Series PM130 PLUS Powermeters

PROFIBUS DP
Communications Protocol

Reference Guide

BG0444 Rev. A1

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Table of Contents

1 General

This document specifies the PM130 PROFIBUS DP messaging protocol used to transfer data between a master PROFIBUS station and the PM130. The document provides the complete information necessary to develop third-party communications software capable of communication with the Series PM130 PLUS devices. Additional information concerning communications operation, configuring the communications parameters, and communications connections is found in "Series PM130 PLUS Powermeters, Installation and Operation Manual".

IMPORTANT

In 3-wire connection schemes, the unbalanced current and phase readings for power factor, active power, and reactive power will be zeros, because they have no meaning. Only the total three-phase power values will be shown.

Designations used in the guide:

EH - available in the meters with the EH suffix

2 PROFIBUS DP Protocol Implementation

2.1 PROFIBUS ID Number and GSD-File

The PM130 uses the certified AnyBus®-IC PROFIBUS communication module from HMS Industrial Networks AB with the registered PROFIBUS ID number 0x1810. The GSD file hms_1810.gsd is shown in Section 6 and is provided with the device on an accompanying CD.

2.2 PROFIBUS Version

The PM130 supports the basic version V0 of the PROFIBUS DP protocol. The V1 and V2 protocol extensions are not supported.

2.3 Baud Rates

The PM130 supports all standard baud rates from 9.6 kbps to 12 Mbps with automatic baud rate detection, so the actual baud rate is only configured in the PROFIBUS master. The baud rate indicated in the PM130 setup shows the baud rate used in communications between the device CPU and the PROFIBUS communication module and does not concern the PROFIBUS baud rate.

2.4 Node Address

The PROFIBUS node address can be manually set to the range of 0 to 126. When it is set to 126 (factory default), the device will support the Set_Slave_Address telegram from the PROFIBUS master so the actual node address can be set using the PROFIBUS master configuration tool. The actual node address received from the fieldbus master is saved to the device setup and can be inspected from the device front panel.

2.5 Input and Output Buffers

The PM130 provides 32 bytes input and 32 bytes output buffers.

2.6 Extended Diagnostic Data

The PM130 does not support Extended Diagnostic Data.

2.7 PROFIBUS Fault Action

Bus in Off-line Mode

When the PROFIBUS goes off-line, the fieldbus outputs are cleared.

Bus in Clear Mode

When the PROFIBUS goes to idle, the fieldbus outputs are cleared..

Fail-safe Outputs State

The fail-safe state for PROFIBUS outputs is either zeroed outputs or frozen outputs so that their contents would not be taken by the device as a new master command when the PROFIBUS goes to on-line.

2.8 PROFIBUS Messaging Protocol

Overview

Since the PM130 transfer buffers only support 32 bytes or less transfer blocks, all of the device registers cannot possibly be sent over PROFIBUS DP every scan. However, a messaging mechanism

allows a master to access all the device registers by placing a command request pointing to the requested items in the output buffer and by receiving a corresponding response in the input buffer.

Because PROFIBUS DP only supports cyclic data transfer between a master and a slave, a master command is sent constantly from a PROFIBUS master to the PM130. The device always handles read requests and the response block is normally updated every 20 ms, however, a write request is handled only once, that is, the device ignores duplicate write commands. This means that a write command sent multiple times would be handled only once. To send a write command once again, toggle the synchronization bit in the control word (see "Master Request Block" below) so the command frame would look different.

Data Types

Data transferred through the PROFIBUS input and output buffers is represented in big endian format: the bytes are ordered from least significant at the highest address to most significant at the lowest address. Data is always transferred in integer format. Negative numbers are represented in 2-complement code.

A PROFIBUS master can request data either in 16-bit word format (unsigned UINT16 or signed INT16 integers), or in 32-bit double word format (unsigned UINT32 or signed INT32 long integers). 32-bit integers are sent in two adjacent words – most significant at the lowest address. Up to 14 words can be read or written by a single master request – 14 data items using 16-bit format or 7 data items using 32-bit format.

The value range allowed for 16-bit data is 0 to 65535 for unsigned numbers and –32768 to 32767 for signed numbers. If the requested data exceeds a 16-bit word range, it is truncated to the maximum allowable negative or positive number and the "over-range error" exception code is set in the control word. When over-range occurs, an unsigned value is reported as 65535, a positive signed value as 32767 and a negative signed value as -32768. To avoid over-range errors with 16-bit integers, linear scaling may be applied to analog data registers (see "16-bit Scaled Data"). Scaling cannot be used with counters and bit-mapped binary registers. Whether scaling is to be used or not is specified in the PROFIBUS master request.

Data Addressing

Device data registers are addressed using 16-bit point identifiers (ID) that are given throughout this guide in four-digit hexadecimal notation.

In the master request and the device response messages, data addresses are defined by two parameters: a start point ID that opens a data block being read or written, and a word count that specifies the number of consecutive words in the block.

Master Request Block

The request block size can vary from 4 to 32 bytes. The actual size is defined when configuring the PROFIBUS master for this device by selecting the OUTPUT module from the device GSD file. Request formats for reading data from and writing data to the device are shown in Tables 2-1 and 2-2. The first two words contain a control word and a point ID for the first data item being accessed.

The requested data block size is specified in 16-bit words. In the event of 32-bit data, the number of words must be even and would be twice the number of items being read or written. Uneven word count will cause an "Invalid address" exception.

Table 2-1 Read Request Block

Bytes	Description	Range	Type	Notes
0,1	Command control	See Table 2-3	UINT16	
2,3	Start point ID	0x0000-0xFFFF	UINT16	

Table 2-2 Write Request Block

Bytes	Description	Range	Type	Notes
0,1	Command control	See Table 2-3	UINT16	
2,3	Start point ID	0x0000-0xFFFF	UINT16	
4-31	Data block		INT16/INT32	32-bit integers occupy two 16-bit words – most significant first

Table 2-3 Request Control

Byte	Bits	Description	Range	Notes
0	0-1	Operation	00=No operation 01=Read 10=Write 11=Clear	"Clear" and "No operation" remove the last master command sent and clear the PROFIBUS input buffer. After the device restarts, "Write" commands are ignored until "Clear" or "Read" is sent first for device synchronization.
	2	Data type	0=32-bit integer 1=16-bit integer	32-bit integers occupy two 16-bit words – most significant first
	3	Unused		
	4	16-bit linear scaling	0=disabled 1=enabled	Only applied to 16-bit analog registers. Will not affect binary registers and counters.
	5-6	Unused		
	7	Synchronization bit	0-1	Toggle the bit to synchronize a response
1	0-3	Word count	1-14	Defines the number of words in the data block
	4-7	Unused		

Note: Bit 0 is a least significant bit (LSB).

Device Response Block

The device response block size can vary from 6 to 32 bytes. The actual block size is defined when configuring the PROFIBUS master for this device by selecting the INTPUT module from the device GSD file. The device response block formats are shown in Tables 2-4 and 2-5.

Successful read and write is acknowledged by the retransmission of bytes 0-3 of the master request. Negative response is acknowledged by the retransmission of bytes 0-3 of the master request with a non-zero exception code in byte 1. Note that the scaling bit in byte 0 may be dropped if there is actually no scaled data in the response message.

Table 2-4 Read Response Block

Bytes	Description	Range	Type	Notes
0,1	Response control	See Table 2-6	UINT16	
2,3	Start point ID	0x0000-0Xffff	UINT16	
4-31	Data block		INT16/INT32	32-bit integers occupy two 16-bit words – most significant first

Table 2-5 Write Response Block

Bytes	Description	Range	Type	Notes
0,1	Response control	See Table 2-6	UINT16	
2,3	Start point ID	0x0000-0xFFFF	UINT16	
4-31	Unused	0		

Table 2-6 Response Control

Byte	Bits	Description	Range	Notes
0	0-1	Operation	00=data is not valid 01=read 10=write 11=data is not valid	"Data is not valid" indicates that the data in the device response block is not reliable and should not be concerned
	2	Data type	0=32-bit integer 1=16-bit integer	32-bit integers occupy two 16-bit words – most significant first
	3	Unused	0	
	4	16-bit linear scaling	0=no scaling 1=scaled data	Only 16-bit analog registers are affected. Binary registers and counters are not scaled.
	5-6	Unused	0	
	7	Synchronization bit	0-1	Synchronized with the master synchronization bit when command handling is completed

Byte	Bits	Description	Range	Notes
1	0-3	Word count	0-14	Indicates the number of words in the data block
	4-7	Exception code	See Table 2-7	

Note: Bit 0 is a least significant bit (LSB).

Table 2-7 Exception Codes

Code	Exception	Cause	Notes
0	No exception		
1	Illegal operation	The requested operation is not allowed for the point	The request is discarded
2	Illegal address	1. Start point ID points to an inexistent point 2. The number of requested points exceeds the actual number of points available 3. Uneven word count with 32-bit data type	The request is discarded
3	Illegal data	Written data is out of the allowable range	The request is discarded
4	Over-range error	The requested data cannot be transmitted using 16-bit data type	The request is handled with over-ranged points being truncated to a maximum allowable 16-bit negative or positive number.

The operation field in the device response indicates that the data in the response block is valid and can be handled by the master. The master should not concern the data in the device response block if this field contains an invalid code, or the exception field contains a non-zero value.

Transfer Synchronization

When a master request is responded, the response synchronization bit is synchronized with the master synchronization bit. Since PROFIBUS transfers are handled in a cyclic fashion, this bit allows the master to control a sequence of pairs "request-response" by simply toggling the synchronization bit in the successive master requests.

In write requests, repeated writes will not be handled if the synchronization bit does not change. If a number of successive writes is required, either toggle the synchronization bit, or send a "Read" or "Clear" command after each write to clear your previous write command.

After the device restarts, the first time synchronization should be done by sending either a "Read' or "Clear" command. The "Write" commands sent immediately after the device restarts will be ignored until the PROFIBUS link is synchronized.

In order to provide reliable synchronous reads and writes in a natively asynchronous PROFIBUS environment, it is recommended to follow a couple of simple rules:

1) Do not change control byte 0 in the request buffer until all other parameters are set. This guarantees that your request will not be carried out while you change the point address or data. Write byte 0 with your new command after you completed setup of the remaining bytes.

2) Do not leave your write command in the request buffer for a long time. Remove it immediately with a "Clear" or "Read" command after you received an acknowledgement.

16-bit Scaled Analog Data

To avoid over-range errors with 16-bit data, liner scaling may be used to scale 32-bit analog readings to 16-bit integer format. When 16-bit data is requested by the master and the scaling bit in the master request is set to 1, any analog register (excluding setup data, counters and binary bit-mapped registers) will be scaled to the range of -32768 to 32767 for bi-directional parameters (such as power and power factor), and to the range of 0 to 32767 for single-ended positive parameters (voltage, current, frequency, etc.). To get a true reading, the reverse conversion should be done using the following formula:

$$Y = ((X - RAW\_LO) \times (ENG\_HI - ENG\_LO)) / (RAW\_HI - RAW\_LO) + ENG\_LO$$

where:

Y - True reading in engineering units
X - Raw input data in the range of RAW_LO to RAW_HI
ENG_LO, ENG_HI - Data low and high scales in engineering units (see Section 4 for device data scales)

RAW_LO - Low conversion scale for raw device data:
RAW_LO = -32768 for a point with a negative LO scale,
RAW_LO = 0 for a point with a zero or positive LO scale
RAW_Hi - High conversion scale for raw device data: RAW_HI = 32767

Refer to Section 4 "Data Scales and Units" for applicable data scales and measurement units. The default voltage scale in the device is 144V (120V+20%). It can be changed via the supplemental PAS software. The recommended voltage scale is 120V+20% = 144V for using with external PT's, and 690V+20% = 828V for a direct connection to power line.

NOTE: If a source data value exceeds the device engineering scale, it is truncated to a maximum allowable negative or positive number and the "over-range error" exception code is returned in the response control word.

CONVERSION EXAMPLES

1. Voltage readings

a) Assume device settings (direct wiring): PT ratio = 1; Voltage scale = 828V (690V + 20%).

Voltage engineering scales (see Section 4):

ENG_HI = Vmax = 828.0 × PT ratio = 828.0 × 1 = 828.0V
ENG_LO = 0V

If the raw data reading is 4748 then the voltage reading in engineering units will be as follows:

Volts reading = (4748 – 0) × (828.0 - 0)/(32767 - 0) + 0 = 120.0V

b) Assume device settings (wiring via PT): PT ratio = 14,400V : 120V = 120; Voltage scale = 144V.

Voltage engineering scales (see Section 4):

ENG_HI = Vmax = 144.0 × PT ratio = 144 × 120 = 17,280V
ENG_LO = 0V

If the raw data reading is 27245 then the voltage reading in engineering units will be as follows:

Volts reading = (27245 – 0) × (17,280 - 0)/(32767 – 0) + 0 = 14,368V

2. Current readings

Assume device settings: CT primary current = 200A.

Current engineering scales (see Section 4):

ENG_HI = Imax = CT primary current × 2 = 200.00 × 2 = 400.00A
ENG_LO = 0A

If the raw data reading is 819 then the current reading in engineering units will be as follows:

Amps reading = (819 – 0) × (400.00 - 0)/(32767 - 0) + 0 = 10.00A

3. Power readings

a) Assume device settings (direct wiring): Wiring 4LL3; PT = 1; CT primary current = 200A; Voltage scale = 828V.

Active Power engineering scales (see Section 4):

ENG_HI = Pmax = Vmax × Imax × 2 = (828.0 × 1) × (200.00 × 2) × 2 = 662,400W = 662.400kW
ENG_LO = -Pmax = -662.400kW

If the raw data reading is 18024 then the power reading in engineering units will be as follows:

Watts reading = (18024 - (-32768)) × (662.400 - (-662.400))/(32767 –(-32768)) + (-662.400) = 364.368kW

If the raw data reading is -500 then the power reading in engineering units will be as follows:

Watts reading = (-500 - (-32768)) × (662.400 - (-662.400))/(32767 – (-32768)) + (-662.400) = -10.097kW

b) Assume device settings (wiring via PT): Wiring 4LN3; PT = 120; CT primary current = 200A; Voltage scale = 144V.

Active Power engineering scales (see Section 4):

ENG_HI = Pmax = Vmax × Imax × 3 = (144 × 120) × (200.00 × 2) × 3/1000 = 20,736kW

ENG_LO = -Pmax = -20,736kW

If the raw data reading is 12000 then the power reading in engineering units will be as follows:

Watts reading = (12000 - (-32768)) × (20,736 - (-20,736))/(32767 – (-32768)) + (-20,736) = 7,594kW

If the raw data reading is -5000 then the power reading in engineering units will be as follows:

Watts reading = (-5000 - (-32768)) × (20,736 - (-20,736))/(32767 – (-32768)) + (-20,736) = -3,164kW

4. Power Factor readings

Power factor engineering scales (see Section 4):

ENG_HI = 1.000.
ENG_LO = -1.000.

If the raw data reading is 29166 then the power factor in engineering units will be as follows:

Power factor reading = (29166 - (-32768)) × (1.000 - (-1.000))/(32767 –(-32768)) + (-1.000) = 0.89

3 Device Register Map

3.1 Analog Registers, Binary Registers and Counters

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x0000	**None**	0		UINT16	R	
	Special Inputs					
0x0101	Phase rotation order	0=error, 1=positive (ABC), 2=negative (CBA)		UINT16	R	
	Counters					
0x0A00	Counter #1	0-99,999		UINT32	R/W	
0x0A01	Counter #2	0-99,999		UINT32	R/W	
0x0A02	Counter #3	0-99,999		UINT32	R/W	
0x0A03	Counter #4	0-99,999		UINT32	R/W	
	1-Cycle Phase Values					
0x0C00	V1/V12 Voltage	0-Vmax	U1	UINT32	R	[1]
0x0C01	V2/V23 Voltage	0-Vmax	U1	UINT32	R	[1]
0x0C02	V3/V31 Voltage	0-Vmax	U1	UINT32	R	[1]
0x0C03	I1 Current	0-Imax	U2	UINT32	R	
0x0C04	I2 Current	0-Imax	U2	UINT32	R	
0x0C05	I3 Current	0-Imax	U2	UINT32	R	
0x0C06	kW L1	-Pmax-Pmax	U3	INT32	R	
0x0C07	kW L2	-Pmax-Pmax	U3	INT32	R	
0x0C08	kW L3	-Pmax-Pmax	U3	INT32	R	
0x0C09	kvar L1	-Pmax-Pmax	U3	INT32	R	
0x0C0A	kvar L2	-Pmax-Pmax	U3	INT32	R	
0x0C0B	kvar L3	-Pmax-Pmax	U3	INT32	R	
0x0C0C	kVA L1	0-Pmax	U3	UINT32	R	
0x0C0D	kVA L2	0-Pmax	U3	UINT32	R	
0x0C0E	kVA L3	0-Pmax	U3	UINT32	R	
0x0C0F	Power factor L1	-1000-1000	×0.001	INT16	R	
0x0C10	Power factor L2	-1000-1000	×0.001	INT16	R	
0x0C11	Power factor L3	-1000-1000	×0.001	INT16	R	
0x0C12	V1/V12 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 2-cycle value
0x0C13	V2/V23 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 2-cycle value
0x0C14	V3/V31 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 2-cycle value
0x0C15	I1 Current THD	0-9999	×0.1%	UINT16	R	2-cycle value
0x0C16	I2 Current THD	0-9999	×0.1%	UINT16	R	2-cycle value
0x0C17	I3 Current THD	0-9999	×0.1%	UINT16	R	2-cycle value
0x0C18	I1 K-Factor	10-9999	×0.1	UINT16	R	2-cycle value
0x0C19	I2 K-Factor	10-9999	×0.1	UINT16	R	2-cycle value
0x0C1A	I3 K-Factor	10-9999	×0.1	UINT16	R	2-cycle value

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x0C1B	I1 Current TDD	0-1000	×0.1%	UINT16	R	2-cycle value
0x0C1C	I2 Current TDD	0-1000	×0.1%	UINT16	R	2-cycle value
0x0C1D	I3 Current TDD	0-1000	×0.1%	UINT16	R	2-cycle value
0x0C1E	V12 Voltage	0-Vmax	U1	UINT16	R	
0x0C1F	V23 Voltage	0-Vmax	U1	UINT16	R	
0x0C20	V31 Voltage	0-Vmax	U1	UINT16	R	
	1-Cycle Total Values					
0x0F00	Total kW	-Pmax-Pmax	U3	INT32	R	
0x0F01	Total kvar	-Pmax-Pmax	U3	INT32	R	
0x0F02	Total kVA	0-Pmax	U3	UINT32	R	
0x0F03	Total PF	-1000-1000	×0.001	INT16	R	
0x0F04	Total PF lag	0-1000	×0.001	UINT16	R	
0x0F05	Total PF lead	0-1000	×0.001	UINT16	R	
0x0F06	Total kW import	0-Pmax	U3	UINT32	R	
0x0F07	Total kW export	0-Pmax	U3	UINT32	R	
0x0F08	Total kvar import	0-Pmax	U3	UINT32	R	
0x0F09	Total kvar export	0-Pmax	U3	UINT32	R	
0x0F0A	3-phase average L-N/L-L voltage	0-Vmax	U1	UINT32	R	1
0x0F0B	3-phase average L-L voltage	0-Vmax	U1	UINT32	R	
0x0F0C	3-phase average current	0-Imax	U2	UINT32	R	
	1-Cycle Auxiliary Values					
0x1000	Not used			UINT32	R	
0x1001	In (neutral) Current	0-Imax	U2	UINT32	R	
0x1002	Frequency	0-Fmax	×0.01Hz	UINT16	R	
0x1003	Voltage unbalance	0-3000	×0.1%	UINT16	R	
0x1004	Current unbalance	0-3000	×0.1%	UINT16	R	
	Phasor					
0x1080	V1/V12 Voltage magnitude	0-Vmax	U1	UINT32	R	1
0x1081	V2/V23 Voltage magnitude	0-Vmax	U1	UINT32	R	1
0x1082	V3/V31 Voltage magnitude	0-Vmax	U1	UINT32	R	1
0x1083	Not used			UINT32	R	
0x1084	I1 Current magnitude	0-Imax	U2	UINT32	R	
0x1085	I2 Current magnitude	0-Imax	U2	UINT32	R	
0x1086	I3 Current magnitude	0-Imax	U2	UINT32	R	
0x1087	Not used			UINT32	R	
0x1088	V1/V12 Voltage angle	-1800-1800	×0.1º	INT16	R	1
0x1089	V2/V23 Voltage angle	-1800-1800	×0.1º	INT16	R	1
0x108A	V3/V31 Voltage angle	-1800-1800	×0.1º	INT16	R	1
0x108B	Not used			INT16	R	
0x108C	I1 Current angle	-1800-1800	×0.1º	INT16	R	
0x108D	I2 Current angle	-1800-1800	×0.1º	INT16	R	
0x108E	I3 Current angle	-1800-1800	×0.1º	INT16	R	
0x108F	Not used			INT16	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
	1-Second Phase Values					
0x1100	V1/V12 Voltage	0-Vmax	U1	UINT32	R	[1]
0x1101	V2/V23 Voltage	0-Vmax	U1	UINT32	R	[1]
0x1102	V3/V31 Voltage	0-Vmax	U1	UINT32	R	[1]
0x1103	I1 Current	0-Imax	U2	UINT32	R	
0x1104	I2 Current	0-Imax	U2	UINT32	R	
0x1105	I3 Current	0-Imax	U2	UINT32	R	
0x1106	kW L1	-Pmax-Pmax	U3	INT32	R	
0x1107	kW L2	-Pmax-Pmax	U3	INT32	R	
0x1108	kW L3	-Pmax-Pmax	U3	INT32	R	
0x1109	kvar L1	-Pmax-Pmax	U3	INT32	R	
0x110A	kvar L2	-Pmax-Pmax	U3	INT32	R	
0x110B	kvar L3	-Pmax-Pmax	U3	INT32	R	
0x110C	kVA L1	0-Pmax	U3	UINT32	R	
0x110D	kVA L2	0-Pmax	U3	UINT32	R	
0x110E	kVA L3	0-Pmax	U3	UINT32	R	
0x110F	Power factor L1	-1000-1000	×0.001	INT16	R	
0x1110	Power factor L2	-1000-1000	×0.001	INT16	R	
0x1111	Power factor L3	-1000-1000	×0.001	INT16	R	
0x1112	V1/V12 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 3-sec value
0x1113	V2/V23 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 3-sec value
0x1114	V3/V31 Voltage THD	0-9999	×0.1%	UINT16	R	[1] 3-sec value
0x1115	I1 Current THD	0-9999	×0.1%	UINT16	R	3-sec value
0x1116	I2 Current THD	0-9999	×0.1%	UINT16	R	3-sec value
0x1117	I3 Current THD	0-9999	×0.1%	UINT16	R	3-sec value
0x1118	I1 K-Factor	10-9999	×0.1	UINT16	R	3-sec value
0x1119	I2 K-Factor	10-9999	×0.1	UINT16	R	3-sec value
0x111A	I3 K-Factor	10-9999	×0.1	UINT16	R	3-sec value
0x111B	I1 Current TDD	0-1000	×0.1%	UINT16	R	3-sec value
0x111C	I2 Current TDD	0-1000	×0.1%	UINT16	R	3-sec value
0x111D	I3 Current TDD	0-1000	×0.1%	UINT16	R	3-sec value
0x111E	V12 Voltage	0-Vmax	U1	UINT16	R	
0x111F	V23 Voltage	0-Vmax	U1	UINT16	R	
0x1120	V31 Voltage	0-Vmax	U1	UINT16	R	
	1-Second Total Values					
0x1400	Total kW	-Pmax-Pmax	U3	INT32	R	
0x1401	Total kvar	-Pmax-Pmax	U3	INT32	R	
0x1402	Total kVA	0-Pmax	U3	UINT32	R	
0x1403	Total PF	-1000-1000	×0.001	INT16	R	
0x1404	Total PF lag	0-1000	×0.001	UINT16	R	
0x1405	Total PF lead	0-1000	×0.001	UINT16	R	
0x1406	Total kW import	0-Pmax	U3	UINT32	R	
0x1407	Total kW export	0-Pmax	U3	UINT32	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x1408	Total kvar import	0-Pmax	U3	UINT32	R	
0x1409	Total kvar export	0-Pmax	U3	UINT32	R	
0x140A	3-phase average L-N/L-L voltage	0-Vmax	U1	UINT32	R	1
0x140B	3-phase average L-L voltage	0-Vmax	U1	UINT32	R	
0x140C	3-phase average current	0-Imax	U2	UINT32	R	
	1-Second Auxiliary Values					
0x1500	Not used			UINT32	R	
0x1501	In (neutral) Current	0-Imax	U2	UINT32	R	
0x1502	Frequency	0-Fmax	×0.01Hz	UINT16	R	
0x1503	Voltage unbalance	0-3000	×0.1%	UINT16	R	
0x1504	Current unbalance	0-3000	×0.1%	UINT16	R	
	Present Volt, Ampere and Power Demands					
0x1600	V1/V12 Volt demand	0-Vmax	U1	UINT32	R	1
0x1601	V2/V23 Volt demand	0-Vmax	U1	UINT32	R	1
0x1602	V3/V31 Volt demand	0-Vmax	U1	UINT32	R	1
0x1603	I1 Ampere demand	0-Imax	U2	UINT32	R	
0x1604	I2 Ampere demand	0-Imax	U2	UINT32	R	
0x1605	I3 Ampere demand	0-Imax	U2	UINT32	R	
0x1606	kW import block demand	0-Pmax	U3	UINT32	R	
0x1607	kvar import block demand	0-Pmax	U3	UINT32	R	
0x1608	kVA block demand	0-Pmax	U3	UINT32	R	
0x1609	kW import sliding window demand	0-Pmax	U3	UINT32	R	
0x160A	kvar import sliding window demand	0-Pmax	U3	UINT32	R	
0x160B	kVA sliding window demand	0-Pmax	U3	UINT32	R	
0x160C	Not used	0		UINT32	R	
0x160D	Not used	0		UINT32	R	
0x160E	Not used	0		UINT32	R	
0x160F	kW import accumulated demand	0-Pmax	U3	UINT32	R	
0x1610	kvar import accumulated demand	0-Pmax	U3	UINT32	R	
0x1611	kVA accumulated demand	0-Pmax	U3	UINT32	R	
0x1612	kW import predicted sliding window demand	0-Pmax	U3	UINT32	R	
0x1613	kvar import predicted sliding window demand	0-Pmax	U3	UINT32	R	
0x1614	kVA predicted sliding window demand	0-Pmax	U3	UINT32	R	
0x1615	PF (import) at Max. kVA sliding window demand	0-1000	×0.001	UINT16	R	
0x1616	kW export block demand	0-Pmax	U3	UINT32	R	
0x1617	kvar export block demand	0-Pmax	U3	UINT32	R	
0x1618	kW export sliding window demand	0-Pmax	U3	UINT32	R	
0x1619	kvar export sliding window demand	0-Pmax	U3	UINT32	R	
0x161A	kW export accumulated demand	0-Pmax	U3	UINT32	R	
0x161B	kvar export accumulated demand	0-Pmax	U3	UINT32	R	
0x161C	kW export predicted sliding window demand	0-Pmax	U3	UINT32	R	
0x161D	kvar export predicted sliding window demand	0-Pmax	U3	UINT32	R	
0x161E	Not used			UINT32	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x161F	Not used			UINT32	R	
0x1620	Not used			UINT32	R	
0x1621	Not used			UINT32	R	
0x1622	In Ampere demand	0-Imax	U2	UINT32	R	
	Total Energies EH					
0x1700	kWh import	0-10^9-1	1 kWh	UINT32	R	
0x1701	kWh export	0-10^9-1	1 kWh	UINT32	R	
0x1702	Not used			INT32	R	
0x1703	Not used			UINT32	R	
0x1704	kvarh import	0-10^9-1	1 kvarh	UINT32	R	
0x1705	kvarh export	0-10^9-1	1 kvarh	UINT32	R	
0x1706	Not used			INT32	R	
0x1707	Not used			UINT32	R	
0x1708	kVAh total	0-10^9-1	1 kVAh	UINT32	R	
	Phase Energies EH					
0x1800	kWh import L1	0-10^9-1	1 kWh	UINT32	R	
0x1801	kWh import L2	0-10^9-1	1 kWh	UINT32	R	
0x1802	kWh import L3	0-10^9-1	1 kWh	UINT32	R	
0x1803	kvarh import L1	0-10^9-1	1 kvarh	UINT32	R	
0x1804	kvarh import L2	0-10^9-1	1 kvarh	UINT32	R	
0x1805	kvarh import L3	0-10^9-1	1 kvarh	UINT32	R	
0x1806	kVAh total L1	0-10^9-1	1 kVAh	UINT32	R	
0x1807	kVAh total L2	0-10^9-1	1 kVAh	UINT32	R	
0x1808	kVAh total L3	0-10^9-1	1 kVAh	UINT32	R	
	V1/V12 Harmonic Distortions EH					1
0x1900	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1901	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1927	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	V2/V23 Harmonic Distortions EH					1
0x1A00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1A01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1A27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	V3/V31 Harmonic Distortions EH					1
0x1B00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1B01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1B27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	I1 Harmonic Distortions EH					
0x1C00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x1C01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1C27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	I2 Harmonic Distortions [EH]					
0x1D00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1D01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1D27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	I3 Harmonic Distortions [EH]					
0x1E00	H01 Harmonic distortion	0-10000	0.01%	UINT16	R	
0x1E01	H02 Harmonic distortion	0-10000	0.01%	UINT16	R	
	...					
0x1E27	H40 Harmonic distortion	0-10000	0.01%	UINT16	R	
	Fundamental Phase Values [EH]					2-cycle values
0x2900	V1/V12 Voltage	0-Vmax	U1	UINT32	R	[1]
0x2901	V2/V23 Voltage	0-Vmax	U1	UINT32	R	[1]
0x2902	V3/V31 Voltage	0-Vmax	U1	UINT32	R	[1]
0x2903	I1 Current	0-Imax	U2	UINT32	R	
0x2904	I2 Current	0-Imax	U2	UINT32	R	
0x2905	I3 Current	0-Imax	U2	UINT32	R	
0x2906	kW L1	-Pmax-Pmax	U3	INT32	R	
0x2907	kW L2	-Pmax-Pmax	U3	INT32	R	
0x2908	kW L3	-Pmax-Pmax	U3	INT32	R	
0x2909	kvar L1	-Pmax-Pmax	U3	INT32	R	
0x290A	kvar L2	-Pmax-Pmax	U3	INT32	R	
0x290B	kvar L3	-Pmax-Pmax	U3	INT32	R	
0x290C	kVA L1	0-Pmax	U3	UINT32	R	
0x290D	kVA L2	0-Pmax	U3	UINT32	R	
0x290E	kVA L3	0-Pmax	U3	UINT32	R	
0x290F	Power factor L1	-1000-1000	×0.001	INT16	R	
0x2910	Power factor L2	-1000-1000	×0.001	INT16	R	
0x2911	Power factor L3	-1000-1000	×0.001	INT16	R	
	Fundamental Total Values [EH]					2-cycle values
0x2A00	Total fundamental kW	-Pmax-Pmax	U3	INT32	R	
0x2A01	Total fundamental kvar	-Pmax-Pmax	U3	INT32	R	
0x2A02	Total fundamental kVA	0-Pmax	U3	UINT32	R	
0x2A03	Total fundamental PF	-1000-1000	×0.001	INT16	R	
	Minimum 1-Cycle Phase Values					
0x2C00	V1/V12 Voltage	0-Vmax	U1	UINT32	R	[1]
0x2C01	V2/V23 Voltage	0-Vmax	U1	UINT32	R	[1]
0x2C02	V3/V31 Voltage	0-Vmax	U1	UINT32	R	[1]
0x2C03	I1 Current	0-Imax	U2	UINT32	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x2C04	I2 Current	0-Imax	U2	UINT32	R	
0x2C05	I3 Current	0-Imax	U2	UINT32	R	
	Minimum 1-Cycle Total Values					
0x2D00	Total kW	-Pmax-Pmax	U3	INT32	R	
0x2D01	Total kvar	-Pmax-Pmax	U3	INT32	R	
0x2D02	Total kVA	0-Pmax	U3	UINT32	R	
0x2D03	Total PF	0-1000	×0.001	UINT32	R	Absolute value
	Minimum 1-Cycle Auxiliary Values					
0x2E00	Not used			UINT32	R	
0x2E01	In Current	0-Imax	U2	UINT32	R	
0x2E02	Frequency	0-Fmax	×0.01Hz	UINT32	R	
	Maximum 1-Cycle Phase Values					
0x3400	V1/V12 Voltage	0-Vmax	U1	UINT32	R	1
0x3401	V2/V23 Voltage	0-Vmax	U1	UINT32	R	1
0x3402	V3/V31 Voltage	0-Vmax	U1	UINT32	R	1
0x3403	I1 Current	0-Imax	U2	UINT32	R	
0x3404	I2 Current	0-Imax	U2	UINT32	R	
0x3405	I3 Current	0-Imax	U2	UINT32	R	
	Maximum 1-Cycle Total Values					
0x3500	Total kW	-Pmax-Pmax	U3	INT32	R	
0x3501	Total kvar	-Pmax-Pmax	U3	INT32	R	
0x3502	Total kVA	0-Pmax	U3	UINT32	R	
0x3503	Total PF	0-1000	×0.001	UINT32	R	Absolute value
	Maximum 1-Cycle Auxiliary Values					
0x3600	Not used			UINT32	R	
0x3601	In Current	0-Imax	U2	UINT32	R	
0x3602	Frequency	0-Fmax	×0.01Hz	UINT32	R	
	Maximum Demands					
0x3700	V1/V12 Maximum volt demand	0-Vmax	U1	UINT32	R	1
0x3701	V2/V23 Maximum volt demand	0-Vmax	U1	UINT32	R	1
0x3702	V3/V31 Maximum volt demand	0-Vmax	U1	UINT32	R	1
0x3703	I1 Maximum ampere demand	0-Imax	U2	UINT32	R	
0x3704	I2 Maximum ampere demand	0-Imax	U2	UINT32	R	
0x3705	I3 Maximum ampere demand	0-Imax	U2	UINT32	R	
0x3706	Not used			UINT32	R	
0x3707	Not used			UINT32	R	
0x3708	Not used			UINT32	R	
0x3709	Maximum kW import sliding window demand	0-Pmax	U3	UINT32	R	
0x370A	Maximum kvar import sliding window demand	0-Pmax	U3	UINT32	R	
0x370B	Maximum kVA sliding window demand	0-Pmax	U3	UINT32	R	
0x3737	Not used			UINT32	R	
0x370D	Not used			UINT32	R	
0x370E	Not used			UINT32	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x370F	Maximum kW export sliding window demand	0-Pmax	U3	UINT32	R	
0x3710	Maximum kvar export sliding window demand	0-Pmax	U3	UINT32	R	
0x3711	Not used			UINT32	R	
0x3712	Not used			UINT32	R	
0x3713	Not used			UINT32	R	
0x3714	Not used			UINT32	R	
0x3715	In Maximum ampere demand	0-Imax	U2	UINT32	R	
	V1/V12 Harmonic Angles EH					1, 3
0x6400	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6400	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6427	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	V2/V23 Harmonic Angles EH					1, 3
0x6500	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6500	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6527	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	V1/V31 Harmonic Angles EH					1, 3
0x6600	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6600	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6627	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	I1 Harmonic Angles EH					3
0x6700	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6700	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6727	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	I2 Harmonic Angles EH					3
0x6800	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6800	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6827	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	I3 Harmonic Angles EH					3
0x6900	H01 Harmonic angle	-1800-1800	×0.1º	INT16	R	
0x6900	H02 Harmonic angle	-1800-1800	×0.1º	INT16	R	
	...					
0x6927	H40 Harmonic angle	-1800-1800	×0.1º	INT16	R	

Point ID	Description	Options/Range[2]	Units[2]	Type	R/W	Notes
0x7C00	**Setpoint Status SP1-SP16 (bitmap)**	0x00000000-0x0000FFFF		UINT32	R	

NOTES:

Energy, power demand and harmonics readings are only available in the PM130EH meters.

1 Voltage and voltage harmonics readings: when the 4LN3, 3LN3 or 3BLN3 wiring mode is selected, the voltages will be line-to-neutral; for any other wiring mode, they will be line-to-line voltages.

2 For volts, amps, power and frequency scales and units, refer to Section 4 ”Data Scales and Units”.

3 Harmonic angles are referenced to the fundamental voltage harmonic H01 on phase L1.

3.2 Minimum/Maximum Log Registers

Point ID	Description	Options/Range/Format[2]	Units[2]	Type	R/W	Notes
	Minimum Phase Values					
0xB000	Min. V1/V12 Voltage	0-Vmax	U1	UINT32	R	[1]
0xB001	Timestamp	F1	sec	UINT32	R	
0xB002	Min. V2/V23 Voltage	0-Vmax	U1	UINT32	R	[1]
0xB003	Timestamp	F1	sec	UINT32	R	
0xB004	Min. V3/V31 Voltage	0-Vmax	U1	UINT32	R	[1]
0xB005	Timestamp	F1	sec	UINT32	R	
0xB006	Min. I1 Current	0-Imax	U2	UINT32	R	
0xB007	Timestamp	F1	sec	UINT32	R	
0xB008	Min. I2 Current	0-Imax	U2	UINT32	R	
0xB009	Timestamp		sec	UINT32	R	
0xB00A	Min. I3 Current	0-Imax	U2	UINT32	R	
0xB00B	Timestamp		sec	UINT32	R	
	Minimum Total Values					
0xB080	Min. Total kW	-Pmax-Pmax	U3	INT32	R	
0xB081	Timestamp		sec	UINT32	R	
0xB082	Min. Total kvar	-Pmax-Pmax	U3	INT32	R	
0xB083	Timestamp		sec	UINT32	R	
0xB084	Min. Total kVA	0-Pmax	U3	UINT32	R	
0xB085	Timestamp		sec	UINT32	R	
0xB086	Min. Total PF	-1000-1000	×0.001	INT32	R	
0xB087	Timestamp		sec	UINT32	R	
	Minimum Auxiliary Values					
0xB100	Not used	0		UINT32	R	
0xB101				UINT32	R	
0xB102	Min. In Current	0-Imax	U2	UINT32	R	
0xB103	Timestamp		sec	UINT32	R	
0xB104	Min. Frequency	0-Fmax	×0.01Hz	UINT32	R	
0xB105	Timestamp		sec	UINT32	R	
	Maximum Phase Values					
0xB200	Max. V1/V12 Voltage	0-Vmax	U1	UINT32	R	[1]
0xB201	Timestamp		sec	UINT32	R	
0xB202	Max. V2/V23 Voltage	0-Vmax	U1	UINT32	R	[1]
0xB203	Timestamp		sec	UINT32	R	
0xB204	Max. V3/V31 Voltage	0-Vmax	U1	UINT32	R	[1]
0xB205	Timestamp		sec	UINT32	R	
0xB206	Max. I1 Current	0-Imax	U2	UINT32	R	
0xB207	Timestamp		sec	UINT32	R	
0xB208	Max. I2 Current	0-Imax	U2	UINT32	R	
0xB209	Timestamp		sec	UINT32	R	

Point ID	Description	Options/Range/Format[2]	Units[2]	Type	R/W	Notes
0xB20A	Max. I3 Current	0-Imax	U2	UINT32	R	
0xB20B	Timestamp		sec	UINT32	R	
	Maximum Total Values					
0xB280	Max. Total kW	-Pmax-Pmax	U3	INT32	R	
0xB281	Timestamp		sec	UINT32	R	
0xB282	Max. Total kvar	-Pmax-Pmax	U3	INT32	R	
0xB283	Timestamp		sec	UINT32	R	
0xB284	Max. Total kVA	0-Pmax	U3	UINT32	R	
0xB285	Timestamp		sec	UINT32	R	
0xB286	Max. Total PF	-1000-1000	×0.001	INT32	R	
0xB287	Timestamp		sec	UINT32	R	
	Maximum Auxiliary Values					
0xB300	Not used	0		UINT32	R	
0xB301				UINT32	R	
0xB302	Max. In Current	0-Imax	U2	UINT32	R	
0xB303	Timestamp		sec	UINT32	R	
0xB304	Max. Frequency	0-Fmax	×0.01Hz	UINT32	R	
0xB305	Timestamp		sec	UINT32	R	
	Maximum Demands					
0xB380	V1/V12 Maximum volt demand	0-Vmax	U1	UINT32	R	1
0xB381	Timestamp		sec	UINT32	R	
0xB382	V2/V23 Maximum volt demand	0-Vmax	U1	UINT32	R	1
0xB383	Timestamp		sec	UINT32	R	
0xB384	V3/V31 Maximum volt demand	0-Vmax	U1	UINT32	R	1
0xB385	Timestamp		sec	UINT32	R	
0xB386	I1 Maximum ampere demand	0-Imax	U2	UINT32	R	
0xB387	Timestamp		sec	UINT32	R	
0xB388	I2 Maximum ampere demand	0-Imax	U2	UINT32	R	
0xB389	Timestamp		sec	UINT32	R	
0xB38A	I3 Maximum ampere demand	0-Imax	U2	UINT32	R	
0xB38B	Timestamp		sec	UINT32	R	
0xB38C	Not used	0		UINT32	R	
0xB38D				UINT32	R	
0xB38E	Not used	0		UINT32	R	
0xB38F				UINT32	R	
0xB390	Not used	0		UINT32	R	
0xB391				UINT32	R	
0xB392	Maximum kW import sliding window demand	0-Pmax	U3	UINT32	R	
0xB393	Timestamp		sec	UINT32	R	
0xB394	Maximum kvar import sliding window demand	0-Pmax	U3	UINT32	R	
0xB395	Timestamp		sec	UINT32	R	
0xB396	Maximum kVA sliding window demand	0-Pmax	U3	UINT32	R	
0xB397	Timestamp		sec	UINT32	R	
0xB398	Not used	0		UINT32	R	

Point ID	Description	Options/Range/Format[2]	Units[2]	Type	R/W	Notes
0xB399				UINT32	R	
0xB39A	Not used	0		UINT32	R	
0xB39B				UINT32	R	
0xB39C	Not used	0		UINT32	R	
0xB39D				UINT32	R	
0xB39E	Maximum kW export sliding window demand	0-Pmax	U3	UINT32	R	
0xB39F	Timestamp		sec	UINT32	R	
0xB3A0	Maximum kvar export sliding window demand	0-Pmax	U3	UINT32	R	
0xB3A1	Timestamp		sec	UINT32	R	
0xB3A2	Not used	0		UINT32	R	
0xB3A3				UINT32	R	
0xB3A4	Not used	0		UINT32	R	
0xB3A5				UINT32	R	
0xB3a6	Not used	0		UINT32	R	
0xB3A7				UINT32	R	
0xB3A8	Not used	0		UINT32	R	
0xB3A9				UINT32	R	
0xB3AA	In Maximum ampere demand	0-Imax	U2	UINT32	R	
0xB3AB	Timestamp		sec	UINT32	R	

NOTES:

Power demand readings are only available in the PM130EH meters.

1 Voltage readings: when the 4LN3, 3LN3 or 3BLN3 wiring mode is selected, the voltages will be line-to-neutral; for any other wiring mode, they will be line-to-line voltages.

2 For volts, amps, power and frequency scales and units, refer to Section 4 ”Data Scales and Units”.

3.3 Device Control and Status Registers

Point ID	Description	Options/Range	Units	Type	R/W	Notes
Device Reset/Clear Registers						
0xA000	Clear total energy registers	0		UINT16	R/W	Read as 0
0xA001	Clear total maximum demand registers	0 = Clear all maximum demands 1 = Clear power demands EH 2 = Clear volt and ampere demands		UINT16	R/W	
0xA004	Clear pulse counters	0 = Clear all counters 1-4 = Clear counter #1-#4		UINT16	R/W	
0xA005	Clear Min/Max log	0		UINT16	R/W	
Device Status Registers						
0x7D03	Present setpoint status SP1-SP16 (bitmap)	0x0000-0xFFFF		UINT16	R	Bits set to 1 indicate operated (activated) setpoints.
0x7D06	Current serial port number	0=COM1, 1=COM2		UINT16	R	
Alarm Notification Registers						
0x7E00	Setpoint alarm status SP1-SP16 (bitmap). Nonvolatile register that keeps the status of the operated setpoints.	0x0000-0xFFFF		UINT16	R/W	When read: Bits set to 1 indicate that the designated setpoint have been operated at least once since the alarm bits were reset. When written: Bits preset to 0 clear corresponding alarms, Bits set to 1 have no effect.
0x7E01	Self-check alarm status (device diagnostics). Nonvolatile register that keeps the status of the internal device diagnostics.	F23		UINT16	R/W	When read: Bits set to 1 indicate that the designated diagnostics failed at least once since the alarm bits were reset. When written: Bits preset to 0 clear corresponding alarms; bits set to 1 have no effect.
Device Identification						
0x7F00-0x7F01	Instrument options	F28		UINT16	R	

3.4 Device Setup Registers

Address	Description	Options/Range	Units	Type	R/W	Notes
Factory Device Settings and Identification						
0xFF40-0xFF5B						
+0	Device serial number	0-999999		UINT32	R	
+1	Device model ID	13010=PM130P, 13030=PM130EH		UINT32	R	
+2-5	Device model name	“PM130P”, “PM130EH”		UINT32	R	Null-terminated string
+6	Device options (bitmap)	0		UINT32	R	Not used
+7-9	Reserved	0		UINT32	R	
+10	Device firmware version number	1101-1199		UINT16	R	Two higher decimal digits = major version number, two lower decimal digits = minor version number
+11	Device firmware build number	1-99		UINT16	R	
+12,13	Reserved			UINT16	R	
+14	Boot loader version number	101-999		UINT16	R	Two higher decimal digits = major version number, two lower decimal digits = minor version number
+15	Boot loader build number	1-99		UINT16	R	
+16-21	Reserved	0		UINT16	R	
+22	V1-V3 inputs range	690	V	UINT16	R	
+23	V1-V3 inputs overload	120	%	UINT16	R	
+24,25	Reserved	0		UINT16	R	
+26	I1-I3 inputs range	1, 5	A	UINT16	R	
+27	I1-I3 inputs overload	200	%	UINT16	R	
Device Data Scales						
0x81F2	Voltage scale, in secondary volts	60-828 (default 144V)	1V	UINT16	R/W	
0x81F3	Current scale, in secondary amps = CT secondary current (1A, 5A) × Current overload	20, 100 (2.0A, 10.0A)	×0.1A	UINT16	R	
Communication Ports Setup						
0x8500-0x851F						
+0	Communication protocol	COM1: 0=SATEC ASCII, 1=Modbus RTU, 2=DNP3.0 COM2: 5=Profibus DP		UINT16	R	
+1	Interface	COM1: 1=RS-422, 2=RS-485 COM2: 7=Profibus		UINT16	R	
+2	Device address	SATEC ASCII: 0-99 Modbus RTU: 1-247 DNP3.0: 0-65532 Profibus: 0-126		UINT16	R	
+3	Baud rate	COM1: 1=300 bps, 2=600 bps, 3=1200 bps, 4=2400 bps, 5=4800 bps, 6=9600 bps, 7=19200 bps, 8=38400 bps, 9=57600 bps,		UINT16	R	COM2 baud rate does not concern the PROFIBUS baud rate

Address	Description	Options/Range	Units	Type	R/W	Notes
		10=115200 bps COM2: 9=57600 bps				
+4	Data format	COM1: 0=7 bits/even parity, 1=8 bits/no parity, 2=8 bits/even parity COM2: 1=8 bits/no parity		UINT16	R	
+5	Flow control	0=no flow control		UINT16	R	N/A for COM1 (read as 65535)
+6	RTS mode	0=not used		UINT16	R	N/A for COM1 (read as 65535)
+7	ASCII compatibility mode	0=disabled, 1=enabled		UINT16	R	
+8-15	Reserved			UINT16	R	
0x8500-0x850F	**COM1 Setup**					
0x8510-0x851F	**COM2 Setup**					
Basic Setup						
0x8600-0x8614						
+0	Wiring mode	F2		UINT16	R/W	
+1	PT ratio	10 to 65000	×0.1	UINT16	R/W	
+2	CT primary current	1 to 10,000	A	UINT16	R/W	
+3	Power block demand period EH	1,2,3,5,10,15,20,30,60 min, 255 = external synchronization	min	UINT16	R/W	If the external synchronization is selected, the DI1 input is considered a pulse or KYZ input. The pulse edge restarts the power demand block accumulation interval. E
+4	Volt/ampere demand period	0 to 1800	sec	UINT16	R/W	
+5-7	Reserved			UINT16	R	Read as 65535
+8	Number of blocks in a sliding window EH	1 to 15		UINT16	R/W	
+9-10	Reserved			UINT16	R	Read as 65535
+11	Nominal line frequency	25, 50, 60, 400	Hz	UINT16	R/W	
+12	Maximum demand load current	0 to 10,000 (0 = CT primary current)	A	UINT16	R/W	
+13-17	Reserved			UINT16	R	Read as 65535
+18	Nominal secondary voltage EH	10 to 690 V		UINT16	R/W	
+19	Reserved			UINT16	R	Read as 65535
+20	PT ratio multiplication factor	×1, ×10		UINT16	R/W	
Device Options Setup						
0x8700-0x870E						
+0	Power calculation mode	0=using reactive power: S=f(P,Q), 1=using non-active power: Q=f(S,P)		UINT16	R	
+1	Energy roll value EH	$0=1\times10^4$, $1=1\times10^5$, $2=1\times10^6$, $3=1\times10^7$, $4=1\times10^8$, $5=1x10^9$		UINT16	R	
+2	Phase energy calculation mode EH	0=disabled, 1=enabled		UINT16	R	
+3-9	Reserved			UINT16	R	Read as 65535
+10	Energy LED test mode EH	0=disabled, 1=Wh test, 2=varh test		UINT16	R	LED pulse rate is 10,000 pulses/kWh
+11	Starting voltage, percent of FS voltage	15-50	×0.1%	UINT16	R	Default 1.5%

Address	Description	Options/Range	Units	Type	R/W	Notes
+12-13	Reserved			UINT16	R	Read as 65535
+14	Device resolution (see Section 4 for details)	0 = Low resolution, 1 = High resolution		UINT16	R	Default 0
Clock Setup						
0x8780	Local time, in seconds, since Jan 1, 1970	F1	sec	UINT32	R/W	

4 Data Scales and Units

Code	Condition	Value/Range	Notes
Data Scales			
Vmax		Voltage scale × PT Ratio, V	2
Imax		Current scale × CT Ratio, A	1, 3
Pmax	Wiring 4LN3, 3LN3, 3BLN3	Vmax × Imax × 3, W	4
	Wiring 4LL3, 3LL3, 3BLL3, 3OP2, 3OP3, 3DIR2	Vmax × Imax × 2, W	
Fmax	Nominal frequency 25, 50 or 60 Hz	100 Hz	
	Nominal frequency 400Hz	500 Hz	
Data Units – Low Resolution Option			
U1		1V	
U2		1A	
U3		1kW/kvar/kVA	
Data Units – High Resolution Option			
U1	PT Ratio = 1	0.1V	
	PT Ratio > 1	1V	
U2		0.01A	
U3	PT Ratio = 1	1W/Var/VA	
	PT Ratio > 1	1kW/kvar/kVA	

See Device Options Setup for information on the device resolution option.

1 CT Ratio = CT primary current/CT secondary current

2 The default Voltage scale is 144V (120V +20%). You can change it via the Device Options setup in PAS.

3 The default Current scale is 2 × CT secondary current (2.0A with 1A secondaries, 10.A with 5A secondaries). You can change it via the Device Options setup in PAS.

4 Pmax is rounded to whole kilowatts. With PT=1.0, if Pmax is greater than 9,999,000 W, it is truncated to 9,999,000 W.

5 Data Formats

Format Code	Value	Description	Notes
Timestamp			
F1		Local time in a UNIX-style format. Represents the number of seconds since midnight (00:00:00), January 1, 1970. The time is valid after January 1, 2000.	946684800 to 2145916799 allowed
Wiring Mode			
F2	0	3OP2 - 3-wire open delta using 2 CTs (2 element)	
	1	4LN3 - 4-wire WYE using 3 PTs (3 element), line-to-neutral voltage readings	
	2	3DIR2 - 3-wire direct connection using 2 CTs (2 element)	
	3	4LL3 - 4-wire WYE using 3 PTs (3 element), line-to-line voltage readings	
	4	3OP3 - 3-wire open delta using 3 CTs (2 1/2 element)	
	5	3LN3 - 4-wire WYE using 2 PTs (2 1/2 element), line-to-neutral voltage readings	
	6	3LL3 - 4-wire WYE using 2 PTs (2 1/2 element), line-to-line voltage readings	
	8	3BLN3 - 3-wire broken delta using 2 PTs (2 1/2 element), line-to-neutral voltage readings	
	9	3BLL3 - 3-wire broken delta using 2 PTs (2 1/2 element), line-to-line voltage readings	
Device Diagnostics			
F23	Bit 0	Reserved	
	Bit 1	Reserved	
	Bit 2 = 1	RAM/Data error	
	Bit 3 = 1	CPU watchdog reset	
	Bit 4 = 1	Sampling fault	
	Bit 5 = 1	CPU exception	
	Bit 6	Reserved	
	Bit 7 = 1	Software watchdog reset	
	Bit 8 = 1	Power down	
	Bit 9 = 1	Device reset	
	Bit 10 = 1	Configuration reset	
	Bit 11 = 1	RTC fault	
	Bit 12	Reserved	
	Bit 13	Reserved	
	Bit 14	Reserved	
	Bit 15 = 1	EEPROM fault	
Instrument Options			
F28	Bit 0=1	Reserved	
	Bit 1=1	690V Option	
	Bits 2-5	Reserved	
	Bit 6=1	Analog output 0/4 or 4/20mA	
	Bit 7=1	Analog output 0-1mA	
	Bit 8=1	Analog output ±1mA	
	Bit 9=1	RO option	
	Bit 10=1	DI option	
	Bit 11=1	Reserved	
	Bit 12=1	Setup is secured by a password (authorization required)	
	Bit 13=1	Reserved	
	Bit 14	Reserved	
	Bit 15	Reserved	
	Bits 16-18	Number of RO - 1	
	Bits 19-22	Number of DI – 1	
	Bits 23-24	Number of AO - 1	
	Bits 25-29	Reserved	
	Bits 30-31	Reserved	

6 Device GSD File

```
;=========================================================
; Profibus Device Database of HMS Industrial Networks AB
; Model : ANYBUS-IC PDP
; Description : ANYBUS-IC Profibus DP slave
; Language : English
; Date : 30 September 2003
; Author : HMS Industrial Networks AB
;
; MODIFICATIONS:
; 30 September 2003:
;  - 'MaxTsdr_xxx' for all baudrates have been optimized for the SPC3 ASIC.
;  - 'Revision' upgrade
;  - 'Hardware_Release' upgrade
;  - 'Software_Release' upgrade
;=========================================================
#Profibus_DP

GSD_Revision        = 2

; Device identification
Vendor_Name         = "HMS Industrial Networks AB"
Model_Name          = "AnyBus-IC PDP"
Revision            = "Version 1.1"
Ident_Number        = 0x1810
Protocol_Ident      = 0         ; DP protocol
Station_Type        = 0         ; Slave device
FMS_supp            = 0         ; FMS not supported
Hardware_Release    = "Version 1.1"
Software_Release    = "Version 1.1"

;Used bitmap
Bitmap_Device       = "ABIC_DE"
Bitmap_Diag         = "ABIC_DI"
Bitmap_SF           = "ABIC_SF"

; Supported baudrates
9.6_supp            = 1
19.2_supp           = 1
45.45_supp          = 1
93.75_supp          = 1
187.5_supp          = 1
500_supp            = 1
1.5M_supp           = 1
3M_supp             = 1
6M_supp             = 1
12M_supp            = 1

; Maximum responder time for supported baudrates
MaxTsdr_9.6         = 15
MaxTsdr_19.2        = 15
MaxTsdr_45.45       = 15
MaxTsdr_93.75       = 15
MaxTsdr_187.5       = 15
MaxTsdr_500         = 15
MaxTsdr_1.5M        = 25
MaxTsdr_3M          = 50
MaxTsdr_6M          = 100
MaxTsdr_12M         = 200

; Supported hardware features
Redundancy          = 0     ; not supported
Repeater_Ctrl_Sig   = 2     ; TTL
24V_Pins            = 0     ; not connected
```

```
Implementation_Type     = "SPC3"

; Supported DP features
Freeze_Mode_supp        = 1     ; supported
Sync_Mode_supp          = 1     ; supported
Auto_Baud_supp          = 1     ; supported
Set_Slave_Add_supp      = 1     ; supported

; Maximum polling frequency
Min_Slave_Intervall     = 1     ; 100 us

; Maximum supported sizes
Modular_Station         = 1     ; modular
Max_Module              = 24
Max_Input_Len           = 48
Max_Output_Len          = 48
Max_Data_Len            = 96
Modul_Offset            = 1

Fail_Safe               = 1     ; Data telegram without data in state CLEAR accepted

Slave_Family            = 0
Max_Diag_Data_Len       = 6

; Definition of modules
Module                  = "IN/OUT:   1 Byte" 0x30
EndModule
;
Module                  = "IN/OUT:   2 Byte ( 1 word)" 0x70
EndModule
;
Module                  = "IN/OUT:   4 Byte ( 2 word)" 0x71
EndModule
;
Module                  = "IN/OUT:   8 Byte ( 4 word)" 0x73
EndModule
;
Module                  ="IN/OUT:  16 Byte ( 8 word)" 0x77
EndModule
;
Module                  = "IN/OUT:  32 Byte (16 word)" 0x7F
EndModule
;
Module                  = "INPUT:    1 Byte" 0x10
EndModule
;
Module                  = "INPUT:    2 Byte ( 1 word)" 0x50
EndModule
;
Module                  = "INPUT:    4 Byte ( 2 word)" 0x51
EndModule
;
Module                  = "INPUT:    8 Byte ( 4 word)" 0x53
EndModule
;
Module                  = "INPUT:   16 Byte ( 8 word)" 0x57
EndModule
;
Module                  = "INPUT:   32 Byte (16 word)" 0x5F
EndModule
;
Module                  = "OUTPUT:   1 Byte" 0x20
EndModule
;
Module                  = "OUTPUT:   2 Byte ( 1 word)" 0x60
EndModule
;
```

```
Module                  = "OUTPUT:   4 Byte ( 2 word)" 0x61
EndModule
;
Module                  = "OUTPUT:   8 Byte ( 4 word)" 0x63
EndModule
;
Module                  = "OUTPUT:  16 Byte ( 8 word)" 0x67
EndModule
;
Module                  = "OUTPUT:  32 Byte (16 word)" 0x6F
EndModule
```