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# Introduction

Victron products which feature the VE.Direct serial communications interface allow simple access to detailed information of that product. This document describes how to receive and interpret this information.

See our Data communication whitepaper for more information on other protocols and products available: [Whitepaper-Data-communication-with-Victron-Energy-products\\_EN.pdf](#).

The VE.Direct interface includes two modes: Text-mode and the HEX-mode. The purpose of the Text-mode is to make retrieving information extremely simple. The product will periodically transmit all run-time fields. The HEX-mode allows not only to read data but also write data, for example, change settings.

There are two different implementations of the Text-mode and HEX-mode:

## Older implementations

- On power up, a VE.Direct interface will always be in Text-mode, and continuously transmits all run-time fields. As soon as it receives a valid HEX-message, it will switch to HEX-mode. It will stay in HEX-mode as long as HEX-messages are frequently received. After a product has not received any valid HEX-messages for several seconds, it will switch back to Text-mode and start to auto transmit the run-time fields periodically again. Some products will send Asynchronous HEX-messages, starting with “:A” and ending with a newline ‘\n’, on their own. These messages can interrupt a regular Text-mode frame.

## Newer implementations

- Always have the Text-mode active, regardless of the HEX-messages.

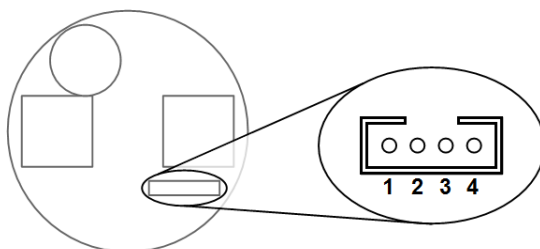
To know more which implementation is applied to your product, please check its specific VE.Direct protocol document.

This document only describes the Text-mode.

Make sure to also read our [VE.Direct protocol FAQ](#), and the [Open source page on Victron Live](#) which lists projects from other people using our VE.Direct protocol

# Physical interface

The VE.Direct interface is accessed via a 4-pin connector. The picture below shows where the VE.Direct connector is located on a BMV-700.



Pin	Producer	Consumer
1	GND	GND
2	VE.Direct-RX	VE.Direct-RX
3	VE.Direct-TX	VE.Direct-TX
4	Power +	Power +

Producers are products, such as the BMV battery monitor and the MPPT solar chargers. Consumers are products reading the data, such as the [Color Control GX](#). When connecting a Producer to a Consumer, the Producer's VE.Direct-TX must be connected to Consumer VE.Direct-RX. The same goes to the Producer VE.Direct-RX, which must be connected to Consumer's VE.Direct-TX. Note that the pins on the MPPT can have alternative functions. Its VE.Direct-RX pin can be used to switch the charger on and off. Its VE.Direct-TX pin can be configured to send a PWM signal, to dim (street-)lights. For details about the connector type see the information at the end of this document.

A VE.Direct to USB interface cable can be purchased from Victron Energy ("VE.Direct to USB", part number ASS030530000). This interface cable provides a virtual comport through USB as well as galvanic isolation.

A VE.Direct to RS232 interface cable can also be purchased from Victron Energy ("VE.Direct to RS232 interface", part number ASS030520500).

## Serial port configuration

Baud rate:	19200
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	None

## Pins to use when using the VE.Direct to RS232 interface

For the communication use the GND, RX and TX pins: pin 5, 2 and 3 on the DB9 connector.

Also the DTR signal (pin 4 on the DB9 connector) and/or the RTS signal (pin 7 on the DB9 connector) must be driven high to power the isolated side of the interface. How to program the DTR and RTS differs between used operating systems and hardware.

For more details see:

[https://www.victronenergy.com/live/vedirect\\_protocol:faq#q2when\\_using\\_the\\_vedirect\\_to\\_rs232\\_interface\\_what\\_pins\\_do\\_i\\_need](https://www.victronenergy.com/live/vedirect_protocol:faq#q2when_using_the_vedirect_to_rs232_interface_what_pins_do_i_need)

## Message format

The device transmits blocks of data at 1 second intervals. Each field is sent using the following format:

<Newline><Field-Label><Tab><Field-Value>

The identifiers are defined as follows:

Identifier	Meaning
<Newline>	A carriage return followed by a line feed (0x0D, 0x0A).
<Field-Label>	An arbitrary length label that identifies the field. Where applicable, this will be the same as the label that is used on the LCD.
<Tab>	A horizontal tab (0x09).
<Field-Value>	The ASCII formatted value of this field. The number of characters transmitted depends on the magnitude and sign of the value.

## Data integrity

The statistics are grouped in blocks with a checksum appended. The last field in a block will always be "Checksum". The value is a single byte, and will not necessarily be a printable ASCII character. The modulo 256 sum of all bytes in a block will equal 0 if there were no transmission errors. Multiple blocks are sent containing different fields.

For more details see:

[https://www.victronenergy.com/live/vedirect\\_protocol:faq#q8how\\_do\\_i\\_calculate\\_the\\_text\\_check\\_sum](https://www.victronenergy.com/live/vedirect_protocol:faq#q8how_do_i_calculate_the_text_check_sum)

## Fields

The values sent over the serial communications interface do not necessarily use the same units as the values on the LCD.

**Note:** The BMV-60xS does not have a full VE.Direct interface. There is only limited support for the Text-mode, see Table I. More details can be found in the document *BMV-60xS Text Protocol*.

[http://www.victronenergy.com/upload/documents/BMV-60xS\\_Text\\_Protocol.pdf](http://www.victronenergy.com/upload/documents/BMV-60xS_Text_Protocol.pdf)

The units used by the serial interface are as follows:

Label	Units	Description	BMV 600	BMV 700	MPPT <sup>1</sup>	Phoenix Inverter	Phoenix Charger
V	mV	Main or channel 1 (battery) voltage	•	•	•	•	•
V2	mV	Channel 2 (battery) voltage					• <sup>2</sup>
V3	mV	Channel 3 (battery) voltage					• <sup>2</sup>
VS	mV	Auxiliary (starter) voltage	•	•			
VM	mV	Mid-point voltage of the battery bank		•			
DM	‰	Mid-point deviation of the battery bank		•			
VPV	mV	Panel voltage			•		
PPV	W	Panel power			•		

<sup>1</sup> The VE.Direct protocol is available in the MPPT 70/15 since firmware version v1.09 and up, and only in newer type MPPT 70/15s: the ones with a product id other than 0x300. The first batches, with PID 0x300, only support fields PID, SER and FW.

<sup>2</sup> Available on Phoenix Smart Chargers with triple outputs only

Label	Units	Description	BMV 600	BMV 700	MPPT <sup>1</sup>	Phoenix Inverter	Phoenix Charger
I	mA	Main or channel 1 battery current	•	•	. <sup>3</sup>		•
I2	mA	Channel 2 battery current					. <sup>2</sup>
I3	mA	Channel 3 battery current					. <sup>2</sup>
IL	mA	Load current			. <sup>4</sup>		
LOAD		Load output state (ON/OFF)			. <sup>5</sup>		
T	°C <sup>6</sup>	Battery temperature		•			
P	W	Instantaneous power		•			
CE	mAh <sup>7</sup>	Consumed Amp Hours	•	•			
SOC	% <sup>7</sup>	State-of-charge	•	•			
TTG	Minutes <sup>7, 8</sup>	Time-to-go	•	•			
Alarm		Alarm condition active	•	•			
Relay		Relay state	•	•	. <sup>9</sup>	. <sup>10</sup>	•
AR		Alarm reason	•	•		•	
OR		Off reason			. <sup>11</sup>	. <sup>12</sup>	
H1	mAh	Depth of the deepest discharge	•	•			
H2	mAh	Depth of the last discharge	•	•			
H3	mAh	Depth of the average discharge	•	•			
H4		Number of charge cycles	•	•			
H5		Number of full discharges	•	•			
H6	mAh	Cumulative Amp Hours drawn	•	•			
H7	mV	Minimum main (battery) voltage	•	•			
H8	mV	Maximum main (battery) voltage	•	•			
H9	Seconds	Number of seconds since last full charge	•	•			
H10		Number of automatic synchronizations	•	•			
H11		Number of low main voltage alarms	•	•			
H12		Number of high main voltage alarms	•	•			
H13		Number of low auxiliary voltage alarms	•				
H14		Number of high auxiliary voltage alarms	•				
H15	mV	Minimum auxiliary (battery) voltage	•	•			
H16	mV	Maximum auxiliary (battery) voltage	•	•			
H17	0.01 kWh	Amount of discharged energy		•			
H18	0.01 kWh	Amount of charged energy		•			
H19	0.01 kWh	Yield total (user resettable counter)			•		
H20	0.01 kWh	Yield today			•		
H21	W	Maximum power today			•		
H22	0.01 kWh	Yield yesterday			•		
H23	W	Maximum power yesterday			•		
ERR		Error code			•		•
CS		State of operation			•	•	•
BMV		Model description (deprecated)	•	•			
FW		Firmware version (16 bit)	•	•	•	•	

<sup>3</sup> MPPT 75/15 and 100/15: Since firmware version v1.15 onwards, the current reported under "I" is the battery current. Firmware version v1.14 and before report the current measured at the output of the converter, without detailing if this current was going to the battery or the loads.

<sup>4</sup> Available since version v1.15, and only for models with a load output.

<sup>5</sup> Available since version v1.12, and only for models with a load output.

<sup>6</sup> When no temperature sensor is connected, "----" will be sent instead of a value.

<sup>7</sup> When the BMV is not synchronised, these statistics have no meaning, so "----" will be sent instead of a value.

<sup>8</sup> When the battery is not discharging the time- to-go is infinite. This is represented as -1.

<sup>9</sup> Available on SmartSolar mppt chargers since firmware version v1.17

<sup>10</sup> Available on Smart Phoenix Inverter

<sup>11</sup> Available on SmartSolar mppt chargers since firmware version v1.44 (VE.Direct models) and v1.03 (SmartSolar VE.Can models)

<sup>12</sup> Available on Phoenix Inverter v1.16

Label	Units	Description	BMV 600	BMV 700	MPPT <sup>1</sup>	Phoenix Inverter	Phoenix Charger
FWE		Firmware version (24 bit)					•
PID		Product ID		•	•	•	•
SER#		Serial number			•	•	•
HSDS		Day sequence number (0..364)			• <sup>13</sup>		
MODE		Device mode				•	•
AC_OUT_V	0.01 V	AC output voltage				•	
AC_OUT_I	0.1 A	AC output current				•	
AC_OUT_S	VA	AC output apparent power				• <sup>14</sup>	
WARN		Warning reason				•	
MPPT		Tracker operation mode			• <sup>15</sup>		

Table I Supported Text-mode fields

## Detailed field description

/

Both for MPPTs and BMVs: when > 0, the battery is being charged, < 0 the battery is being discharged.

### Alarm

This shows the buzzer alarm state of the BMV. During normal operation, this will be "OFF". When a buzzer alarm occurs the value will change to "ON".

**Note:** This refers to the value of the alarm condition, and not the buzzer itself. This means that once a condition has occurred, the value will be "ON" until all alarm conditions have cleared; regardless of whether or not a button has been pressed to silence the buzzer.

### Relay

This shows the relay alarm state. The product specific descriptions show the factory default behaviour.

BMV: during normal operation the relay is "OFF", if a relay alarm occurs the value will change to "ON".

MPPT chargers: during normal operation the relay is "OFF", if there is a battery low voltage condition value will change to "ON".

Phoenix Smart Inverter: during normal operation (inverting) the relay is "ON".

Phoenix Smart Chargers: during normal operation (charging) the relay is "ON".

**Note for both Alarm and Relay:** BMV-600's with firmware v2.09 or lower used to send "On" and "Off" instead of "ON" and "OFF". It is therefore recommended to use a case-insensitive string comparison in your implementation, for example `stricmp()`.

### FW

The firmware version of the device. The version is reported as a whole number, e.g. 208 for firmware version 2.08. The value C208 means release candidate C for version 2.08.

**Note:** This field is available in the BMV since version 2.08

### FWE

<sup>13</sup> Available on BlueSolar mppt chargers since firmware version v1.16

<sup>14</sup> Available on Phoenix Inverter (some models) since firmware version v1.16

<sup>15</sup> Available on BlueSolar mppt chargers since firmware version v1.37

The firmware version of the device. The version contains up to 6 digits, 0 padding on the left side is not mandatory. Examples: 0208FF or 208FF for firmware version 2.08 (last digit FF indicates an official release), 020801 for firmware version 2.08-beta-01.

#### **AR**

Alarm reason; this field describes the cause of the alarm. Since multiple alarm conditions can be present at the same time the values of the separate alarm conditions are added. The value total is sent in decimal notation.

		BMV	Inverter
Low Voltage	1	•	•
High Voltage	2	•	•
Low SOC	4	•	
Low Starter Voltage	8	•	
High Starter Voltage	16	•	
Low Temperature	32	•	•
High Temperature	64	•	•
Mid Voltage	128	•	
Overload	256		•
DC-ripple	512		•
Low V AC out	1024		•
High V AC out	2048		•
Short Circuit	4096		
BMS Lockout	8192		

E.g. a value of 5 would indicate the presence of a low SOC alarm and a low Voltage.

**Note:** This field is available in the BMV since version 2.08

#### **WARN**

Warning reason is implemented for inverters only. It provides the cause of a warning. The bit definition is the same as for AR. More warnings can be active at the same time. Warnings always represent the current status of the measured parameter (temperature/battery voltage in/VAC-out). This is different than for alarm reason AR. AR remembers the reason what caused the inverter to switch off (active protection) until it is switched on again.

#### **OR**

Off reason, this field described why a unit is switched off.

No input power	0x00000001
Switched off (power switch)	0x00000002
Switched off (device mode register)	0x00000004
Remote input	0x00000008
Protection active	0x00000010
Paygo	0x00000020
BMS	0x00000040
Engine shutdown detection	0x00000080
Analysing input voltage	0x00000100

#### **CAP\_BLE**

Off reason, this field described why a unit is switched off.

BLE supports switching off	0x00000001
BLE switching off is permanent	0x00000002



**PID**

The product id:

BMV-700	0x203
BMV-702	0x204
BMV-700H	0x205
BlueSolar MPPT 70 15*	0x0300*
BlueSolar MPPT 75 50*	0xA040*
BlueSolar MPPT 150 35*	0xA041*
BlueSolar MPPT 75 15	0xA042
BlueSolar MPPT 100 15	0xA043
BlueSolar MPPT 100 30*	0xA044*
BlueSolar MPPT 100 50*	0xA045*
BlueSolar MPPT 150 70	0xA046
BlueSolar MPPT 150 100	0xA047
BlueSolar MPPT 100 50 rev2	0xA049
BlueSolar MPPT 100 30 rev2	0xA04A
BlueSolar MPPT 150 35 rev2	0xA04B
BlueSolar MPPT 75 10	0xA04C
BlueSolar MPPT 150 45	0xA04D
BlueSolar MPPT 150 60	0xA04E
BlueSolar MPPT 150 85	0xA04F
SmartSolar MPPT 250 100	0xA050
SmartSolar MPPT 150 100*	0xA051*
SmartSolar MPPT 150 85*	0xA052*
SmartSolar MPPT 75 15	0xA053
SmartSolar MPPT 75 10	0xA054
SmartSolar MPPT 100 15	0xA055
SmartSolar MPPT 100 30	0xA056
SmartSolar MPPT 100 50	0xA057
SmartSolar MPPT 150 35	0xA058
SmartSolar MPPT 150 100 rev2	0xA059
SmartSolar MPPT 150 85 rev2	0xA05A
SmartSolar MPPT 250 70	0xA05B
SmartSolar MPPT 250 85	0xA05C
SmartSolar MPPT 250 60	0xA05D
SmartSolar MPPT 250 45	0xA05E
SmartSolar MPPT 100 20	0xA05F
SmartSolar MPPT 100 20 48V	0xA060
SmartSolar MPPT 150 45	0xA061
SmartSolar MPPT 150 60	0xA062
SmartSolar MPPT 150 70	0xA063
SmartSolar MPPT 250 85 rev2	0xA064
SmartSolar MPPT 250 100 rev2	0xA065
BlueSolar MPPT 100 20	0xA066
BlueSolar MPPT 100 20 48V	0xA067
SmartSolar MPPT 250 60 rev2	0xA068
SmartSolar MPPT 250 70 rev2	0xA069
SmartSolar MPPT 150 45 rev2	0xA06A
SmartSolar MPPT 150 60 rev2	0xA06B
SmartSolar MPPT 150 70 rev2	0xA06C
SmartSolar MPPT 150 85 rev3	0xA06D
SmartSolar MPPT 150 100 rev3	0xA06E
BlueSolar MPPT 150 45 rev2	0xA06F
BlueSolar MPPT 150 60 rev2	0xA070
BlueSolar MPPT 150 70 rev2	0xA071

SmartSolar MPPT VE.Can 150/70	0xA102
SmartSolar MPPT VE.Can 150/45	0xA103
SmartSolar MPPT VE.Can 150/60	0xA104
SmartSolar MPPT VE.Can 150/85	0xA105
SmartSolar MPPT VE.Can 150/100	0xA106
SmartSolar MPPT VE.Can 250/45	0xA107
SmartSolar MPPT VE.Can 250/60	0xA108
SmartSolar MPPT VE.Can 250/70	0xA109
SmartSolar MPPT VE.Can 250/85	0xA10A
SmartSolar MPPT VE.Can 250/100	0xA10B
SmartSolar MPPT VE.Can 150/70 rev2	0xA10C
SmartSolar MPPT VE.Can 150/85 rev2	0xA10D
SmartSolar MPPT VE.Can 150/100 rev2	0xA10E
BlueSolar MPPT VE.Can 150/100	0xA10F
BlueSolar MPPT VE.Can 250/70	0xA112
BlueSolar MPPT VE.Can 250/100	0xA113
SmartSolar MPPT VE.Can 250/70 rev2	0xA114
SmartSolar MPPT VE.Can 250/100 rev2	0xA115
SmartSolar MPPT VE.Can 250/85 rev2	0xA116
Phoenix Inverter 12V 250VA 230V*	0xA201*
Phoenix Inverter 24V 250VA 230V*	0xA202*
Phoenix Inverter 48V 250VA 230V*	0xA204*
Phoenix Inverter 12V 375VA 230V*	0xA211*
Phoenix Inverter 24V 375VA 230V*	0xA212*
Phoenix Inverter 48V 375VA 230V*	0xA214*
Phoenix Inverter 12V 500VA 230V*	0xA221*
Phoenix Inverter 24V 500VA 230V*	0xA222*
Phoenix Inverter 48V 500VA 230V*	0xA224*
Phoenix Inverter 12V 250VA 230V	0xA231
Phoenix Inverter 24V 250VA 230V	0xA232
Phoenix Inverter 48V 250VA 230V	0xA234
Phoenix Inverter 12V 250VA 120V	0xA239
Phoenix Inverter 24V 250VA 120V	0xA23A
Phoenix Inverter 48V 250VA 120V	0xA23C
Phoenix Inverter 12V 375VA 230V	0xA241
Phoenix Inverter 24V 375VA 230V	0xA242
Phoenix Inverter 48V 375VA 230V	0xA244
Phoenix Inverter 12V 375VA 120V	0xA249
Phoenix Inverter 24V 375VA 120V	0xA24A
Phoenix Inverter 48V 375VA 120V	0xA24C
Phoenix Inverter 12V 500VA 230V	0xA251
Phoenix Inverter 24V 500VA 230V	0xA252
Phoenix Inverter 48V 500VA 230V	0xA254
Phoenix Inverter 12V 500VA 120V	0xA259
Phoenix Inverter 24V 500VA 120V	0xA25A
Phoenix Inverter 48V 500VA 120V	0xA25C
Phoenix Inverter 12V 800VA 230V	0xA261
Phoenix Inverter 24V 800VA 230V	0xA262
Phoenix Inverter 48V 800VA 230V	0xA264
Phoenix Inverter 12V 800VA 120V	0xA269
Phoenix Inverter 24V 800VA 120V	0xA26A
Phoenix Inverter 48V 800VA 120V	0xA26C
Phoenix Inverter 12V 1200VA 230V	0xA271
Phoenix Inverter 24V 1200VA 230V	0xA272
Phoenix Inverter 48V 1200VA 230V	0xA274

Phoenix Inverter 12V 1200VA 120V	0xA279
Phoenix Inverter 24V 1200VA 120V	0xA27A
Phoenix Inverter 48V 1200VA 120V	0xA27C
Phoenix Inverter 12V 1600VA 230V	0xA281
Phoenix Inverter 24V 1600VA 230V	0xA282
Phoenix Inverter 48V 1600VA 230V	0xA284
Phoenix Inverter 12V 2000VA 230V	0xA291
Phoenix Inverter 24V 2000VA 230V	0xA292
Phoenix Inverter 48V 2000VA 230V	0xA294
Phoenix Inverter 12V 3000VA 230V	0xA2A1
Phoenix Inverter 24V 3000VA 230V	0xA2A2
Phoenix Inverter 48V 3000VA 230V	0xA2A4
Phoenix Smart IP43 Charger 12 50 (1+1)	0xA340
Phoenix Smart IP43 Charger 12 50 (3)	0xA341
Phoenix Smart IP43 Charger 24 25 (1+1)	0xA342
Phoenix Smart IP43 Charger 24 25 (3)	0xA343
Phoenix Smart IP43 Charger 12 30 (1+1)	0xA344
Phoenix Smart IP43 Charger 12 30 (3)	0xA345
Phoenix Smart IP43 Charger 24 16 (1+1)	0xA346
Phoenix Smart IP43 Charger 24 16 (3)	0xA347

\* These models are phased out.

## CS

The state of operation. See the table below for the possible values.

		MPPT	Inverter	Charger
Off	0	•	•	•
Low power	1		• (1)	
Fault	2	•	•	•
Bulk	3	•		•
Absorption	4	•		•
Float	5	•		•
Storage	6			•
Equalize (manual)	7	•		
Inverting	9		•	
Power supply	11			•
Starting-up	245	•		
Repeated absorption	246			•
Auto equalize / Recondition	247	•		•
BatterySafe	248			•
External Control	252	•		

(1) Load search

## ERR

The error code of the device (relevant when the device is in the fault state). See the table below for the possible values.

No error	0
Battery voltage too high	2
Charger temperature too high	17
Charger over current	18
Charger current reversed	19
Bulk time limit exceeded	20
Current sensor issue (sensor bias/sensor broken)	21
Terminals overheated	26
Converter issue (dual converter models only)	28
Input voltage too high (solar panel)	33

Input current too high (solar panel)	34
Input shutdown (due to excessive battery voltage)	38
Input shutdown (due to current flow during off mode)	39
Lost communication with one of devices	65
Synchronised charging device configuration issue	66
BMS connection lost	67
Network misconfigured	68
Factory calibration data lost	116
Invalid/incompatible firmware	117
User settings invalid	119

**Note1:** Error 19 can be ignored, this condition regularly occurs during start-up or shutdown of the MPPT charger. Since version 1.15 this error will no longer be reported.

**Note2:** Error 21 can be ignored for 5 minutes, this condition regularly occurs during start-up or shutdown of the MPPT charger. Since version 1.16 this warning will no longer be reported when it is not persistent.

### ***HSDS***

Historical data. The day sequence number, a change in this number indicates a new day. This implies that the historical data has changed. Range 0..364.

**Note:** The HSDS field is available in the MPPT charger since version v1.16.

### ***SER#***

The serial number of the device. The notation is LLYYMMSSSSS, where LL=location code, YYWW=production date stamp (year, week) and SSSSS=unique part of the serial number.  
Example: HQ1328Y6TF6

### ***BMV (deprecated)***

This field contains a textual description of the BMV model, for example 602S or 702. It is deprecated, refer to the field PID instead.

### ***MODE***

The possible values for the device mode are listed in this table.

		Inverter	Charger
VE_REG_MODE_CHARGER	1		•
VE_REG_MODE_INVERTER	2	•	
VE_REG_MODE_OFF	4	•	•
VE_REG_MODE_ECO	5	•	
VE_REG_MODE_HIBERNATE	253	• (1)	

(1) Smart only

### ***MPPT***

The possible values for the tracker operation are listed in this table.

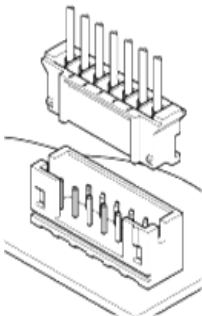
Off	0
Voltage or current limited	1
MPP Tracker active	2





## Implementation guidelines

When implementing a VE.Text parser it is recommended to reserve two buffers. For the field label a buffer of 9 bytes is needed and for the field value a buffer length of 33 bytes is required. The value should be parsed as soon as a single field is received and should then be stored in a temporary record. The maximum number of fields in a block is 22; keep at least 22 temporary records. Once the complete block is validated by evaluating the checksum, the contents of the temporary records can be copied to its corresponding final records. If the checksum turned out to be invalid, the temporary records need to be cleared.

## Connector types

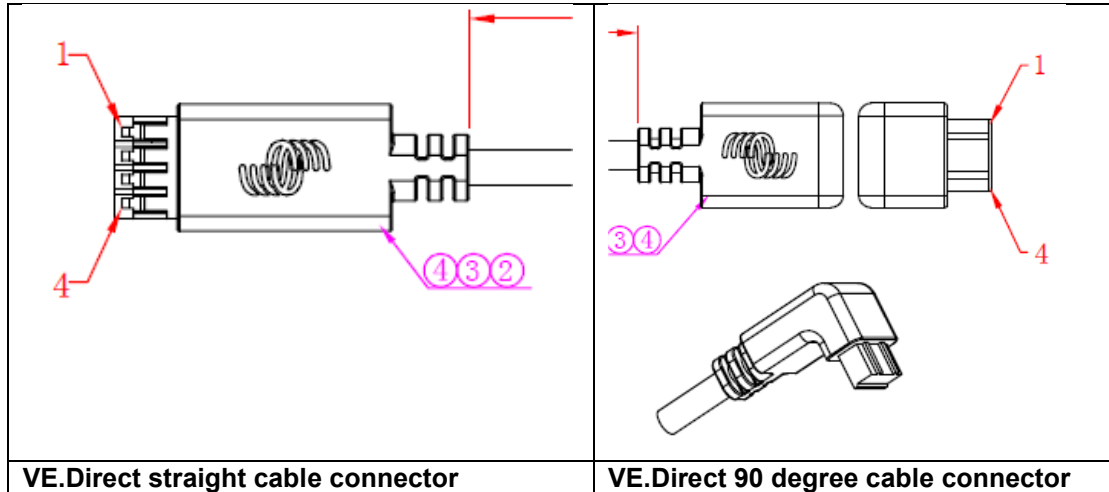
Below the information about the connector type used for VE.Direct. There are 3 through hole type connectors and 2 surface mount types available.

<b>Brand</b>	JST		
<b>Serie</b>	PH connector, 4 pin types		
<b>Description</b> 	Pitch 2.0mm Available in through hole and smt. Top and side entry models Also a high version of the through hole top entry model is available Most types are available from Farnell.		
	Website information		
	<a href="http://www.jst-mfg.com/product/detail_e.php?series=199">http://www.jst-mfg.com/product/detail_e.php?series=199</a>		
	<a href="http://www.jst-mfg.com/product/pdf/eng/ePH.pdf">http://www.jst-mfg.com/product/pdf/eng/ePH.pdf</a>		
<b>Through hole</b>	<b>Farnell code</b>	<b>JST code</b>	<b>Link</b>
<b>Pcb part straight</b>	<a href="#">9492437</a>	B4B-PH-K-S(LF)(SN)	<a href="http://nl.farnell.com/jst-japan-solderless-terminals/b4b-ph-k-s-lf-sn/header-top-entry-4way-2mm/dp/9492437">http://nl.farnell.com/jst-japan-solderless-terminals/b4b-ph-k-s-lf-sn/header-top-entry-4way-2mm/dp/9492437</a>
<b>Pcb part 90degree</b>	<a href="#">9492488</a>	S4B-PH-K-S(LF)(SN)	<a href="http://nl.farnell.com/jst-japan-solderless-terminals/s4b-ph-k-s-lf-sn/header-side-entry-4way/dp/9492488">http://nl.farnell.com/jst-japan-solderless-terminals/s4b-ph-k-s-lf-sn/header-side-entry-4way/dp/9492488</a>
<b>Surface mount</b>			
<b>Pcb part straight</b>	<a href="#">9491929</a>	B4B-PH-SM4-TB(LF)(SN)	<a href="http://nl.farnell.com/jst-japan-solderless-terminals/b4b-ph-sm4-tb-lf-sn/header-top-entry-smd-4way/dp/9491929">http://nl.farnell.com/jst-japan-solderless-terminals/b4b-ph-sm4-tb-lf-sn/header-top-entry-smd-4way/dp/9491929</a>
<b>Pcb part 90 degree smd</b>	<a href="#">9492631</a>	S4B-PH-SM4-TB(LF)(SN)	<a href="http://nl.farnell.com/jst-japan-solderless-terminals/s4b-ph-sm4-tb-lf-sn/header-side-entry-smd-4way/dp/9492631">http://nl.farnell.com/jst-japan-solderless-terminals/s4b-ph-sm4-tb-lf-sn/header-side-entry-smd-4way/dp/9492631</a>
<b>Pcb part straight high type</b>	-	BH4B-PH(LF)(SN)	<a href="http://www.jst-mfg.com/product/detail_e.php?series=200">http://www.jst-mfg.com/product/detail_e.php?series=200</a> <a href="http://www.jst-mfg.com/product/pdf/eng/ePH-H.pdf">http://www.jst-mfg.com/product/pdf/eng/ePH-H.pdf</a>

			
TH top entry	TH side entry	SMT top entry	SMT side entry

## VE.Direct cable

For the VE.Direct cable a molded part was created to make it more durable.  
There is a straight and 90 degree angle model. See pictures below.



## Document history

Version	Date	Changes
1	24 April 2008	Document created.
1.1	05 May 2008	Added historical information for the starter battery. Added alarm and relay state information.
1.2	16 May 2008	Added the part number for the serial to TTL cable.
2.0	16 June 2008	Added a checksum field to the protocol, and removed the ETX framing character.
2.1	05 May 2009	Added details on which RS232 connections must be implemented by the monitoring application.
2.2	24 June 2009	Updated to reflect the change in product naming.
2.3	01 December 2009	Added BMV-600S and field BMV, FW and AR
2.4	12 April 2011	Renamed the protocol and document to BMV Text Protocol
2.5	16 October 2012	Added details on On/Off vs ON/OFF for Relay and Alarm state
3.0	31 June 2013	Document changed to be the VE.Direct specification document
3.1	16 August 2013	Added BMV-70x alarms Added detailed field description paragraph Description of release candidates in FW field
3.2	7 February 2014	Removed fields H13 and H14 from BMV-70x
3.3	24 March 2014	Added history fields (HS* and HDn*) for the MPPT chargers.
3.4	22 May 2014	Updated product id list (PID)
3.5	3 July 2014	Added error 119 in the error code table (ERR)
3.6	30 July 2014	Changed HDnYP> HdnY, HdnYC> HDnC, added HSDS
3.7	11 September 2014	Text protocol I=Battery current, CS=Charger state. Added remark HS*, HDn* are available since v1.15. Added IL (load current)
3.8	24 September 2014	Updated physical connection section Removed HDn*, HS* sections, moved to HEX protocol Updated HSDS description.
3.9	30 September 2014	Reworded some sentences to make them more clear and changed footnote sign to numbers. <del>H19..H23 deprecated since v1.16</del> , HSDS will be available since v1.16
3.10	6 November 2014	ERR section, added note 2 regarding error 21.
3.11	7 November 2014	ERR section, updated note 2 regarding error 21.
3.12	9 December 2014	H19..H23 will remain present
3.13	29 January 2015	Added chapter 'Implementation guidelines'
3.14	25 March 2015	Fields table: removed deprecated for fields H19..H23
3.15	1 May 2015	Updated charger error code table (ERR)
3.16	9 July 2015	Added information about connector types
3.17	20 July 2015	Updated whitepaper url in the introduction section
3.18	20 August 2015	Added links to open source page and vedirect faq
3.19	25 February 2016	Updated PID section (MPPT models) Relay field now also available in SmartSolar models
3.20	14 March 2016	Updated with Phoenix Inverter textmode fields
3.21	1 April 2016	Mention Asynchronous HEX-messages. Added VE.Direct to RS232 interface cable.
3.22	28 September 2016	Swapped RX & TX in the pinout
3.23	2 October 2017	Added pin information for VE.Direct to RS232 interface
3.24	22 March 2018	Added PIDs for 120V + 800VA + 1200VA inverters and new Smart Solar chargers
3.25	10 September 2018	Added tracker information (MPPT)



Version	Date	Changes
3.26	27 November 2018	<p>Added for Smart Phoenix Inverters:</p> <ul style="list-style-type: none"> <li>• PIDs for Smart Inverters 1600/2000VA - 230Vac</li> <li>• Support of hibernate mode</li> <li>• Relay description</li> <li>• Label AC_OUT_S</li> <li>• Label OR (off reason)</li> <li>• Label CAP_BLE</li> </ul> <p>Added Phoenix Smart Chargers:</p> <ul style="list-style-type: none"> <li>• Labels V2,V3,I2,I3 and FWE</li> <li>• Added FWE description</li> </ul> <p>Added SmartSolar MPPT VE.Can product ids. Update descriptions of CS, MODE and ERR fields.</p>
3.27	11 September 2019	<p>Update Supported Text-mode fields table:</p> <ul style="list-style-type: none"> <li>• OR filed was added to the SmartSolar since firmware version v1.44 (VE.Direct chargers) and v1.03 (SmartSolar MPPT VE.Can chargers)</li> </ul>
3.28	26 February 2020	<p>Added new PIDs for SmartSolars and BlueSolars</p> <ul style="list-style-type: none"> <li>• From 0xA066 to 0xA071</li> <li>• From 0xA10B to 0xA116</li> </ul> <p>Changed maximum number of fields in a block, on the text protocol, from 18 to 22.</p>
3.29	20 July 2020	Add FAQ URL to chapter "Data integrity"
3.30	01 February 2021	Update introduction explaining new behaviour of Text-mode on newer implementations.
3.31	04 March 2021	Update Physical interface description text.