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Communication Protocol WH4013

Electronic Electricity Meter

for

DIN Rail-Assembling

| | |
|--------------|------------|
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DZG Metering GmbH, Heidelberger Str. 32, D-16515 Oranienburg



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DZG Metering GmbH
Heidelberger Str. 32
D-16515 Oranienburg

Notice:

This manual describes electricity meters of the type DVS60x.xx. It includes all necessary informations for assembling, setting into operation and use of the meter.

Used Symbols

| | |
|---|---|
|  | <p>Danger through Electric Voltages The symbol indicates warnings, which may lead to personal injuries or death if it is ignored. Take all necessary precautions to avoid danger !</p> |
|  | <p>Warning The symbol indicates warnings to a possible dangerous situation which may lead to personal injuries or damage to properties. Avoid dangerous situations !</p> |
| | <p>Attention! „Attention“ indicates warnings, which may lead to damage of properties if not observed.</p> |
|  | <p>Notice „Notice“ indicates important information in the manual.</p> |
|  | <p>The symbol is printed on the nameplate as references to further informations in a instruction manual prepared for the customer.</p> |



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1 Detailed data definition

1.1 Data classification

| Data type | abbreviation | Data | Attribute (Read or write) |
|-------------------|--------------|--|------------------------------|
| Holding registers | HR | Meter parameter; Tariff rate parameters; Demand parameters; Load profile parameters; Display parameters; Event log. | Read Write |
| File record | FR | Load profile | Read |

1.2 Energy and Demand

1.2.1 Code(binary)

AA XX XXXX XXXX XXXX
00

AA = Data type
00 = parameter or event log
(Detailed definition reference 1.3)

01

01 = energy

10

10 = max demand

11

11 = The occurred Time of max demand

AA BB BBBX XXXX XXXX

BB BBB = History data

00 000

00 000 = Current data

00 001

00 001 = Prev1 data

00 010

00 010 = Prev2 data

.....

10 100

10 100 = Prev20 data

AABB BBBC XXXX XXXX

C = Direction

0

0 = forward

1

1 = reverse

AABB BBBC DXXX XXXX

D = active or reactive

0

0 = active

1

1 = reactive(this meter do not have)

AABB BBBC DEE X XXXX

EE = Relevant Phase

00

00 = Total

01

01 = Phase L1

10

10 = Phase L2

11

11 = Phase L3

AABB BBBC DEE F FFFX

F FFF = Tariff rate(split-phase do not have tariff rate X)

0 000

0 000 = tariff rate all

0 001

0 001 = tariff rate 1

0 010

0 010 = tariff rate 2

.....

1 000

1 000 = tariff rate 8



AABB BBBC DEEF FFF**G**

G = MODBUS specified in each register is 2 bytes, this section defines the data is 4 bytes, so G always equal to zero

0 = high word
1 = low word

1.2.2 E.g. for Energy data

| Name | Binary Address | Hexadecimal Address | Data Format (4 bytes, 3 decimal places, the unit : kWh) | | |
|--|------------------------|---------------------|---|------------------------|-------------|
| The current total tariff rate import active energy | 0100 0000 0000 0000 | 0x4000 | 0x0011 | 0x00112233 =1122867 | 1122.867kWh |
| | 0100 0000 0000 0001 | 0x4001 | 0x2233 | | |

1.2.3 E.g. for Demand data

| Name | Binary Address | Hexadecimal Address | Data Format (4 bytes, 4 decimal places, the unit : kWh) | | |
|--|------------------------|---------------------|---|------------------------|------------|
| The current tariff rate 1 export active demand | 1000 0001 0000 0010 | 0x8102 | 0x0011 | 0x00112233 =1122867 | 112.2867kW |
| | 1000 0001 0000 0011 | 0x8103 | 0x2233 | | |

1.2.4 E.g. for Demand data occurred time

| Name | Binary Address | Hexadecimal Address | Data Format (4 bytes of second index) | | |
|--|------------------------|---------------------|---------------------------------------|------------------------|------------|
| Prev1 tariff rate 5 import active demand occurred time | 1100 0010 0000 1010 | 0xC20A | 0x0011 | 0x00112233 =1122867 | 1122867sec |
| | 1100 0010 0000 1011 | 0xC20B | 0x2233 | | |

1.2.5 Log of demand stored and demand reset

Code(binary)

0010 000X XXXX XXXX demand stored and reset

- When the demand of archived and reset, Meter will record the relevant time,
- record 20 times
- - record archived and reset time second index;

| Name | Hexadecimal Address | Data Format(4 bytes) |
|------|---------------------|----------------------|
|------|---------------------|----------------------|



| | | | | |
|--------------------|--------|--------|------------|------------|
| Prev1 data | 0x2000 | 0x0011 | 0x00112233 | 1122867sec |
| | 0x2001 | 0x2233 | = 1122867 | |
| Prev2 data | 0x2002 | | | |
| | 0x2003 | | | |
| | | | | |
| | | | | |
| Prev20 data | 0x2026 | | | |
| | 0x2027 | | | |

1.3 Parameter data

Code(binary)

000**H HH**XX XXXX XXXX
 0000 **00**XX XXXX XXXX
 0000 **01**XX XXXX XXXX
 0000 **10**XX XXXX XXXX
 0000 **11**XX XXXX XXXX
 0001 **00**XX XXXX XXXX

H HH = Parameter type
0 00 = Instantaneous data
0 01 = basic parameter
0 10 = Tariff rate and demand calculation parameters
0 11 = Load Profile parameters
1 00 = Display parameters

1.3.1 Instantaneous data

| Name | Hexadecimal Address | Data Format(4 bytes) | | |
|--------------------------------------|---------------------|----------------------|------------|------------------------------|
| | | | | |
| The total Import active power | 0x0000 | 0x0011 | 0x00112233 | 1 decimal places, the unit W |
| | 0x0001 | 0x2233 | = 1122867 | |
| The total export active power | 0x0002 | 0x0011 | 0x00112233 | 1 decimal places, the unit W |
| | 0x0003 | 0x2233 | = 1122867 | |
| L1 Voltage effective value | 0x0004 | 0x0011 | 0x00112233 | 2 decimal places, the unit V |
| | 0x0005 | 0x2233 | = 1122867 | |
| L2 Voltage effective value | 0x0006 | 0x0011 | 0x00112233 | 2 decimal places, the unit V |
| | 0x0007 | 0x2233 | = 1122867 | |
| L3 Voltage effective value | 0x0008 | 0x0011 | 0x00112233 | 2 decimal places, the unit V |
| | 0x0009 | 0x2233 | =1122867 | |
| L1 Current effective value | 0x000A | 0x0011 | 0x00112233 | 3 decimal places, the unit A |
| | 0x000B | 0x2233 | = 1122867 | |
| L2 current effective value | 0x000C | 0x0011 | 0x00112233 | 3 decimal places, the unit A |
| | 0x000D | 0x2233 | = 1122867 | |
| L3 current effective value | 0x000E | 0x0011 | 0x00112233 | 3 decimal places, the unit A |
| | 0x000F | 0x2233 | = 1122867 | |
| Power factor | 0x0010 | 0x0011 | 0x00112233 | 3 decimal |



| | | | | |
|--|------------------|------------------|-------------------------|-------------------------------------|
| | 0x0011 | 0x2233 | = 1122867 | places, unitless. |
| Frequency | 0x0012 0x0013 | 0x0011 0x2233 | 0x00112233 = 1122867 | 3 decimal places, the unit Hz |
| The total Import demand | 0x0014 0x0015 | 0x0011 0x2233 | 0x00112233 = 1122867 | 4 decimal places, the unit kW |
| The total export demand | 0x0016 0x0017 | 0x0011 0x2233 | 0x00112233 = 1122867 | 4 decimal places, the unit kW |
| L1 voltage threshold | 0x0018 0x0019 | 0x0011 0x2233 | 0x00112233 = 1122867 | 3 decimal places, the unit % |
| L2 voltage threshold | 0x001A 0x001B | 0x0011 0x2233 | 0x00112233 = 1122867 | 3 decimal places, the unit % |
| L3 voltage threshold | 0x001C 0x001D | 0x0011 0x2233 | 0x00112233 = 1122867 | 3 decimal places, the unit % |

1.3.2 basic parameter

| Name | Hexadecimal Address | Data Format (default 2 bytes) | Attribute (Read or write) |
|---------------------------------|----------------------------|---|---------------------------|
| Second index | 0x0400 0x0401 | 4 bytes,the unit: s (Only in the Factory Mode meter is allowed to be set 0 value) | RW |
| Meter number | 0x0402 0x0403 0x0404 | 6 bytes,Low in the first ,Compression BCD(Only in the Factory Mode meter is writable) | RW |
| Soft clock date | 0x0405 0x0406 | 2 bytes definition refer to Date format which below this form | RW |
| Soft clock time | 0x0407 0x0408 | 2 bytes definition refer to Time format which below this form | RW |
| Asynchronous clock cycle | 0x0409 0x040A | 4 bytes, the unit:s | RW |
| Communication baud rate | 0x040B | 5 – 9600bps 6 – 19200bps Other – Retain | RW |
| Rated Voltage | 0x040C | 230.00V,2 decimal places | R |
| Rated Current | 0x040D | 5.000A,3 decimal | R |



| | | | |
|---|--------|--|----|
| | | places | |
| Rated Frequency | 0x040E | 50.000Hz,3 decimal places | R |
| Maximum Current | 0x040F | 65.000A,3 decimal places | R |
| Active pulse constant | 0x0410 | 1000imp/kWh | R |
| Active remote control pulse constant | 0x0411 | Configurable : 1000 imp/kWh 500 imp/kWh 250 imp/kWh 100 imp/kWh | RW |
| Times of Demand archived | 0x0412 | | R |
| Status word | 0x0413 | definition refer to Status format which below this form Status format | R |
| | | | |
| Factory production commands | 0x04FF | 0 – Initialization 1 –Clear the energy demand 2 – Clear the event logs 3 –Clear Load Profile 4 –Enter the calibration status 5 – Upgrade the Firmware | W |

| | | |
|----------------------------------|-------|----------|
| Date and time format | Octet | 8 |
| Date format | Octet | 4 |
| Year | U08 | 1 |
| Month (1..12) | U08 | 1 |
| Day (1..31) | U08 | 1 |
| Day of week (1:Monday, 0:Sunday) | U08 | 1 |
| Time format | Octet | 4 |
| Hour (0..23) | U08 | 1 |
| Minute (0..59) | U08 | 1 |
| Second (0..59) | U08 | 1 |
| Hundredths (0..99) | U08 | 1 |

| |
|-------------------------|
| Status formats |
| bit 0 - RTC error |
| bit 1 - EEPROM error |
| bit 2 - Dataflash error |
| bit 3 - Reserved |
| bit 4 - Reserved |
| bit 5 - Reserved |
| bit 6 - Reserved |



bit 7 - Reserved
 bit 8 - Phase failure–phase 1
 bit 9 - Phase failure–phase 2
 bit10 - Phase failure–phase 3
 bit11 - Anti Phase Sequence
 bit12 - Reserved
 bit13 - Reserved
 bit14 - Reserved
 bit15 - Reserved

1.3.3 Tariff Rate and Demand calculation parameters

| Name | Hexadecimal Address | Data Format (2 bytes) | Attribute (Read or write) |
|---------------------------------|---------------------|--|--|
| Demand calculation cycle | 0x0800 | 60,120,300, 600,900,1200, The unit :s | RW |
| Demand archived | 0x0801 | 1 – Archived others – Don't archived | W |
| The current Tariff rate | 0x0802 | [1,8] | When the tariff rate is controlled by external terminal, This parameter is read-only; When the tariff rate is controlled by command, This parameter can be read and written |
| Tariff Rate control word | 0x0803 | 0 – controlled by external terminal 1 – controlled by command –Retain | RW |

1.3.4 Load Profile parameters

| Name | Hexadecimal Address | Data Format (2 bytes) | Attribute (Read or write) |
|------------------------|---------------------|---|---------------------------|
| Record interval | 0x0C00 | 1,2,5,30, 60,120, 300,600,900,1800,3600,the | RW |



| | | | |
|--------------------------------|--------|--|----|
| | | unit:s When the parameter is set less than or equal to 60, load profile winding is prohibited | |
| Record points amount | 0x0C01 | Maximum 43200 | R |
| Configure the channel 1 | 0x0C02 | Second Index | R |
| Configure the channel 2 | 0x0C03 | | RW |
| Configure the channel 3 | 0x0C04 | Voltage, current, power, Power factor, demand, energy or status word | RW |
| Configure the channel 4 | 0x0C05 | | RW |
| Configure the channel 5 | 0x0C06 | | RW |
| Configure the channel 6 | 0x0C07 | | RW |
| Configure the channel 7 | 0x0C08 | | RW |
| Configure the channel 8 | 0x0C09 | | RW |

1.3.5 Display parameters

| Name | Hexadecimal Address | Data Format (2 bytes) | Attribute (Read or write) |
|--|---------------------|--------------------------------|---------------------------|
| Auto mode display interval time | 0x1000 | 4~20, the unit:s , Default 10s | RW |
| Manual mode Display exiting interval time | 0x1001 | 4~20,the unit; s, Default 10s | RW |
| Whether enable the Test mode | 0x1002 | 0 – yes 1 – no | RW |
| Auto mode display amount | 0x1010 | 0~32 | RW |
| Manual mode display amount | 0x1011 | 0~32 | RW |
| Test mode display amount | 0x1012 | 0~32 | RW |
| configurable | 0x1100~ | Voltage, current, | RW |



| | | | |
|---|-------------------|--|----|
| display items under the auto mode | 0x111F | Power, Frequency Demand, Energy or Second Index, (OBIS code display reference standard) | |
| configurable display items under the manual mode | 0x1120~ 0x113F | | RW |
| configurable display items under the test mode | 0x1140~ 0x115F | | RW |

1.3.6 Configurable display items

| Name | Hexadecimal Address | OBIS code | Notes | |
|--|---------------------|-----------------|--|--------|
| Tariff rate X Import active energy | reference 1.2 | 1.8.x | X=0 means total | |
| Tariff rate X Export active energy | | 2.8.x | The history data of 20 archived cycle can also be displayed. when display historical data, OBIS area Of the display will be display the OBIS codes and Prxx alternating. | |
| Tariff rate X Import active demand | | 1.6.x | | |
| Tariff rate X export active demand | | 2.6.x | | |
| Phase L1 total import Active energy | | 21.8.0 | | |
| Phase L1 total export Active energy | | 22.8.0 | | |
| Phase L2 total import Active energy | | 41.8.0 | | |
| Phase L2 total export Active energy | | 42.8.0 | | |
| Phase L3 total import Active energy | | 61.8.0 | | |
| Phase L3 total export Active energy | | 62.8.0 | | |
| total import Active Power | | reference 1.3.1 | | 1.7.0 |
| total export Active Power | | | | 2.7.0 |
| L1 Voltage effective value | | | | 32.7.0 |
| L2 Voltage effective value | 52.7.0 | | | |
| L3 Voltage effective value | 72.7.0 | | | |
| L1 Current | 31.7.0 | | | |



| | | | |
|-----------------------------------|--------------------|--------|--|
| effective value | | | |
| L2 Current effective value | | 51.7.0 | |
| L3 Current effective value | | 71.7.0 | |
| Power factor | | 13.7.0 | |
| Frequency | | 14.7.0 | |
| Soft clock date | reference 1.3.2 | 0.9.2 | |
| Soft clock time | | 0.9.1 | |

1.4 Event log

Code(binary)

001 I III X XXXX XXXX
 001 0 001 X XXXX XXXX
 001 0 010 X XXXX XXXX
 001 0 011 X XXXX XXXX
 001 0 100 X XXXX XXXX

I III = Data type
 0 001 = Second index reset event
 0 010 = Power on and Power off event
 0 011 = Second index synchronization event
 0 100 = The clock asynchronous event

1.4.1 Power on and Power off event

Record at least the last 20 times, the data will be reset automatically when the second index reset, Record format is as follows:

- 1.Second index at the last time power off;
- 2.Second index at this time power on;

| Name | Hexadecimal Address | Data Format (4 bytes) | | |
|----------------------|---------------------|-----------------------|-------------------------|---|
| Prev1 record | 0x2400 0x2401 | 0x0011 0x2230 | 0x00112230 = 1122864 | Second index of the last time power off, 1122864sec |
| | 0x2402 0x2403 | 0x0011 0x2233 | 0x00112233 = 1122867 | Second index of this time power on ,1122867sec |
| Prev2 record | 0x2404 | | | |
| | 0x2405 | | | |
| | 0x2406 | | | |
| | 0x2407 | | | |
| | | | | |
| | | | | |
| Prev20 record | 0x244C | | | |
| | 0x244D | | | |
| | 0x244E | | | |



| | | | | |
|--|--------|--|--|--|
| | 0x244F | | | |
|--|--------|--|--|--|

•

1.4.2 Second index synchronization event log

- Record at least the last 20 times
Record format is as follows:
 - 1. Second index at the Synchronous moment;
 - 2. Second stamp before the Synchronous moment;
 - 3. Second stamp after the Synchronous moment.
- Notes : Second stamp is reference time defined by UNIX system,
Starting at 1970.1.1 00:00:00.

| Name | Hexadecimal Address | Data Format (4 bytes) | | |
|----------------------|---------------------|-----------------------|-------------------------|--|
| Prev1 record | 0x2600 0x2601 | 0x0011 0x2230 | 0x00112230 = 1122864 | Second index at the Synchronous moment, 1122864sec |
| | 0x2602 0x2603 | 0x0011 0x2233 | 0x00112233 = 1122867 | Second stamp before the Synchronous moment; 1122867sec |
| | 0x2604 0x2605 | 0x0011 0x2236 | 0x00112236 = 1122870 | Second stamp after the Synchronous moment. 1122870sec |
| Prev2 record | 0x2606 | | | |
| | 0x2607 | | | |
| | 0x2608 | | | |
| | 0x2609 | | | |
| | 0x260A 0x260B | | | |
| | | | | |
| | | | | |
| Prev20 record | 0x2672 | | | |
| | 0x2673 | | | |
| | 0x2674 | | | |
| | 0x2675 | | | |
| | 0x2676 0x2677 | | | |

1.4.3 The clock asynchronous event log

Soft clock needs periodic calibration (period is configurable), if was not calibrated during the calibration period, record the clock asynchronous event log.

Recorded 20 times,

Record the Second index when the asynchronous occurred;

•

| Name | Hexadecimal Address | Data Format (4 bytes) | | |
|---------------------|---------------------|-----------------------|------------|------------|
| Prev1 record | 0x2800 | 0x0011 | 0x00112233 | 1122867sec |
| | 0x2801 | 0x2233 | = 1122867 | |



| | | | | |
|----------------------|------------------|--|--|--|
| Prev2 record | 0x2802 0x2803 | | | |
| | | | | |
| | | | | |
| Prev20 record | 0x2826 0x2827 | | | |

1.5 Load profile record

Load profile will be read in the form of file, record maximum 43200 points, each point save to a file, containing eight channels of data, the number of bytes in each channel fixed on 4, The bytes which did not used will be filled with 0 x00
The record of Load profile will be reset automatically when the second index reset.

| Name | File number | Record number | Data Format (4 bytes) | | |
|-------------------------|-------------|-------------------|-----------------------|-------------------------|---|
| Prev1 record | 0x0001 | 0x0000 | 0x0011 | 0x00112233 = 1122867 | Channel1 data : Fixed for Second index 1122867sec |
| | | 0x0001 | 0x2233 | | Channel 2 data |
| | | 0x0002 | | | Channel 3 data |
| | | 0x0003 | | | Channel 4 data |
| | | 0x0004 | | | Channel 5 data |
| | | 0x0005 | | | Channel 6 data |
| | | 0x0006 | | | Channel 7 data |
| | | 0x0007 | | | Channel 8 data |
| | | 0x0008 | | | |
| | | 0x0009 | | | |
| | | 0x000A | | | |
| | | 0x000B | | | |
| | | 0x000C | | | |
| | | 0x000D | | | |
| | | 0x000E | | | |
| | | 0x000F | | | |
| Prev2 record | 0x0002 | 0x0000~ 0x000F | | | |
| | | | | | |
| | | | | | |
| Prev43200 record | 0xA8C0 | 0x0000~ 0x000F | | | |



1.6 Definition of other useful data in the meter

1.6.1 RTU Communicate Address

The two digits lowest value of Meter ID plus 1.

e.g. meter ID : 0000000011 , the communicate address: 11+1 =12.

1.6.2 Device Identification

| Object ID | Describe | Data Type | Data Length | Notes |
|-----------|---------------|--------------|-------------|-------|
| 0x00 | Manufacturers | ASCII String | 3 | REC |
| 0x01 | Product code | ASCII String | 8 | |
| 0x02 | Version | ASCII String | 5 | V2.01 |

1.7 MMS Communication data format e.g.

1.7.1 Read data

Send to meter: **12 03 04 0D 00 01 16 5A**

12 –communication address

03 –means read

04 0D—register address ,means **Rated Current**

00 01 ---length of register data

16 5A-- verify

Receive : **12 03 02 13 88 30 D1**

12 –communication address

03 –means read

02—length of data field

13 88 ---data field

30 D1—CRC

1.7.2 Write data

1. ACK

Send to meter : **12 06 04 0B 00 06 7B 99**

12 –communication address

06 –means write

04 0B—register address ,means **Communication baud rate**

00 06 --- data

7B 99-- CRC

Receive : **12 06 04 0B 00 06 7B 99**

Receive data consistent with the send data means write successful.

2. NACK



Some commands is writable only in the Factory Mode meter.If not in the factory mode, meter will return the NACK when commands be written.

Send to meter : **12 06 04 FF 00 02 3B A8**

12 –communication address

06 –means write

04 FF—register address ,means **Factory production commands**

00 02 --- data, means **Clear the event logs**

3B A8—CRC

Receive : **12 86 04 B2 66**

12 –communication address

86 –means **NACK**

04—abnormal sign of write register

B2 66 --- CRC