (BOOL): indicates if the parameter to be read is a bit or a word: Word = 0, Bit = 1.
- FirstGFX (INT): the address of the first GFX4 on the rack to be interrogated.
- LastGFX (INT): the address of the last GFX4 on the rack to be interrogated.
- DBSource (INT): the number of the first source DB containing the first value to be written in the selected parameter. The total number of DBs to be created equals the number of GFX4s to be interrogated.
- WordDB (INT): the number of the word of the DBs containing the values to be written in the selected GFX4s.

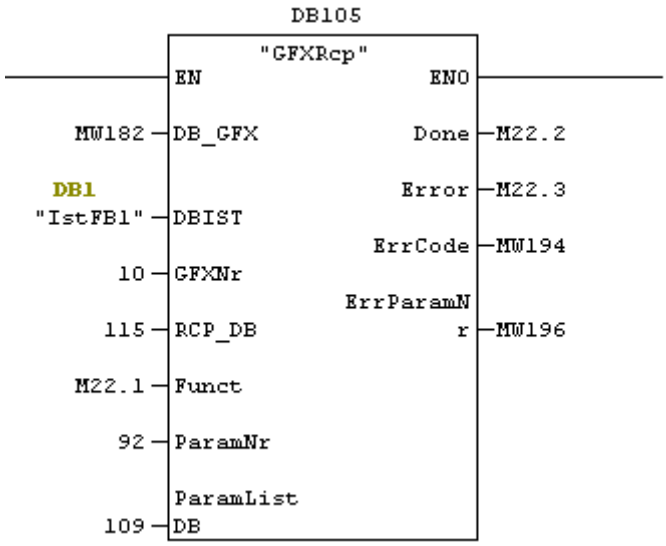
Output parameters:

- JobDone (BOOL): value is 1 when read job is done
- Error (BOOL): value is 1 when there is an error during the read job.
- ErrorCode (INT): error code (in case of error)
  1 Illegal function
  2 Illegal data address
  3 Illegal data value
  6 Slave device busy
  9 Illegal number data
  10 Read only data
  20 Timeout Communication
  21 Input value error

- ErrorGFXnr (INT): number of instrument that caused the error (in case of error)..

6.4.7 FB15 “GFX_RCP”

Saves a set of parameters from a GFX4 in a DB or transmits a set of parameters contained in a DB to a GFX4.



Input parameters:

- DB_GFX (INT): indicates the number (only the number in figures or an INT variable that contains the value) of the DB assigned to the GFX4 rack to be worked on.
- DBIST (BLOCK_DB): indicates the name (use the symbolic name of the DB or the full indication “DBxx”) of the instance DB of the FB1 “OPGeflex” assigned to this rack of GFX4.
- GFXNr (INT): the address of the GFX4 to be worked on.
- RCP_DB (INT): the number of the DB to be written in or from which the set of data is to be read.
- Funct (BOOL): specifies the type of job to be run:
  False = Store (save GFX4 parameters in DB)
  True = Load (load DB parameters in GFX4)
- ParamNr (INT): the number of parameters to be saved/read.
- ParamListDB (INT): the number of the DB in which, on each line, the Modbus address of the parameters to be read/written is specified.

Output parameters:

- Done (BOOL): value is 1 when write job is done
- Error (BOOL): value is 1 when there is an error during the write job.
- ErrorCode (INT): error code (in case of error)
  1 Illegal function
  2 Illegal data address
  3 Illegal data value
  6 Slave device busy
  9 Illegal number data
  10 Read only data
  20 Timeout Communication
  21 Input value error

- ErrorParamNr (INT): in case of error, the function writes the ordinal number of the DB with the list of addresses of the parameter that caused the error.

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