DPC72

COMMUNICATION PROTOCOL

Version 2 Revision 1

November 05th, 2009

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1   COMMUNICATION PROTOCOL

1.1   Introduction

DPC72-Bxxx is equipped with a 2-wire RS485 serial interface. The data format is fixed:

- 1 start bit
- 8 data bit
- 1 stop bit
- Parity: none, odd or even (selectable)
- Baud-rate: 4800 or 9600 band (selectable)

The serial interfaces uses the MODBUS/JBUS (RTU) protocol.
The host starts the communication by sending the relevant request frame. Each frame is composed by 4 types of information:

- **slave address**: it is a number within the range from 1 to 255 which identifies each instrument connected to the network;
- **function code (command)**: it defines the control type (reading of n words, writing of one word)
- **data field**: it defines the function parameters (e.g. address of the word be written, value of this word, etc.)
- **control word (CRC)**: it is used to detect transmission errors that may occur.

The master calculates the CRC after defining address, function number and data field. When the slave receives the query, it stores the data in a temporary buffer. After that, the CRC is calculated and compared with the one received. If the two CRC values are the same and the address is correct, the slave carries out the command and then sends back its reply.

1.2   MODBUS functions

These functions are available on DPC72:
- Reading of n "Holding Registers" (code 03h).
- Reading of n "Input Register" (code 04h).
- Writing of one "Holding Registers" (code 06h).
- Diagnostic (code 08h with sub-function code 00h).
- Broadcast mode (writing instruction on address 00h).

IMPORTANT:
1) In this document the "Modbus address" field is indicated in two mode:
    1.1) "**Modicom address**": it is the "6-digit Modicom" representation with Modbus function code 04 (Read Input Registers) . It is possible to read the same values with function code 03 (Read Holding Register) replacing the first digit with number "4".
    1.2) "**Physical address**": it is the "word address" value included in the communication frame.
2) The functions 03h and 04h have exactly the same effect.
3) The communication parameters must be set in according to the configuration of the instrument (refer to DPC72 instruction manual).

1.2.1   Function 03h (Read holding registers)

This function code is used to read the contents of a contiguous block of holding registers (word). The Request frame specifies the starting register address and the number of registers to be read. It is possible to read maximum 6 registers (words) with a single request.
The register data in the response message are packed as two bytes per register (word), with the binary contents right justified within each byte. For each register, the first byte contains the high order bits (MSB) and the second contains the low order bits (LSB).

Request frame

Description	Length	Value	Note
Physical Address	1 byte	1 to F7h (1 to 255)	
Function code	1 byte	03h	
Starting Address	2 bytes	010Ch to 2000h	Byte order: MSB, LSB
Quantity of Registers (**N** word)	2 bytes	1 to 06h	Byte order: MSB, LSB
CRC	2 bytes		

Response frame (correct action)

Description	Length	Value	Note
Physical Address	1 byte	1 to F7h (1 to 255)	
Function code	1 byte	03h	
Byte count	1 byte	**N** word * 2	
Register value	**N***2 bytes		Byte order: MSB, LSB
CRC	2 bytes		

Response frame (incorrect action)

Description	Length	Value	Note
Physical Address	1 byte	1 to F7h (1 to 255)	Possible exception :
Function code	1 byte	83h	01h: illegal function 02h: illegal data address
Exception code	1 byte	01h, 02h, 03h, 04h	03h: illegal data value
CRC	2 bytes		04h: slave device failure

1.2.2   Function 04h (Read input registers)

This function code is used to read the contents of a contiguous block of input registers (words). The Request frame specifies the starting register address and the number of registers to be read. It is possible to read maximum 6 registers (words) with a single request.
The register data in the response message are packed as two bytes per register (word), with the binary contents right justified within each byte. For each register, the first byte contains the high order bits (MSB) and the second contains the low order bits (LSB).

Request frame

Description	Length	Value	Note
Physical Address	1 byte	1 to F7h (1 to 255)	
Function code	1 byte	04h	
Starting Address	2 bytes	010Ch to 2000h	Byte order: MSB, LSB
Quantity of Registers (**N** word)	2 bytes	1 to 06h	Byte order: MSB, LSB
CRC	2 bytes		

Response frame (correct action)

Description	Length	Value	Note
Physical Address	1 byte	1 to F7h (1 to 255)	
Function code	1 byte	04h	
Byte count	1 byte	**N** word * 2	
Register value	**N***2 bytes		Byte order: MSB, LSB
CRC	2 bytes		

Response frame (incorrect action)

Description	Length	Value	Note
Physical Address	1 byte	1 to F7h (1 to 255)	Possible exception :
Function code	1 byte	84h	01h: illegal function
Exception code	1 byte	01h, 02h, 03h, 04h	02h: illegal data address 03h: illegal data value
CRC	2 bytes		04h: slave device failure

1.2.3   Function 06h (Write single holding register)

This function code is used to write a single holding register. The Request frame specifies the address of the register (word) to be written and its contents.
The correct response is an echo of the request, returned after the register contents have been written.

Request frame

Description	Length	Value	Note
Physical Address	1 byte	1 to F7h (1 to 255)	
Function code	1 byte	06h	
Starting Address	2 bytes	0198h to 1056h	Byte order: MSB, LSB
Register value	2 bytes		Byte order: MSB, LSB
CRC	2 bytes		

Response frame (correct action)

Description	Length	Value	Note
Physical Address	1 byte	1 to F7 (1 to 255)	
Function code	1 byte	06h	
Starting Address	2 bytes	0198h to 1056h	Byte order: MSB, LSB
Register value	2 bytes		Byte order: MSB, LSB
CRC	2 bytes		

Response frame (incorrect action)

Description	Length	Value	Note
Physical Address	1 byte	1 to F7 (1 to 255)	Possible exception :
Function code	1 byte	86h	01h: illegal function
Exception code	1 byte	01h, 02h, 03h, 04h	02h: illegal data address 03h: illegal data value
CRC	2 bytes		04h: slave device failure

1.2.4   Function 08h (Diagnostic with sub-function code 00h)

MODBUS function code 08h provides a series of tests to check the communication system between a client (Master) device and a server (Slave), or to check various internal error conditions within a server. DPC72 supports only 0000h sub-function code (Return Query Data). With this sub-function the data passed in the request data field is to be returned (looped back) in the response. The entire response message should be identical to the request.

Request frame

Description	Length	Value	Note
Physical Address	1 byte	1 to F7 (1 to 255)	
Function code	1 byte	08h	
Sub-function	2 bytes	0000h	
Data (**N** word)	2 bytes	**N** word * 2	Byte order: MSB, LSB
CRC	2 bytes		

Response frame (correct action)

Description	Length	Value	Note
Physical Address	1 byte	1 to F7 (1 to 255)	
Function code	1 byte	08h	
Sub-function	2 bytes	0000h	
Data (**N** word)	2 bytes	**N** word * 2	Byte order: MSB, LSB
CRC	2 bytes		

Response frame (incorrect action)

Description	Length	Value	Note
Physical Address	1 byte	1 to F7 (1 to 255)	Possible exception :
Function code	1 byte	88h	01h: illegal function
Exception code	1 byte	01h, 02h, 03h, 04h	02h: illegal data address 03h: illegal data value
CRC	2 bytes		04h: slave device failure

1.2.5   Broadcast mode

In broadcast mode the master can send a request (command) to all the slaves. No response is returned to broadcast requests sent by the master. It is possible to send the broadcast message only with function code 06h and using address 00h.

1.3   Application notes

1.3.1   General consideration

1. In case of RS485 interface: to avoid errors due to the signal reflections or line coupling, it is necessary to terminate the input of the last instrument on the network, and also the reception of the Host. Alternatively, it is also possible to bias the Host transmission (N.B.: it is only possible to either terminate or bias the Host, not both). The termination on both the instrument and the host is necessary even in case of point-to-point connection, within short distances.
2. In case of RS485 interface: the GND connection is optional if a shielded cable is used.
3. In case of RS485 interface: for connections longer than 1000m, a line amplifier is necessary.
4. If an instrument does not answer within the "max answering time", it is necessary to repeat the query. If the instrument does not answer after 2 or 3 consecutive queries, it must be considered as not connected, faulty or with wrong address. The same consideration is valid in case of CRC errors or incomplete frames.
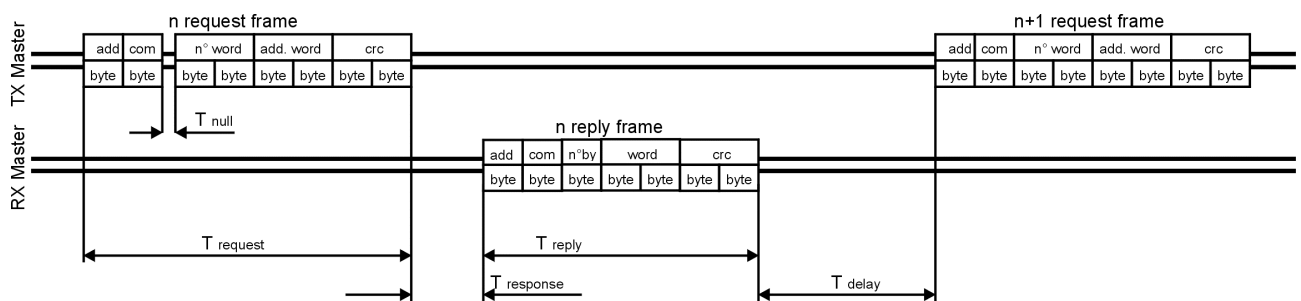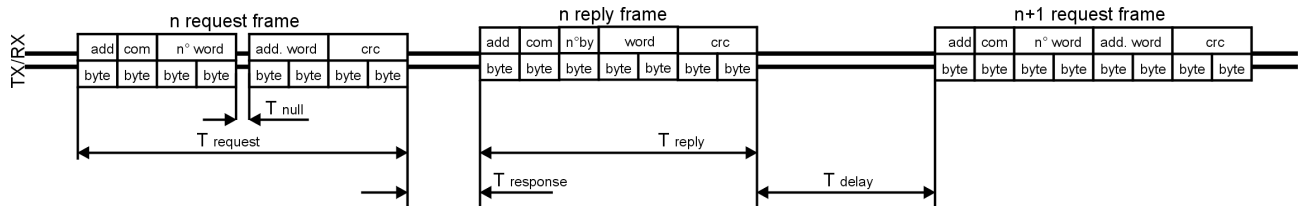
1.3.2   MODBUS timing

Fig. 1 : 4-wire timing diagram

Fig. 2 : 2-wire timing diagram

Tab. 1-1

Timing characteristics of reading function:	msec
T response: Max answering time	500ms
T response: Typical answering time	40ms
T delay: Minimum time for a new query	4800 baud-rate: 3,5 char 9600 baud-rate: 3,5 char
T null: Max interruption time on the request frame	4800 baud-rate: 2,5 char 9600 baud-rate: 2,5 char

2   TABLES

2.1   Data format representation in Carlo Gavazzi instruments

The variables are represented by integer numbers, with 2's complement notation in case of "signed" format, using the following:

Tab. 2-1

Format	IEC data type	Description	Bits	Range
CHAR	USINT	Unsigned character	8	0 .. 255
INT16	INT	Integer	16	-32768 .. 32767
UINT16	UINT	Unsigned integer	16	0 .. 65535
BCD	BYTE	Binary to decimal	8	0x00 .. 0x99

The integers are represented in INT16 (16 bit) or UINT16 (16 bit) format with or without sign (the byte order inside the single word is MSB->LSB).

2.1.1   Maximum and minimum electrical values

The max and min electric values for each variable are indicated in the following table.
VL-L nom : 480V (Vmax = Vnom x 1,20)
VL-L nom : 277V (Vmax = Vnom x 1,20)

Tab. 2-2

Engineering unit	Input Versions B001and B003 (480VL-L)	
	min value	max value
V (L-L)	0	576 V
Phase sequence (*)	0	1
Hz	44.0 Hz	66.0 Hz
DF (Hz/s) (**)	0.0	50.0

Engineering unit	Input Version B002 (480VL-L / 277VL-N)	
	min value	max value
V (L-L)	0	576 V
V (L-N)	0	332 V
Phase sequence (*)	0	1
Hz	44.0 Hz	66.0 Hz

Note :
(*) This variable does not have any engineering unit. Its value is a convention.
(**) Frequency derivative : this variable has only absolute values.

2.2   Istantaneous variables

MODBUS**: read only mode with functions code 03 and 04**

Tab. 2-3

Versions B001 and B003					
Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
300401	0190h	1	V L1-L2	UINT	Format: value = volt x 10
300402	0191h	1	V L2-L3	UINT	Format: value = volt x 10
300403	0192h	1	V L3-L1	UINT	Format: value = volt x 10
300406	0195h	1	Phase sequence	UINT	The value **1** indicates all the 3 phases are present and have the correct sequence. The value **0** indicates a wrong connection.
300407	0196h	1	Hz	UINT	Format: value = Hz x 1000
300408	0197h	1	D Hz	UINT	Frequency derivative value. Format: value = Hz/s x 10

Version B002					
Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
When Voltage mode = 0 (see on address 01d7h)					
300401	0190h	1	V L1-L2	UINT	Format: value = volt x 10
300402	0191h	1	V L2-L3	UINT	Format: value = volt x 10
300403	0192h	1	V L3-L1	UINT	Format: value = volt x 10
When Voltage mode = 1 (see on address 01d7h)					
300401	0190h	1	V L1-N	UINT	Format: value = volt x 10
300402	0191h	1	V L2-N	UINT	Format: value = volt x 10
300403	0192h	1	V L3-N	UINT	Format: value = volt x 10
300405	0194h		VLLsys	UINT	Format: value = volt x 10
300406	0195h	1	Phase sequence	UINT	The value **1** indicates all the 3 phases are present and have the correct sequence. The value **0** indicates a wrong connection.
300407	0196h	1	Hz	UINT	Format: value = Hz x 1000
300417	01A0h	1	Average V1	UINT	Format: value = volt x 10
300418	01A1h	1	Average V2	UINT	Format: value = volt x 10
300419	01A2h	1	Average V3	UINT	Format: value = volt x 10

2.3   Data and time variables

MODBUS**: read only mode with functions code 03 and 04**

Tab. 2-4

Modicom address	Physical address	Length (words)	VARIABLE	Data Format	Notes
300394	0189h	1	Month and day of the month informations.	BCD	MSB: month of the year. LSB: day of the month.
300395	018Ah	1	Year and day of the week informations.	BCD	MSB: day of the week. LSB: year.
300396	018Bh	1	Hour and minutes informations.	BCD	MSB: minutes. LSB: hour.
300397	018Ch	1	Seconds information.	BCD	MSB: not used. LSB: seconds.

2.4 Programming parameters (read only)

MODBUS**: read only mode with functions code 03 and 04**

Tab. 2-5

Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
300408	0198h	1	Events	UINT	Number of events.
300409	0199h	1	Log index	UINT	EEPROM index for the next LOG.
300410	019Ah	1	Password	UINT	Programming access password (range 0000 to 9999)
300411	019Bh	1	Power on time	UINT	Waiting time at the start up. min value = 1 sec max value = 6 sec
Versions B001 and B003					
300412	019Ch	1	Default page	UINT	Default visualization page. 1 → VLL 2 → dF (Hz, dHz/dt, seq.) 3 → date and hour
Versions B002					
300412	019Ch	1	Default page	UINT	Default visualization page. 1 → VLN / VLL 2 → Average (VLN / VLL) 3 → dF (Hz, dHz/dt, seq.) 4 → date and hour
300413	019Dh	1	Baudrate	UINT	Baudrate for the serial COM port: min value = 0 → 4800baud max value = 1 → 9600baud
300413	019Eh	1	Address	UINT	Address for the serial COM port: min value = 1 max value = 255
300414	019Fh	1	Parity bit	UINT	Parity bit for serial COM port: 0 → NONE 1 → ODD 2 → EVEN

2.5   Set points (read only)

MODBUS: **read only mode with functions code 03 and 04**

Tab. 2-6

Modicom address	Physical address	Length (words)	Set point settings	Data Format	Notes
			Upper Voltage setpoint		**Value for B001/B003 or B002**
304448	01BFh	1	Enable Set point 1control	UINT	1 → Set point control enabled default value: 1 (*)
304449	01C0h	1	Set point 1 value	UINT	min value = 230.0 VLN / 400.0 VLL max value = 277.0 VLN / 480.0 VLL default value: 265.0 VLN / 460.0 VLL for B002 (*) 480.0 VLL for B003 (*) 460.0 VLL for B001.
304450	01C1h	1	Delay activation time for Set point 1	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
304451	01C2h	1	Hysteresis for Set point 1	UINT	default value: 120 (12.0 VLL) (*)
			Lower Voltage setpoint		
304452	01C3h	1	Enable Set point 2 control	UINT	1 → Set point control enabled default value: 1 (*)
304453	01C4h	1	Set point 2 value	UINT	min value = 185.0 VLN / 320.0 VLL max value = 230.0 VLN / 400.0 VLL default value: 185.0 VLN / 320.0 VLL for B002 (*) 320.0 VLL for B001 and B003 (*)
304454	01C5h	1	Delay activation time for Set point 2	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
304455	01C6h	1	Hysteresis for Set point 2	UINT	default value: 120 (12.0 VLL) (*)
			Upper Frequency setpoint		
304456	01C7h	1	Enable Set point 3 control	UINT	1 → Set point control enabled default value: 1 (*)
304457	01C8h	1	Set point 3 value	UINT	min value = 45000 (45 Hz) for B002 (*) max value = 65000 (65 Hz) for B002 (*) default value: 50200 (50.2 Hz) for B002(*) min value = 50000 (45 Hz) for B003 (*) max value = 51500 (65 Hz) for B003 (*) default value: 50300 (50.3 Hz) for B003(*)
304458	01C9h	1	Delay activation time for Set point 3	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
304459	01CAh	1	Hysteresis for Set point 3	UINT	default value: 100 (0.100 Hz) (*)
			Lower Frequency setpoint		
304460	01CBh	1	Enable Set point 4 control	UINT	1 → Set point control enabled default value: 1 (*)
304461	01CCh	1	Set point 4 value	UINT	min value = 45000 (45 Hz) for B002 (*) max value = 65000 (65 Hz) for B002 (*) default value: 47500 (47.5 Hz) for B002(*) min value = 48500 (48.5 Hz) for B003 (*) max value = 49800 (49.8 Hz) for B003 (*) default value: 49700 (49.7 Hz) for B003(*)
304462	01CDh	1	Delay activation time for Set point 4	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
304463	01CEh	1	Hysteresis for Set point 4	UINT	default value: 90 (0.090 Hz) (*)

Modicom address	Physical address	Length (words)	Set point settings	Data Format	Notes
Version B001 and B003					
			Frequency derivative		0 → Set point control disabled 1 → Set point control enabled default value: 0 (*)
304464	01CFh	1	Enable Set point 5 control	UINT	min value = 100 (0.1 Hz/s) max value = 1000 (1.0 Hz/s) default value: 100 (0.1 Hz/s) (*)
304465	01D0h	1	Set point 5 value	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
304466	01D1h	1	Delay activation time for Set point 5	UINT	default value: 20 (0.020 Hz/s) (*)
304467	01D2h	1	Hysteresis for Set point 5	UINT	
Version B002					
			Voltage Quality		
304464	01CFh	1	Enable Set point Voltage Quality control	UINT	1 → Set point control enabled default value: 1 (*)
304465	01D0h	1	Set point Voltage Quality value	UINT	min value = 254.0 VLN / 440.0 VLL max value = 265.0 VLN / 460.0 VLL default value: 254.0 VLN / 440.0 VLL (*)
304466	01D1h	1	Recovery time for voltage quality	UINT	min value = 0 s max value = 180.0 s default value: 30.0 s
304467	01D2h	1	Average integration time	UINT	min value = 1.0 min max value = 30.0 min default value: 10.0 min
			phase sequence		
304468	01D3h	1	Enable Set point 6 control	UINT	0 → Set point control disabled 1 → Set point control enabled default value: 0 (*)
304469	01D4h	1	Set point 6 value	UINT	min value = 0 (wrong phase sequence) max value = 1 (correct phase sequence) default value: 0 (**)
304470	01D5h	1	Delay activation time for Set point 6	UINT	min value = 0 (0.00 s) max value = 100 (1.00 s) default value: 5 (*)
304471	01D6h	1	Hysteresis for Set point 6	UINT	default value: 0 (**)
Version B002					
			System		
304472	01D7h	1	Voltage mode control	UINT	min value = 0 (system monitoring phase-phase voltage) max value = 1 (system monitoring phase-neutral voltage) default value: 1
304473	01D8h	1	Recovery time after Short interruption < 3 s	UINT	min value = 0 s max value = 30.0 s default value: 5.0 s
304474	01D9h	1	Recovery time after Long interruption > 3 s	UINT	min value = 0 s max value = 180.0 s default value: 30.0 s

Note:
(*) all these values are according to the "VDE V 0126-1-1" norm for the version B002, are according to the "ENEL DK5940" directive for version B003.

2.6 Alarm status (read only)

MODBUS**: read only mode with functions code 03 and 04**

Tab. 2-7

Modicom address	Physical address	Length (words)	Variable	Data Format	Notes
300366	016Dh	1	Alarm status	UINT	Bits 0: set point 1 status 0 → no allarm 1 → set point exceeded Bits 1: set point 2 status 0 → no allarm 1 → set point exceeded Bits 2: set point 3 status 0 → no allarm 1 → set point exceeded Bits 3: set point 4 status 0 → no allarm 1 → set point exceeded Bits 4: set point Voltage Quality for the version B002 set point 4 status df for the versions B001 and B003 0 → no allarm 1 → set point exceeded Bits 5: set point 6 status 0 → no allarm 1 → set point exceeded

2.7 Selector Position (read only)

MODBUS**: read only mode with functions code 03 and 04**

Tab. 2-8

Modicom address	Physical address	Length (words)	Variable	Data Format	Notes
300370	0171h	1	Selector position	UINT	LOCKPOS = 0 1POSITION = 1 2POSITION = 2 3POSITION = 3

2.8 Remote control of the output relays (read and write)

MODBUS**: read and write mode**

Tab. 2-9

Modicom address	Physical address	Length (words)	Variable	Data Format	Notes
304445	01BCh	1	Remote control status	UINT	(always selectable) 0000h → No remote control activated. AA00h → Remote control activated, all the output relays are deenergized
					(No selectable in LOCK position) AA01h → Remote control activated, the output relay 1 is energized. AA02h → Remote control activated, the output relay 2 is energized. AA03h → Remote control activated, all the output relays are energized

2.9 Carlo Gavazzi Controls identification code (read only)

MODBUS**: read only mode with functions code 03 and 04**

Tab. 2-10

Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
300012	000Bh	1	Carlo Gavazzi Controls identification code	UINT	003Ch = DPC72DM48-B003 002Bh = DPC72DM48-B002

2.10 Firmware version (read only)

MODBUS**: read only mode with functions code 03 and 04**

Tab. 2-11

Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
300525	020Ch	1	Firmware Revision	UINT	MSB: alphanumeric information 00h → A 01h → B … LSB: progressive number 00h → 0 01h → 1 … Es: 0001h → A1 0000h = DPC72-B003 ver.A rev.0 0100h = DPC72-B001 ver.B rev.0 0200h = DPC72-B002 ver.C rev.0

2.11 LOGs memory area (read only)

MODBUS**: read only mode with functions code 03 and 04.**

Tab. 2-12

Modicom address	Physical address	Length (words)	LOG values	Data Format	Notes
304225	1080h	2	Alarm type and date of the LOG1	USINT / BCD	Bits 31…24 : month of the year (BCD) Bits 23…16 : day of the month (BCD) Bits 15…8 : alarm type (USINT) 　0 → V UP 　1 → V LO 　2 → Fr UP 　3 → Fr LO 　4 → Voltage Quality for B002 　Frequency derivative for B001/B003 　5 → Wrong phase sequence 　6 → Prdn (power down) bits 7…0 : year (BCD)
304227	1082h	1	Time of the LOG1	BCD	MSB : hour of the day (24h format) LSB : minutes
304228	1083h	1	Value of the LOG1	UINT	Value which generated the event.
304229	1084h	2	Alarm type and date of the LOG2	USINT / BCD	Bits 31…24 : month of the year (BCD) Bits 23…16 : day of the month (BCD) Bits 15…8 : alarm type (USINT) 　0 → V UP 　1 → V LO 　2 → Fr UP 　3 → Fr LO 　4 → Voltage Quality for B002 　Frequency derivative for B001/B003 　5 → Wrong phase sequence 　6 → Prdn (power down) bits 7…0 : year (BCD)
304231	1086h	1	Time of the LOG2	BCD	MSB : hour of the day (24h format) LSB : minutes
304232	1087h	1	Value of the LOG2	UINT	Value which generated the event.
304233	1088h	2	Alarm type and date of the LOG3	USINT / BCD	Bits 31…24 : month of the year (BCD) Bits 23…16 : day of the month (BCD) Bits 15…8 : alarm type (USINT) 　0 → V UP 　1 → V LO 　2 → Fr UP 　3 → Fr LO 　4 → Voltage Quality for B002 　Frequency derivative for B001/B003 　5 → Wrong phase sequence 　6 → Prdn (power down) bits 7…0 : year (BCD)
304235	108Ah	1	Time of the LOG3	BCD	MSB : hour of the day (24h format) LSB : minutes
304236	108Bh	1	Value of the LOG3	UINT	Value which generated the event.
304237	108Ch	2	Alarm type and date of the LOG4	USINT / BCD	Bits 31…24 : month of the year (BCD) Bits 23…16 : day of the month (BCD) Bits 15…8 : alarm type (USINT) 　0 → V UP 　1 → V LO 　2 → Fr UP 　3 → Fr LO 　4 → Voltage Quality for B002 　Frequency derivative for B001/B003 　5 → Wrong phase sequence 　6 → Prdn (power down) bits 7…0 : year (BCD)
304239	108Eh	1	Time of the LOG4	BCD	MSB : hour of the day (24h format) LSB : minutes
304240	108Fh	1	Value of the LOG4	UINT	Value which generated the event.

Modicom address	Physical address	Length (words)	LOG values	Data Format	Notes
304241	1090h	2	Alarm type and date of the LOG5	USINT / BCD	Bits 31…24 : month of the year (BCD) Bits 23…16 : day of the month (BCD) Bits 15…8 : alarm type (USINT) 0 → V UP 1 → V LO 2 → Fr UP 3 → Fr LO 4 → Voltage Quality for B002 Frequency derivative for B001/B003 5 → Wrong phase sequence 6 → Prdn (power down) bits 7…0 : year (BCD)
304243	1092h	1	Time of the LOG5	BCD	MSB : hour of the day (24h format) LSB : minutes
304244	1093h	1	Value of the LOG5	UINT	Value which generated the event.
304245	1094h	2	Alarm type and date of the LOG6	USINT / BCD	Bits 31…24 : month of the year (BCD) Bits 23…16 : day of the month (BCD) Bits 15…8 : alarm type (USINT) 0 → V UP 1 → V LO 2 → Fr UP 3 → Fr LO 4 → Voltage Quality for B002 Frequency derivative for B001/B003 5 → Wrong phase sequence 6 → Prdn (power down) bits 7…0 : year (BCD)
304247	1096h	1	Time of the LOG6	BCD	MSB : hour of the day (24h format) LSB : minutes
304248	1097h	1	Value of the LOG6	UINT	Value which generated the event.
304249	1098h	2	Alarm type and date of the LOG7	USINT / BCD	Bits 31…24 : month of the year (BCD) Bits 23…16 : day of the month (BCD) Bits 15…8 : alarm type (USINT) 0 → V UP 1 → V LO 2 → Fr UP 3 → Fr LO 4 → Voltage Quality for B002 Frequency derivative for B001/B003 5 → Wrong phase sequence 6 → Prdn (power down) bits 7…0 : year (BCD)
304251	109Ah	1	Time of the LOG7	BCD	MSB : hour of the day (24h format) LSB : minutes
304252	109Bh	1	Value of the LOG7	UINT	Value which generated the event.
304253	109Ch	2	Alarm type and date of the LOG8	USINT / BCD	Bits 31…24 : month of the year (BCD) Bits 23…16 : day of the month (BCD) Bits 15…8 : alarm type (USINT) 0 → V UP 1 → V LO 2 → Fr UP 3 → Fr LO 4 → Voltage Quality for B002 Frequency derivative for B001/B003 5 → Wrong phase sequence 6 → Prdn (power down) bits 7…0 : year (BCD)
304255	109Eh	1	Time of the LOG8	BCD	MSB : hour of the day (24h format) LSB : minutes
304256	109Fh	1	Value of the LOG8	UINT	Value which generated the event.

Modicom address	Physical address	Length (words)	LOG values	Data Format	Notes

304257	10A0h	2	Alarm type and date of the LOG9	USINT / BCD	Bits 31…24 : month of the year (BCD)
					Bits 23…16 : day of the month (BCD)
					Bits 15…8 : alarm type (USINT)
					  0 → V UP
					  1 → V LO
					  2 → Fr UP
					  3 → Fr LO
					  4 → Voltage Quality for B002
					  Frequency derivative for B001/B003
					  5 → Wrong phase sequence
					  6 → Prdn (power down)
					bits 7…0 : year (BCD)

304259	10A2h	1	Time of the LOG9	BCD	MSB : hour of the day (24h format) LSB : minutes
304260	10A3h	1	Value of the LOG9	UINT	Value which generated the event.

304261	10A4h	2	Alarm type and date of the LOG10	USINT / BCD	Bits 31…24 : month of the year (BCD)
					Bits 23…16 : day of the month (BCD)
					Bits 15…8 : alarm type (USINT)
					  0 → V UP
					  1 → V LO
					  2 → Fr UP
					  3 → Fr LO
					  4 → Voltage Quality for B002
					  Frequency derivative for B001/B003
					  5 → Wrong phase sequence
					  6 → Prdn (power down)
					bits 7…0 : year (BCD)

304263	10A6h	1	Time of the LOG10	BCD	MSB : hour of the day (24h format) LSB : minutes
304264	10A7h	1	Value of the LOG10	UINT	Value which generated the event.

Note about alarm types:
V UP → one of the voltage inputs went over the threshold;
V LO → one of the voltage inputs went under the threshold;
Fr UP → the system frequency went over the threshold;
Fr LO → the system frequency went under the threshold;
D Fr → the value of the average Voltage went over the threshold for VERSION B002 or the absolute value of the frequency derivative went over the threshold for VERSION B001 and B003;
PS   → wrong phase sequence detected.

2.12 Programming parameter tables (read and write)

2.12.1 Password configuration menu

MODBUS**: read and write mode** (always editable)

Tab. 2-13

Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
304099 **6**04099	1002h	1	Password	UINT	min valid value: 0 max valid value: 9999 default = 0 If the value is outside the limits the instrument considers the value equal to 0.

2.12.2   Power on time delay menu

MODBUS**: read and write mode** (no lock editable)

Tab. 2-14

Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
304100 **6**04100	1003h	1	Power on time	UINT	min value = 1 s max value = 6 s default = 2 s If the value is outside the limits the instrument considers the value equal to 1.

2.12.3   Dafault page menu

MODBUS**: read and write mode** (always editable)

Tab. 2-15

Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
Versions B001 and B003					
304101 **6**04101	1004h	1	Default page	UINT	Default visualization page. 1 → VLL 2 → Fr (Hz, dHz/dt, seq.) 3 → date and hour
Versions B002					
304101 **6**04101	1004h	1	Default page	UINT	Default visualization page. 1 → VLN / VLL 2 → Average (VLN / VLL) 3 → Fr (Hz, dHz/dt, seq.) 4 → date and hour

2.12.4   Serial port configuration menu

MODBUS**: read and write mode** (always editable)

Tab. 2-16

Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
304102 **6**04102	1005h	1	Baudrate	UINT	min value = 0 (4800 buad) max value = 1 (9600 baud) default = 1 (9600 baud)
304103 **6**04103	1006h	1	Address	UINT	min value = 1 max value = 255 default = 1
304104 **6**04104	1007h	1	Parity	UINT	Parity bit for serial COM port: 0 → NONE 1 → ODD 2 → EVEN

2.12.5 Set points menu (read and write)

MODBUS**: read and write mode** (no lock editable)

Modicom address	Physical address	Length (words)	Set point settings	Data Format	Notes
			Upper Voltage setpoint		**Value for B001/B003 or B002**
304118 **6**04118	1028h	1	Enable Set point 1control	UINT	1 → Set point control enabled default value: 1 (*)
304119 **6**04119	1029h	1	Set point 1 value	UINT	min value = 230.0 VLN / 400.0 VLL max value = 277.0 VLN / 480.0 VLL default value: 265.0 VLN / 460.0 VLL for B002 (*) 480.0 VLL for B003 (*) 460.0 VLL for B001.
304120 **6**04120	102Ah	1	Delay activation time for Set point 1	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
304121 **6**04121	102Bh	1	Hysteresis for Set point 1	UINT	default value: 120 (12.0 VLL) (*)
			Lower Voltage setpoint		
304122 **6**04122	102Ch	1	Enable Set point 2 control	UINT	1 → Set point control enabled default value: 1 (*)
304123 **6**04123	102Dh	1	Set point 2 value	UINT	min value = 185.0 VLN / 320.0 VLL max value = 230.0 VLN / 400.0 VLL default value: 185.0 VLN / 320.0 VLL for B002 (*) 320.0 VLL for B001 and B003 (*)
304124 **6**04124	102Eh	1	Delay activation time for Set point 2	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
304125 **6**04125	102Fh	1	Hysteresis for Set point 2	UINT	default value: 120 (12.0 VLL) (*)
			Upper Frequency setpoint		
304126 **6**04126	1030h	1	Enable Set point 3 control	UINT	1 → Set point control enabled default value: 1 (*)
304127 **6**04127	1031h	1	Set point 3 value	UINT	min value = 45000 (45 Hz) for B002 (*) max value = 65000 (65 Hz) for B002 (*) default value: 50200 (50.2 Hz) for B002(*) min value = 50000 (45 Hz) for B003 (*) max value = 51500 (65 Hz) for B003 (*) default value: 50300 (50.3 Hz) for B003(*)
304128 **6**04128	1032h	1	Delay activation time for Set point 3	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
304129 **6**04129	1033h	1	Hysteresis for Set point 3	UINT	default value: 100 (0.100 Hz) (*)
			Lower Frequency setpoint		
304130 **6**04130	1034h	1	Enable Set point 4 control	UINT	1 → Set point control enabled default value: 1 (*)
304131 **6**04131	1035h	1	Set point 4 value	UINT	min value = 45000 (45 Hz) for B002 (*) max value = 65000 (65 Hz) for B002 (*) default value: 47500 (47.5 Hz) for B002(*) min value = 48500 (48.5 Hz) for B003 (*) max value = 49800 (49.8 Hz) for B003 (*) default value: 49700 (49.7 Hz) for B003(*)
304132 **6**04132	1036h	1	Delay activation time for Set point 4	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
304133 **6**04133	1037h	1	Hysteresis for Set point 4	UINT	default value: 90 (0.090 Hz) (*)

Modicom address	Physical address	Length (words)	Set point settings	Data Format	Notes
			Version B001 and B003		
			Frequency derivative		
3**04134** 6**04134**	1038h	1	Enable Set point 5 control	UINT	0 → Set point control disabled 1 → Set point control enabled default value: 0 (*)
3**04135** 6**04135**	1039h	1	Set point 5 value	UINT	min value = 100 (0.1 Hz/s) max value = 1000 (1.0 Hz/s) default value: 100 (0.1 Hz/s) (*)
3**04136** 6**04136**	103Ah	1	Delay activation time for Set point 5	UINT	min value = 5 (0.05 s) max value = 100 (1.00 s) default value: 5 (*)
3**04137** 6**04137**	103Bh	1	Hysteresis for Set point 5	UINT	default value: 20 (0.020 Hz/s) (*)
			Version B002		
			Voltage Quality		
3**04134** 6**04134**	1038h	1	Enable Set point Voltage Quality control	UINT	1 → Set point control enabled default value: 1 (*)
3**04135** 6**04135**	1039h	1	Set point Voltage Quality value	UINT	min value = 254.0 VLN / 440.0 VLL max value = 265.0 VLN / 460.0 VLL default value: 254.0 VLN / 440.0 VLL (*)
3**04136** 6**04136**	103Ah	1	Recovery time for voltage quality	UINT	min value = 0 s max value = 180.0 s default value: 30.0 s
3**04137** 6**04137**	103Bh	1	Average integration time	UINT	min value = 1.0 min max value = 30.0 min default value: 10.0 min
			phase sequence		
3**04138** 6**04138**	103Ch	1	Enable Set point 6 control	UINT	0 → Set point control disabled 1 → Set point control enabled default value: 0 (*)
3**04139** 6**04139**	103Dh	1	Set point 6 value	UINT	min value = 0 (wrong phase sequence) max value = 1 (correct phase sequence) default value: 0 (**)
3**04140** 6**04140**	103Eh	1	Delay activation time for Set point 6	UINT	min value = 0 (0.00 s) max value = 100 (1.00 s) default value: 5 (*)
3**04141** 6**04141**	103Fh	1	Hysteresis for Set point 6	UINT	default value: 0 (**)
			Version B002		
			System		
3**04142** 6**04142**	1040h	1	Voltage mode control	UINT	min value = 0 (system monitoring phase-phase voltage) max value = 1 (system monitoring phase-neutral voltage) default value: 1
3**04143** 6**04143**	1041h	1	Recovery time after Short interruption < 3 s	UINT	min value = 0 s max value = 30.0 s default value: 5.0 s
3**04144** 6**04144**	1042h	1	Recovery time after Long interruption > 3 s	UINT	min value = 0 s max value = 180.0 s default value: 30.0 s

Note:
(*) all these values are according to the "VDE V 0126-1-1" directive for the Version B002, are according to the "ENEL DK5940" directive for Version B003
(**) these values are according to the "ENEL DK5940" directive and have fixed values.
When the parameters are written they become operative when the the knob comes back to lock position.

2.12.6 Set date and hour (read and write)

MODBUS**: read and write mode** (always editable)

Tab. 2-17

Modicom address	Physical address	Length (words)	VARIABLE ENG. UNIT	Data Format	Notes
300521 **6**00521	0208h	1	LSB : seconds MSB : minutes	BCD	min value = 0x00 max value = 0x59
300522 **6**00522	0209h	1	LSB : hours MSB: day of the week	BCD	min value = 0x00 max value = 0x23
300523 **6**00523	020Ah	1	LSB : day of the month MSB : month of the year	BCD	min value = 0x00 max value = 0x31
300524 **6**00524	020Bh	1	LSB : year (2-digit format) MSB : not used	BCD	min value = 0x08 max value = 0x99
629296	726Fh	1	Write new date command	UINT	This command upload the new values for the date.

2.12.7 Reset commands

MODBUS**: write only mode**

Tab. 2-18

Modicom address	Physical address	Length (words)	Command Value	Data Format	Notes
621061	5245h	1	0001h	UINT	(No selectable in lock position) Load the preset value for all set points according to the "ENEL DK5940" directive for version B001 and B003 Load the preset value for all set points, according to the "VDE V 0126-1-1" directive, and reset average calculation for version B002
			0002h		(always selectable) Events reset. The number of detected events counter will be erased, but the last 10 logs will be able to be read via serial port.
			0003h		(always selectable) Events and Logs reset. In this case ALL the data memory for recording the events will be erased. All information will be lost.
			0004h		(always selectable) Reset average calculation. The average calculation restart, only for version B002