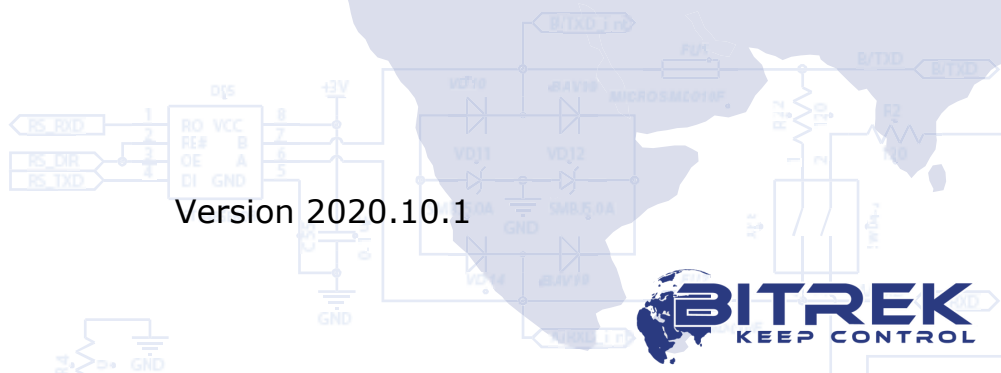


Operating manual

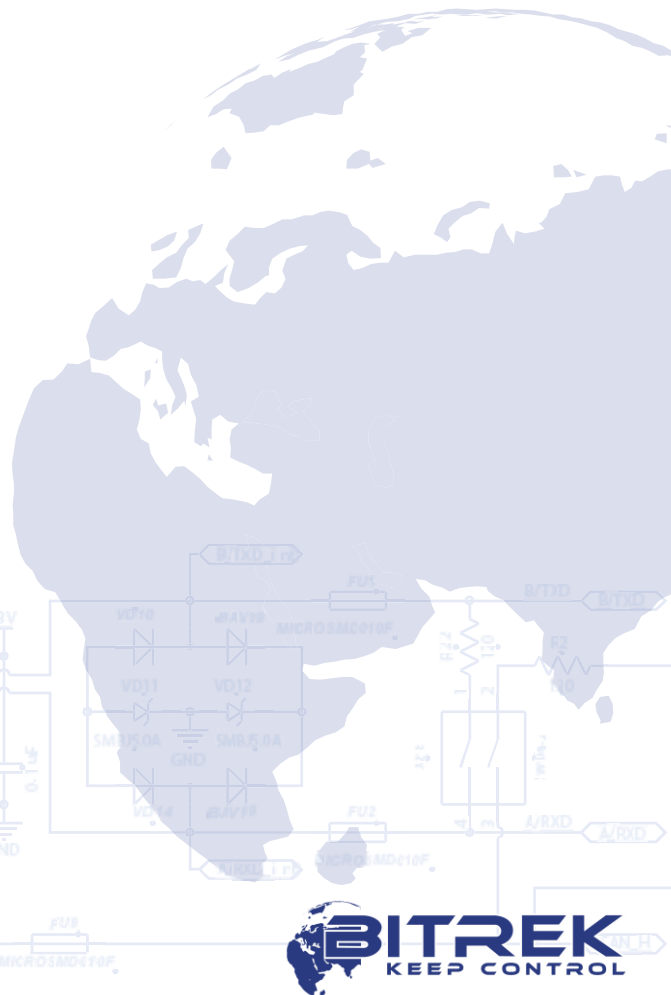
BITREK CONNECT Module CN03



Version 2020.10.1

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Purpose of the device

The CN03 module of the Bitrek Connect system is designed for monitoring the technical operational parameters of vehicles equipped with a CAN bus and transmitting these parameters to the Connect-Bus. In addition the module can work with fuel level sensors, RFID readers and threshold sensors via the RS-485 interface.

Scope of delivery

The scope of delivery of CN03 module for the BITREK CONNECT system is as follows:

1. Module CN03 – 1 pcs.
2. Technical datasheet – 1 pcs.
3. Warranty certificate – 1 pcs.
4. Package box – 1 pcs.
5. Micro-Fit cable 4-pin – 1 pcs.
6. Micro-Fit cable 6-pin – 1 pcs.
7. Rubber plug – 3 pcs.

Device specifications

Device specifications are shown in Table 1 below.

Table 1. Device specification

No.	Parameters	Characteristics
1	Power supply voltage	From 9 V to 36 V
2	Average current consumption (12 V)	30 mA
3	Digital interface for connection fuel level sensors, RFID readers, threshold sensors	RS-485
4	CAN standard	FMS
5	Maximum quantity of supported fuel level sensors	8
6	Maximum quantity of supported RFID-readers	4
7	Maximum quantity of supported threshold sensors	15
8	Operating temperature	From -30 °C to +80 °C
9	Relative humidity	80 ± 15 %
10	Dimensions (W x L x H)	78 x 83 x 30 mm
11	Housing protection class	IP44
12	Net weight	80 g.
13	Gross weight	110 g.

Appearance of the device and its dimensions

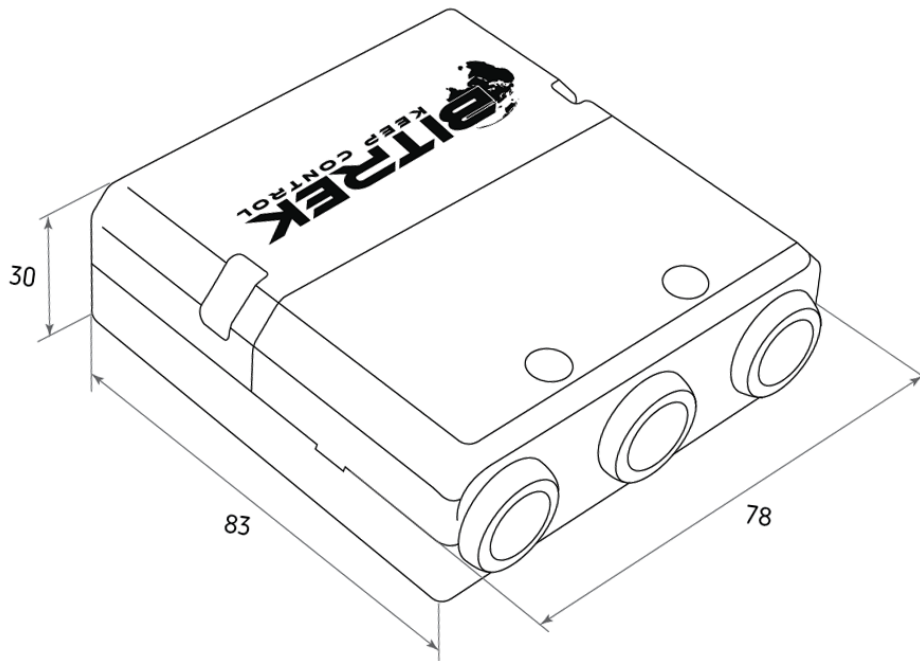


Figure 1. Appearance and dimensions

Device pin assignment

The CN03 module is equipped with three Micro-Fit connectors (Fig. 2).

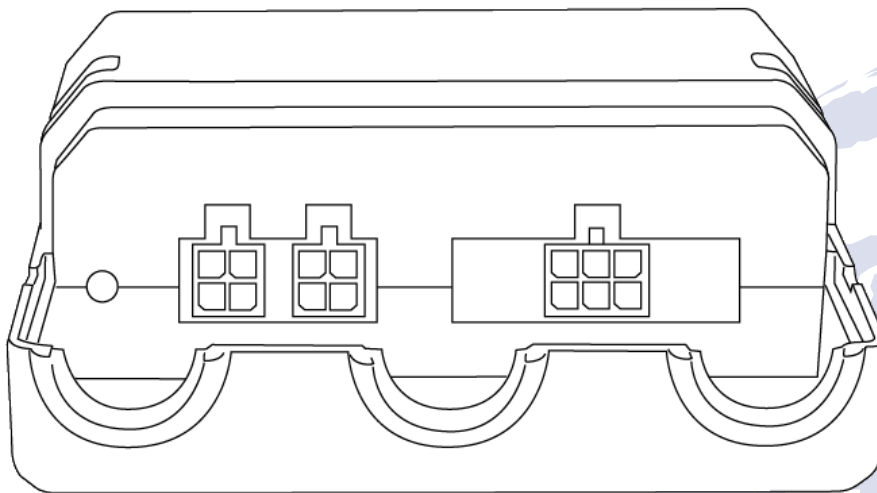


Figure 2. The appearance of the connectors

The four-pin connectors (Fig. 3) are Connect-Bus connectors that have module power outputs and bus signal line outputs.

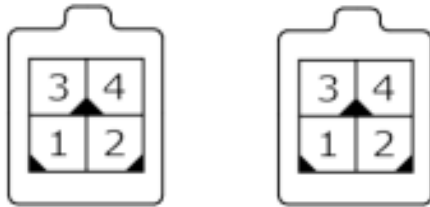


Figure 3. Connect-Bus connectors No.1 and No.2

Pinout of Connect-Bus connectors is shown in Table 2.

Table 2. Connect-Bus connectors pinout

No.	Contact name	Signal type	Contact assignment
1	GND	Power	Common wire (ground)
2	CAN L	Input/output	«CAN_L» signal of the Connect-Bus
3	+ Vin	Power	"+" Onboard power supply (nominal voltage 12 V or 24 V)
4	CAN H	Input/output	«CAN_H» signal of the Connect-Bus

The six-pin connector (Fig. 4) is the connector for fuel level sensors, threshold sensors and RFID readers. It has sensor power leads, RS-485 signal lines and vehicle CAN bus signal lines.

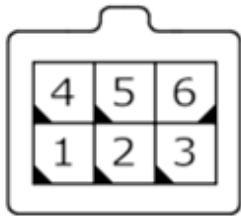


Figure 4. External devices connector

Pinout of external devices connector is shown in Table 3.

Table 3. External devices connector pinout

No.	Contact name	Signal type	Contact assignment
1	GND	Power	Common wire (ground)
2	CAN H	Input/output	Signal "L" of the vehicle's CAN interface
3	RS-485 A	Input/output	Signal «A» of RS-485
4	+ Vout	Power	Secure power output for extra sensors (voltage is equal to +Vin)
5	CAN L	Input/output	Signal "H" of the vehicle's CAN interface
6	RS-485 B	Input/output	Signal «B» of RS-485

Indication description

On the front panel of the module, on the side of the connectors, there are two LEDs that indicate the current state of the device.

Red LED - blinking in case of successful data exchange via RS-485.

Green LED - lights up continuously when the device starts successfully.

Module configuration

The CN03 module has a number of configurable parameters the list of which is presented in [Appendix 1](#). To configure the module, the Bitrek Connect system configurator module is used, as well as the Connect Configurator software. The procedure for working with the configurator module and software is described in detail in the "Guide for organizing and configuring the Bitrek Connect system".

Configuring the module to work with arbitrary PGNs

The parameters FMSPGN00 - FMSPGN19 are used to configure arbitrary PGN 11-bit or 29-bit, expected on the CAN-bus of the vehicle and transmitted into the Connect-Bus with the address substitution for the current module address. If the parameter is zero, then this PGN is considered disabled and does not participate in the work. These parameters are configured in HEX form and have the following format:
PRIO PGN ADDR

where:

PRIO - message priority;

PGN - message body (PGN);

ADDR - is the sender's address.

For example: there is a need to configure an arbitrary PGN 18FEE900 (Fuel Consumption: LFC, 1000 mS). To do this, write the value 18FEE900 into the "Custom PGN00" (ID7800) parameter (Fig. 5). Then set the bit depth of the PGN00 parameter equal to 29-bits since this PGN is 29-bit (Fig. 6). This can be done using the Connect Configurator software.

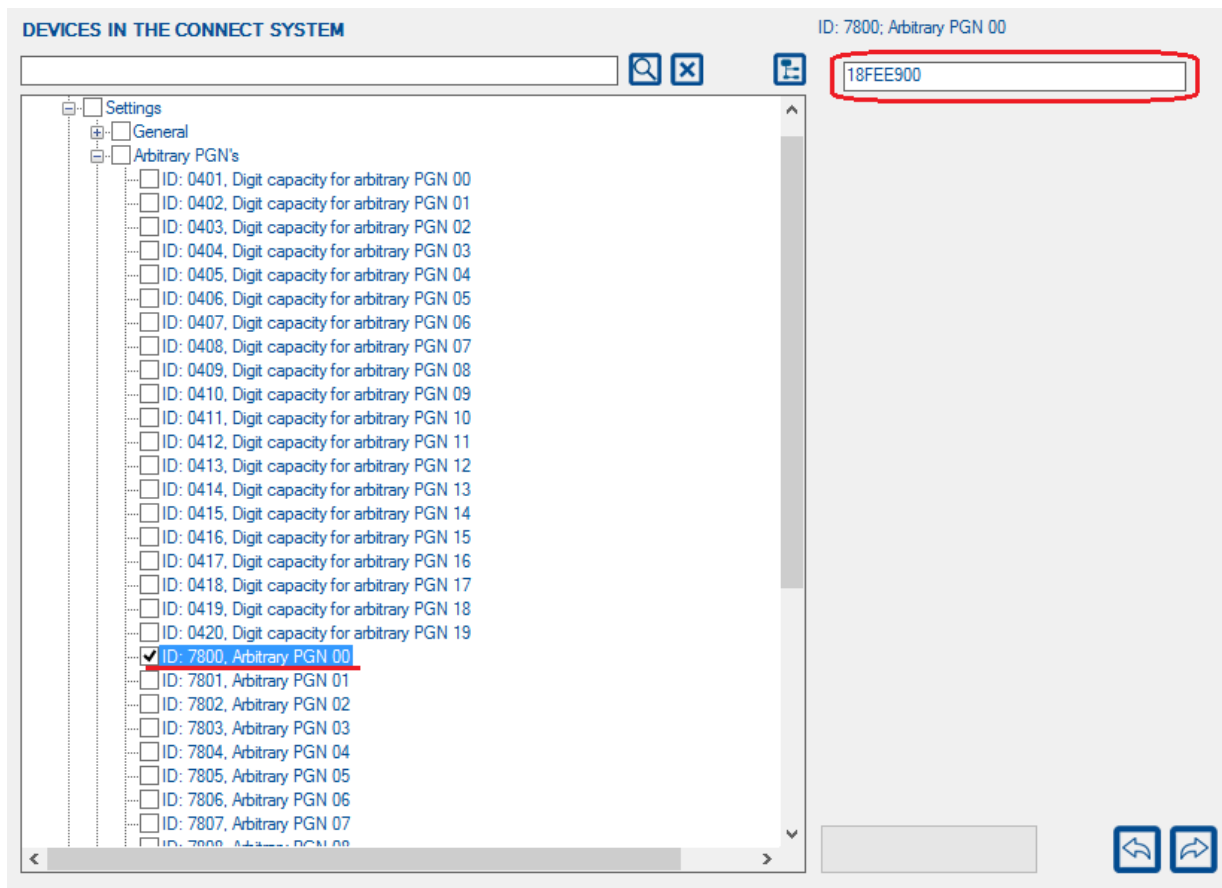


Figure 5. Setting the value for arbitrary PGN



Figure 6. Setting the digit capacity for arbitrary PGN

The CAN receive filter will then be configured to receive messages from CANID 18FEE900. After receiving such a message, the current message address will be replaced with the peripheral address of the CN03 module and it will be transmitted into the Connect-Bus.

Configuring the module to work with fuel level sensors

Each fuel level sensor connected to the CN03 module must be pre-configured. The configuration comes down to assigning each sensor on the RS-485 bus its own network address. After the network addresses of the fuel level sensors are assigned you can start configuring the CN03 module.

Open the tree-like list of module parameters by clicking on the "+" symbol. The list displays the Settings group. In the "Fuel Sensor RS-485" subgroup the following parameters must be configured: "FLS address" (Fig. 7) and "FLS polling enable" (Fig. 8). The parameters "FLS polling period" and "FLS transmission period to the Connect-Bus" can be left unchanged (default value).

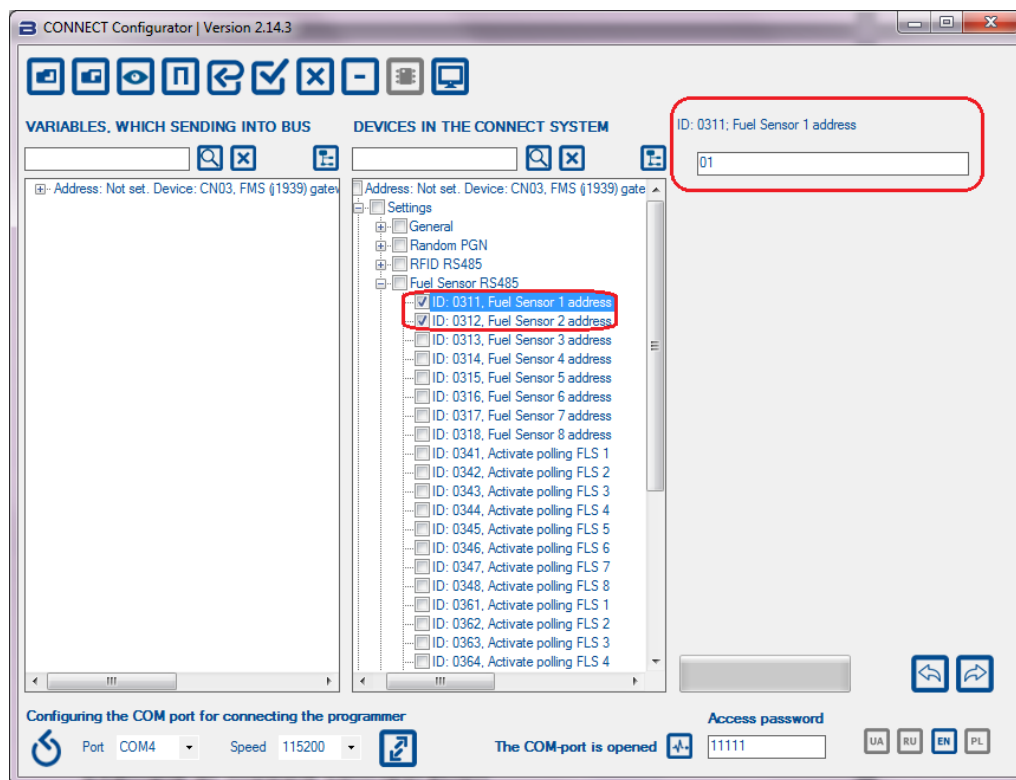


Figure 7. Setting an address for Fuel Level sensor

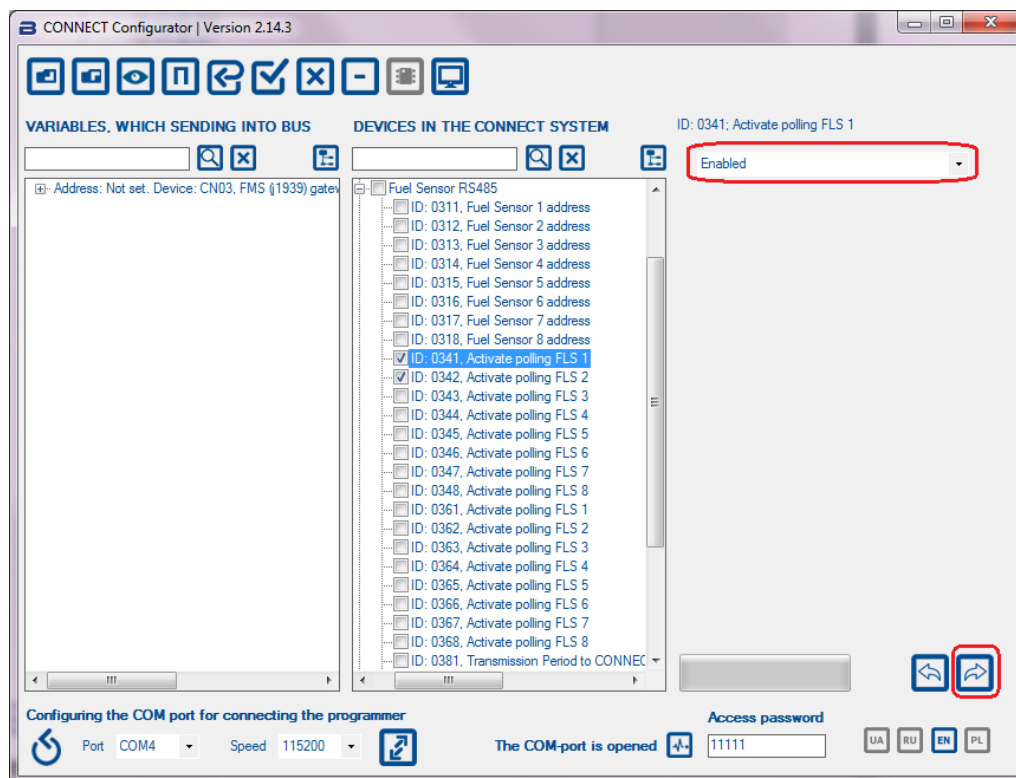


Figure 8. Activating polling of the sensor

After that the CN03 module will poll the fuel level sensor which is located at the 1st network address on the RS-485 bus. The received data message will be transmitted to the Connect-Bus.

Configuring the module to work with RFID readers

The module is configured to work with RFID readers in the same way as for Fuel Level sensors. In the subgroup of settings "RFID RS-485" you must specify the address of the reader on the RS-485 bus and enable the module to poll it (Fig.9). The parameters "RFID polling period" and "RFID transmission period on the Connect-Bus" can be left unchanged.



Note:

Data exchange between RFID readers and CN03 module is carried out according to RCS SOVA data transfer protocols.

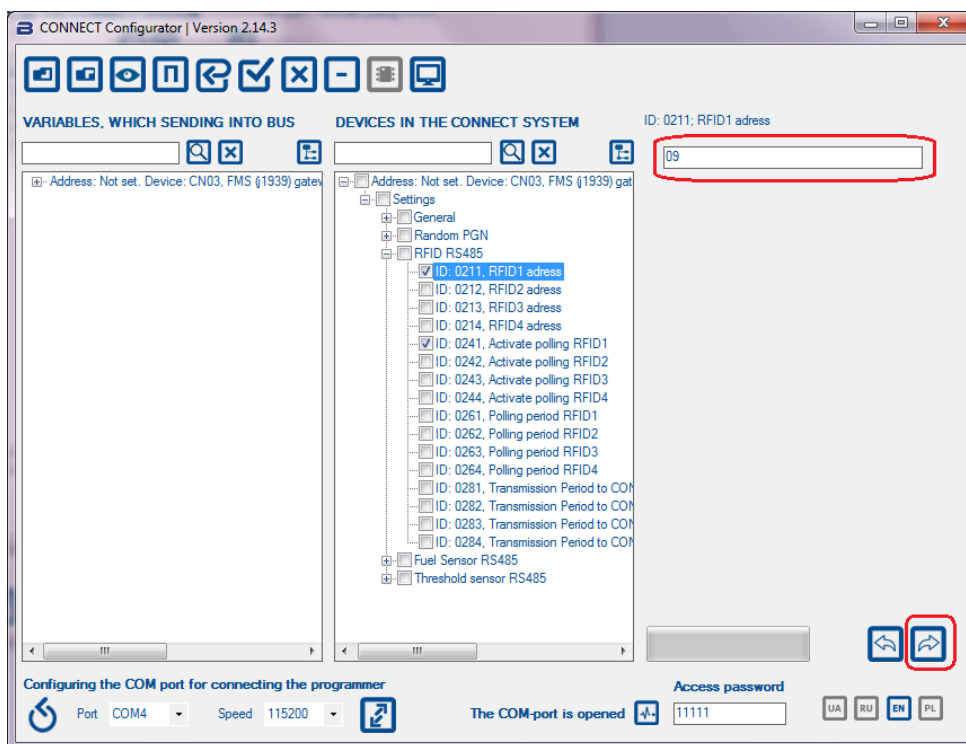


Figure 9. Configuring RFID reader

Configuring the module to work with RS-485 threshold sensors

Each threshold sensor connected to the module must be pre-configured. The setup is comes down to setting a unique network address on the RS-485 bus for each threshold sensor. The FL Configurator software is used to configure the network address of the threshold sensors.



Note:

The network addresses of the threshold sensors do not have to match the network addresses of the used fuel level sensors.

Then, in the subgroup of settings "Threshold sensors RS485" it is necessary to enable polling of the sensor, specify its network address on the RS-485 bus, specify the upper and lower thresholds (Fig. 10, Fig.11). These parameters must be configured separately for each of the used threshold sensors.

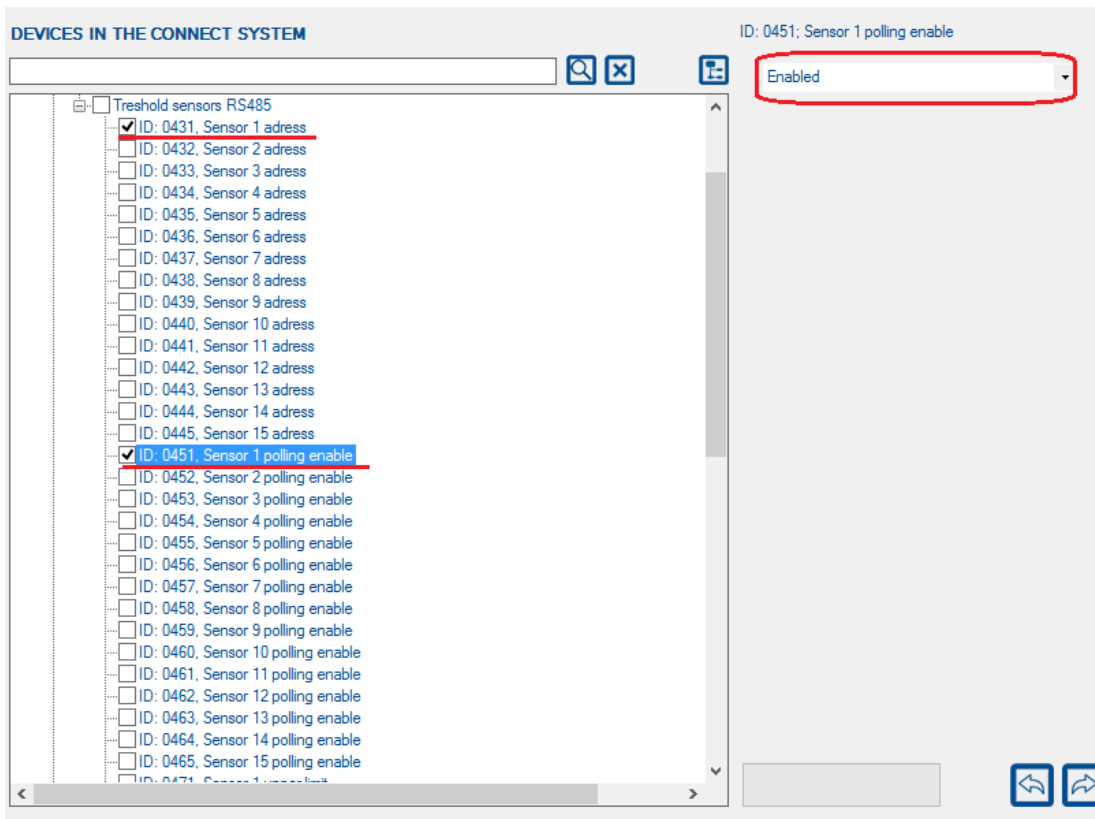


Figure 10. Enabling polling of the threshold sensor

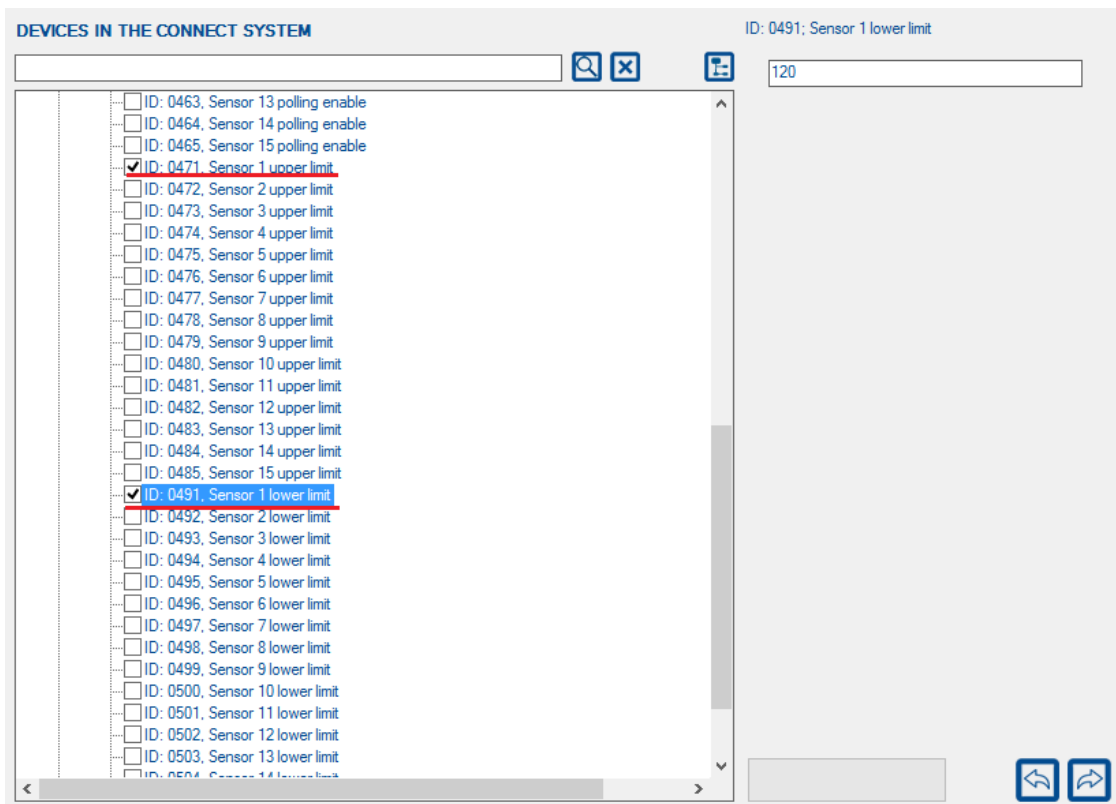


Figure 11. Setting upper and lower limits of the sensor

In total, up to 15 sensors can be connected to the module simultaneously. At the same time it is recommended to allow polling only actually connected sensors.

There are 15 parameters in the CN03 module settings (id 431 - id 445) for specifying the network addresses of the connected sensors. When specifying network addresses you need to start from the principle: the network address of the lowest installed sensor must be entered in parameter corresponding to the 1st sensor in the CN03 module and further on order.



The upper and lower thresholds are set according to the principle described below.

"Upper limit" is the value of the sensor if which the CN03 module decides that the sensor is activated. The value written in this field should be 15-35% less than the actual value obtained with a sensor immersed in the grain. This is done to ensure sensor triggering.

"Lower limit" is the sensor value at which the module CN03 decides that the sensor has moved from active (triggered) state to inactive. The value written in this field must be 15-35% greater than the actual value of the empty sensor.

Setting example:

Threshold sensors are mounted in an empty silo, all sensors have a zero level calibrated to the level of 100. The silo is then filled with grain so that several sensors are covered. After filling you need to record their readings. For example: filled sensors showed the level 200. In this case, in the "Upper limit" field, you need enter the value 170 and in the "Lower limit" field - 130.

Presettet PGNs of FMS standard

The CN03 module has a group of pre-configured PGNs of the FMS standard (J1939) which are always listened and transmitted to the Connect-Bus, regardless of the settings of arbitrary PGNs. The list of such PGNs is shown in Table 4.

The principle of operation of the device is as follows: the module accepts all messages whose CANID contains a PGN from the list of preset ones ignoring the message priority and sender address. The received CANIDs are transmitted to the Connect-Bus with priority 0x18 and the module address.

Table 4. List of pre-configured PGN's

No.	PGN	Description
1	0x18FEE900	Engine Total Fuel Used
2	0x18FEFC00	Fuel Level
3	0x18FEF200	Engine Fuel Rate
4	0x18FEF200	Engine Instantaneous Fuel Economy
5	0x18FD0900	High Resolution Fuel Consumption
6	0x18F00400	Engine Speed

No.	PGN	Description
7	0x18F00400	Actual Engine - Percent Torque
8	0x18FEE500	Engine Total Hours of Operation
9	0x18FEEE00	Engine Coolant Temperature
10	0x18F00300	Engine Percent Load At Current Speed
11	0x18F00500	Transmission Current Gear
12	0x18F00500	Transmission Selected Gear
13	0x18FEE800	Compass bearing
14	0x18FEE800	Navigation-Based Vehicle Speed
15	0x18FEE800	Pitch
16	0x18FEE800	Altitude
17	0x18FEF300	Latitude
18	0x18FEF300	Longitude
19	0x18FEC100	High Resolution Total Vehicle Distance
20	0x18FEF500	Ambient Air Temperature
21	0x18FEF100	Wheel-Based Vehicle Speed
22	0x18FEF100	Clutch Switch
23	0x18FEF100	Brake Switch
24	0x18FEF100	Cruise Control Set Switch
25	0x18F00300	Accelerator Pedal Position 1
26	0x18FE7000	Gross Combination Vehicle Weight
27	0x18FEF100	Parking Brake Switch
28	0x18FE4E00	Status 2 of doors
29	0x18FE4E00	Position of doors

Appendix 1. Device parameters

Parameter name	Configuration ID	Bit depth	Parameter assignment	Default value
General				
CANSlaveAddr	0200	1 byte	Device address on the CONNECT-BUS	1
DevicePIN	0400	4 bytes	Terminal password	11111
CANSpeed	0201	1 byte	CAN speed setting	250 kbit\s
Arbitrary PGN's				
PGNBitSize00 – PGNBitSize19	0401 – 0420	1 byte	Arbitrary PGN digit capacity	0 (disabled)
FMSPGN00 – FMSPGN19	7800 – 7819	4 bytes	PGN which is transmits from the CAN-bus of the vehicle to the CONNECT-BUS	0 (disabled)
RFID RS-485				
AddrSova1 – AddrSova4	0211 – 0214	1 byte	RFID address on RS-485 bus	1 – 4
Sova1Ena – Sova4Ena	0241 – 0244	1 byte	RFID polling enabling	1
GetPeriodSova1 – GetPeriodSova4	0261 – 0264	2 bytes	RFID polling period (*100 ms)	100 (10 seconds)
SendPeriodSova1 – SendPeriodSova4	0281 – 0284	2 bytes	Period of RFID data sending to the CONNECT BUS (*100 ms)	10 (1 second)
Fuel Sensors RS-485				
Fuel1Addr – Fuel8Addr	0311 – 0318	1 byte	Fuel Sensor address on RS-485 bus	11 – 18
Fuel1Ena – Fuel8Ena	0341 – 0348	1 byte	Fuel Sensor polling enabling	1
GetPeriodFuel1 – GetPeriodFuel8	0361 – 0368	2 bytes	Fuel Sensor polling period (*100 ms)	100 (10 seconds)

Parameter name	Configuration ID	Bit depth	Parameter assignment	Default value
SendPeriodFuel1 – SendPeriodFuel8	0381 – 0388	2 bytes	Period of Fuel Sensor data sending to the CONNECT BUS (*100 ms)	10 (1 second)
Threshold sensors RS-485				
AddrSens1 – AddrSens15	0431 – 0445	1 byte	Threshold Sensor address on RS-485 bus	20 – 34
Sens1Ena – Sens15Ena	0451 – 0465	1 byte	Threshold Sensor polling enabling	0 (disabled)
Sens1UpLimit – Sens15UpLimit	0471 – 0485	2 bytes	Threshold Sensor upper limit	170
Sens1DownLimit – Sens15DownLimit	0491 – 0505	2 bytes	Threshold Sensor lower limit	120
GetPeriodSens1 – GetPeriodSens15	0397	2 bytes	Threshold Sensors polling period (*100 ms)	100 (10 seconds)
SendPeriodSens1 – SendPeriodSens15	0398	2 bytes	Period of Threshold Sensors data sending to the CONNECT BUS (*100 ms)	10 (1 second)

Appendix 2. List of variables transmitted to the Connect-Bus

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
System						
1	Device model	4	18F713	0	32	10
2	Software version	4	18F713	32	32	10
3	Module working time	4	18F712	0	32	10
4	Number of module restarts	4	18F712	32	32	10
CAN J1939 (FMS Standard)						
5	Engine Total Fuel Used	4	18FEE9	32	32	0
6	Fuel Level	1	18FEFC	8	8	0
7	Engine Fuel Rate	2	18FEF2	0	16	5
8	Engine Instantaneous Fuel Economy	2	18FEF2	16	16	5
9	High Resolution Fuel Consumption	4	18FD09	32	32	0
10	Engine Speed	2	18F004	24	16	5
11	Engine Total Hours of Operation	4	18FEE5	0	32	0
12	Engine Coolant Temperature	1	18FEEE	0	8	5
13	Engine Percent Load At Current Speed	1	18F003	16	8	5

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
14	Actual Engine - Percent Torque	1	18F004	16	8	5
15	Transmission Current Gear	1	18F005	24	8	5
16	Transmission Selected Gear	1	18F005	0	8	5
17	Compass bearing	2	18FEE8	0	16	0
18	Navigation-Based Vehicle Speed	2	18FEE8	16	16	0
19	Pitch	2	18FEE8	32	16	0
20	Altitude	2	18FEE8	48	16	0
21	Latitude	4	18FEF3	0	32	0
22	Longitude	4	18FEF3	32	32	0
23	High Resolution Total Vehicle Distance	4	18FEC1	0	32	0
24	Ambient Air Temperature	2	18FEF5	24	16	5
25	Wheel-Based Vehicle Speed	2	18FEF1	8	16	5
26	Clutch Switch	1	18FEF1	30	2	5
27	Brake Switch	1	18FEF1	28	2	5
28	Cruise Control Set Switch	1	18FEF1	24	2	5
29	Accelerator Pedal Position 1	1	18F003	8	8	5

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
30	Gross Combination Vehicle Weight	2	18FE70	16	16	0
31	Parking Brake Switch	1	18FEF1	2	2	0
32	Status 2 of doors	1	18FE4E	6	2	0
33	Position of doors	1	18FE4E	0	4	0
Fuel Sensor RS485						
38	Status of FLS 1	1	18F709	0	1	10
39	Status of FLS 2	1	18F70A	0	1	10
40	Status of FLS 3	1	18F70B	0	1	10
41	Status of FLS 4	1	18F70C	0	1	10
42	Status of FLS 5	1	18F70D	0	1	10
43	Status of FLS 6	1	18F70E	0	1	10
44	Status of FLS 7	1	18F70F	0	1	10
45	Status of FLS 8	1	18F710	0	1	10
46	Fuel temperature of FLS 1	1	18F709	16	8	10
47	Fuel temperature of FLS 2	1	18F70A	16	8	10
48	Fuel temperature of FLS 3	1	18F70B	16	8	10

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
49	Fuel temperature of FLS 4	1	18F70C	16	8	10
50	Fuel temperature of FLS 5	1	18F70D	16	8	10
51	Fuel temperature of FLS 6	1	18F70E	16	8	10
52	Fuel temperature of FLS 7	1	18F70F	16	8	10
53	Fuel temperature of FLS 8	1	18F710	16	8	10
54	Fuel level of FLS 1	2	18F709	24	16	10
55	Fuel level of FLS 2	2	18F70A	24	16	10
56	Fuel level of FLS 3	2	18F70B	24	16	10
57	Fuel level of FLS 4	2	18F70C	24	16	10
58	Fuel level of FLS 1	2	18F70D	24	16	10
59	Fuel level of FLS 6	2	18F70E	24	16	10
60	Fuel level of FLS 7	2	18F70F	24	16	10
61	Fuel level of FLS 8	2	18F710	24	16	10
RFID RS485						
62	Status of RFID 1	1	18F701	0	2	5
63	Status of RFID 2	1	18F702	0	2	5

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
64	Status of RFID 3	1	18F703	0	2	5
65	Status of RFID 4	1	18F704	0	2	5
66	Card number of RFID 1	8	18F701	16	40	5
67	Card number of RFID 2	8	18F702	16	40	5
68	Card number of RFID 3	8	18F703	16	40	5
69	Card number of RFID 4	8	18F704	16	40	5
Threshold sensors RS485						
70	Fulness level (bit mask)	2	18F720	0	16	5
71	Grain level	2	18F720	16	16	5
72	Upper threshold	2	18F720	32	16	5
73	Bit mask of allowed sensors	2	18F721	0	16	5
74	Bit mask of connected sensors	2	18F721	16	16	5
75	Activity on the RS-485 bus of threshold sensor 1	1	18F731	0	8	5
76	Activity on the RS-485 bus of threshold sensor 2	1	18F732	0	8	5
77	Activity on the RS-485 bus of threshold sensor 3	1	18F733	0	8	5
78	Activity on the RS-485 bus of threshold sensor 4	1	18F734	0	8	5

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
79	Activity on the RS-485 bus of threshold sensor 5	1	18F735	0	8	5
80	Activity on the RS-485 bus of threshold sensor 6	1	18F736	0	8	5
81	Activity on the RS-485 bus of threshold sensor 7	1	18F737	0	8	5
82	Activity on the RS-485 bus of threshold sensor 8	1	18F738	0	8	5
83	Activity on the RS-485 bus of threshold sensor 9	1	18F739	0	8	5
84	Activity on the RS-485 bus of threshold sensor 10	1	18F73A	0	8	5
85	Activity on the RS-485 bus of threshold sensor 11	1	18F73B	0	8	5
86	Activity on the RS-485 bus of threshold sensor 12	1	18F73C	0	8	5
87	Activity on the RS-485 bus of threshold sensor 13	1	18F73D	0	8	5
88	Activity on the RS-485 bus of threshold sensor 14	1	18F73E	0	8	5
89	Activity on the RS-485 bus of threshold sensor 15	1	18F73F	0	8	5
90	Status of threshold sensor 1	1	18F731	8	8	5
91	Status of threshold sensor 2	1	18F732	8	8	5
92	Status of threshold sensor 3	1	18F733	8	8	5
93	Status of threshold sensor 4	1	18F734	8	8	5
94	Status of threshold sensor 5	1	18F735	8	8	5

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
95	Status of threshold sensor 6	1	18F736	8	8	5
96	Status of threshold sensor 7	1	18F737	8	8	5
97	Status of threshold sensor 8	1	18F738	8	8	5
98	Status of threshold sensor 9	1	18F739	8	8	5
99	Status of threshold sensor 10	1	18F73A	8	8	5
100	Status of threshold sensor 11	1	18F73B	8	8	5
101	Status of threshold sensor 12	1	18F73C	8	8	5
102	Status of threshold sensor 13	1	18F73D	8	8	5
103	Status of threshold sensor 14	1	18F73E	8	8	5
104	Status of threshold sensor 15	1	18F73F	8	8	5
105	Temperature of threshold sensor 1	1	18F731	16	8	5
106	Temperature of threshold sensor 2	1	18F732	16	8	5
107	Temperature of threshold sensor 3	1	18F733	16	8	5
108	Temperature of threshold sensor 4	1	18F734	16	8	5
109	Temperature of threshold sensor 5	1	18F735	16	8	5
110	Temperature of threshold sensor 6	1	18F736	16	8	5

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
111	Temperature of threshold sensor 7	1	18F737	16	8	5
112	Temperature of threshold sensor 8	1	18F738	16	8	5
113	Temperature of threshold sensor 9	1	18F739	16	8	5
114	Temperature of threshold sensor 10	1	18F73A	16	8	5
115	Temperature of threshold sensor 11	1	18F73B	16	8	5
116	Temperature of threshold sensor 12	1	18F73C	16	8	5
117	Temperature of threshold sensor 13	1	18F73D	16	8	5
118	Temperature of threshold sensor 14	1	18F73E	16	8	5
119	Temperature of threshold sensor 15	1	18F73F	16	8	5
120	Level of threshold sensor 1	2	18F731	24	16	5
121	Level of threshold sensor 2	2	18F732	24	16	5
122	Level of threshold sensor 3	2	18F733	24	16	5
123	Level of threshold sensor 4	2	18F734	24	16	5
124	Level of threshold sensor 5	2	18F735	24	16	5
125	Level of threshold sensor 6	2	18F736	24	16	5
126	Level of threshold sensor 7	2	18F737	24	16	5

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
127	Level of threshold sensor 8	2	18F738	24	16	5
128	Level of threshold sensor 9	2	18F739	24	16	5
129	Level of threshold sensor 10	2	18F73A	24	16	5
130	Level of threshold sensor 11	2	18F73B	24	16	5
131	Level of threshold sensor 12	2	18F73C	24	16	5
132	Level of threshold sensor 13	2	18F73D	24	16	5
133	Level of threshold sensor 14	2	18F73E	24	16	5
134	Level of threshold sensor 15	2	18F73F	24	16	5
135	Polling enable of threshold sensor 1	1	18F731	56	8	5
136	Polling enable of threshold sensor 2	1	18F732	56	8	5
137	Polling enable of threshold sensor 3	1	18F733	56	8	5
138	Polling enable of threshold sensor 4	1	18F734	56	8	5
139	Polling enable of threshold sensor 5	1	18F735	56	8	5
140	Polling enable of threshold sensor 6	1	18F736	56	8	5
141	Polling enable of threshold sensor 7	1	18F737	56	8	5
142	Polling enable of threshold sensor 8	1	18F738	56	8	5

No.	Parameter name	Bit depth	PGN	Start Bit	Bit Total	Time out
143	Polling enable of threshold sensor 9	1	18F739	56	8	5
144	Polling enable of threshold sensor 10	1	18F73A	56	8	5
145	Polling enable of threshold sensor 11	1	18F73B	56	8	5
146	Polling enable of threshold sensor 12	1	18F73C	56	8	5
147	Polling enable of threshold sensor 13	1	18F73D	56	8	5
148	Polling enable of threshold sensor 14	1	18F73E	56	8	5
149	Polling enable of threshold sensor 15	1	18F73F	56	8	5

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