*DL3000 – Modbus*

DL3000 – modbus

The DL3000 modbus is industrial FAT32 SD card data logger for RS - 485 modbus interface. Developed to be compatible with the VW 80 000 and VW 801 01 standards the device provides ideal solution for saving data from industrial gen-set and engine drive applications. Every logged value can be protected for under or over limit with corresponding binary output action.
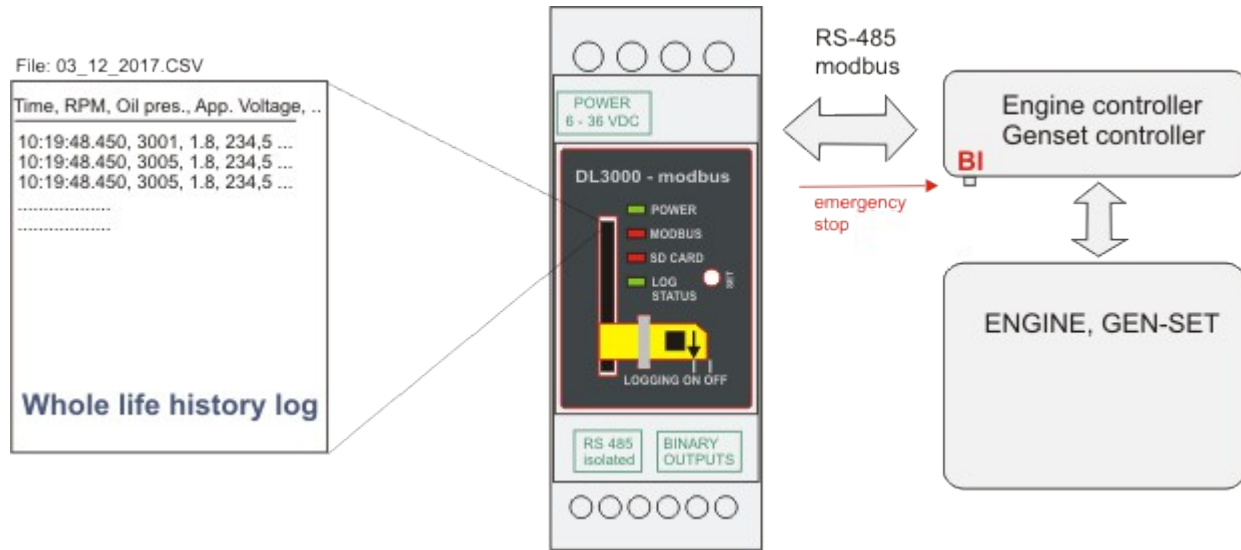
Features:
- **Precise RTC clock for backward analyses in low cost applications without RTC**
- **Whole life history log of your application for easy warranty claims in the case of application failure**
- **Window protections (both low and high level) for any logged value with corresponding binary output setting action**
- **FAT32 SD card format provides folders, files data structure immediately visible in any PC OS (Windows, Linux, ..) with common micro USB cable**
- **No other HW tool for device setting, after connection with cabel the device acts as the external hard drive (mass storage device), configuration file is edited on the disk**
- **Robust automotive design - developed to be compatible with VW 80 000, VW 801 01 standards**
- **Data logging from up to 4 modbus slave devices**
- **Working with all common commercial SD cards witch capacity up to 32 GB (SD, SDHC)**
- **New FW automatic re-flashing function**

Applications:
- **protecting of gen-sets, pumps, engine drive applications etc. ..**
- **marine applications**

Table of content:

Document revisions:

Date	Comment
16/01/17	First release

Typical application – two modbus slaves:

The logger continusly read and log data from the modbus slaves devices with the precise time marks. Files are named with the date format (example: 03_12_17.CSV) and are stored in the corresponding folders (SLAVE1, SLAVE2, ..).

Each logged value of any slave can also be protected for over and under limit with the adjustable time delay. When alarm for the overlimit or underlimit is activated corresponding binary outputs are set.
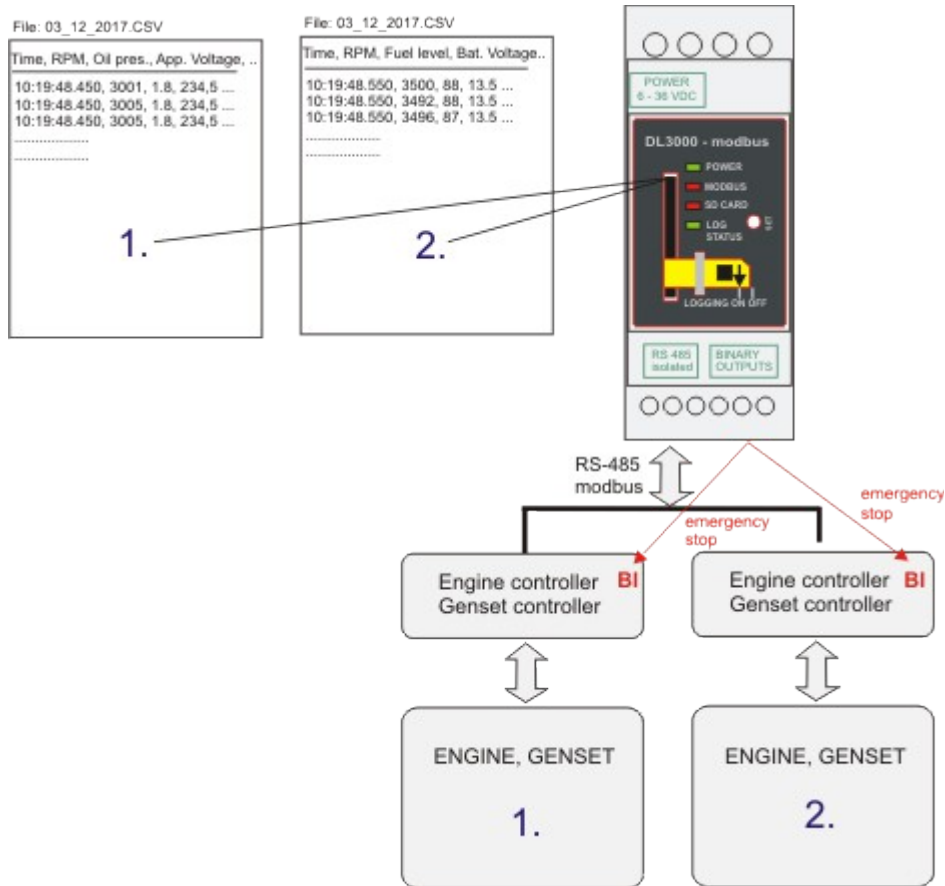
Product description – wiring diagram:

Wiring example with 2 slaves on the bus.

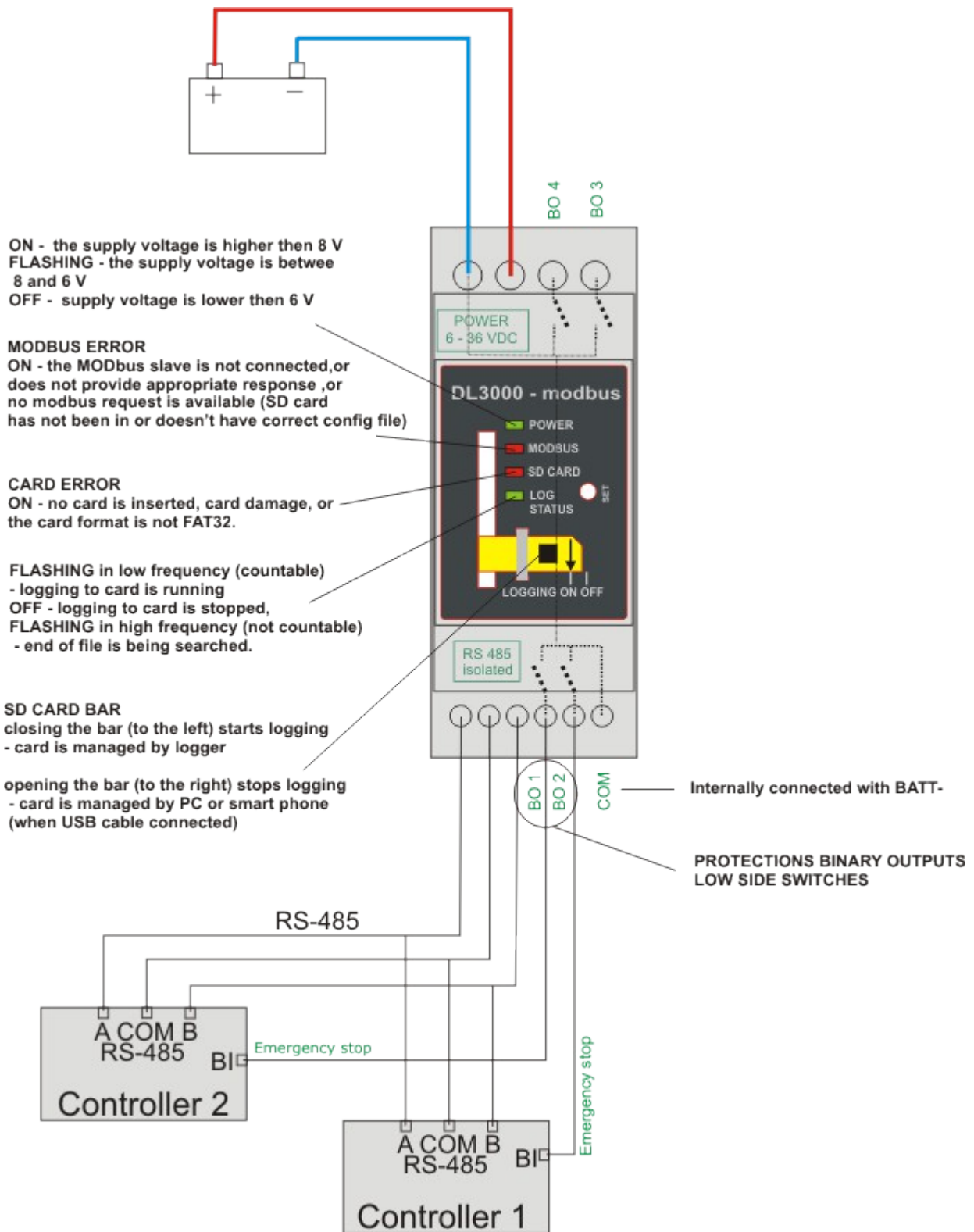ON - the supply voltage is higher then 8 V
FLASHING - the supply voltage is betwee
 8 and 6 V
OFF - supply voltage is lower then 6 V

MODBUS ERROR
ON - the MODbus slave is not connected,or
does not provide appropriate response ,or
no modbus request is available (SD card
has not been in or doesn't have correct config file)

CARD ERROR
ON - no card is inserted, card damage, or
the card format is not FAT32.

FLASHING in low frequency (countable)
- logging to card is running
OFF - logging to card is stopped,
FLASHING in high frequency (not countable)
 - end of file is being searched.

SD CARD BAR
closing the bar (to the left) starts logging
- card is managed by logger

opening the bar (to the right) stops logging
- card is managed by PC or smart phone
(when USB cable connected)

Internally connected with BATT-

PROTECTIONS BINARY OUTPUTS
LOW SIDE SWITCHES

POWER
6 - 36 VDC

DL3000 - modbus

POWER
MODBUS
SD CARD
LOG
STATUS
SET

LOGGING ON OFF

RS 485
isolated

BO 4
BO 3
BO 1
BO 2
COM

RS-485

A COM B
RS-485
BI
Emergency stop
Controller 2

A COM B
RS-485
BI
Emergency stop
Controller 1

Basic functionality – data management:

As the file system on the card is FAT32, depending of the position of card bar, the card is controlled either with:
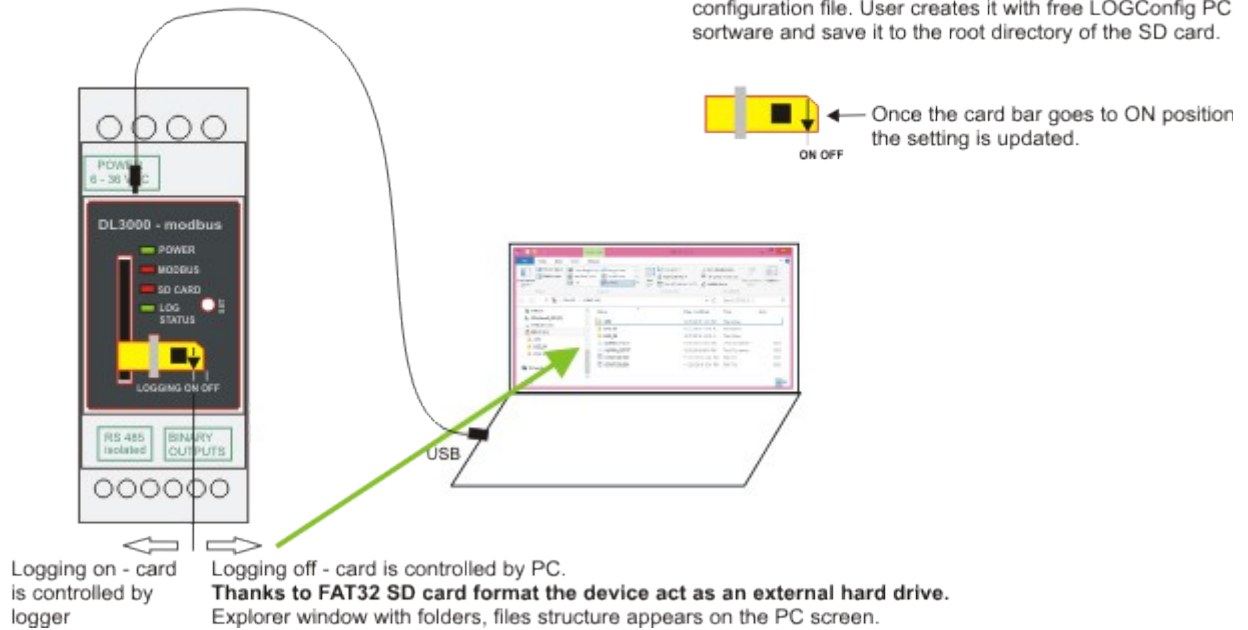
- PC (logging off, bar on the right side)
- with the logger (logging on, bar on the left side)

When none USB cable is available, the card can be removed and read directly in any laptop, PC.

Controlling of the SD card content

Setting of the device

Setting of all adjustable parameters is done through configuration file. User creates it with free LOGConfig PC sortware and save it to the root directory of the SD card.

Once the card bar goes to ON position the setting is updated.

ON OFF

POWER
6 - 36 V DC

DL3000 - modbus

- POWER
- MODBUS
- SD CARD
- LOG STATUS

LOGGING ON OFF

| RS 485 isolated | BINARY OUTPUTS |

USB

Logging on - card is controlled by logger

Logging off - card is controlled by PC.
Thanks to FAT32 SD card format the device act as an external hard drive.
Explorer window with folders, files structure appears on the PC screen.

Note: For USB connection any conventional micro USB (mobile phone cable) cable can be used.

Setting of the logger:

When the card bar is in OFF position (on the right side) and the USB cable is connected:

- Create configuration file (CONFIG.BIN) in the LogConfig PC software
- Re-write configuration file (CONFIG.BIN) in the root directory of the SD card with your file

After switching the card bar to ON position, the configuration file is read by logger and the setting is updated.

Creating configuration file with Log config PC SW:

List of adjustable parameters in configuration file:
Tab general:

Parameter on the tab general:	Description
Number of slaves connected on the bus (number of configuration files):	• 1 – 4
Slave addresses:	Slave addresses connected on the bus. Each slave must have its unique address. • 1 - 32
RS-485 Baud rate:	Baud rate for RS-485 bus communication. • 9600 kbit/s • 19200 kbit/s (default value) • 38400 kbit/s • 57600 kbit/s
Time zone:	Time zone for system time. User should set it based on the current location. • GMT +- 12 (default value = GMT + 1)
Automatic switch to summer time:	• enabled • disabled (default value)
Date:	Parameter allowing system time edit from the SD card. Note: For system time edit from the SD card the parameter value set button for time set must be set to enabled.
Time:	Parameter allowing system time edit from the SD card. Note: for system time edit from the SD card the parameter value set button for time set must be set to enabled.
Logging period (time stamp):	Period of modbus data logging to the log files. It can be set as different value for each slave. • 1 – 60 s (default value = 1s)
Answer requests gap:	Minimum time gap in ms between received modbus slave answer and next modbus request - the same value for all slaves. • default value: 5 ms
New file creation frequency:	• new file each day (default value) • new file each week • new file each month
Set button for time set:	After setting to value enabled, the SET button function change from geo fencing setting to editing of system time from the CARD values. • enabled • disabled (default value)
BOUT assigned to CONFIG0X.BIN:	Binary output assigned to each slave (config file).

	• Default assignment: ○ CONFIG01.BIN → BO1 ○ CONFIG02.BIN → BO2 ○ CONFIG03.BIN → BO3 ○ CONFIG04.BIN → BO4
NO/NC:	Normally closed, normally open parameter for each binary output. ○ CONFIG01.BIN → NC ○ CONFIG02.BIN → NC ○ CONFIG03.BIN → NC ○ CONFIG04.BIN → NC
Starting RPM for protections:	Can be set for each modbus slave. • 2000 RPM (default value)

Tab specific for creation of each config file:
Vlozit obrazek (print screen) karty CONFIGXX.BIN s popisy v obrazku.

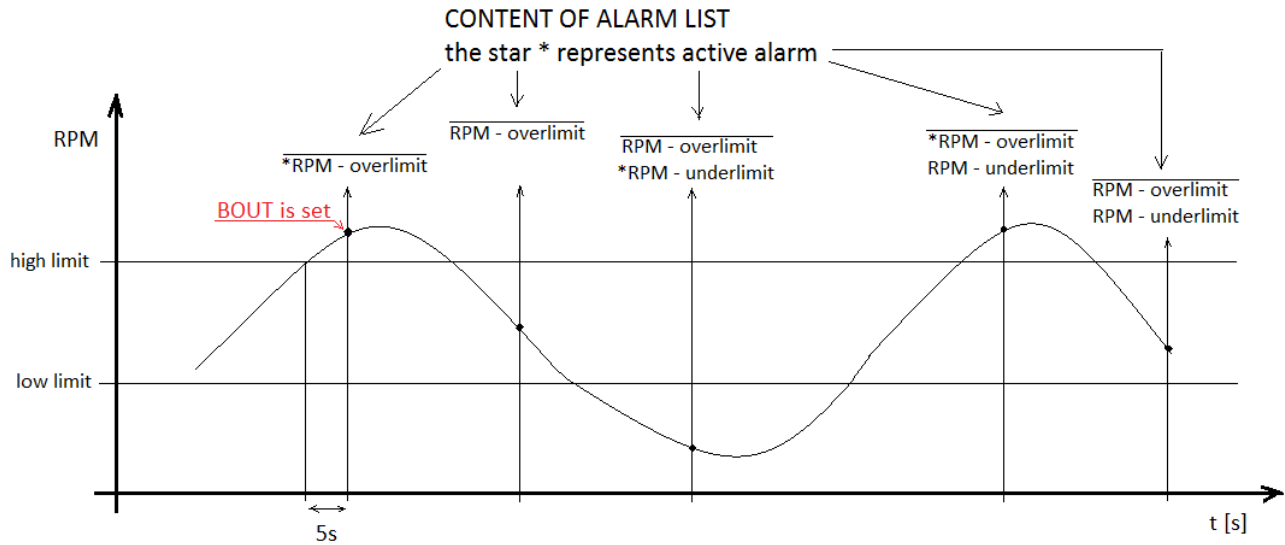## New FW automatic re-flashing function:

If there is a new FW file with the correct file name in the root directory of the SD card the device automatically re-flashes itself. Flashing of the new FW version is indicated of synchronized flashing of all LEDs with ½ second time interval.

Logged data values protections:

For each logged value a window protection (both high and low level) can be set. When the limit value is crossed for defined time the corresponding binary output is set. The user can set protected values in the Log config PC SW in configuration file. When the limit value is crossed for define time the note (alarm) appears in the alarm list (ALARM.TXT) file in the root directory of the SD card.
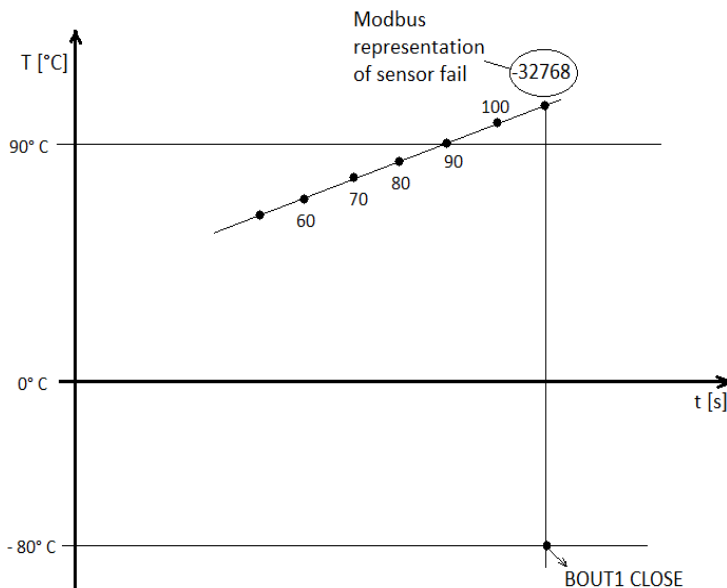
Active alarms – the actual value is still outside the limit - is represented with star, see following picture.
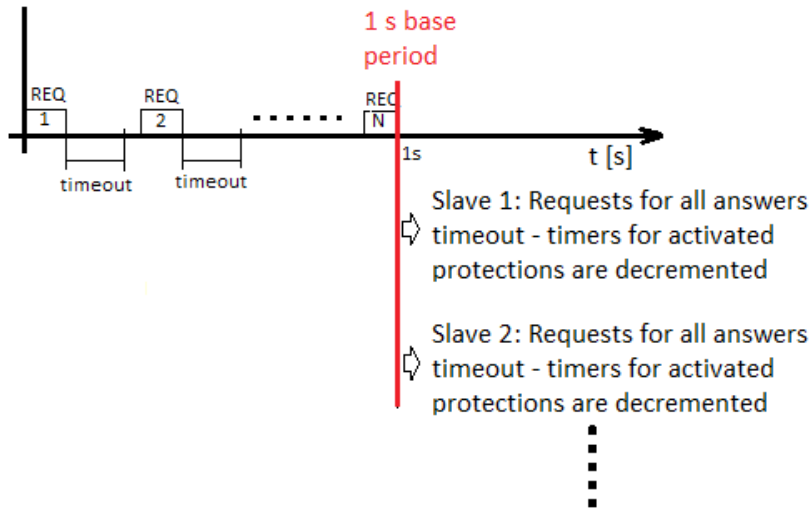
CONTENT OF ALARM LIST
the star * represents active alarm

RPM

RPM - overlimit

*RPM - overlimit

RPM - overlimit
*RPM - underlimit

*RPM - overlimit
RPM - underlimit

RPM - overlimit
RPM - underlimit

BOUT is set

high limit

low limit

5s

t [s]

Sensor fail representation on the modbus:

Some controllers can announce sensor fail on modbus interface with negative number (in spite of the fact that the value is positive and exceed the protection limit).
It's recommended to always activate windows protections (both high and low level) even if the opposite level protection is not required.
For example: the over-limit protection is required for engine temp. High limit is set to 90 degree of Celsius with 10 second delay, set the protection for low level to -80 degree of Celsius with no delay.
This will prevent the missing alarm situation when sensor fail is represented with negative number.
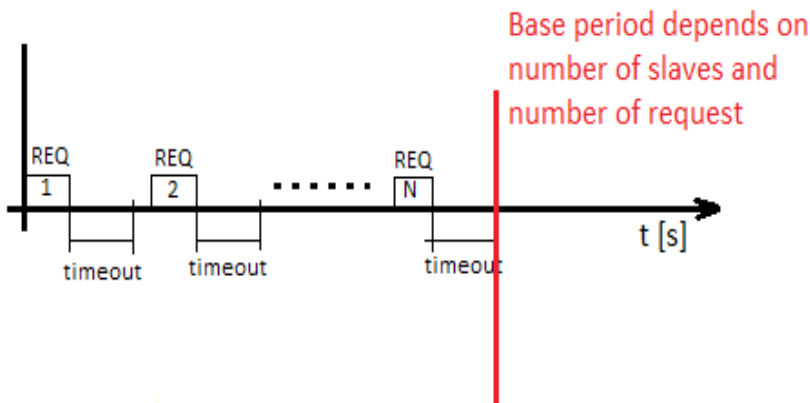Check how your controller represents the sensor fail situation on the modbus.

Modbus representation of sensor fail   -32768

T [°C]

100

90° C

90

80

70

60

0° C

t [s]

- 80° C

BOUT1 CLOSE

Different behavior with protections on and off in the case of slave answer timeout.

1 s base period

REQ 1   REQ 2   ····   REQ N

1s   t [s]

timeout   timeout

⇨ Slave 1: Requests for all answers timeout - timers for activated protections are decremented

⇨ Slave 2: Requests for all answers timeout - timers for activated protections are decremented

With protections activated:With protections disabled:

Protections are not activated
simple logger function

Base period depends on number of slaves and number of request

REQ 1   REQ 2   ····   REQ N

t [s]

timeout   timeout   timeout

Technical data:

Nominal power supply: 12, 24 VDC
Power supply range: 6 – 36 VDC (voltage under 8 V is indicated by flashing of power LED)
Power consumption: 350 mA for 12 VDC, 250 mA for 24 VDC

Temperature range: - 40 – 85 °C
RS-485 modbus interface: galvanically separated, 2 kV isolation
Binary outputs:
     BO1, BO2, BO3, BO4 – open collectors:
     maximal sink current: 1 A
     maximal switching voltage: 36 VDC

Dimensions: 90 x 65 x 35 mm
Weight: 660 g
Protection level: IP65