TDK

MODBUS Specification

DUSH Series | Uninterruptible DC Power Supplies

emea.lambda.tdk.com/dush-series

DS000052A01_DUSH_Modbus_Specification.docx

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1 General Description

With a MODBUS/RTU interface as standard the DUSH DIN-Rail DC-UPS can be easily connected directly to the control level in intelligent industrial environments. A high number of real-time status values for monitoring, enabling the early identification of status changes or even failures. Numerous adjustable parameters make complete remote maintenance of the system possible.

All MODBUS settings are collected in this application note. Please follow the table of contents to jump directly the appropriate chapter.

Some of the settings are only available for the -0M model of the DUSH series and therefore marked with an additional information (only -0M model). Specific setting information and complete descriptions are available in the separate user manual of the corresponding DIN-Rail products with MODBUS functionality.

For types bigger then 16bit, access all registers in one transaction (multiple register read or write) to ensure atomic operation.

ⓘ NOTICE

The DUSH is capable of communicating through MODBUS/RTU as specified on MODBUS over serial line and MODBUS APPLICATION PROTOCOL SPECIFICATION.
Documents available on: www.modbus.org.

2 Types and Fields

2.1 MODBUS Types

Type	Modbus function codes		Description
	Read	Write	
BIT	1,2	5,15	Single bit with value 0 or 1
SINT16	3,4	6,16	Signed 16 bit value (2's complement)
UINT16	3,4	6,16	Unsigned 16 bit value
SINT32	3	16	Signed 32 bit value (2's complement) Composed of 2 consecutive registers in big-endian order.
UINT32	3	16	Unsigned 32 bit value. Composed of 2 consecutive registers in bigendian order.
DATE	3	16	Time and date field. Composed of 4 Modbus registers as follows:

Address offset	Byte	Description
0	MSB	Reserved, set to 0
	LSB	Year-2000
1	MSB	Month (1=January)
	LSB	Day of the month
2	MSB	Hour of the day (24h format)
	LSB	Minutes
4	MSB	Milliseconds
	LSB	

2.2 MODBUS Fields

Address	Type	R/W	Unit	Min.	Max.	Description
Common						
0x0010	DATE	R/W			R/W	Real time clock.
Settings						
0x1000	UINT16	R/W	1	1	247	Modbus address.
0x1001	UINT16	R/W	1	1	5	Modbus baudrate. 1: 9600 baud 2: 19200 baud 3: 38400 baud 4: 57600 baud 5: 115200 baud
0x1002	UINT16	R/W	1	1	3	Modbus parity. 1: None

Address	Type	R/W	Unit	Min.	Max.	Description
						2: Even 3: Odd
0x1003	UINT16	R/W	1	1	2	Modbus stop bits.
0x1010	UINT16	R/W	1	1	4	Battery type. 1: Lead 2: Nickel 3: Lithium 4: Supercapacitor
0x1011	UINT16	R/W	0.1V	10	58	Battery charge voltage.
0x1012	UINT16	R/W	0.1A	0.5	20	Battery charge current.
0x1013	UINT16	R/W	0.1V	10	58	Battery float voltage.
0x1014	UINT16	R/W	0.1V	5	58	Battery low voltage.
0x1015	UINT16	R/W	0.1V	5	58	Battery deep discharge voltage.
0x1016	UINT16	R/W	0.1A	5	21	Battery max. discharge current.
0x1017	UINT16	R/W	0.1Ah	1	1000	Battery capacity - Supercap capacitance.
0x1018	SINT16	R/W	1°C	-40	60	Battery min. temperature.
0x1019	SINT16	R/W	1°C	-40	60	Battery max. temperature.
0x101A	UINT16	R/W	1kh	1	100	Battery lifetime.
0x101B	UINT16	R/W	1	0	3	Ri alarm mode. 0: Disabled 1: Fix 2: Automatic3: Automatic done
0x101C	UINT16	R/W	0.1mΩ	0	300	Ri nom.
0x101D	UINT16	R/W	1%	50	300	Ri max. variation.
0x1020	UINT16	R/W	1	1	2	Operating mode. 1: UPS 2: DC/DC
0x1021	UINT16	R/W	0.1V	10	58	Nominal output voltage.
0x1022	UINT16	R/W	0.1A	5	21	Max. input current.
0x1023	UINT16	R/W	0.1A	1	21	Max. output current.
0x1024	UINT16	R/W	1	0	1	Max. Backup time enable. 0: Disabled 1: Enabled
0x1025	UINT16	R/W	1min	1	1440	Max. backup time.
0x1026	UINT16	R/W	1	0	1	Buzzer enable. 0: Disabled 1: Enabled
0x1027	UINT16	R/W	1	0	65535	Relay 1 configuration (see 2.2.26).
0x1028	UINT16	R/W	1	0	65535	Relay 2 configuration (see 2.2.27).
0x1029	UINT16	R/W	1	1	2	Inhibit polarity.

Address	Type	R/W	Unit	Min.	Max.	Description
						1: Low 2: High
0x102A	UINT16	R/W	1	1	2	DC/DC output mode. 1: Single 2: Parallel
0x102B	UINT16	R/W	1	0	1	Output enable. 0: Disabled 1: Enabled
0x102C	UINT16	R/W	1	0	1	Aux enable. 0: Disabled 1: Enabled
0x102D	UINT16	R/W	1	0	1	Cold start on inhibit toggle. 0: Disabled 1: Enabled
0x102E	UINT16	R/W	1	0	1	Cold start on battery connection. 0: Disabled 1: Enabled
0x1030	UINT16	R/W	1	0	1	PC shutdown enable. 0: Disabled 1: Enabled
0x1031	UINT16	R/W	1	0	1	PC automatic restart enable. 0: Disabled 1: Enabled
0x1032	UINT16	R/W	1s	1	3600	PC shutdown delay.
0x1033	UINT16	R/W	1s	1	600	PC shutdown time.
0x1034	UINT16	R/W	1s	1	60	PC restart minimum time.
0x1035	UINT16	R/W	0.1A	0	20	PC off detection current threshold.
0x1036	UINT16	R/W	1s	1	60	PC off detection timer.
0x1040	UINT16	R/W	1	0	1	Blink output on backup enable. 0: Disabled 1: Enabled
0x1041	UINT16	R/W	1s	10	600	Blink output on backup Ton.
0x1042	UINT16	R/W	0.1s	0.1	60	Blink output on backup Toff.
0x1043	UINT16	R/W	1	0	1	Output short circuit latch enable. 0: Disabled 1: Enabled
0x1044	UINT16	R/W	0.1V	3	58	Output short circuit detection voltage threshold.
0x1045	UINT16	R/W	1	0	1	High inrush load enable.

Address	Type	R/W	Unit	Min.	Max.	Description
						0: Disabled 1: Enabled
0x1046	UINT16	R/W	1%	10	90	UPS not ready SoC threshold
0x1047	UINT16	R/W	1%	10	90	UPS near empty SoC threshold
0x1048	UINT16	R/W	1	0	1	Lock settings 0: Disabled 1: Enabled
0x1049	UINT16	R/W	1s	1	600	Delayed device shutdown time
0x104A	UINT16	R/W	1s	1	600	Delayed device reset time
0x104B	UINT16	R/W	1%	80	95	Backup start threshold
0x1050	UINT16	R/W	1	0	1	Battery cycle
0x1051	UINT16	R/W	1week	1	52	Battery cycle every
0x1052	UINT16	R/W		1	7	Battery cycle day
0x1053	UINT16	R/W	1h	0	23	Battery cycle hour
0x1054	UINT16	R/W	1min	0	59	Battery cycle minute
0x1055	UINT16	R/W	1%	10	90	Battery cycle SoC threshold
0x1056	UINT16	R/W	1min	1	1440	Battery cycle time threshold
0x1100	DATE	R/W				Battery installation date.
0x1104	UINT16	R/W	1	0	65535	Battery charge cycles.
0x1105	UINT16	R	1	0	1	Battery cycle in progress
0x1106	DATE	R				Next battery cycle
Metering						
0x2000	SINT16	R	0.1V	0	60	Input voltage.
0x2001	SINT16	R	0.1A	0	40	Input current
0x2002	SINT16	R	0.1V	0	60	Output voltage.
0x2003	SINT16	R	0.1A	0	40	Output current.
0x2004	SINT16	R	0.1V	0	60	Battery voltage.
0x2005	SINT16	R	0.1A	-25	25	Battery current.
0x2006	SINT16	R	0.1V	0	60	Auxiliary voltage.
0x2007	SINT16	R	0.1A	0	20	Auxiliary current.
0x2008	SINT16	R	0.1°C	-40	85	External temperature.
0x2009	SINT16	R	0.1mΩ	0	3000	Battery internal resistance.
0x200A	SINT16	R	0.1%	0	100	Battery charge percent.
0x200B	SINT16	R	0.1Ah	0	10000	Battery charge capacity.
0x2010	UINT16	R	1cycle	0	65535	Boot cycles.
0x2020	UINT32	R	1h	0	500000	Operating time.
0x2022	UINT32	R	1h	0	500000	Battery operating time.

Address	Type	R/W	Unit	Min.	Max.	Description
Commands						
0x3000	BIT	W	1	0	1	Perform Ri measurement.
0x3001	BIT	W	1	0	1	Shutdown.
0x3002	BIT	W	1	0	1	Reset device.
0x3003	BIT	W	1	0	1	Battery cycle start
0x3004	BIT	W	1	0	1	Battery cycle stop
0x3005	BIT	W	1	0	1	Delayed device shutdown
0x3006	BIT	W	1	0	1	Delayed device reset
State						
0x4000	BIT	R	1	0	1	Battery charging.
0x4001	BIT	R	1	0	1	Battery floating.
0x4002	BIT	R	1	0	1	Battery discharging.
0x4010	BIT	R	1	0	1	Battery disconnected.
0x4011	BIT	R	1	0	1	Battery Ri too high.
0x4012	BIT	R	1	0	1	Battery under temperature.
0x4013	BIT	R	1	0	1	Battery over temperature.
0x4014	BIT	R	1	0	1	Battery lifetime elapsed.
0x4015	BIT	R	1	0	1	Battery charge failure.
0x4016	BIT	R	1	0	1	Battery SoC < 25%.
0x4017	BIT	R	1	0	1	Battery over discharge current.
0x4018	BIT	R	1	0	1	Battery low.
0x4019	BIT	R	1	0	1	Battery deep discharged.
0x4020	BIT	R	1	0	1	USB powered.
0x4021	BIT	R	1	0	1	Cold start.
0x4022	BIT	R	1	0	1	PC shutdown.
0x4023	BIT	R	1	0	1	PC power off.
0x4024	BIT	R	1	0	1	External temperature sensor presence.
0x4025	BIT	R	1	0	1	Inhibit.
0x4026	BIT	R	1	0	1	Output disabled.
0x4027	BIT	R	1	0	1	Auxiliary output disabled.
0x4028	BIT	R	1	0	1	UPS not ready
0x4029	BIT	R	1	0	1	UPS near empty
0x402A	BIT	R	1	0	1	Battery cycle active
0x4030	BIT	R	1	0	1	Backup.
0x4031	BIT	R	1	0	1	Input under voltage.
0x4032	BIT	R	1	0	1	Input over voltage.

Address	Type	R/W	Unit	Min.	Max.	Description
0x4033	BIT	R	1	0	1	Output under voltage.
0x4034	BIT	R	1	0	1	Output over voltage.
0x4035	BIT	R	1	0	1	Output overload.
0x4036	BIT	R	1	0	1	Input over current.
0x4037	BIT	R	1	0	1	Auxiliary output overload.
0x4038	BIT	R	1	0	1	External temperature sensor error.
0x4039	BIT	R	1	0	1	Backup time left < 25%.
0x403A	BIT	R	1	0	1	Warning over temperature.
0x403B	BIT	R	1	0	1	Error over temperature.
0x403C	BIT	R	1	0	1	Output short circuit
0x403D	BIT	R	1	0	1	Internal Failure

2.3 MODBUS Settings

Modbus address	
Default value	1
Range	1..247
Resolution	1
Unit	N/A
LCD name	Modbus address
Modbus address	0x1000

The Modbus slave address for the device.
The same address is used for USB and RS485 connection.

Modbus baudrate	
Default value	38400
Values (Modbus value)	9600 (1), 19200 (2), 38400 (3), 57600 (4), 115200 (5)
Unit	N/A
LCD name	Modbus baudrate
Modbus address	0x1001

The Modbus slave address for the device.
The same address is used for USB and RS485 connection.

Modbus paraty	
Default value	Even
Values (Modbus value)	None (1), Even (2), Odd (3)
Unit	N/A
LCD name	Modbus parity
Modbus address	0x1002

The parity for Modbus over RS485 serial port. Available values are None, Even, Odd.

Modbus stop bits	
Default value	1
Range	1, 2
Resolution	1
Unit	N/A
LCD name	Modbus stop bits
Modbus address	0x1003
The parity for Modbus over RS485 serial port.	

Battery type	
Default value	Pb
Values (Modbus value)	Lead (1), Nickel (2), Lithium (3), SuperCap (4)
Unit	N/A
LCD name	Bat. type
Modbus address	0x1010
Defines the type of battery connected to the device. See DUSH user manual for details about the different charging algorithms.	

Battery charge voltage	
Default value	10V
Range	10 .. 58V
Resolution	0.1V
Unit	Volts
LCD name	Bat. charge U
Modbus address	0x1011
The maximum voltage applied to the battery while charging. See DUSH user manual for details about the use of this parameter on the different charging algorithms.	

Battery charge current	
Default value	0.5A
Range	0.5 .. 20A
Resolution	0.1A
Unit	Amperes
LCD name	Bat. charge I
Modbus address	0x1012
The maximum current sourced to the battery while charging. See DUSH user manual for details about the use of this parameter on the different charging algorithms.	

Battery float voltage	
Default value	10V
Range	10 .. 58V
Resolution	0.1V
Unit	Volts
LCD name	Bat. float U
Modbus address	0x1013

Battery float voltage
The maximum voltage applied to the battery once it's fully charged. See DUSH user manual for details about the use of this parame-ter on the different charging algorithms.

Battery low voltage	
Default value	5V
Range	5 .. 58V
Resolution	0.1V
Unit	Volts
LCD name	Bat. low U
Modbus address	0x1014
Threshold for "Battery low" alarm.	

Battery deep discharge voltage	
Default value	5V
Range	5 .. 58V
Resolution	0.1V
Unit	Volts
LCD name	Bat. deep disch. U
Modbus address	0x1015
Threshold for the "Battery deep discharge" alarm.	

Battery max. discharge current	
Default value	21A
Range	5 .. 21A
Resolution	0.1A
Unit	Amperes
LCD name	Bat. max. disch. I
Modbus address	0x1016
During backup the DUSH limits the maximum discharge current to this value reducing the output voltage if necessary.	

Battery capacity | Supercap capacitance	
Default value	1Ah or 1F
Range	1 .. 1000Ah or F
Resolution	0.1Ah or F
Unit	Ampee hours or Farad
LCD name	Bat. capacity
Modbus address	0x1017
Nominal capacity (Ah) of the installed battery or capacitance (F) in case a Supercapacitor is installed. This parameter is used to calculate the battery State of Charge (SoC) during charge and discharge.	

Battery min. temperature	
Default value	-40°C
Range	-40 .. 60°C
Resolution	1°C
Unit	Degree celsius
LCD name	Bat. min. T
Modbus address	0x1018
Threshold for the “Battery under temperature” alarm.	

Battery max. temperature	
Default value	60°C
Range	-40 .. 60°C
Resolution	1°C
Unit	Degree celsius
LCD name	Bat. max. T
Modbus address	0x1019
Threshold for the “Battery over temperature” alarm.	

Battery lifetime	
Default value	100kh
Range	1 .. 100kh
Resolution	1kh
Unit	Kilo hours
LCD name	Bat. lifetime
Modbus address	0x101A
Threshold for the “Battery lifetime elapsed” alarm.	

Ri alarm mode	
Default value	Disabled
Values (Modbus value)	Disabled (0), Fixed (1), Automatic (2), Auto. Done (3)
Unit	N/A
LCD name	Ri mode
Modbus address	0x101B
Mode of operation for the “Battery Ri too high” alarm.	

Ri nom.	
Default value	1mΩ
Range	1 .. 300mΩ
Resolution	0.1mΩ
Unit	mΩ
LCD name	Ri nominal
Modbus address	0x101C
Used for the threshold calculation of the “Battery Ri too high” alarm.	
Ri max. variation	
Default value	300%
Range	50 .. 300%
Resolution	1%
Unit	Percent
LCD name	Ri max. variation
Modbus address	0x101D
Used for the threshold calculation of the “Battery Ri too high” alarm.	

Nominal output voltage	
Default value	10V
Range	10 .. 58V
Resolution	0.1V
Unit	Volts
LCD name	Output nominal U
Modbus address	0x1021
DUSH enters backup mode when the output voltage drops below 90% of the nominal value, it is also the regulated output voltage during backup.	

Max. input current	
Default value	20A
Range	1 .. 21A
Resolution	0.1A
Unit	Amperes
LCD name	Max. input I
Modbus address	0x1022
DUSH limits the maximum input current to this value reducing the battery charging current if necessary.	

Max. output current	
Default value	20A
Range	5 .. 21A
Resolution	0.1A
Unit	Amperes
LCD name	Max. output I
Modbus address	0x1023
DUSH limits the maximum output current to this value reducing the output voltage if necessary.	

Max. backup time enable	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	Backup time enable
Modbus address	0x1024
If enabled the DUSH shuts down if the backup last more than the “Max. backup time” value.	
Max. backup time	
Default value	1440min
Range	1 .. 1440min
Resolution	1min
Unit	Minutes
LCD name	Back. time max
Modbus address	0x1025
If “Max. Backup time enable” field is enabled the DUSH shuts down if the backup last more than the specified amount of time.	

Buzzer enable (only -0M)	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	Buzzer enable
Modbus address	0x1026
Enable/Disable buzzer sound in case of alarm.	

Relay 1 configuration	
Default value	Normally open, Bat. life time, Bat. Ri too high, Bat. Charge failure
Flags (bit)	Normally open (0), Backup (1), Soc < 25% (2), Bat. life time (3), Bat. Ri too high (4), Bat. Low (5), Bat. Disconnected (6), Bat. charge failure (7), Backup left < 25% (8), UPS not ready (9), UPS empty (10)
Unit	N/A
LCD name	Relay 1
Modbus address	0x1027

This field defines the behavior of relay 1 as follows:

Normally open	1 or more enabled state active	Relay contact status
True	No	Open
True	Yes	Closed
False	No	Closed
False	Yes	Open

Relay 2 configuration	
Default value	Normally open, Bat. life time, Bat. Ri too high, Bat. Charge failure
Flags (bit)	Normally open (0), Backup (1), Soc < 25% (2), Bat. life time (3), Bat. Ri too high (4), Bat. Low (5), Bat. Disconnected (6), Bat. charge failure (7), Backup left < 25% (8), UPS not ready (9), UPS empty (10)
Unit	N/A
LCD name	Relay 2
Modbus address	0x1028

This field defines the behavior of relay 2 (see “Relay 1 configuration”).

Inhibit polarity	
Default value	High
Values (Modbus value)	Low (1), High (2)
Unit	N/A
LCD name	Inhibit polarity
Modbus address	0x1029

Selects the active polarity of the inhibit input. See DUSH user manual for more information about the inhibit function.

Output enable	
Default value	Enabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	Output enable
Modbus address	0x102B

Enable/Disable output.

Auxiliary output enable	
Default value	Enabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	Aux enable
Modbus address	0x102C
Enable/Disable auxiliary output.	

Cold start on inhibit toggle	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	CS on inhibit
Modbus address	0x102D
Enable/Disable the cold start on inhibit toggle as explained in the DUSH user manual.	

Cold start on battery connection	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	CS on battery
Modbus address	0x102E
Enable/Disable the cold start on battery connection as explained in the DUSH user manual.	

PC shutdown enable	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	PC shutdown enable
Modbus address	0x1030
See DUSH user manual	

PC automatic restart enable	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	PC restart enable
Modbus address	0x1031
See DUSH user manual	

PC shutdown delay	
Default value	3600s
Range	1 .. 3600s
Resolution	1s
Unit	Seconds
LCD name	PC shutdown delay
Modbus address	0x1032
See DUSH user manual	

PC shutdown time	
Default value	600s
Range	1 .. 600s
Resolution	1s
Unit	Seconds
LCD name	PC shutdown time
Modbus address	0x1033
See DUSH user manual	

PC restart minimum time	
Default value	1s
Range	1 .. 60s
Resolution	1s
Unit	Seconds
LCD name	PC restart time
Modbus address	0x1034
See DUSH user manual	

PC off detection current threshold	
Default value	0A
Range	0 .. 20A
Resolution	0.1A
Unit	Amperes
LCD name	PC OFF I
Modbus address	0x1035
See DUSH user manual	

PC off detection timer	
Default value	1s
Range	1 .. 60s
Resolution	1s
Unit	Seconds
LCD name	PC OFF time
Modbus address	0x1036
See DUSH user manual	

Blink output on backup enable	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	Blink output enable
Modbus address	0x1040
See DUSH user manual	

Blink output on backup Ton	
Default value	10s
Range	10 .. 600s
Resolution	1s
Unit	Seconds
LCD name	Blink out Ton
Modbus address	0x1041
See DUSH user manual	

Blink output on backup Toff	
Default value	0.2s
Range	0.1 .. 60s
Resolution	0.1s
Unit	Seconds
LCD name	Blink out Toff
Modbus address	0x1042
See DUSH user manual	

Output short circuit latch enable	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	Out SC latch enable
Modbus address	0x1043
When enable the device disables the output when a short circuit is detected on the output. To restart the output the operator must press the “OK” button from the front panel.	

Output short circuit detection voltage threshold	
Default value	3V
Range	3 .. 58V
Resolution	0.1V
Unit	Volts
LCD name	Out SC detection th
Modbus address	0x1044
By default the output short circuit is detected only if the residual voltage on the output pins is < 3V. In some application where long cables are connected to the output, if a short circuit is applied at the end of the cable, the residual voltage on the connector may be > 3V. In this case, increasing the detection threshold, ensures the short circuit is detected.	

Output short circuit detection voltage threshold	
High inrush load enable	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	High inrush enable
Modbus address	0x1045
When enable, the unit send a higher current pulse when the output is switched on, to withstand loads with a high start-up inrush current.	

UPS not ready SoC threshold	
Default value	90%
Range	10 .. 90%
Resolution	1%
Unit	Percent
LCD name	Not ready SoC th
Modbus address	0x1046
Sets the State of Charge threshold for the UPS not ready signal.	

UPS near empty SoC threshold	
Default value	10%
Range	10 .. 90%
Resolution	1%
Unit	Percent
LCD name	Near empty SoC th
Modbus address	0x1047
Sets the State of Charge threshold for the UPS near empty signal.	

Lock settings	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	Lock settings
Modbus address	0x1048
When enabled, disables the possibility to modify any device setting through the device's SETTING menu apart itself. The shortcut for toggle the value of this field is keep pressed at the same time the ⇧ (Up) and ⇩ (Down) buttons for at least 3 seconds when you are into the SETTINGS menu.	

Delayed device shutdown time	
Default value	60s
Range	1 .. 60s
Resolution	1s
Unit	Seconds
LCD name	Delayed shdn time
Modbus address	0x1049
Specifies the time delay between the shutdown command and its execution.	

Delayed device reset time	
Default value	60s
Range	1 .. 600s
Resolution	1s
Unit	Seconds
LCD name	Delayed reset time
Modbus address	0x104A
Specifies the time delay between the reset command and its execution.	

Backup start threshold	
Default value	90%
Range	80 .. 95%
Resolution	1%
Unit	Percent
LCD name	Backup start th
Modbus address	0x104B
Specifies the input voltage, expressed as percentage of output nominal voltage, at which the backup starts.	

Backup cycle	
Default value	Disabled
Values (Modbus value)	Disabled (0), Enabled (1)
Unit	N/A
LCD name	Battery cycle
Modbus address	0x1050
When enabled the device schedules and activates an periodic battery discharge based on day of week, time, and periodicity.	

Backup cycle every	
Default value	1 week
Range	1 .. 52 weeks
Resolution	1 week
Unit	Weeks
LCD name	Battery cycle every
Modbus address	0x1051
Periodicity in weeks of the battery cycle.	

Backup cycle day	
Default value	Disabled
Values (Modbus value)	Monday (1), Tuesday (2), Wednesday (3), Thursday (4), Friday (5), Saturday (6), Sunday(7)
Unit	N/A
LCD name	Battery cycle day
Modbus address	0x1052
Specifies on which day of the week the battery cycle should be performed.	

Backup cycle time	
Default value	6h
Range	0 .. 23h
Resolution	1h
Unit	Hours
LCD name	Battery cycle time
Modbus address	0x1053

Specifies at which hour of the day the battery cycle should be performed.

Backup cycle minute	
Default value	0min
Range	0 .. 59min
Resolution	1min
Unit	Minutes
LCD name	Battery cycle time
Modbus address	0x1054

Specifies at which minute of the hour the battery cycle should be performed.

Backup cycle SoC threshold	
Default value	75%
Range	0 .. 90%
Resolution	1%
Unit	Percent
LCD name	Battery cycle SoC th
Modbus address	0x1055

Specifies at which state of charge the battery cycle must be stopped.

Backup cycle time threshold	
Default value	5min
Range	1 .. 1440min
Resolution	1min
Unit	Minutes
LCD name	Battery cycle time th
Modbus address	0x1056

Specifies after how many minutes from start the battery cycle must be stopped.

Backup installation date	
Default value	1st January 2000
Range	from 1st January 2000 to 31st December 2099
Unit	N/A
LCD name	Bat. installation date
Modbus address	0x1100

This field is used to compute the battery lifetime. If the battery lifetime exceeds the “Battery lifetime” value, the “Battery lifetime elapsed” alarm activates.

Backup charge cycles	
Default value	0
Range	0 .. 65535
Resolution	1
Unit	Cycles
LCD name	Bat. charge cycles
Modbus address	0x1104

The value increments automatically at the end of a battery charge cycle.

2.4 Info

Firmware version	
LCD name	FW version
Modbus	Device identification Object ID 0x02
3.3 digit indicating the firmware major minor version.	

Firmware subversion	
LCD name	FW subversion
Modbus	Device identification Object ID 0x80
3 digit indicating the firmware subversion.	

Build date	
LCD name	FW subversion
Modbus	Device identification Object ID 0x82
Firmware build date.	

Build time	
LCD name	FW subversion
Modbus	Device identification Object ID 0x83
Firmware build time.	

Serial number	
LCD name	FW subversion
Modbus	Device identification Object ID 0x81
Device serial number.	

Boot cycles	
LCD name	FW subversion
Modbus address	0x2010
Counter of power ON cycles.	

Operating time	
LCD name	FW subversion
Modbus address	0x2020
DUSH operating hour counter.	

Battery operating time	
LCD name	FW subversion
Modbus address	0x2022
Hours elapsed since the “**Fehler! Verweisquelle konnte nicht gefunden werden.**” (2.2.59).	

2.5 Logs

Battery charging	
LCD name	Bat charging
Modbus address	0x4000
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when the battery is charging.	

Battery floating	
LCD name	Bat floating
Modbus address	0x4001
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when the battery is fully charged.	

Battery discharging	
LCD name	Bat discharging
Modbus address	0x4002
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when the battery is discharging.	

Battery cycle active	
LCD name	Battery cycle active
Modbus address	0x4003
Value 1	Ended (0), Started (1)
Value 2	Status 0 → 1: Battery voltage at battery cycle start Status 1 → 0: Minimum battery voltage during battery cycle
Active when a battery cycle is in progress.	

USB powered	
LCD name	USB powered
Modbus address	0x4020
Value 1	Inactive (0), Active (1)
Value 2	Not used
DUSH is powered by USB only.	

Cold start	
LCD name	Cold start
Modbus address	0x4021
Value 1	Inactive (0), Active (1)
Value 2	Not used
DUSH has powered ON through cold start (see DUSH user manual).	

PC shutdown	
LCD name	PC shutdown
Modbus address	0x4022
Value 1	Inactive (0), Active (1)
Value 2	Not used
Command to shutdowns the PC (see DUSH user manual).	

PC power off	
LCD name	PC power OFF
Modbus address	0x4023
Value 1	Inactive (0), Active (1)
Value 2	Not used
Command to power OFF the PC (see DUSH user manual), DUSH output switches OFF.	

External temperature sensor presence	
LCD name	Ext. T sensor presence
Modbus address	0x4024
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active if the optional external temperature sensor is connected.	

Inhibit	
LCD name	Inhibit
Modbus address	0x4025
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active if the inhibit input signal is asserted (see DUSH user manual).	

Output disabled	
LCD name	Output disabled
Modbus address	0x4026
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active if the output is disabled in settings.	

Auxiliary output disabled	
LCD name	Aux disabled
Modbus address	0x4027
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active if the auxiliary output is disabled in settings.	

2.6 Alarms

Battery disconnected	
LCD name	Bat. disconnected
Modbus address	0x4010
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when no battery is detected by DUSH. The detection of the battery disconnection can take up to 40s when the battery is in charging state and up to 20s when the battery is in float state.	

Battery Ri too high	
LCD name	Bat. Ri too high
Modbus address	0x4011
Value 1	Inactive (0), Active (1)
Value 2 (Milli ohm)	Status 0 → 1: Offending threshold Status 1 → 0: Max. measured value
Active when measured battery internal resistance exceed the alarm threshold (see DUSH user manual).	

Battery under temperature	
LCD name	Bat. under temperature
Modbus address	0x4012
Value 1	Inactive (0), Active (1)
Value 2 (Degree Celsius)	Status 0 → 1: Offending threshold Status 1 → 0: Min. measured value
Active when the battery measured temperature (using the optional external sensor) is under the threshold specified in “Battery min. temperature” field. If active the battery charged is disabled.	

Battery over temperature	
LCD name	Bat. over temperature
Modbus address	0x4013
Value 1	Inactive (0), Active (1)
Value 2 (Degree Celsius)	Status 0 → 1: Offending threshold Status 1 → 0: Max. measured value
Active when the battery measured temperature (using the optional external sensor) exceed the threshold specified in “Battery max. temperature” field. If active the battery charged is disabled.	

Battery lifetime elapsed	
LCD name	Modbus address
Modbus address	0x4014
Value 1	Inactive (0), Active (1)
Value 2	Status 0 → 1: Offending threshold Status 1 → 0: Max. calculated value
Active when the actual calculated battery lifetime exceeds the threshold specified in “Battery lifetime” field.	

Battery charge failure	
LCD name	Bat. charge fail
Modbus address	0x4015
Value 1	Inactive (0), Active (1)
Value 2	Not used

Active when DUSH could not charge the battery correctly. When active, the battery charger is disabled. Disconnect the battery to reset the alarm.

Battery SoC <25%	
LCD name	Bat. SoC < 25%
Modbus address	0x4016
Value 1	Inactive (0), Active (1)
Value 2	Not used

Active when the battery State of Charge is under 25% of the nominal full charge capacity.

Battery over discharge current	
LCD name	Bat. over discharge I
Modbus address	0x4017
Value 1	Inactive (0), Active (1)
Value 2 (Amperes)	Status 0 → 1: Offending threshold Status 1 → 0: Max. measured value

Active when the measured battery discharge current reaches the threshold specified in “Battery max. discharge current” field.

Battery low	
LCD name	Bat. low
Modbus address	0x4018
Value 1	Inactive (0), Active (1)
Value 2 (Volts)	Status 0 → 1: Offending threshold Status 1 → 0: Min. measured value

Active when the measured battery voltage is under the threshold specified in “Battery low voltage” field .

Battery disconnected	
LCD name	Bat. disconnected
Modbus address	0x4010
Value 1	Inactive (0), Active (1)
Value 2	Not used

Active when no battery is detected by DUSH.
The detection of the battery disconnection can take up to 40s when the battery is in charging state and up to 20s when the battery is in float state.

Battery deep discharge	
LCD name	Bat. deep discharge
Modbus address	0x4019
Value 1	Inactive (0), Active (1)
Value 2 (Volts)	Status 0 → 1: Offending threshold Status 1 → 0: Min. measured value
Active when the battery measured voltage is under the threshold specified in “Battery deep discharge voltage” field.	

Backup	
LCD name	Backup
Modbus address	0x4030
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when the system is in backup (DUSH user manual).	

Input under voltage	
LCD name	Input under voltage
Modbus address	0x4031
Value 1	Inactive (0), Active (1)
Value 2 (Volts)	Status 0 → 1: Offending threshold Status 1 → 0: Min. measured value
Active when the measured input voltage is under 90% of the “Nominal output voltage” field.	

Input over voltage	
LCD name	Input over voltage
Modbus address	0x4032
Value 1	Inactive (0), Active (1)
Value 2 (Volts)	Status 0 → 1: Offending threshold Status 1 → 0: Min. measured value
Active when the measured input voltage exceeds 120% of the “Nominal output voltage” field.	

Output under voltage	
LCD name	Output under voltage
Modbus address	0x4033
Value 1	Inactive (0), Active (1)
Value 2 (Volts)	Status 0 → 1: Offending threshold Status 1 → 0: Min. measured value
Active when the measured output voltage is under 90% of the “Nominal output voltage” field.	

Output over voltage	
LCD name	Output over voltage
Modbus address	0x4034
Value 1	Inactive (0), Active (1)
Value 2 (Volts)	Status 0 ⟶ 1: Offending threshold Status 1 ⟶ 0: Min. measured value
Active when the measured output voltage exceeds 120% of the “Nominal output voltage” field.	

Output overload	
LCD name	Output overload
Modbus address	0x4035
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when the measured output current reaches the threshold specified in “Max. output current” field.	

Input over current	
LCD name	Input over current
Modbus address	0x4036
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when the measured input current reaches the threshold specified in “Max. input current” field.	

Auxiliary output overload	
LCD name	Aux overload
Modbus address	0x4037
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when an excessive load is detected on the auxiliary output.	

External temperature sensor error	
LCD name	Ext. T sensor error
Modbus address	0x4038
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when the external temperature sensor is not connected while it’s use is mandatory like in NiMh battery charging.	

Backup time left <25%	
LCD name	Backup time left < 25%
Modbus address	0x4039
Value 1	Inactive (0), Active (1)
Value 2	Not used
Active when the system is in backup and the maximal backup time is less than the “Max. backup time” filed.	

Warning over temperature	
LCD name	Warn. over temperature
Modbus address	0x403A
Value 1	Inactive (0), Active (1)
Value 2	Not used

Active when the internal temperature is high. If the temperature increases more the device may switch OFF.

Error over temperature	
LCD name	Error over temperature
Modbus address	0x403B
Value 1	Inactive (0), Active (1)
Value 2	Not used

Active when the internal temperature is too high. To prevent damage the device switches OFF.

Output short circuit	
LCD name	Output short circuit
Modbus address	0x403C
Value 1	Inactive (0), Active (1)
Value 2	Not used

Active when a short circuit is detected on the output.

Internal failure	
LCD name	Internal failure
Modbus address	0x403D
Value 1	Inactive (0), Active (1)
Value 2	Internal fail code

Active when an internal failure is detected.

2.7 Events

Power ON event	
LCD name	Power ON
Modbus address	0xE000
Value 1	Power ON count
Value 2	Not used
Generated at every time the DUSH is turned ON.	

Shutdown event	
LCD name	Shutdown
Modbus address	0xE001
Value 1	Shutdown count
Value 2	Shutdown reason: 1 - Deep discharge 2 - Max. backup time elapsed 3 - Shutdown command 4 - Reset command 5 - Inhibit signal 6 - Power down
Generated at every time the DUSH is turned OFF.	

Battery cycle triggered by	
LCD name	Bat. cycle triggered by
Modbus address	0xE002
Value 1	Schedule (0), User (1)
Value 2	Not used
Schedule (0) if the battery cycle is started automatically on scheduled date/time, User (1) if the battery cycle is started by user.	

Battery cycle ended by	
LCD name	Bat. cycle ended by
Modbus address	0xE003
Value 1	State of charge (1), Time limit (2), Input UV (3), Battery in charge (4), User (5)
Value 2	Not used
Specifies the cause/reason of battery cycle ending	State of charge: Battery cycle ended at specified state of charge Time limit: Battery cycle ended after specified time Input UV: Battery cycle end caused by the input under voltage Battery in charge: Batt. cycle ended because battery is charging User: Battery cycle stopped by user

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