Introduction

For the correct management of a MODBUS network the master must know how to query each slave, that is which kind of communication, which function codes and which addresses for the slaves and their parameters. In the present document all the information for master configuration are given: details about physical layer (RTU, baud rate, etc), implemented Modbus function codes, and exchange parameters address map.
The address map of the MODBUS parameters is provided as a table at the end of this document. For each parameter, the MODBUS address, the range, the scale factor and the default values are provided. Moreover, a brief description of each parameter is given.

Electrical characteristics

The unit (DC-UPS) is configured as a SLAVE in a MODBUS network.
The slave unit is compliant to the following specifications:

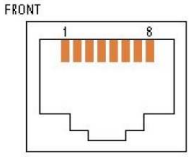
1. Transmission mode: MODBUS **RTU**
2. Electrical Interface: RS485 half-duplex serial line
3. baud rate: 4800 / 9600 (default) / 19200 / 38400 bps
4. data format: 8 data bits
5. parity: even (default) / odd / none
6. stop bits: 1 (parity **odd** or **even**) / 1 or 2 selectable (parity **none**)
7. slave address: configurable in the range 1 (default) to 247
8. terminator: none (dipswitch off) or 120Ω (dipswitch on)
9. polarization: selectable through dipswitches:

FAILSAFE A: none (dipswitch off) or 560Ω resistor between A and +5V (dipswitch on)
FAILSAFE B: none (dipswitch off) or 560Ω resistor between B and GND (dipswitch on)

Previous CBI2801224A devices had both FAILSAFE A and B resistors hard-wired: to replicate such configuration, both FAILSAFE A and B dipswitches should be set in their ON position

10. cable: shielded twisted pair, 8-wire RJ-45 plug
11. connector type: RJ-45
12. connector name: AUX2 – AUX3
13. pin-out (fig. below): A = pin 5, B = pin 4, Common = pin 3

AUX2 – AUX3 RJ-45 connector



Functional characteristics

The slave waits for a request from the master. Such requests may be "unicast" (addressed to one slave only) or "broadcast" (addressed to all slaves simultaneously).
When a request is received, the slave checks the packet before performing the action requested in the packet. Different errors may occur: format error in the request, invalid action, etc.. In case of error, a reply

is sent to the master. Once the required action has been completed, a unicast message requires that a reply be formatted and sent to the master. If the slave detects an error in the received frame (frame error or invalid address), no response is returned to the master. Broadcast requests may be only write requests; no response is returned to the master. All parameters that the slave exchanges with the master are 16 bit MODBUS Holding Registers (HR), with address range 40001-40114. Only the registers listed in the table at the end of this document are used, the other ones are always 0.
Parameters can be subdivided into monitoring, history, configuration and alarm sets.

Some of the configuration parameters may be set by either hardware (dipswitches, jumpers, trimmer and time buffering selector on the device) or software control (MODBUS communications described in this document). The hardware controls are effective when the device is configured as STANDALONE. The software ones are effective when the device is configured as a MODBUS SLAVE: in this case hardware controls are ignored, with the exception of the nominal voltage and power supply function enable.

NOTICE: the nominal output voltage (12 or 24V) and the device functionality as a DCUPS or Power supply function at the battery terminals are ALWAYS and ONLY selected at the power-up by means of the hardware controls ("SELECTION OUT VOLTAGE" jumper and "ENABLE POWER SUPPLY" dipswitch respectively), irrespective of the device being configured as a STANDALONE or MODBUS SLAVE device.

The device is configured as STANDALONE at power-up in the case the four "BATTERY TYPE" dipswitches are in any position EXCEPT ALL BEING IN THEIR "ON" POSITION.
When the device is configured as a STANDALONE device, the battery charging algorithm is set through the four "BATTERY TYPE" dipswitches at power-up and cannot be changed as long as the device remains configured as STANDALONE. The unit remains configured as such and uses the hardware settings (jumpers, trimmer etc.) until, after power-on, it receives a valid unicast request through the MODBUS interface.
At the first valid request it replies and configures itself as SLAVE MODBUS device. Henceforth, the device uses the DEFAULT MODBUS parameter values and ignores the hardware controls. Now the value of the holding register 40091 mirrors the battery charging algorithm selected by means of the four "BATTERY TYPE" dipswitch configuration at powerup, so that when the device reconfigures itself as a MODBUS SLAVE device, the battery charging algorithm does not change. After the device has reconfigured itself as a MODBUS SLAVE device, all the writable parameters (refer to the "Read/write" column in the table at the end of the document) can be modified provided the value that is being written is in the respective permissible range. In particular, the charging algorithm can be changed by writing the desired value to holding register 40091 (for the values corresponding to the charging algorithms, please refer to the table at the end of the document). Writing to holding register 40091 is only allowed when the battery is not connected to the device. If any change has been made to the parameter values, they remain valid as long as the device is on. If a parameter save action is performed (write 1 to holding register 40114), all the configuration and history parameters are stored in the user non-volatile memory onboard the device. This allows the user to save a customized set of parameters and be able to recall them at subsequent power ups.
In order to recall such customized set of parameters, the unit must be powered up with the four "BATTERY TYPE" dipswitches all in their ON position.
In this case the device is powered up as MODBUS SLAVE device directly: unlike the case where the device was powered up as STANDALONE, in this case it uses the latest MODBUS parameters stored in its user non-volatile memory and not the hardware settings (except the "SELECTION OUT VOLTAGE" and "ENABLE POWER SUPPLY"), even if there is no physical MODBUS connection with the master. Notice that in this case the charging algorithm that is executed conforms to the value of holding register 40091 stored in the user non-volatile memory onboard the device.
This allows users to customize the charging parameters in the office and then be able to use the device on the field using the customized parameters without having to carry a MODBUS master device to control it on the field.

The following Modbus functions for Holding Register management are supported:

Function code 3 (0x03): Read Holding Register

Request		
Function code	1 Byte	**0x03**
Starting Address	2 Bytes	0x0000 to 0xFFFF
Quantity of Registers	2 Bytes	1 to 125 (0x7D)
Response		
Function code	1 Byte	**0x03**
Byte count	1 Byte	2 x **N***
Register value	**N*** x 2 Bytes	
Error		
Error code	1 Byte	**0x83**
Exception code	1 Byte	01 or 02

Function code 6 (0x06): Write Single Register

Request		
Function code	1 Byte	**0x06**
Register Address	2 Bytes	0x0000 to 0xFFFF
Register Value	2 Bytes	0x0000 to 0xFFFF
Response		
Function code	1 Byte	**0x06**
Register address	2 Byte	0x0000 to 0xFFFF
Register value	2 Bytes	0x0000 to 0xFFFF
Error		
Error code	1 Byte	**0x86**
Exception code	1 Byte	01 or 02

N*: quantity of registers

Function code 16 (0x10): Write Multiple Register

Request		
Function code	1 Byte	**0x10**
Starting Address	2 Bytes	0x0000 to 0xFFFF
Quantity of Registers	2 Bytes	0x0001 to 0x007B
Byte count	1 Byte	2 x **N***
Registers value	**N*** x 2 Bytes	value
Response		
Function code	1 Byte	**0x03**
Starting address	2 Bytes	0x0000 to 0xFFFF
Quantity of registers	2 Bytes	1 to 123 (0x7B)
Error		
Error code	1 Byte	**0x90**
Exception code	1 Byte	01 or 02

Communications parameters settings

Devices are configured for communications at **9600bps** with **even parity (1 stop bit)** by default.

The permissible slave address range is: 1-247. Note that the address must be unique for every slave present in the same Modbus network.

Parameter 0 (HR 40001) stores the address of the slave unit. The default value for this parameter is 1. It is possible to modify this value writing the new desired value (1-247) to HR40001. We detail step-by-step the slave address configuration procedure outlined below:

1. connect the slave unit with default address 1 alone with the master, disconnecting every other possible slave unit, in order to avoid addressing conflicts;
2. the master sends to the slave the new desired address at holding register 0 (40001);

3. henceforth, the master queries the slave at the new address, and the slave accepts unicast queries only at such address;
4. the master can force the slave to store the new address in the slave non-volatile memory onboard the device by setting "save to flash" parameter (write 1 to holding register 40114), so that the slave preserves its address at next power-on;
5. after such address configuration it is possible to connect every other slave unit already configured.

Similarly it is possible to modify the serial communication default settings (baud rate and parity), that are stored at addresses 1 (HR 40002) and 2 (HR 40003). If any of them is modified, the master must query the slave using such modified settings. To store the newly set communications parameter values, write 1 to holding register 40114. Holding register 40003 sets the parity value for the serial communications and also the number of the expected stop bits according to the following table:

HR 40003 VALUE	PARITY	NUMBER OF STOP BITS
0	NONE	2
1	ODD	1
2 (default value)	EVEN	1
3	NONE	1

Note that values 0 and 3 for HR 40003 differ in the number of the expected stop bits .

Note also that irrespective of the device configuration at power on (stand alone or Modbus slave), when the device becomes a Modbus slave device it always uses the communications parameter (HR4001 thru HR40003) values stored in the user non-volatile memory onboard the device.

Restoring communications parameters to factory settings

To restore the communication parameter values (0-2: slave address, baud rate, parity):

1. switch off slave unit: disconnect AC mains and battery;
2. turn "TIME BUFFERING" selector in position 7;
3. turn "BATTERY CHARGING LEVEL" trimmer all counterclockwise in position MIN;
4. press "BATTERY START" button and then switch on slave unit connecting AC mains or battery;
5. keep pressed "BATTERY START" button for 10 seconds; during these 10 seconds the 3 LEDs stay steady ON; at the end of these 10 seconds all 3 LEDs (together with 2 relays) switch off and switch on again sequentially for 3 times, and then the unit starts up with default communication settings restored;
6. henceforth, "TIME BUFFERING" selector and "BATTERY CHARGING LEVEL" trimmer are available again for their standard function;

NOTE – If during the 10 seconds "BATTERY START" button is released or "TIME BUFFERING" selector or "BATTERY CHARGING LEVEL" are changed , the unit starts up immediately (without the 3 LEDs triple blinking) and communication settings remain the previous ones; the factory ones are NOT restored.

Restoring configuration parameters to factory settings

Whatever the current set of values of parameters, writing the value 1 to Holding Register 40066 restores the default values of the configuration holding registers 40069 thru 40107, and also configures the device to the default charging algorithm, i.e. the Open Lead one. Writing 1 to Holding register 40066 is only possible when the battery is not connected. Then, the master can save these settings again in slave non-volatile memory by writing 1 to holding register 40114. Notice that reads from holding registers 40066 and 40114 always return 0, because the slave, as soon as detects a written "1" to such registers, performs the requested action and immediately resets the register.

ADELSYSTEM CBI2801224A MODBUS MAP Rev 3.12

		Holding Address	Value	Parameter Details	Parameter Details description	Factory Setting	Range	Scale factor	Unit	Notes	Read/ Write
Monitoring	Battery	40004	Power supply function enabled at the battery terminals	0 = Disabled / 1 = Power supply function enabled at the battery terminals	Its value is 1 when the power supply function at the battery terminals is enabled by means of the ENABLE POWER SUPPLY dipswitch on the front panel of the device; otherwise it is 0		0-1				Read only
		40005	Charging status	Current charging status: 0=None / 1=Recovery / 2=Bulk / 3=Absorption / 4=Trickle	Notifies the current phase of the charging algorithm. Notice: in the case of NiCd, the absorption step is not available		0-4				Read only
		40008	Battery voltage	Voltage measured at the battery terminals	Value measured by the device		0-65535		mV		Read only
		40014	Battery charge current	Measured value of the battery charge current	Value measured by the device		0-65535		mA		Read only
		40017	Battery discharge current	Measured value of the battery discharge current	Value measured by the device		0-65535		mA		Read only
		40024	Battery type currently selected	The battery type currently selected (0 = Open lead, 1 = AGM lead, 2 = GEL lead, 3 = NiCd/NiMH , 4 = Unexpected configuration)	Mirrors the value selected by the HR40091 or by the Battery Type dipswitches on the device front panel. Its value is 4 in the case an unexpected dipswitch configuration has been set by the user on the device front panel.		0-4				Read only
		40026	Battery temperature	Temperature measured on the battery by means of the external battery temperature probe (in Kelvin units, conversion formula T(℃) = T(K)-273)	This holding register displays the temperature measured by the temperature sensor, when the probe is connected. Otherwise it displays the value 0.		233-381 (-40℃ ...+108℃)		K		Read only
	Device	40007	Nominal output voltage	12 = 12 Vdc output setting ; 24 = 24 Vdc output setting	Nominal voltage of the device according to its configuration. In the case of CBI2801224A, it is set by means of the SELECTION OUT VOLTAGE jumper on the device front panel. No Jumper= 12 Vdc configuration Jumper present = 24 Vdc configuration		12/24		V		Read only
		40025	Hardware configuration at powerup	Displays the dipswitch and jumper configuration detected at powerup: bit0=AGM Lead, bit1=GEL Lead, bit2=NiCd-NiMH, bit3=Option"4" dipswitch, bit4 = Lifetest Enable, bit5 = Power supply function enable at the battery terminals, bit6 = Fast charge enable, bit7 = Option jumper, bit8 = Selection out voltage	Bit mask: a number ranging from 0 to 65535 evaluated according to its base-2 representation. In a base-2 representation, a number ranging from 0 to 65535 is a sequence of 16 digits that can assume only two values: 0 and 1. Each of such digits is called a bit. In such a representation, the 16 bits are arranged in this sequence: bit 15 bit 14 .... bit 1 bit 0. In a bit mask each bit describes a condition that can be either true (bit value = 1) or false (bit value = 0). For example if the value of bit 5 in this bit mask is 1, the ENABLE POWER SUPPLY dipswitch was found in its ON position at powerup.				bit 15 ... bit 0	bitx=1-->jumper inserted / dipswitch on	Read only
		40029	On-board temperature inside the device	Temperature inside the device (in Kelvin units, conversion formula T(℃) = T(K)-273)			233 - 398 (-40℃ ...+125℃)		K		Read only
		40068	DCUPS/CB function	Display the function of the device: 1 = CBI		1					Read only
		40103	Firmware ID	Identifier of the device firmware release			0-65535				Read only
	Input	40006	Power management DC-UPS	0 = Backup (mains is not available and the load connected at the Output Load terminals is supplied by the battery) 1 = Charging (mains is available and the battery -if connected - is charging) 2 = Power boost (the power required to supply the load connected at the Output Load terminals is drawn both from the mains and from the battery)	Provides information concerning the ongoing activity of the system, focusing on the power flow: from battery to load (when its value is 0), from mains to load and / or battery (when its value is 1) and from mains+battery to load (when its value is 2)		0-2				Read only
		40030	AC input voltage	AC Input voltage	This holding register displays the value of the AC voltage mains input. Measured value range: (90VAC - 135VAC) and (180VAC - 305VAC). When the AC voltage measured at mains input is outside these ranges, it has the following behaviour: it displays 90 when AC magnitudes lower than 90VAC are measured ; it displays 135 when the measured voltage at the AC input is in the 135VAC-180VAC range; it displays 305 in the case an AC voltage magnitude higher than 305VAC is detected.		90-135/ 180 - 305		V AC		Read only
	Load	40011	Output load voltage	Voltage measured at the output load terminals	Value measured by the device		0-65535		mV		Read only
		40020	Output load current	Measured value of the current drawn from the output load terminals	Value measured by the device		0-65535		mA		Read only
History	Battery	40048	Number of charge cycles completed	Number of completed charge cycles	A charge cycle is considered to be completed when the device, from absorption, transitions to trickle charge.		0-65535			write only 0 (to reset the holding register value to 0)	Read/write
		40049	Charge cycles not completed	Number of aborted charge cycles, not completed	A charge cycle is considered to be aborted if -during any charging phase except trickle- the battery is detached or a mains outage occurs or a short-circuit condition occurs at the load output		0-65535			write only 0 (to reset the holding register value to 0)	Read/write
		40050	Ah charged	Total Ampere-hours charged: scale factor 0.1 (ex. 1000=100Ah)	Net Ah charged = (Ah charged - Ah discharged): it is the net charge (expressed in Ampère-hours) transferred to the battery. Not active when the power supply function is enabled at the battery terminals		0-65535	0.1	Ah	write only 0 (to reset the holding register value to 0)	Read/write
		40051	Total run time	Total run time in charging mode	Time, elapsed from power-up, during which the battery has been charging. The timer is halted when the device is in backup or when the battery is not wired		0-65535		min	write only 0 (to reset the holding register value to 0)	Read/write
		40052	Number of low battery voltage events	Number of low-battery-voltage events	Battery low voltage threshold is 1.83V per cell (e.g. 11V when the device is configured with a nominal voltage of 12V). Not active when power supply function is enabled at the battery terminals		0-65535			write only 0 (to reset the holding register value to 0)	Read/write
		40053	Number of high DC voltage events at battery output	Number of high voltage events at the battery output terminals	High voltage threshold is defined as 15.25V/ 30.5V when the device is configured for a nominal voltage of 12V/24V respectively. Not active when the power supply function is enabled at the battery terminals		0-65535			write only 0 (to reset the holding register value to 0)	Read/write
		40058	Number power boost events	Number of power boost events	A power boost event occurs when the battery is supplying current to a load (connected at the output load terminals) when mains is available		0-65535			write only 0 (to reset the holding register value to 0)	Read/write
		40059	Highest battery voltage	Highest voltage acquired at the battery terminals			0-65535		mV		Read only
		40062	Lowest battery voltage	Lowest voltage acquired at the battery terminals			0-65535		mV		Read only
	Device	40056	Number of overtemperature inside events	Number of internal overtemperature events	For the CBI280 the internal overtemperature threshold is 110 ℃		0-65535			write only 0 (to reset the holding register value to 0)	Read/write
	Input	40054	Number of low AC voltage events at mains input	Number of low AC voltage events at the mains AC input	AC mains is considered to be too low when either in the <90VAC forbidden range or in the 135VAC-180VAC forbidden range		0-65535			write only 0 (to reset the holding register value to 0)	Read/write
		40055	Number of High AC voltage events at mains input	Number of high AC voltage events at the mains AC input	AC mains is considered to be too high when in the >305VAC forbidden range		0-65535			write only 0 (to reset the holding register value to 0)	Read/write
		40057	Number of mains-backup transitions	Number of mains <-> backup transitions	Incremented by 1 every time a mains to backup transition is performed or a backup to mains transition is performed		0-65535			write only 0 (to reset the holding register value to 0)	Read/write
	Load	40060	Highest output load voltage	Highest voltage acquired at the output load terminals			0-65535		mV		Read only
		40063	Lowest output load voltage	Lowest voltage acquired at the output load terminals			0-65535		mV		Read only
Configuration	Battery	40071	Deep discharge battery prevention	Battery voltage at which, during backup, the device shuts down to prevent the battery from being deeply discharged	Battery voltage at which, during backup, the device shuts down to prevent the battery from being deeply discharged . The voltage is expressed in units of mV per cell. To obtain the voltage at the battery terminals this value has to be multiplied times the number of cells. The number of cells is 6 in the case of 12V Open Lead /AGM /GEL systems, 12 in the case of 24V Open Lead /AGM /GEL systems, 10 in the case of 12V NiCd/NiMH systems, 20 in the case of 24V NiCd/NiMH systems.	1750 (Lead)/ 1000 (NiCd)	1500-2000 (Lead)/ 650-1200 (NiCd)		mV/cell		Read/write
		40072	Maximum charge current	Sets the maximum allowed charging current	This holding register sets the maximum value of the charging current.		1500-15000 (12V) / 1000-10000 (24V)		mA		Read/write
		40073	Bulk voltage	Bulk voltage setting per cell	Target voltage to be reached by the battery during the constant-current bulk charge phase	2400 (Lead)/ 1500 (NiCd)	2200-2450 (Lead)/ 1400-1500 (NiCd)		mV/cell		Read/write
		40074	Max bulk timer	Maximum bulk duration timer	Maximum duration of the bulk charge phase. If this timeout expires, the device transitions to trickle charge	15	1-24		h		Read/write
		40075	Min bulk timer	Minimum bulk duration timer	Minimum duration of the bulk charge phase	60	1-240		sec		Read/write
		40076	Threshold voltage starting max bulk timer	Maximum bulk duration timer trigger voltage	Battery voltage magnitude above which the transition from slow-recovery to bulk charge occurs. At that moment the maximum bulk duration timer is triggered.	1667 (Lead)/ 1000 (NiCd)			mV/cell		Read only
		40077	Absorption voltage	Absorption voltage setting per cell	Sets the battery voltage per cell during absorption charge	2375	2200-2450		mV/cell		Read/write
		40078	Max absorption timer	Maximum absorption duration timer	Maximum duration of the absorption phase, after which the device transitions to trickle charge	5	1-24		h		Read/write
		40079	Min absorption timer	Minimum absorption duration timer	Minimum duration of the absorption phase	15	1-240		min		Read/write
		40080	Return amps to trickle	Return current value (% of maximum charge current) to go to trickle	Magnitude of the battery charge current below which the transition from absorption to trickle charge occurs. Value expressed as a percentage of the maximum charge current (set by Holding register 40072)	6	1-50		%		Read/write
		40081	Return amps timer	Return current timer to go to trickle	Time interval during which the charge current magnitude must remain below the value expressed by Holding register 40080 in order to transition to trickle charge	30	1-240		sec		Read/write
		40082	Trickle voltage	Trickle voltage setting per cell	Sets the value (per cell) of the voltage at which the battery is kept after it has been fully charged.	2230 (Open Lead)/ 2250 (AGM Lead)/ 2300 (GEL Lead)/ 1500 (NiCd)	2200-2450 (Lead)/ 1400-1500 (NiCd)		mV/cell		Read/write
		40083	Force boost charge	If set to 1 during trickle charge, it forces a transition to bulk charge	Open / AGM / GEL lead algorithms only. If set to 1 during trickle charge, it forces a manual transition to bulk charge.	0	0-1				Read/write
		40084	Return to bulk voltage from trickle	Voltage (per cell) below which the system transitions from trickle to bulk charge	Open / AGM / GEL lead algorithms only. If during trickle charge the battery voltage becomes lower than this voltage threshold (e.g. due to a prolonged power boost condition) and it remains so for a time interval expressed by Holding register 40085, the device transitions to bulk charge to charge the battery	2000	1750-2150		mV/cell		Read/write
		40085	Return to bulk delay	Trickle to bulk transition delay after the battery voltage has got below the "Return to bulk voltage" voltage level (Holding register 40084)	Open / AGM / GEL lead algorithms only. Time delay to confirm that the battery has discharged significantly during trickle charge, so that a bulk charge must be undertaken	30	1-240		sec		Read/write
		40086	Traction bulk	Traction of the bulk voltage per cell. In terms of timing consider the parameter 40075	Open / AGM / GEL lead algorithms only. Additional voltage (per cell) to ensure the bulk voltage (holding register 40073) can be reached at full power	50			mV/cell		Read only
		40091	Lead/AGM/NiCd/NiMH	Set the battery type and its respective charging algorithm: 0 = Open lead (trickle voltage 2.23V per cell) / 1 = AGM Lead (trickle voltage 2.25V per cell) / 2 = GEL Lead (trickle voltage 2.30V per cell) / 3 = NiCd - NiMH (-ΔV / voltage plateau detection algorithm)	Sets the battery type. Writing to this holding register is only possible when the battery is not connected.	0	0-3				Read/write
		40092	Lifetest enable	Battery life test ENABLED (=1)/ DISABLED(=0)	Enables the battery internal impedance measurement. Open / AGM / GEL lead algorithms only. Such check is not performed if the power supply function is enabled at the battery terminals	0	0-1				Read/write
	Device	40066	Factory settings	Set the configuration parameters to their default value	Writing 1 restores the configuration parameters (i.e. the implemented holding registers having addresses 40069 thru 40107) to their default value, and sets the device to the default charging curve, which is the Open Lead one. Writing to this holding register is only possible when battery is not connected. Notice that the restored default parameters are not automatically stored in the user non-volatile memory onboard the device. However, they can then be stored by writing 1 to Holding register 40114.	0	0-1			write only 1	Read/write
		40067	Product name	Device type (0=DCUPS480W, 1=SFP126-245A, 2=CB CYCLIC, 3=CBI NAUTIC, 4 = CBI2801224)	This holding register identifies the product type.	4	0-4				Read only
		40104	Time buffering	Time buffering setting in backup	Time duration of interval when the load is supplied by the battery in the case of mains outage. After such time has elapsed, the output load terminals are deenergized and the device itself is powered off	0 (no time limit)	0-65535		sec		Read/write
		40114	Save to FLASH	Saves current communication, history and configuration parameters in the user internal memory onboard the device						write only 1	Read/write
	Load	40107	Device switchoff delay	Delay of the device power off in backup after the battery voltage has been found lower than the completely discharged Battery Voltage (as expressed by holding register 40071)	Device switch off delay setting	10	1-240		sec		Read/write
	System	40001	Address of slave unit	Device modbus address	MODBUS address of the device (must be unique on the bus). The device uses the value currently stored in its internal memory. Can be reset to its default value by a hardware procedure (refer to the MODBUS Technical specification for further details).	1	1-247				Read/write
		40002	Baud rate for serial communication	Baud rate of serial communication with the device	Baudrate of the serial communications of the device. The baudrate must be the same for all the devices on the same bus. The Device uses the value currently stored in its user internal memory. Can be reset to its default value by a hardware procedure (refer to the MODBUS Technical specification for further details).	9600	4800 / 9600/ 19200 / 38400		bps		Read/write
		40003	Parity bit for serial communication	Parity bit of serial communication: 0 = No parity with 2 stop bits; 1 = Odd parity with 1 stop bit; 2 = Even parity with 1 stop bit; 3 = No parity with 1 stop bit	Parity setting of the communication with the device. It must be the same for all the devices on the same bus. Note also the number of stop bits expected for each permitted value. The device uses the value currently stored in its user internal memory. Can be reset to its default value by a hardware procedure (refer to the MODBUS Technical specification for further details).	2	0-3				Read/write
Alarm	Battery	40032	Battery connection alarm	bit0=Reversed polarity, bit1=battery not connected, bit2=internal cell shorted, bit3=sulphated battery, bit4=power boost, bit5 =battery temperature too high, bit6 =reserved for future use, bit7 = bad battery cables or connection	Bit mask; bit 0 value is 1 in the case a battery has been connected to the device with wrong polarity; the value of bit 1 is 1 in the case no battery is connected to the device or the previously connected one has been disconnected. The value of bit 2 is 1 if one or more than one of the cells inside the battery are shorted. Bit 3 value is 1 when a battery is found to be sulphated. Bit 4 value is 1 when the load has been supplied both by the battery and the mains for more than 4 minutes thus the battery is discharging; bit 5 is set when battery temperature exceeds 63℃, it is reset to 0 when battery temperature is lower or equal than 60℃. Bit 7 value is set to 1 i f too-high a wiring resistance is measured for the battery cables.				bit 15 ... bit 0	bitx=1-->alarm	Read only
		40035	Battery voltage alarm	bit0=High battery voltage; alarm in case of battery connected with nominal voltage higher than the nominal voltage setting. bit1=low battery voltage (backup under 1,83V/cell): battery lower than 30% of the internal capacity bit2=device was powered up by pressing the BATTERY START button with a battery almost flat, lower than the value specified by Holding Register 40071	Bit mask. The value of bit 0 is equal to 1 when a battery voltage with a voltage higher than 15.25V / 30.5V (when the nominal voltage of the product is 12V /24V respectively) is connected. The value of bit 1 is equal to 1 when, during backup, the battery voltage has become lower than 1.83V/cell, which means that the battery is almost flat. Bit 2 value is equal to 1 when the device has been powered up by pressing the start button (in the absence of AC mains), with a battery with a voltage that is lower than the value set in Holding Register 40071.				bit 15 ... bit 0	bitx=1-->alarm	Read only
		40044	Battery temperature sensor failure	bit0 = battery temperature sensor is connected but faulty	Bit mask. The value of bit 0 of the mask is set to 1 when the external temperature sensor probe is detected to be connected, but it is faulty.				bit 15 ... bit 0	bitx=1-->alarm	Read only
	Device	40043	Device failure	bit0=Internal failure, bit1=mains detector failure, bit2=not used, bit3=Lifetest not possible, bit4=not used, bit5=not used	Bit mask. When any of the bits in this mask is set to 1 by the internal self diagnostic system, the device needs servicing. Servicing can be done exclusively by the factory. There are no user-serviceable parts inside the device.				bit 15 ... bit 0	bitx=1-->alarm	Read only
		40047	On board temperature alarm	1=Temperature inside the device is too high	If the value of the holding register is 1, the temperature inside the device has been detected to be too high. In this case the battery charge current limit is reduced to 1/10 of the value set by Holding Register 40072 or set by means of the "Battery Charging Level "trimmer located on the device front panel (if Modbus is not used)		0-1			1=alarm	Read only
	Input	40045	AC power input voltage alarm	bit0 = AC input voltage too high, bit1 = AC input voltage too low	Bit mask. AC input voltage is considered too high if its magnitude is >305VAC, it is considered to be too low if its magnitude is <90VAC or in the 135VAC-180VAC range				bit 15 ... bit 0	bitx=1-->alarm	Read only
		40046	Input mains on / backup	0=Mains available/1=Mains not available	The holding register value is 0 when mains is available, it is 1 when mains is not available (e.g. due to mains outage): in this case the load is powered by the battery.		0-1			1=alarm	Read only
	Load	40038	Load alarm	Short circuit or overload at the output load terminals. If the power supply function is enabled at the battery terminals a short circuit or overload at the battery terminals causes the same alarm.	Its value is 1 if, in the case of power supply function at the battery terminals is not enabled, a short circuit or an overload is detected at the Output Load terminals. In the case the power supply function at the battery terminals is enabled, its value is 1 if a short circuit or an overload is detected at the Output Load terminals or a short circuit is detected across the Battery Output terminals.					1=alarm	Read only