

Firmware versions and pump models:

- 151.06 and higher for e-LNEEE, e-LNESE, e-LNTEE and e-LNTSE
- 101.10 and higher for e-HME, e-SVE, VME and e-SVIE

Modbus® Protocol
Parameter List



Smart Pump Range

xylem

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1. Introduction and Safety

1.1 Purpose of this manual

This manual shows and discusses the Modbus® addresses implemented in Smart Pump Range products.

The data managed by the Smart Pump Range unit consist of:

- Parameters: read & write, used to set modes, activate functions and write on the drive
- Information: read only, to acquire values from the drive.



CAUTION:

Before using the unit make, sure to read and fully understand the Smart Pump Range Use and Maintenance Manual.

1.2 Acronyms

MIN	Minimum
MAX	Maximum
DEF	Default
R	Read only
R/W	Read & Write
UM	Unit of measurement
LSW/MSW	Least Significant Word / Most Significant Word
N.A.	Not accessible through the user interface

2 A few facts about the Modbus® Protocol

NOTE:

The Modbus® Protocol is an international standardized Bus Protocol. The general information within this Manual is just a brief overview, for detailed information please use the Modbus® Protocol Reference Guide, or any other source of information (e.g. Modbus® org. "MODBUS® application protocol specification" available on the Internet).

This protocol defines a message structure that controllers will recognize and use, regardless of the type of networks over which they communicate. It describes the process a controller uses to request access to another device, how it will respond to requests from the other devices, and how errors will be detected and reported. It establishes a common format for the layout and contents of message fields.

During communications on a Modbus® network, the protocol determines how each controller will know its device address, recognize a message addressed to it, determine the kind of action to be taken, and extract any data or other information contained in the message.

2.1 Communication

Smart Pump Range products use the RS485 serial interface that defines connect pinouts, cabling, signal levels, transmission baud rates and parity checking.

Controllers communicate using a master-client technique, in which only the master can start a transfer or polling. The other devices (Clients) respond by supplying the requested data to the master, or by taking the action requested in the query.

2.2 Broadcasting

On Smart Pump Range products the broadcast function is not supported.

2.3 Data protection

Standard Modbus® serial networks use two kinds of error checking:

- Parity checking (even or odd) can be optionally applied to each character
- Frame checking (LRC or CRC) is applied to the entire message.

Both the character check and message frame check are generated in the master device and applied to the message contents before transmission. The client device checks each character and the entire message frame during receipt.

Detailed information can be found in the Modbus® Protocol Reference Guide.

2.4 Transmission mode

The data managed by the Smart Pump Range unit can be accessed considering the Modbus® virtual memory, consisting of Holding Registers for all values.
The Modbus® Protocol transmission Mode available on Smart Pump Range products is Modbus® RTU (selectable via parameter P50 Communication protocol).
The serial port communication parameters (P51 Address, P52 Baudrate, P54 Parity Mode) shall be selected according to network configuration.

NOTE:

The mode and serial parameters must be the same for all devices on the Modbus® network.

The following modes are supported by Smart Pump Range products and can be selected via parameter P54 Parity Mode:

- 8N1 1 start bit, 8 data bits, 1 stop bit, No parity
- 8N2 1 start bit, 8 data bits, 2 stop bits, No parity
- 8E1 1 start bit, 8 data bits, 1 stop bit, Even parity
- 8O1 1 start bit, 8 data bits, 1 stop bit, Odd parity¹

The default serial port configuration is P51 Address = 1, P52 Baudrate = 9600, P54 Parity Mode = 8N1.

2.5 Supported function codes

The Modbus® protocol function codes implemented in Smart Pump Range products are:

- Read Holding Registers (hex code 0x03), to read both Holding Registers representing Parameters and Information
- Write Multiple Registers (hex code 0x10), to write Holding Registers representing the Parameters.

2.5.1 Example 1

0x03 Read Holding Registers - READ COMMAND read the binary contents of holding registers in the client.

Note: the Modbus® Registers are addressed starting at zero, e.g. Holding Register indexed 0x3F has to be addressed as 0x3E.

Example: Read the Current Pressure

Query

Client Address	0x01	Could be set on Smart Pump Range products via parameter P51
Function	0x03	Read Holding Register
Starting Address High	0x00	
Starting Address Low	0x3E => 62 DEC =>	Current Pressure Modbus address
No. of Points High	0x00	
No. of Points Low	0x01	Read one holding register is supported
Error Check CRC-High	0xC6	
Error Check CRC-Low	0xE5	Generated CRC-Checksum

Response

Client Address	0x01	
Function	0x03	
Byte count	0x02	
Data High	0x02	
Data Low	0x08 => 208 HEX = 520 DEC => Actual Value = 5,20 bar	
Error Check CRC-High	0xE2	
Error Check CRC-Low	0xB8	Generated CRC-Checksum

¹ When the optional RS485 Module Smart Pump is installed, the network configuration 801 is not available and the parameter P52 does not show this selection.

2.5.2 Example 2

0x10 Write Multiple Registers - WRITE COMMAND writes values into a block of contiguous registers. Broadcast is not supported.

Note: the Modbus® Registers are addressed starting at zero, e.g. Holding Register indexed 0xCB has to be addressed as 0xCA.

Example: set Ramp 1 and Ramp 2 to 25 s, Ramp 3 and Ramp 4 to 100 s.

Query

Client Address	0x01	Could be set on Smart Pump Range products via parameter P51
Function	0x10	Write Multiple Registers
Starting Address High	0x00	
Starting Address Low	0xCA	=> 202 DEC => first register is Ramp 1
Q.ty of Registers High	0x00	
Q.ty of Registers Low	0x04	a total 4 registers (Ramp 1 to Ramp 4) to be written
Byte count	0x08	2 * Quantity of Registers
Reg Value High	0x00	
Reg Value Low	0x19	=> 19 HEX = 25 DEC => sets Ramp 1 to 25 sec
Reg Value High	0x00	
Reg Value Low	0x19	=> 19 HEX = 25 DEC => sets Ramp 2 to 25 sec
Reg Value High	0x00	
Reg Value Low	0x64	=> 64 HEX = 100 DEC => sets Ramp 3 to 100 sec
Reg Value High	0x00	
Reg Value Low	0x64	=> 64 HEX = 100 DEC => sets Ramp 4 to 100 sec
Error Check CRC-High	0x14	
Error Check CRC-Low	0x78	Generated CRC-Checksum

Response

Client Address	0x01	
Function	0x10	
Starting Address High	0x00	
Starting Address Low	0xCA	
Q.ty of Registers High	0x00	
Q.ty of Registers Low	0x04	a total of 4 registers (Ramp 1 to Ramp 4) written
Error Check CRC-High	0xF4	
Error Check CRC-Low	0xE1	Generated CRC-Checksum

3 Connections and data handling

NOTE:

For detailed information regarding installation, wiring and configuration of the Smart Pump range product, please read and follow the relative manual.

NOTE:

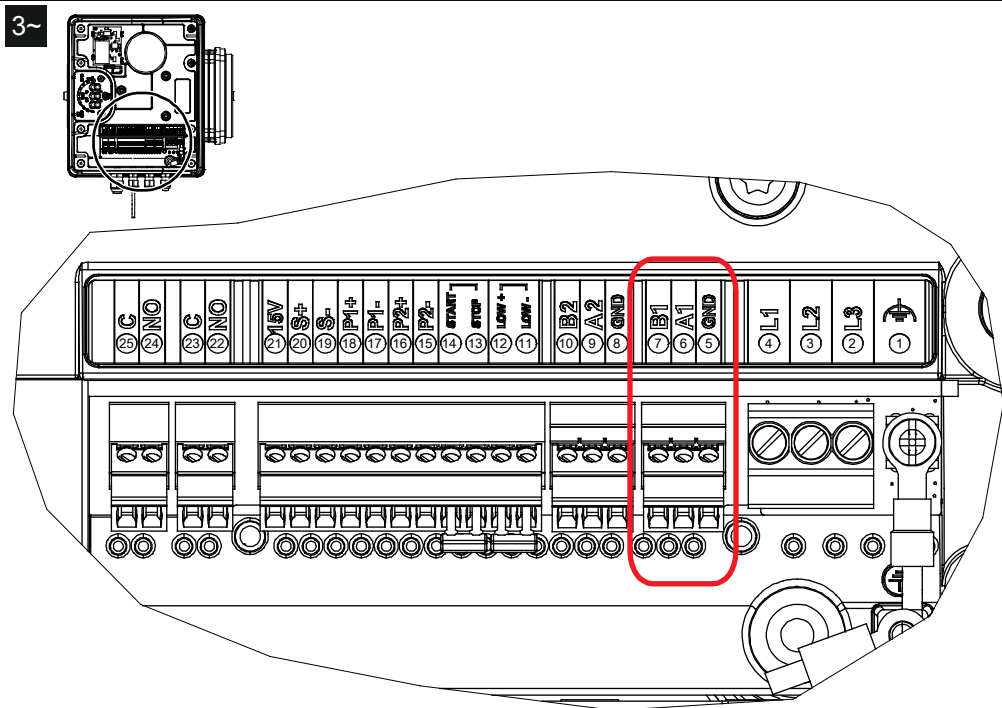
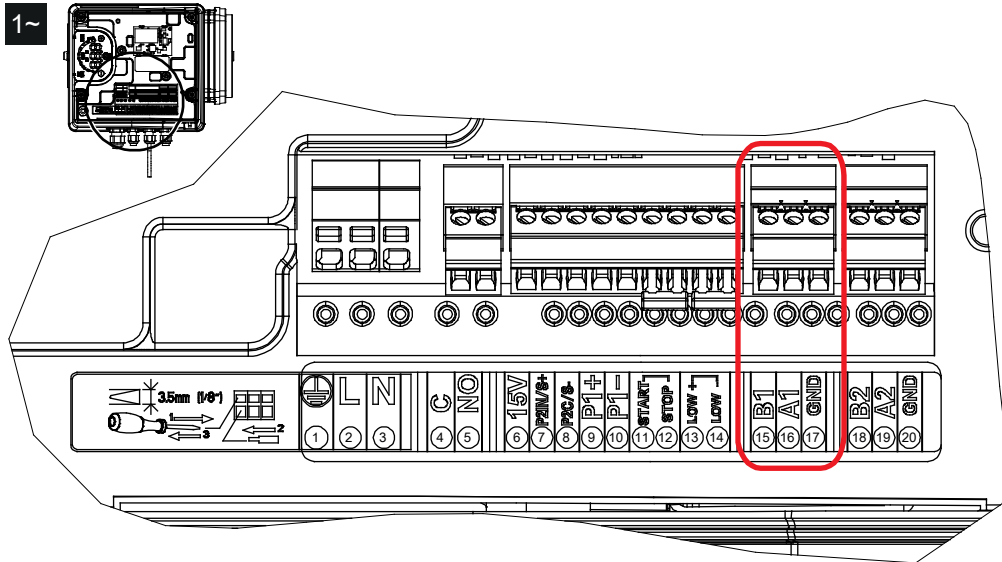
It is suggested to set parameter "P69 Avoid frequent parameters saving" to YES when a Smart Pump range product is connected to an External Device via Modbus®. This parameter limits the frequency with which the unit stores the required value P02 in the EEPROM memory, in order to extend its life.

When the Modbus® RTU communication is active between the Smart Pump range product and an External Device, the Smart Pump range product "locks" the possibility to change most of the system parameters from the local push buttons on the drive. This is to prevent conflicts between the values (read and written) by the (remote) External Device, and the parameters values that could be over-written/changed by the local operator. The remote lock for parameters edit can be disabled stopping the Modbus® communication.

3.1 Connect a stand-alone product to an External Device

- Unscrew the dedicated screws and remove the plastic cover of the Smart Pump electronic drive, in order to proceed wiring the control terminals; for reference, the wiring harness scheme is reported on the terminal block label.
- Terminal position and numbering is different between single phase and three-phase version.
- No additional modules are needed to connect a stand-alone Smart Pump range product to an External Device via RS485.
- Terminals 15 (B1), 16 (A1) and 17 (GND) on single-phase version and 7 (B1), 6 (A1), 5 (GND) on three-phase version are used for the communication with an external control device (e.g. PLC, BMS, etc.).
- Do not connect the ground of the control card to other voltage potentials or to PE.

See chapter 4 for the Registers List of e-LNEEE, e-LNESE, e-LNTEE and e-LNTSE pumps.
See chapter 5 for the Registers List of e-HME, e-SVE, VME and e-SVIE pumps.



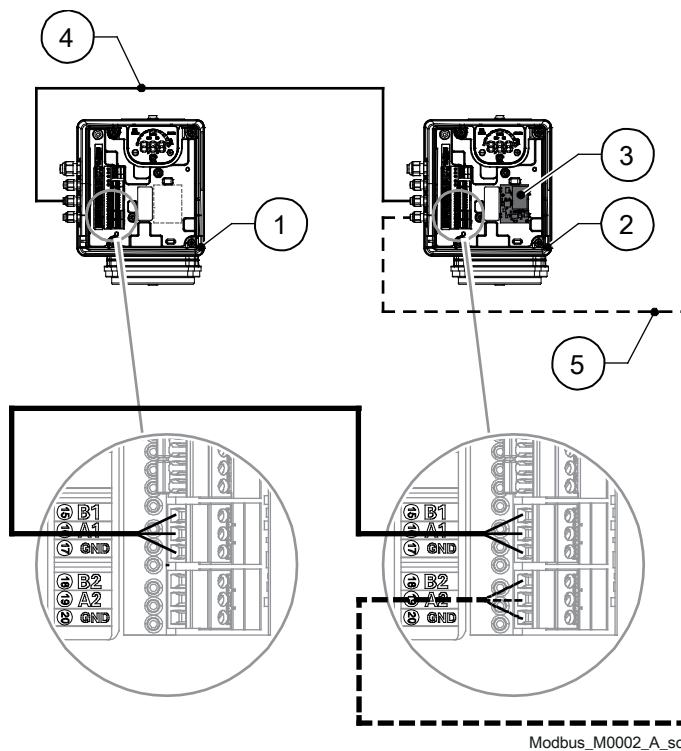
Modbus_M0001_E_sc

3.2 Connect two e-LNEEE, e-LNESE, e-LNTEE or e-LNTSE pumps running in Dual Pump mode to an External Device

The Dual Pump mode, available only for e-LNEEE, e-LNESE, e-LNTEE and e-LNTSE pumps, allows the connection of two motor drives in a MASTER - FOLLOWER configuration.

- Master or Follower configuration can be set via parameter P38 Dual Pump Configuration.
- The information about the Follower unit are available through the Modbus® registers of the Master Unit (see **Registers List of e-LNEEE, e-LNESE, e-LNTEE and e-LNTSE pumps**, page 11).
- The parameter P51 Address need be set only on the MASTER pump.
- To connect a Dual Pump mode set to an External Device, an RS485 Module Smart Pump must be installed on the MASTER unit.
- Terminals 15 (B1), 16 (A1) and 17 (GND) (on single-phase version) and 7 (B1), 6 (A1), 5 (GND) (on three-phase version) are dedicated to the Master - Follower communication (dual pump link).

- Terminals 18 (B2), 19 (A2) and 20 (GND) on single-phase MASTER unit, or terminals 10 (B2), 9 (A2) and 8 (GND) on three-phase MASTER unit, are dedicated to the External Device communication network.

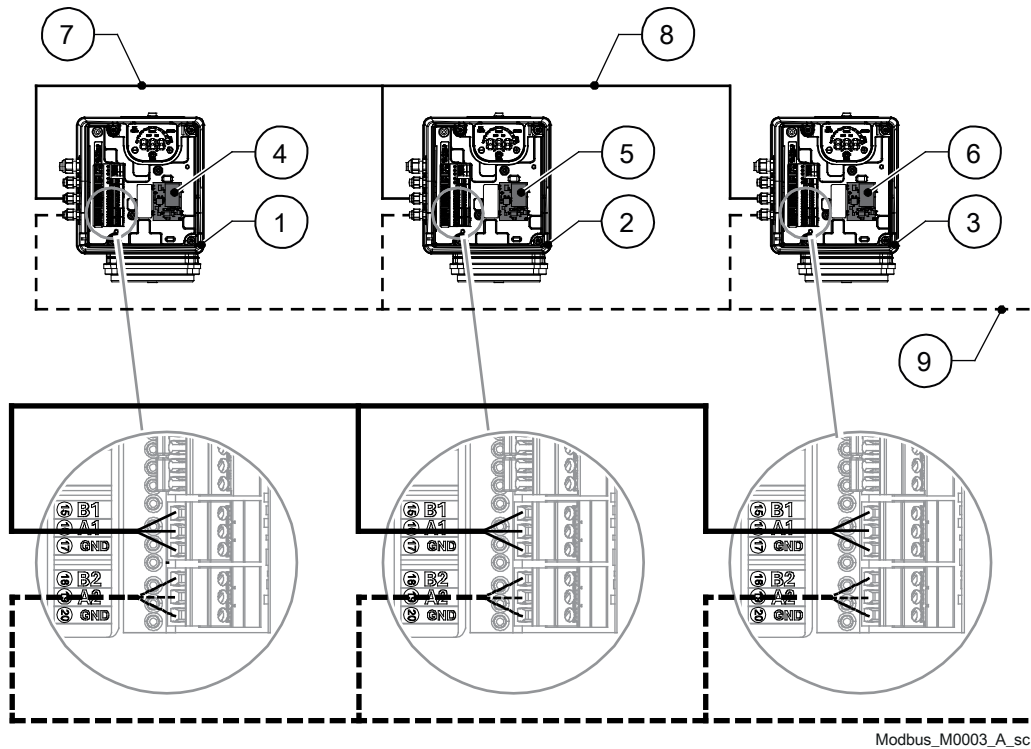


1. Follower drive
2. Master drive
3. RS485 module
4. Dual pump link
5. External device communication network

3.3 Connect two or three e-HME, e-SVE, VME or e-SVIE pumps running in Multi-Pump mode to an External Device

The Multi-Pump mode, available only for e-HME, e-SVE, VME and e-SVIE pumps, allows the connection of two or three motor drives in a Multi-Master Multi-Pump configuration.

- Each unit of the booster set equipped with a RS485 Module Smart Pump has its unique Modbus address and provides a complete list of registers to the External Device (see **Registers List of e-HME, e-SVE, VME and e-SVIE pumps**, page 17).
- The parameter P51 Address must be set to a unique value on each unit of the booster set. The parameter P51 Address is the identification number of the Smart Pump range product in the Modbus network.
- The parameter P55 Multipump Address must be set to a unique value on each unit of the booster set. The parameter P55 is the identification number of the Smart Pump range product in the Multi-Pump network.
- To connect a Multi-Pump mode booster set to an External Device, each drive must be equipped with a RS485 Module Smart Pump. For a two pumps booster set, two RS485 Modules are needed; for a three pumps booster set, three RS485 modules are needed.
- Terminals 15 (B1), 16 (A1) and 17 (GND) (on single-phase unit) and 7 (B1), 6 (A1), 5 (GND) (on three-phase unit) are dedicated to the Multi-Pump communication (multi-pump link).
- Terminals 18 (B2), 19 (A2) and 20 (GND) on single-phase unit, or terminals 10 (B2), 9 (A2) and 8 (GND) on three-phase unit, are dedicated to the External Device communication network.



Modbus_M0003_A_sc

1. First drive
2. Second drive
3. Third drive
4. RS485 module
5. RS485 module
6. RS485 module
7. Multi pump link
8. Multi pump link
9. External device communication network

Special care should be taken when an External Device (by mean of Modbus® protocol), requires to read and write Smart Pump range product parameters, being the drive connected into a Multi-Pump system too.

In particular:

- In a Multi-Pump application, to "Read Holding Registers" requests on the Modbus®, each Smart Pump range product returns to the External Device exclusively its own parameters, not parameters of other drives connected in the booster set
- In a Multi-Pump application, requests of "Write Multiple Registers" on the Modbus® must be sent by the external device to all Smart Pump range products connected, even if the parameters to be written are "Global" (for the booster set).

4 Registers List of e-LNEEE, e-LNESE, e-LNTEE and e-LNTSE pumps

4.1 System information

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
30 [R]	P17	Software version	-	-	-	-
31 [R]	N.A.	Map version progressive	-	-	-	-
32 [R]	N.A.	Map version	-	-	-	-
33 [R]	N.A.	Preset parameter progressive	-	-	-	-
34 [R]	N.A.	Preset parameter version	-	-	-	-
35 [R]	N.A.	Hydraulic version	-	-	-	-

4.2 Registers block #1

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
50 [R/W]	On display	Start / Stop command 0 = [START] 1 = [STOP]	-	0	1	0
52 [R/W]	P25	Control mode 0 = [ACT] 1 = [CPP] 2 = [PPP]	-	0	3	1
53 [R/W]	On display	Speed set in ACT mode	rpm	Parameter P27	Parameter P26	-
54 [R]	P16	Motor Speed	rpm	-	-	-
55 [R/W]	P41	Pressure Sensor Unit Of Measure 0 = [BAR] 1 = [PSI]	-	0	1	0
56 [R/W]	On display	Pressure setting for CPP	bar/100, psi/10	0	Depending on the type of pump unit	Depending on the type of pump unit
57 [R/W]	On display	Pressure setting for PPP	bar/100, psi/10	0	Depending on the type of pump unit	Depending on the type of pump unit
59 [R/W]	P40	Sensor selection 0 = [No sensor] 1 = [2 individual sensors] 2 = [1 differential sensor] 3 = [4÷20 mA Speed Reference] 4 = [0÷10 V Speed Reference]	-	0	2	1
60 [R/W]	P42	Full scale value for pressure sensor 1	bar/100, psi/10	0	2500 / 3630	Depending on the type of pump unit
61	P43	Full scale value for pressure sensor 2	bar/100,	0	2500 / 3630	Depending on the type of

[R/W]			psi/10			pump unit
62 [R]	On display	Current pressure	bar/100, psi/10	0	-	-
63 [R]	N.A.	Reserved	-	-	-	-
64 [R]	P14	Inverter Current	mA	0	-	-
65 [R]	P15	Inverter Voltage	V	0	-	-
66 [R]	N.A.	Current power	W	0	-	-
67 [R]	N.A.	Temperature of winding 1	°C	0	255	-
68 [R]	N.A.	Temperature of winding 2	°C	0	255	-
69 [R]	N.A.	Temperature of winding 3	°C	0	255	-
70 [R]	P13	Power Module Temperature	°C	0	255	-
71 [R]	On display	Current error	-	-	-	0
72 [R]	N.A.	Error bitField LSW bit 0: E01 Internal communication error bit 1: E02 Motor overload error bit 2: E03 DC-bus overvoltage error bit 3: E04 Motor step loss bit 4: E05 EEPROM Data memory error bit 5: E06 Grid voltage error bit 6: E07 Motor winding temperature error bit 7: E08 Power module temperature error bit 8: E05 Corrupted factory data bit 9: E05 Corrupted memory password bit 10: E09 NTC probe overtemperature bit 11: E10 Dry run bit 12: E09 NTC probe error bit 13: E04 Locked rotor bit 14: E09 Motor not connected bit 15: E11 Error LOW	-	0	65535	0
73 [R]	N.A.	Error bitField MSW bit 0: reserved bit 1: E13 Pressure sensor configuration error bit 2: reserved bit 3: reserved bit 4: reserved bit 5: reserved bit 6: E15 Loss of phase error bit 7: E05 Motor selection error bit 8: E44 Missing speed reference analog input	-	0	65535	0
74 [R]	On display	Current alarm	-	-	-	0

75 [R]	N.A.	Alarm bitField LSW bit 0: A15 EEPROM write failure bit 1: reserved bit 2: A03 Derating bit 3: reserved bit 4: A06 LOW alarm bit 5: reserved bit 6: reserved bit 7: A05 Data memory alarm bit 8: reserved bit 9: A43 Both sensors faulty	-	-	-	-
76 [R]	N.A.	Alarm bitField MSW bit 0: A20 Internal alarm bit 1: A20 Internal alarm bit 2: A20 Internal alarm bit 3: A20 Internal alarm bit 4: A20 Internal alarm bit 5: A20 Internal alarm bit 6: A20 Internal alarm	-	0	65535	0
77 [R/W]	P22	System password	-	1	999	66
78 [R/W]	P23	Lock Function 0 = [OFF] 1 = [ON]	-	0	1	1
79 [R]	P65	Test Run - Time Start	h	0	100	100
80 [R/W]	P66	Test Run - Speed	rpm	Parameter P27	Parameter P26	2000
81 [R/W]	P67	Test Run - Time Duration	s	0	180	10
82 [R/W]	N.A.	Keyboard Lock	-	0	1	0
83 [R/W]	P39	Twin control mode 0 = [Backup] 1 = [Alternate] 2 = [Parallel] 3 = [Forced parallel]	-	0	3	1

4.3 Factory restore

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
195 [R/W]	P68	Default Values Reload 0 = [No] 1 = [Res]	-	0	1	0

4.4 Registers block #2

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
200 [R/W]	P26	Max. RPM set	rpm	ACT set	3600	-
201 [R/W]	P27	Min. RPM speed	rpm	800	ACT set	-
216 [R/W]	P69	Avoid Frequent Parameters Saving 0 = [no] 1 = [yes]	-	0	1	0

4.5 Registers block #3

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
301 [R/W]	N.A.	Multipump - Switch Interval	h	0	250	24
306 [R/W]	P48	Lack Of Water Switch Input 0 = [dis] 1 = [ALR] 2 = [err]	-	0	2	0

4.6 Registers block #4

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
600 [R]	N.A.	Follower - Current power	W	-	-	-
601 [R]	N.A.	Follower - Current Head	bar/100, psi/10	-	-	-
602 [R]	N.A.	Reserved	-	-	-	-
603 [R]	N.A.	Follower - Motor speed	rpm	-	-	-
604 [R]	N.A.	Follower - Temperature of winding 1	°C	-	-	-
605 [R]	N.A.	Follower - Temperature of winding 2	°C	-	-	-
606 [R]	N.A.	Follower - Temperature of winding 3	°C	-	-	-
607 [R]	N.A.	Follower - Power Module Temperature	°C	-	-	-
608 [R]	N.A.	Follower - Inverter Current	mA	-	-	-
609 [R]	N.A.	Follower - Alarm bitField LSW bit 0: A15 EEPROM write failure bit 1: reserved bit 2: A03 Derating bit 3: reserved bit 4: A06 LOW alarm bit 5: reserved bit 6: reserved bit 7: A05 Data memory alarm bit 9: A43 Both sensors faulty bit 10: reserved bit 11: reserved	-	-	-	-

		bit 12: reserved bit 13: A41 Sensor 1 faulty bit 14: A42 Sensor 2 faulty bit 15: reserved				
610 [R]	N.A.	Follower - Alarm bitField MSW bit 0: A20 Internal alarm bit 1: A20 Internal alarm bit 2: A20 Internal alarm bit 3: A20 Internal alarm bit 4: A20 Internal alarm bit 5: A20 Internal alarm bit 6: A20 Internal alarm	-	-	-	-
611 [R]	On display	Follower - Current error	-	-	-	-

4.7 System life counters

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
1000 [R]	P05-P06	Operating time LSW	s	-	-	-
1001 [R]	P05-P06	Operating time MSW	s	-	-	-
1002 [R]	P07-P08	Motor time LSW	s	-	-	-
1003 [R]	P07-P08	Motor time MSW	s	-	-	-

Example of use:

- Operating time LSW = 18587d (0x489B)
- Operating time MSW = 1d (0x0001)
- Operating time = 0x0001489B = 84123 s.

4.8 Data log block #0... #7

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
1020 [R]	N.A.	Error log [0] Error code	s	-	-	-
1021 [R]	N.A.	Error log [0] Error start time LSW	s	-	-	-
1022 [R]	N.A.	Error log [0] Error start time MSW	s	-	-	-
1023 [R]	N.A.	Error log [0] Error end time LSW	s	-	-	-
1024 [R]	N.A.	Error log [0] Error end time MSW	s	-	-	-
1025 [R]	N.A.	Error log [0] Error BitField LSW	-	-	-	-
1026 [R]	N.A.	Error log [0] Error occurrences counter	-	-	-	-
1027 [R]	N.A.	Error log [0] Rev. set	rpm	-	-	-
1028 [R]	N.A.	Error log [0] Rev. measured	rpm	-	-	-
1029	N.A.	Error log [0] Phase current	mA	-	-	-

[R]						
1030 [R]	N.A.	Error log [0] Alarm BitField LSW	-	-	-	-
1031 [R]	N.A.	Error log [0] Alarm BitField MSW	-	-	-	-
1032 [R]	N.A.	Error log [0] Status BitField I/O	-	-	-	-
1033 [R]	N.A.	Error log [0] Power	W	-	-	-
1034 [R]	N.A.	Error log [0] Reserved	-	-	-	-
1035 [R]	N.A.	Error log [0] Pressure	bar/100, psi/10	-	-	-
1036 [R]	N.A.	Error log [0] Power module temperature	°C	-	-	-
1037 [R]	N.A.	Error log [0] Start/Stop status (see register 50)	-	-	-	-
1038 [R]	N.A.	Error log [0] Reserved	-	-	-	-
1039 [R]	N.A.	Error log [0] Error BitField MSW	-	-	-	-
1040 [R]	N.A.	Error log [0] Not used	-	-	-	-
1041 [R]	N.A.	Error log [0] Not used	-	-	-	-

The Data log block #1 to #7 have the same list of register of Data log block #0. The addresses are as follow:

- Data log block #1 - from 1050 to 1071;
- Data log block #2 - from 1080 to 1101;
- Data log block #3 - from 1110 to 1131;
- Data log block #4 - from 1140 to 1161;
- Data log block #5 - from 1170 to 1191;
- Data log block #6 - from 1200 to 1221;
- Data log block #7 - from 1230 to 1251.

Each new error condition, corresponding to an error code shown on the display, fills a new Data log block, starting from block #0.

If Data log block #7 is filled, the next error condition fills Data log block #0, deleting previous data stored.

Latest Data log block filled correspond to the information visible via parameter "P09 1st error", the previous Data block information via parameter "P10 2nd error" and so on.

5 Registers List of e-HME, e-SVE, VME and e-SVIE pumps

5.1 System information

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
30 [R]	P17	Software version	-	-	-	-
31 [R]	N.A.	Map version progressive	-	-	-	-
32 [R]	N.A.	Map version	-	-	-	-
33 [R]	N.A.	Preset parameter progressive	-	-	-	-
34 [R]	N.A.	Preset parameter version	-	-	-	-
35 [R]	N.A.	Hydraulic version	-	-	-	-

5.2 Registers block #1

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
50 [R/W]	On display	Start / Stop command 0 = [START] 1 = [STOP]	-	0	1	0
51 [R/W]	P04	Auto-start 0 = [OFF] 1 = [ON]	-	0	1	1
52 [R/W]	P25	Control mode 0 = [ACT] 1 = [HCS] 2 = [MSE] 3 = [MSY]	-	0	3	1
53 [R/W]	On display	Speed set in ACT mode	rpm	Parameter P27	Parameter P26	-
54 [R]	P16	Motor Speed	rpm	-	-	-
55 [R/W]	P41	Pressure Sensor Unit Of Measure 0 = [BAR] 1 = [PSI]	-	0	1	0
56 [R/W]	On display	Pressure setting for HCS / MSE / MSY	bar/100, psi/10	0	Depending on the type of pump unit	Depending on the type of pump unit
58 [R]	P02	Effective Required Value	bar/100, psi/10	-	-	-
59 [R/W]	P40	Sensor selection 2 = [Sensor 1] 3 = [ISP] 4 = [VSP]	-	2	4	2
60	P42	Full scale value for pressure sensor 1	bar/100,	0	2500 / 3630	Depending on the type of

[R/W]			psi/10			pump unit
62 [R]	On display	Current pressure	bar/100, psi/10	0	-	-
63 [R]	N.A.	Reserved	-	-	-	-
64 [R]	P14	Inverter Current	mA	0	-	-
65 [R]	P15	Inverter Voltage	V	0	-	-
66 [R]	N.A.	Current power	W	0	-	-
67 [R]	N.A.	Temperature of winding 1	°C	0	255	-
68 [R]	N.A.	Temperature of winding 2	°C	0	255	-
69 [R]	N.A.	Temperature of winding 3	°C	0	255	-
70 [R]	P13	Power Module Temperature	°C	0	255	-
71 [R]	On display	Current error	-	-	-	0
72 [R]	N.A.	Error bitField LSW bit 0: E01 Internal communication error bit 1: E02 Motor overload error bit 2: E03 DC-bus overvoltage error bit 3: E04 Motor step loss bit 4: E05 EEPROM Data memory error bit 5: E06 Grid voltage error bit 6: E07 Motor winding temperature error bit 7: E08 Power module temperature error bit 8: E05 Corrupted factory data bit 9: E05 Corrupted memory password bit 10: E09 NTC probe overtemperature bit 11: E10 Dry run bit 12: E09 NTC probe error bit 13: E04 Locked rotor bit 14: E09 Motor not connected bit 15: E11 Error LOW	-	0	65535	0
73 [R]	N.A.	Error bitField MSW bit 0: E12 Sensor faulty bit 1: E13 Pressure sensor configuration error bit 2: E30 Multi-pump protocol error bit 3: E14 Low pressure error bit 4: reserved bit 5: reserved bit 6: E15 Loss of phase error bit 7: E05 Motor selection error bit 8: E44 Missing speed reference analog input	-	0	65535	0
74 [R]	On display	Current alarm	-	-	-	0

75 [R]	N.A.	Alarm bitField LSW bit 0: A15 EEPROM write failure bit 1: reserved bit 2: A03 Derating bit 3: reserved bit 4: A06 LOW alarm bit 5: A30 Multi-pump connection alarm bit 6: A31 Loss of multi-pump connection bit 7: A05 Data memory alarm	-	-	-	-
76 [R]	N.A.	Alarm bitField MSW bit 0: A20 Internal alarm bit 1: A20 Internal alarm bit 2: A20 Internal alarm bit 3: A20 Internal alarm bit 4: A20 Internal alarm bit 5: A20 Internal alarm bit 6: A20 Internal alarm	-	0	65535	0
77 [R/W]	P22	System password	-	1	999	66
78 [R/W]	P23	Lock Function 0 = [OFF] 1 = [ON]	-	0	1	1
79 [R]	P65	Test Run - Time Start	h	0	100	100
80 [R/W]	P66	Test Run - Speed	rpm	Parameter P27	Parameter P26	2000
81 [R/W]	P67	Test Run - Time Duration	s	0	180	10
82 [R/W]	N.A.	Keyboard lock	-	0	1	0

5.3 Factory restore

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
195 [R/W]	P68	Default Values Reload 0 = [No] 1 = [Res]	-	0	1	0

5.4 Registers block #2

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
200 [R/W]	P26	Max. RPM set	rpm	Speed set in ACT mode	3600	-
201 [R/W]	P27	Min. RPM speed	rpm	800	Speed set in ACT mode	-
202 [R/W]	P28	Ramp 1	s	1	250	3
203 [R/W]	P29	Ramp 2	s	1	250	3
204 [R/W]	P30	Ramp 3	s	1	999	35
205 [R/W]	P31	Ramp 4	s	1	999	35
206 [R/W]	P32	Ramp Speed Min Acceleration	s/10	20	250	20
207 [R/W]	P33	Ramp Speed Min Deceleration	s/10	20	250	20
208 [R/W]	P34	Speed Min Configuration 0 = [STP] 1 = [SMI]	-	0	1	Depending on the type of pump unit
209 [R/W]	P35	Smin time	s	0	100	0
210 [R/W]	P36	Window	%	0	100	10
211 [R/W]	P37	Hysteresis	%	0	100	80
212 [R/W]	P03	Regulation Restart Value	%	0	100	100
213 [R/W]	P45	Pressure Minimum Threshold	bar/100, psi/10	0	Pressure setpoint (see register 56)	0
214 [R/W]	P46	Pressure Minimum Threshold - Delay Time	s	1	100	2
215 [R/W]	P47	Pressure Minimum Threshold - Automatic Error Reset 0 = [OFF] 1 = [ON]	0	0	1	1
216 [R/W]	P69	Avoid Frequent Parameters Saving 0 = [no] 1 = [yes]	-	0	1	0

5.5 Registers block #3

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
300 [R/W]	P56	Multipump - Max Units	-	1	3	3
301 [R/W]	P57	Multipump - Switch Interval	h	0	250	24
302 [R/W]	P61	Multipump Synchronous - Speed Limit	rpm	Parameter P27	3600	Depending on the type of pump unit
303 [R/W]	P62	Multipump Synchronous - Window	rpm	0	1000	150
304 [R/W]	P58	Multipump - Actual Value Increase	bar/100, psi/10	0	2500 / 3630	35
305 [R/W]	P59	Multipump - Actual Value Decrease	bar/100, psi/10	0	2500 / 3630	15
306 [R/W]	P48	Lack Of Water Switch Input 0 = [dis] 1 = [ALR] 2 = [err]	-	0	2	0
307 [R/W]	P60	Multipump - Enable Speed	rpm	Parameter P27	Parameter P26	Depending on the type of pump unit
308 [R]	P63	Multipump - Priority	-	1	3	-
309 [R]	P64	Multipump revision	-	-	-	-
310 [R/W]	P38	Speed Lift	rpm	0	3600	min rpm
311 [R/W]	P39	Lift Amount	%	0	200	0

5.6 System life counters

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
1000 [R]	P05-P06	Operating time LSW	s	-	-	-
1001 [R]	P05-P06	Operating time MSW	s	-	-	-
1002 [R]	P07-P08	Motor time LSW	s	-	-	-
1003 [R]	P07-P08	Motor time MSW	s	-	-	-

Example of use:

- Operating time LSW = 18587d (0x489B)
- Operating time MSW = 1d (0x0001)
- Operating time = 0x0001489B = 84123 s.

5.7 Data log block #0...#7

Address (dec)	Menu Index	Description	UM	MIN	MAX	DEF
1020 [R]	N.A.	Error log [0] Error code	s	-	-	-
1021 [R]	N.A.	Error log [0] Error start time LSW	s	-	-	-
1022 [R]	N.A.	Error log [0] Error start time MSW	s	-	-	-
1023 [R]	N.A.	Error log [0] Error end time LSW	s	-	-	-
1024 [R]	N.A.	Error log [0] Error end time MSW	s	-	-	-
1025 [R]	N.A.	Error log [0] Error BitField LSW	-	-	-	-
1026 [R]	N.A.	Error log [0] Error occurrences counter	-	-	-	-
1027 [R]	N.A.	Error log [0] Rev. set	rpm	-	-	-
1028 [R]	N.A.	Error log [0] Rev. measured	rpm	-	-	-
1029 [R]	N.A.	Error log [0] Phase current	mA	-	-	-
1030 [R]	N.A.	Error log [0] Alarm BitField LSW	-	-	-	-
1031 [R]	N.A.	Error log [0] Alarm BitField MSW	-	-	-	-
1032 [R]	N.A.	Error log [0] Status BitField I/O	-	-	-	-
1033 [R]	N.A.	Error log [0] Power	W	-	-	-
1034 [R]	N.A.	Error log [0] Reserved	-	-	-	-
1035 [R]	N.A.	Error log [0] Pressure	bar/100, psi/10	-	-	-
1036 [R]	N.A.	Error log [0] Power module temperature	°C	-	-	-
1037 [R]	N.A.	Error log [0] Start/Stop status (see register 50)	-	-	-	-
1038 [R]	N.A.	Error log [0] Reserved	-	-	-	-
1039 [R]	N.A.	Error log [0] Error BitField MSW	-	-	-	-
1040 [R]	N.A.	Error log [0] Not used	-	-	-	-
1041 [R]	N.A.	Error log [0] Not used	-	-	-	-

The Data log block #1 to #7 have the same list of register of Data log block #0. The addresses are as follow:

- Data log block #1 - from 1050 to 1071;
- Data log block #2 - from 1080 to 1101;
- Data log block #3 - from 1110 to 1131;
- Data log block #4 - from 1140 to 1161;
- Data log block #5 - from 1170 to 1191;
- Data log block #6 - from 1200 to 1221;
- Data log block #7 - from 1230 to 1251.

Each new error condition, corresponding to an error code shown on the display, fills a new Data log block, starting from block #0.

If Data log block #7 is filled, the next error condition fills Data log block #0, deleting previous data stored.

Latest Data log block filled correspond to the information visible via parameter "P09 1st error", the previous Data block information via parameter "P10 2nd error" and so on.

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