VE.Direct Protocol

Phoenix Inverters

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victron energy
B L U E   P O W E R

1 VE.Direct Protocol

1.1 VE.Direct commands

The frame format of the VE.Direct protocol has the following general format:

: [command] [data][data][…] [check]\n

Where the colon indicates the start of the frame and the newline is the end of frame. The sum of all data bytes and the check must equal 0x55. Since the normal protocol is in text values the frames are sent in their hexadecimal ASCII representation, ['0' .. '9'], ['A' .. 'F'], must be uppercase. There is no need to escape any characters.

: [command] [dataHighNibble, dataLowNibble][……] [checkHigh, checkLow] \n

Note: The command is only sent as a single nibble. Numbers are sent in Little Endian format. An error response with value 0xAAAA is sent on framing errors.

Command		Description	
0	Enter boot	0x51FA51FA51FA51FA51FA as payload will enable bootloader mode.	
1	Ping	Check for presence, the response is an 'Rsp ping' containing version and firmware type. See the response ping message.	
3	App version	Returns the version of the firmware as stored in the header in an 'Rsp Done' message.	
4	Product Id	Returns the Product Id of the firmware as stored in the header in an 'Rsp Done' message.	
6	Restart	Restarts the device, no response is sent.	
7	Get	Returns a get response with the requested data or error is returned.	
		uint16	the id of the value to get
		uint8	flags, should be set to zero
8	Set	Returns a set response with the requested data or error is returned.	
		uint16	the id of the value to set
		uint8	flags, should be set to zero
		type depends on id	value
A	Async	Asynchronous data message. Should not be replied.	
		uint16	the id of the value being returned
		uint8	flags, defined below
		type depends on id	value
2, 5, 9, B-F	reserved		

VE.Direct responses are formatted in the same manner as commands, but use response codes.:

Response		Description
1	Done	Successful execution of the received command. Payload depends on command.
3	Unknown	Unknown command, data is the unknown command.
4	Error	Frame error (payload=0xAAAA), unable to enter bootloader (payload=0).
5	Ping	The version number is directly interpreted from the hex representation, e.g. 0x0101 is version 1.01. The two most significant bits indicate the firmware type: b00: bootloader b01: application b10: tester b11: release candidate In case of release candidate the lowest two bits of the highest nibble together with type indicate the release candidate number. E.g. 0xD101 represents release candidate D of version 1.01. Note that there can only be 4 release candidates per version.
7	Get	uint16 id: of the value being returned uint8 flags: defined below type depends on id value
8	Set	uint16 id of the value which was set uint8 flags: defined below type depends on id value

The following set / get flags are currently defined (reply):

Flag	Name	Meaning
0x01	Unknown Id	The specified id does not exist
0x02	Not supported	Attempting to write to a read only value
0x04	Parameter Error	The new value is out of range or inconsistent

1.2 Product ID values

The product ID (PID) defines whether firmware is compatible with the device.
Next a list of all VE.Direct and Smart inverters who support the VE.Direct Protocol as described in this document.

Device	Name	Remark
A201	Phoenix Inverter 12V 250VA 230Vac	obsolete (32k)
A202	Phoenix Inverter 24V 250VA 230Vac	obsolete (32k)
A204	Phoenix Inverter 48V 250VA 230Vac	obsolete (32k)
A211	Phoenix Inverter 12V 375VA 230Vac	obsolete (32k)
A212	Phoenix Inverter 24V 375VA 230Vac	obsolete (32k)
A214	Phoenix Inverter 48V 375VA 230Vac	obsolete (32k)
A221	Phoenix Inverter 12V 500VA 230Vac	obsolete (32k)
A222	Phoenix Inverter 24V 500VA 230Vac	obsolete (32k)
A224	Phoenix Inverter 48V 500VA 230Vac	obsolete (32k)
A231	Phoenix Inverter 12V 250VA 230Vac 64k	
A232	Phoenix Inverter 24V 250VA 230Vac 64k	
A234	Phoenix Inverter 48V 250VA 230Vac 64k	
A239	Phoenix Inverter 12V 250VA 120Vac 64k	
A23A	Phoenix Inverter 24V 250VA 120Vac 64k	
A23C	Phoenix Inverter 48V 250VA 120Vac 64k	
A241	Phoenix Inverter 12V 375VA 230Vac 64k	
A242	Phoenix Inverter 24V 375VA 230Vac 64k	
A244	Phoenix Inverter 48V 375VA 230Vac 64k	
A249	Phoenix Inverter 12V 375VA 120Vac 64k	
A24A	Phoenix Inverter 24V 375VA 120Vac 64k	
A24C	Phoenix Inverter 48V 375VA 120Vac 64k	
A251	Phoenix Inverter 12V 500VA 230Vac 64k	
A252	Phoenix Inverter 24V 500VA 230Vac 64k	
A254	Phoenix Inverter 48V 500VA 230Vac 64k	
A259	Phoenix Inverter 12V 500VA 120Vac 64k	
A25A	Phoenix Inverter 24V 500VA 120Vac 64k	
A25C	Phoenix Inverter 48V 500VA 120Vac 64k	
A261	Phoenix Inverter 12V 800VA 230Vac 64k	
A262	Phoenix Inverter 24V 800VA 230Vac 64k	
A264	Phoenix Inverter 48V 800VA 230Vac 64k	
A269	Phoenix Inverter 12V 800VA 120Vac 64k	
A26A	Phoenix Inverter 24V 800VA 120Vac 64k	
A26C	Phoenix Inverter 48V 800VA 120Vac 64k	
A271	Phoenix Inverter 12V 1200VA 230Vac 64k	
A272	Phoenix Inverter 24V 1200VA 230Vac 64k	
A274	Phoenix Inverter 48V 1200VA 230Vac 64k	
A279	Phoenix Inverter 12V 1200VA 120Vac 64k	
A27A	Phoenix Inverter 24V 1200VA 120Vac 64k	
A27C	Phoenix Inverter 48V 1200VA 120Vac 64k	
A281	Phoenix Inverter Smart 12V 1600VA 230Vac 64k	Smart, integrated Bluetooth
A282	Phoenix Inverter Smart 24V 1600VA 230Vac 64k	Smart, integrated Bluetooth
A284	Phoenix Inverter Smart 48V 1600VA 230Vac 64k	Smart, integrated Bluetooth
A291	Phoenix Inverter Smart 12V 2000VA 230Vac 64k	Smart, integrated Bluetooth
A292	Phoenix Inverter Smart 24V 2000VA 230Vac 64k	Smart, integrated Bluetooth
A294	Phoenix Inverter Smart 48V 2000VA 230Vac 64k	Smart, integrated Bluetooth

Device	Name	Remark
A2A1	Phoenix Inverter Smart 12V 3000VA 230Vac 64k	Smart, integrated Bluetooth
A2A2	Phoenix Inverter Smart 24V 3000VA 230Vac 64k	Smart, integrated Bluetooth
A2A4	Phoenix Inverter Smart 48V 3000VA 230Vac 64k	Smart, integrated Bluetooth
A2B1	Phoenix Inverter Smart 12V 5000VA 230Vac 64k	Smart, integrated Bluetooth
A2B2	Phoenix Inverter Smart 24V 5000VA 230Vac 64k	Smart, integrated Bluetooth
A2B4	Phoenix Inverter Smart 48V 5000VA 230Vac 64k	Smart, integrated Bluetooth
A2E1	Phoenix Inverter 12V 800VA 230Vac 64k HS	redesign (replaces A261)
A2E2	Phoenix Inverter 24V 800VA 230Vac 64k HS	redesign (replaces A262)
A2E4	Phoenix Inverter 48V 800VA 230Vac 64k HS	redesign (replaces A264)
A2E9	Phoenix Inverter 12V 800VA 120Vac 64k HS	redesign (replaces A269)
A2EA	Phoenix Inverter 24V 800VA 120Vac 64k HS	redesign (replaces A26A)
A2EC	Phoenix Inverter 48V 800VA 120Vac 64k HS	redesign (replaces A26C)
A2F1	Phoenix Inverter 12V 1200VA 230Vac 64k HS	redesign (replaces A271)
A2F2	Phoenix Inverter 24V 1200VA 230Vac 64k HS	redesign (replaces A272)
A2F4	Phoenix Inverter 48V 1200VA 230Vac 64k HS	redesign (replaces A274)
A2F9	Phoenix Inverter 12V 1200VA 120Vac 64k HS	redesign (replaces A279)
A2FA	Phoenix Inverter 24V 1200VA 120Vac 64k HS	redesign (replaces A27A)
A2FC	Phoenix Inverter 48V 1200VA 120Vac 64k HS	redesign (replaces A27C)

1.3 Message examples

\n at the end of the message is implied.

Ping
:154
:51641F9
0x4116 = talking to application version 1.16

Application version
:352
:11641FD
Like ping, application version 1.16

Product Id
:451
:1000351
`0x300` = BlueSolar MPPT 70|15

Restart
:64F
No response, restarted

Get Battery Maximum Current
:7F0ED0071
:7F0ED009600DB
Value = 0x0096 = 15.0A

Set Battery Maximum Current
Set to 10.0A = 0x0064
:8F0ED0064000C
:8F0ED0064000C
Acknowledged with the new value returned.

Unsupported command
:253
:3020050
Unknown response

Invalid frame (checksum wrong)
:452
:4AAAAFD
Error response

Asynchronous message
:A0102000543
The unit reports register 0x0201 (device state) with value 0x05 (float).

1.4 Text Protocol

When no VE.Direct queries are sent to the device, the charger periodically sends human readable (TEXT) data to the serial port. See the "VE.Direct Protocol" document for a detailed description of the contents and availability of the information.

2 Inverter register description

The register in this chapter can be accessed for reading and/or writing by using the **:Get** (read) and **:Set** (write) commands of the VE.Direct Protocol. Whether the connection is established by using the actual VE.Direct-USB cable, or via a Bluetooth Dongle makes no difference.

2.1 Saving and Reverting registers

Registers used for user settings, need to be saved to none-volatile-memory (NVM) when modified. Unlike for most Victron products a register with a changed setting is **not automatically saved**

After changing one or more settings it is required to execute the NvmSave command via 0xEB99. Until this command is executed the registers will revert to the old (last saved) value after a power down cycle or reset.

ID	Register name	R/W	Type	Scale	Unit	Note
0xEB99	VE_REG_INV_NVM_COMMAND	W	un8			
0x0004	VE_REG_RESTORE_DEFAULT	W	-			

2.1.1 None-volatile memory command (register 0xEB99)

Data	Command name	Description
0	No command	return value
1	NvmSave	Save current user settings to NVM
2	NvmRevert	Cancel modified settings. Load most recent saved user settings.
3	NvmBackup	Undo last save. Load second last time saved settings. After an update of the FW it is possible the backup is not available. Then the settings are reverted instead.
4	NvmDefault	Load the factory default values. Identical to VE_REG_RESTORE_DEFAULT 0x0004

2.1.2 Restore user defaults (register 0x0004)

When a write message is addressed to register Id 0x0004 all user settings of the device are restored to the factory default values. Factory calibration data is preserved. The data part of this message is not required and ignored.

2.2 Product information registers

Read only registers with static information about the device

ID	Register name	R/W	Type	Scale	Unit	Note
0x0100	VE_REG_PRODUCT_ID	R	un32	-	-	
0x0101	VE_REG_PRODUCT_REVISION Hardware version	R	un24	-	-	
0x0102	VE_REG_APP_VER Software version	R	un32	-	-	
0x010A	VE_REG_SERIAL_NUMBER	R	string	-	-	
0x010B	VE_REG_MODEL_NAME	R	string	-	-	
0x2203	VE_REG_AC_OUT_RATED_POWER	R	sn16	1	VA	1)
0x0140	VE_REG_CAPABILITIES1	R	un32	-	-	2)
0x0150	VE_REG_CAPABILITIES_BLE	R/(W)	un32	-		3)
0x2202	VE_REG_AC_OUT_NOM_VOLTAGE	R	un8	1	V	1)
0xEDEF	VE_REG_BAT_VOLTAGE	R	un8	1	V	1)

Note 1) Available since version 1.10
Note 2) Available since version 1.15
Note 3) Available since version 1.17 for Smart inverters only

2.2.1 Product ID (register 0x0100)

Struct	Description
un8	0
un16	ID number of the device (PID)
un8	0xFE

2.2.2 Product Revision (register 0x0101)

Struct	Description
un8	0
un16	HW revision number

2.2.3 FW application version (register 0x0102)

Byte	Description
0	0
1	Minor
2	Major, + bits 7 and 6 indicate SW type: *00=bootloader* *01=application (released)* *02=tester* *03=release candidate(beta)*

2.2.4 Capabilities (register 0x0140)

Bit	Description of the option bit	Small 32k note1)	Small 64k <= 1200VA	Smart
8	Remote input available	1	1	1
17	Built in user-relay available and support of registers: VE_REG_RELAY_MODE and VE_REG_RELAY_CONTROL	0	0	1
27	OpenPaygo token compatible	0	version >=1.17	version >=1.17
28	Support of device hibernation: VE_REG_DEVICE_MODE = VE_REG_MODE_HIBERNATE (0xFD)	0	0	1
29	Improved load current measurement and support of registers: VE_REG_AC_OUT_APPARENT_POWER and VE_REG_AC_LOAD_SENSE_POWER_THRESHOLD VE_REG_AC_LOAD_SENSE_POWER_CLEAR	0	revision >= 7, see register 0x0101	1

Note 1) Small 32k devices (PID A20x, A21x or A22x) are obsolete, production stopped in November 2016

2.2.5 Capabilities BLE (register 0x0160)

Bit	Description of the option bit
0	Support Bluetooth transceiver (BLE) On/Off mode Is "true" if the integrated BLE is running on Bluetooth-SW version 2.17 or higher.
1	BLE mode Off is permanent Is "false" since the BLE can be enabled via VE.Direct

Available since version 1.17 for Smart Inverters
This register should only be accessed for reading. The write property is enabled for internal purposes only.

2.3 Generic device status registers

Status registers about the current mode of operation of the device

ID	Register name	R/W	Type	Scale	Unit	Note
0x0201	VE_REG_DEVICE_STATE	R	un8	-	-	
0x0207	VE_REG_DEVICE_OFF_REASON_2	R	un32	-	-	1)
0x031C	VE_REG_WARNING_REASON	R	un16	-	-	
0x031E	VE_REG_ALARM_REASON	R	un16	-	-	

Note 1) Since version 1.17. To receive announcements of this register via Bluetooth BLE-SW version 2.20 or higher is required.

2.3.1 Device state values (register 0x0201)

State	Name	Meaning
0	Off	Not inverting. When due to a protection the inverter will automatically start again when the cause is solved.
1	Low Power	Eco load search active
2	Fault	Not inverting due to a fatal active protection. A turn OFF-ON cycle is required to enable the device again.
9	Inverting	Normal operating

2.3.2 Device off reasons (register 0x0207)

Each bit represents an off reason

Bit	Meaning (bitN = 1: active, bitN = 0: inactive)
0	No input power (will also cause a battery alarm)
2	Soft power button or SW controlled (VE.Direct or Bluetooth)
3	HW remote input connector
4	Internal reason (see alarm reason for more info)
5	PayGo, out of credit, need token

2.3.3 Warning reasons (register 0x031C)

Each bit represents a warning or alarm reason.

Bit	Meaning (bitN = 1: active, bitN = 0: inactive)
0	Low battery voltage
1	High battery voltage
5	Low temperature
6	High temperature
8	Overload
9	Poor DC connection, triggered by battery current ripple or a hot DC terminal 1)
10	Low AC-output voltage
11	High AC-output voltage

Note 1: DC terminal temperature measurement only available in the larger models

Note 2: A "High AC-output voltage" alarm occurs when the AC-output of the inverter is connected to mains while the inverter is turned on.

2.3.4 Alarm reasons (register 0x031E)

See §2.3.3 Warning reasons (register 0x031C) . But only the reason that triggered an alarm, causing the inverting to switch off to protect itself or the load, is shown.

2.4 Generic device control registers

Registers to control the mode of operation of the device

ID	Register name	R/W	Type	Scale	Unit	Note
0x0090	VE_REG_BLE_MODE	R/W	un8	-	-	2)
0x0200	VE_REG_DEVICE_MODE	R/W	un8	-	-	
0xEC41	VE_REG_SETTINGS_CHANGED	R/W	un32			3)

Note 2) Since version 1.17. Smart-Inverters only, see §2.2.4 Capabilities (register 0x0140).

Note 3) Since version 1.17. Time in Unix-timestamp format. Default = 0xFFFFFFFF. External applications can read and write to this register. It is not controlled by and has no effect on the operation of the inverter.

2.4.1 BLE mode (register 0x0090)

State	Name	Meaning
0	BLE-enabled	0 = BLE off, 1 = BLE on

Since version 1.17, see §2.2.4 Capabilities (register 0x0140)

Set 0 to disable the Bluetooth transceiver (BLE) of the Smart Inverters. When it is disabled it can be enabled via VE.Direct only.

2.4.2 Device mode values (register 0x0200, user setting)

Mode	Meaning	Note
2	Inverter On	
3	Device On (multi compliant)	1)
4	Device Off	VE.Direct is still enabled
5	Eco mode	
0xFD	Hibernate	VE.Direct is affected 2)

Note 1) Available since version 1.15
Multi compliant value 1(Device On), the response value will be 2 (Inverter On)

Note 2) Available since version 1.15, see §2.2.4 Capabilities (register 0x0140). The Hibernate mode has impact on the VE.Direct functionality. Communication can only be started when the device sends a text frame, at least once per 30 seconds, or after pressing the User-button. As long as a VE.Direct message is received every 24 seconds the device will not enter the hibernation mode.(Note that communication via Bluetooth is not affected)

2.5 Inverter operation registers

Read only registers with measured information about the device

ID	Register name	R/W	Type	Scale	Unit	Note
0x1040	VE_REG_HISTORY_TIME	R	un32	1	s	1)
0x1041	VE_REG_HISTORY_ENERGY	R	un32	0.01	kVAh	1)
0x2201	VE_REG_AC_OUT_CURRENT	R	sn16	0.1	A	
0x2200	VE_REG_AC_OUT_VOLTAGE	R	sn16	0.01	V	
0x2205	VE_REG_AC_OUT_APPARENT_POWER	R	sn32	1	VA	2)
0xEB4E	VE_REG_INV_LOOP_GET_IINV	R	sn16	0.001	A	
0xED8D	VE_REG_DC_CHANNEL1_VOLTAGE (battery voltage)	R	sn16	0.01	V	

Note 1) Since version 1.17, lifetime data

Note 2) Since version 1.15, see §2.2.4 Capabilities (register 0x0140)

2.6 User AC-out control registers

ID	Register name	R/W	Type	Scale	Unit	
0x0230	VE_REG_AC_OUT_VOLTAGE_SETPOINT	W	un16	0.01	V	
0x0231	VE_REG_AC_OUT_VOLTAGE_SETPOINT_MIN	R	un16	0.01	V	1)
0x0232	VE_REG_AC_OUT_VOLTAGE_SETPOINT_MAX	R	un16	0.01	V	1)
0x2206	VE_REG_AC_LOAD_SENSE_POWER_THRESHOLD	W	un16	1	VA	5)
0x2207	VE_REG_AC_LOAD_SENSE_POWER_CLEAR	W	un16	1	VA	5)
0xEB03	VE_REG_INV_WAVE_SET50HZ_NOT60HZ	W	un8			
0xEB04	VE_REG_INV_OPER_ECO_MODE_INV_MIN	W	sn16	0.001	A	2)
0xEB06	VE_REG_INV_OPER_ECO_MODE_RETRY_TIME	W	un8	0.25	s	3)
0xEB10	VE_REG_INV_OPER_ECO_LOAD_DETECT_PERIODS	W	un8	0.02/ 0.016	s	4)

Note 1) Limits for user setting VE_REG_AC_OUT_VOLTAGE_SETPOINT. Out of range input levels will be clamped to these levels.

Note 2) Eco search mode threshold based on AC-current (only for version 1.00 up to 1.14, see note 5)

Note 3) Interval of the power test bursts when the Eco load search mode is active.

Note 4) Since version 1.17. Duration of a power test burst, when Eco load search mode is active, expressed in number of periods of the AC-out frequency (either 50 or 60Hz). For some loads with a delayed "turn-on" response, like dimmable LED-lightbulbs, it is required to enlarge the default value in order to detect the load.

Note 5) Since version 1.15, see Capabilities in §2.2.4 Capabilities (register 0x0140).
Eco search mode threshold with hysteresis based on apparent power. Replaces VE_REG_INV_OPER_ECO_MODE_INV_MIN. Available in Smart Inverters and in all VE-Direct inverters with a product revision >= 7 (see *Product Revision (register 0x0101)*)

2.6.1 Load sense power hysteresis (register 0x2206 0x2207)

user setting DEVICE_MODE	Connected load (and no active protections)	Eco load search mode
Eco	Load < VE_REG_AC_LOAD_SENSE_POWER_THRESHOLD	active
Eco	Load > VE_REG_AC_LOAD_SENSE_POWER_CLEAR	inactive
On	don't care	inactive

Note: Typically, set the CLEAR level higher than the search activate THRESHOLD to prevent continues switching of the eco load search mode. The required minimal difference is load/inrush-current dependent.

2.6.2 AC out frequency (register 0xEB03)

State	Name	Description
0	60Hz	AC-out frequency is 60Hz
1	50Hz	AC-out frequency is 50Hz

Changing this setting is only effective after the NvmSave command is executed, see §2.1

2.7 User battery control registers

ID	Register name	R/W	Type	Scale	Unit	
0x2210	VE_REG_SHUTDOWN_LOW_VOLTAGE_SET	W	un16	0.01	V	1)
0x0320	VE_REG_ALARM_LOW_VOLTAGE_SET	W	un16	0.01	V	2)
0x0321	VE_REG_ALARM_LOW_VOLTAGE_CLEAR	W	un16	0.01	V	3)
0x2211	VE_REG_VOLTAGE_RANGE_MIN	R	un16	0.01	V	4)
0x2212	VE_REG_VOLTAGE_RANGE_MAX	R	un16	0.01	V	4)
0xEBBA	VE_REG_INV_PROT_UBAT_DYN_CUTOFF_ENABLE	W	un8			5)
0xEBB7	VE_REG_INV_PROT_UBAT_DYN_CUTOFF_FACTOR	W	un16			5)
0xEBB5	VE_REG_INV_PROT_UBAT_DYN_CUTOFF_FACTOR2000	W	un16			5)
0xEBB3	VE_REG_INV_PROT_UBAT_DYN_CUTOFF_FACTOR250	W	un16			5)
0xEBB2	VE_REG_INV_PROT_UBAT_DYN_CUTOFF_FACTOR5	W	un16			5)
0xEBB1	VE_REG_INV_PROT_UBAT_DYN_CUTOFF_VOLTAGE	R	un16	0.001	V	5)

Note 1) Low battery voltage shutdown threshold.
Note 2) Low battery warning threshold, also below this level the inverter will not start-up after a shut-down.
Note 3) Charge detect threshold after a long-term low voltage shut down. If the battery voltage exceeds this level the alarm is cleared, and the inverter will restart.
Note 4) Limits for all battery user threshold settings, e.g. VE_REG_ALARM_LOW_VOLTAGE_SET. Out of range input levels will be clamped to these levels.
Note 5) Since version 1.03.

2.7.1 Dynamic cut-off enable (register 0xEBBA)

State	Name	Meaning
0	Disabled	Shut down threshold is defined by VE_REG_SHUTDOWN_LOW_VOLTAGE_SET
1	Enabled	Shut down threshold is a function of the AC-out current. The effective level can be obtained via register VE_REG_INV_PROT_UBAT_DYN_CUTOFF_VOLTAGE

The dynamic cut off feature overrules the settings
VE_REG_SHUTDOWN_LOW_VOLTAGE_SET and
VE_REG_ALARM_LOW_VOLTAGE_SET.
The actual shutdown threshold is a function of the load current and can be obtained via register
VE_REG_INV_PROT_UBAT_DYN_CUTOFF_VOLTAGE

2.8 Relay control registers

ID	Register name	R/W	Type	Scale	Unit	Note
0x034E	VE_REG_RELAY_CONTROL	R / W	un8			1)
0x034F	VE_REG_RELAY_MODE	W	un8			1)

Note 1) Since version 1.15, see §2.2.4 Capabilities (register 0x0140)

2.8.1 Relay mode (register 0x034F) user setting

State	Name	Meaning
4	Normal operation	Default, On during normal operation (warnings are ignored)
0	Warnings and alarms	Off when a warning or alarm is active (inverter on)
5	Battery low	Off when a low battery warning or alarm is active
6	External fan	On when the internal fan is on
3	Disabled relay	Always Off
2	Remote	Controlled by writing to VE_REG_RELAY_CONTROL (0x034E)

2.8.2 Relay control or status (register 0x034E)

State	Name	Meaning
0	Off	NO = open, NC = closed
1	On	NO = closed, NC = open

The read response of this register is always is the current status of the relay. Only when the Relay mode is "Remote" the relays is controlled by writing 0 or 1 to this register. In other Relay modes writing to this register is ignored.

Revision Log

1) 2018-05-24
Initial document

2) 2018-9-13
Replaced "device id" with "product id"

3) 2018-11-22
Added changes for Smart Inverters supported since FW version 1.15

4) 2019-09-27
Added instructions on saving settings
Added 50Hz/60Hz setting
Added new features since FW version 1.17
      Support Bluetooth on/off
      Enhanced ECO load search mode timing

5) 2021-09-06
Add Product-ID for 5000VA Smart Inverters
Added description CAPABILITIES1 bit 27
Fix type of 0xEBBA 'VE_REG_INV_PROT_UBAT_DYN_CUTOFF_ENABLE' is un8