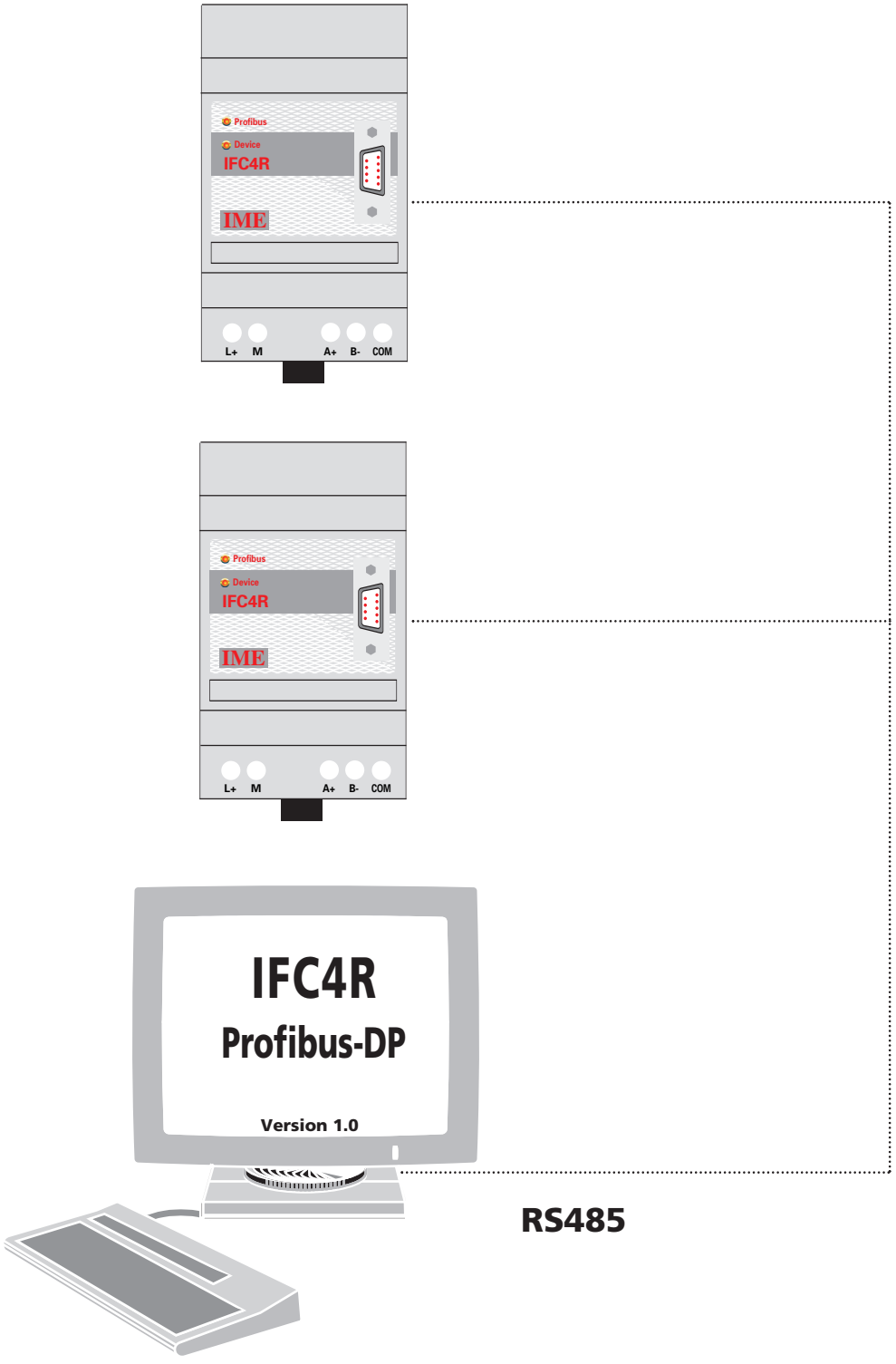
IME



Communication Protocol

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IME
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1.0 TECHNICAL DATA

Housing: plastic housing for rail din mounting type DIN EN 50022 (TS35)

Front protection: IP 20 for both front mask and terminals

Dimensions : length 54 mm; height 90 mm; depth 58 mm
(not taking in account the 9 sub-D connector)

Environmental conditions: working temperature –10°C - 55°C
storing temperature –20°C - 60°C

Power supply: 18..35 Vdc (60 mAmps)

Terminals: screw type (type K) for cables up to 2.5 mm^2 in accordance

Weight : about 150 g.

Interface: profibus DP SUB-D 9 poles (EN 50170)

Baud rate: up to 1.5 MBaud (Profibus side) – 9600 (EIA RS485 side)

Profibus DP IN/OUT: 32 bytes IN, 32 bytes OUT

Max device number: 32 devices on the same network

2.0 GENERAL DESCRIPTION

The **NEMO** Profibus link is a gateway between the **NEMO** type devices and the Profibus line.

The device is equipped by a **Profibus-DP controller** (in accordance with the EN50170 standard) and by a EIA RS485 line for the link with the NEMOs.

The IFC4R is a DP slave capable to manage up to 32 devices on the same line. It has two main tasks :

1) Retrieving the data from the NEMOS on the RS485 line

2) Transmitting, when required, the data to the Profibus master.

3.0 DEVICE STARTUP

When initialising the device some operations are required :

1) Load the file .GSD in the programming software of the master

2) Configure the hardware in the way that the address space used by the IN and OUT peripherals is 32 BYTES.

3) The address is selectable by changing the dip-switch configuration and it must be between 1 and 127.

See forward in this document for the description of the case and the position of the dip-switch.

See hereunder the modality for setting the Profibus address :

Example : address 3 (decimal)

dip-switch	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Setting	**ON**	**ON**	**Off**	**Off**	**Off**	**Off**	**Off**	**Off**
Meaning	**1**	**+ 2^1**						

Example : address 9 (decimal)

dip-switch	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Setting	**ON**	**Off**	**Off**	**ON**	**Off**	**Off**	**Off**	**Off**
Meaning	**1**	**+ 0**	**+ 0**	**+ 2^3**				

4) After the address has been set, power down the IFC4R

5) The baud rate on NEMO must be set at 9600 Baud

6) The Modbus address must be between 1 and 255

4.0 COMMUNICATION

On the application layer (PLC), the telegrams exchanged between the Profibus interface and the master, are shaped in 32 bytes for the output - and input peripherals.

These telegrams consist of a header which uses 4 bytes and 28 bytes of user data for measured values.

Output Telegrams PLC PB-interface

Peripheral - Output Address	Meaning /contents	Value
Header byte 0, Base address output periphery - offset = 0	Telegram - or block number of the segment to be requested	1...MAX decimal
Header byte 1, Base address output periphery - offset = 1	NEMO Address	1...255
Header byte 2, **Control BYTE** Base address output periphery - offset = 1	Bits for controlling the internal communication	8 Bit binary
Header byte 3, Base address output periphery - offset = 3	Reserved, not used at the moment	
Data byte 0...27 Base address output periphery - offset = 4...31	7 28 user databyte, not used at the moment	

Input Telegrams PB-interface PLC

Peripheral - Input Address	Meaning /contents	Value
Header byte 0, Base address output periphery - offset = 0	Returned Telegram - Block number of the requested block	1...MAX decimal
Header byte 1, Base address output periphery - offset = 1	NEMO Address	1...255
Header byte 2, Base address output periphery - offset = 1	Reserved, not used at this time	
Header byte 3, **Status BYTE** Base address output periphery - offset = 3	**STATUS MESSAGES**	8 Bit binary
Data byte 0...27 Base address output periphery - offset = 4...31	28 bytes user data of the measured values	WORD, DWORD

For the transfer of all Control byte (Output header byte 2 ? NEMO 96)

Control byte (Output header byte 2 ? NEMO 96)

Bit 0: Internal Request start/stop

Logical value 1 : this bit has to be set by PLC in order to start the retrieving process of data from the NEMO and prepare them for Profibus communication.

After this, the internal operation continues ciclically.

Note : for this reason it would be better to stop the internal processing to avoid overloading the device.

Logical value 0 : this bit has to be reset by PLC in order to stop the internal process.

Bit 1 : not used

Bit 2 : TRUE = 50 WORDS telegram length for NEMO

FALSE = 47 WORDS telegram length for NEMO D6 / NEMO 96I / NEMO 96S

Status byte (E-header byte 3 ? NEMO)

Byte 3 of the data returned by NEMO includes error and status bits with the following meaning.

Bit 0: Logical value 1 : Nemo address is wrong (1..255)

Bit 1: Logical value 1 : block number specified in BYTE 0 of the control telegram wrong.

Respect the limits (1..4).

Logical value 0 : OK

Bit 2: Internal error (CRC16 error)

Bit 3: Internal error (response timeout)

Bit 4: Logical value 1 : internal data processing still running

Logical value 0 : internal data processing not running

Bit 5: Logical value 1 : internal data processing completed

Logical value 0 : internal data processing not yet completed

Bit 6-7: Not used

The schematic conceptual flow of the program FB is the following :

```
block number = 1;        /* init the number of block to be required to NEMO 96 */
status = 1;              /* init the internal status of the software */

while (TRUE) begin
    case (status) :
        if 1 begin
            bit 2.0 (output header) = 1;          /*start NEMO 96 internal process */
            BYTE 0 (Output header) = block number;
            status = 2;
        end case

        if 2 begin
            if (bit 3.4 = 1) begin                /*internal processing running */
                bit 2.0 (output header) = 0;      /* stop NEMO 96 internal processing
                                                     after the completion of the
                                                     current operation */
                status = 3;
            end
        end case

        if 3 begin
            if   (bit 3.5 = 1) begin              /*internal processing finished */
                (data in the telegram are valid )

                if (telegram is OK) begin         /* block number between input and
                                                     output headers agree ... */
                    transfer data from telegram in the PLC area;
                    block number = +1;
                    if (block number > 7) begin
                        block number = 1;
                        status = 1;               /* restart */
                    else begin
                        status = 3;               /* next request */
                    end

                end

            end
        end case
End while
```

5.0 VARIABLES

Block 1

Offset	Measurement		Format	Resolution
0	Header Byte 0 (block number 1)		BYTE	
1	Header Byte 1 (Nemo address)		BYTE	
2	Header Byte 2		BYTE	
3	Header Byte 3 (status)		BYTE	
4	Phase voltage L1	MSB	DWORD	1 mV
5		MB2	(LONG)	
6		MB1		
7		LSB		
8	Phase voltage L2	MSB	DWORD	1 mV
9		MB2	(LONG)	
10		MB1		
11		LSB		
12	Phase voltage L3	MSB	DWORD	1 mV
13		MB2	(LONG)	
14		MB1		
15		LSB		
16	Current L1	MSB	DWORD	1 mA
17		MB2	(LONG)	
18		MB1		
19		LSB		
20	Current L2	MSB	DWORD	1 mA
21		MB2	(LONG)	
22		MB1		
23		LSB		
24	Current L3	MSB	DWORD	1 mA
25		MB2	(LONG)	
26		MB1		
27		LSB		
28	Three phase active power	MSB	DWORD	0,01 / 1W *
29		MB2	(LONG)	
30		MB1		
31		LSB		

Block 2

Offset	Measurement		Format	Resolution
0	Header Byte 0 (block number 1)		BYTE	
1	Header Byte 1 (Nemo address)		BYTE	
2	Header Byte 2		BYTE	
3	Header Byte 3 (status)		BYTE	
4	Three phase reactive power	MSB	DWORD	0,01 / 1var *
5		MB2	(LONG)	
6		MB1		
7		LSB		
8	Three phase apparent power	MSB	DWORD	0,01 / 1var *
9		MB2	(LONG)	
10		MB1		
11		LSB		
12	Active positive energy	MSB	DWORD	Wh **
13		MB2	(LONG)	
14		MB1		
15		LSB		
16	Phase-to-phase voltage L1-2	MSB	DWORD	1 mV
17		MB2	(LONG)	
18		MB1		
19		LSB		
20	Phase-to-phase voltage L2-3	MSB	DWORD	1 mV
21		MB2	(LONG)	
22		MB1		
23		LSB		
24	Phase-to-phase voltage L1-3	MSB	DWORD	1 mV
25		MB2	(LONG)	
26		MB1		
27		LSB		
28	Active negative energy	MSB	DWORD	Wh **
29		MB2	(LONG)	
30		MB1		
31		LSB		

Block 3

Offset	Measurement		Format	Resolution
0	Header Byte 0 (block number 1)		BYTE	
1	Header Byte 1 (Nemo address)		BYTE	
2	Header Byte 2		BYTE	
3	Header Byte 3 (status)		BYTE	
4	Frequency	HB	WORD	0,1 Hz
5		LB		
6	Reserved	HB	WORD	
7		LB		
8	Power factor	HB	WORD	0...100
9		LB		
10	Power factor sector	HB	BYTE	
11		LB	BYTE	****
12	Reserved	HB	BYTE	
13				
14		MB1		
15		LSB		
16	Positive reactive energy	MSB	DWORD	varh **
17		MB2	(LONG)	
18		MB1		
19		LSB		
20	Reserved	B	BYTE	
21	Active power sign	B	BYTE	0 /1 ***
22	Negative reactive power	MSB	DWORD	varh **
23		MB2	(LONG)	
24		MB1		
25		LSB		
26	Reserved	B	BYTE	
27	Reactive power sign	B	BYTE	0 /1 ***
28	Reserved	HB	WORD	
29		LB		
30	Reserved	HB	DWORD	
31		LB		

Block 4

Offset	Measurement		Format	Resolution
0	Header Byte 0 (block number 1)		BYTE	
1	Header Byte 1 (Nemo address)		BYTE	
2	Header Byte 2		BYTE	
3	Header Byte 3 (status)		BYTE	
4	Reserved	HB	WORD	
5		LB		
6	Average value of power	MSB	DWORD	0,01 / 1W *
7		MB2	(LONG)	
8		MB1		
9		LSB		
10	Peak maximum demand	MSB	DWORD	0,01 / 1W *
11		MB2	(LONG)	
12		MB1		
13		LSB		
14	Counter of the average power	HB	WORD	1 minute
15		LB		
16	Neutral current	MSB	DWORD	1 mA
17		MB2	(LONG)	
18		MB1		
19		LSB		
20	Current transformer ratio	HB	WORD	
21		LB		
22	Voltage transformer ratio	HB	WORD	
23		LB		
24	Reserved			
25	Reserved			
26	Reserved			
27	Reserved			
28	Reserved			
29	Reserved			
30	Reserved			
31	Reserved			

*) Power

Unit : hundredths of W / var / VA if KTA*KTV < 6000

W / var / VA if KTA*KTV ? 6000

Example : 900 VA => 90000 if KTA*KTV < 6000

=> 900 if KTA*KTV ? 6000

**) Energy

See the protocol manual of each device for the engineering unit of the energy values

***) Power sign

0 : positive

1 : negative

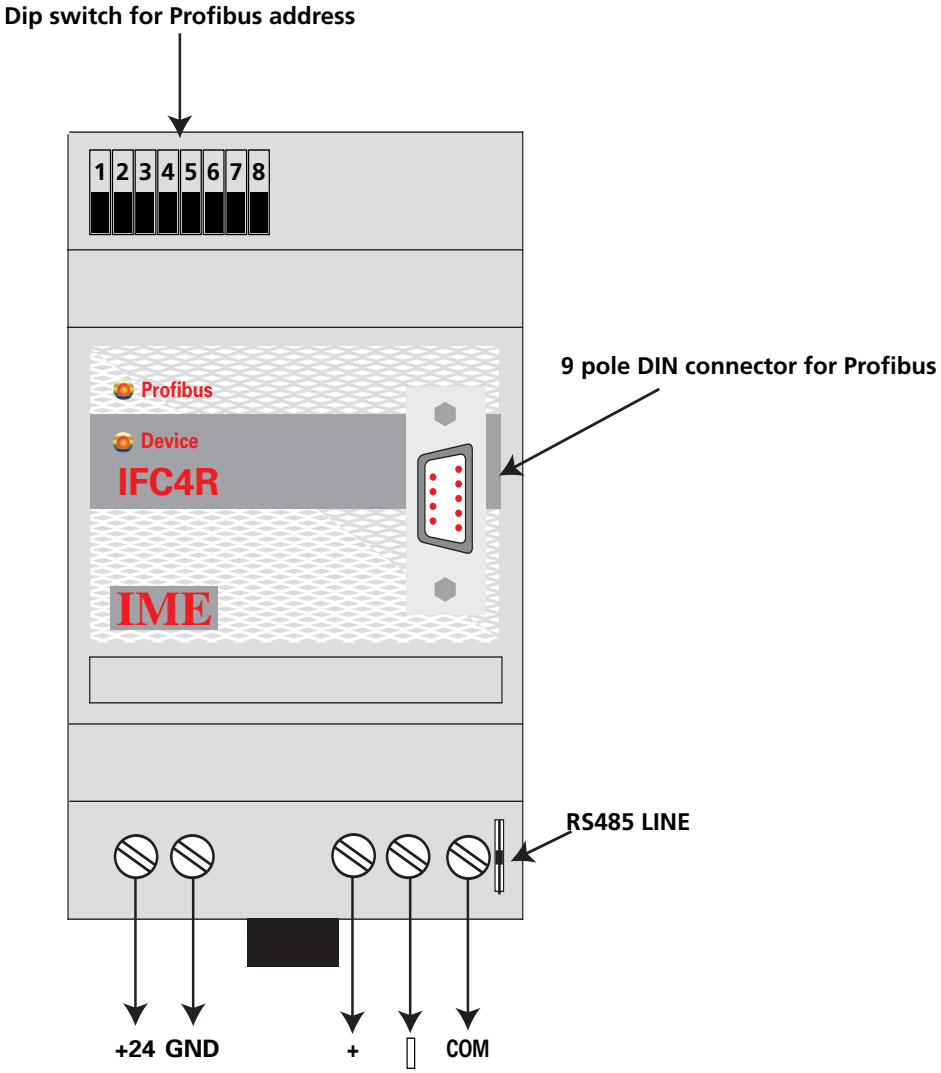
****) Sector of power factor

0 : PF = 1

1 : PF inductive

2 : PF capacitive

6.0 PIN OUT


Dip switch for Profibus address
1 2 3 4 5 6 7 8
Profibus
Device
IFC4R
IME
9 pole DIN connector for Profibus
RS485 LINE
+24
GND
+
COM