

FUEL LEVEL SENSOR NIKOLIN BLE





NIKOLIN

Instructions for setup and

connection

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1 Goal and purpose

The goal and purpose of the BLE Fuel Level Sensor (hereinafter referred to as BLE FLS) Setup and Connection Work Instructions include the following aspects:

1. Ensuring correct connection and configuration: the manual contains step-by-step instructions that help users to correctly connect and configure the software (hereinafter referred to as software) for correct operation of the BLE FLS.

2. Improved performance: proper software customization allows for optimal sensor performance, resulting in more efficient and accurate measurements.

3. Reduced error rate: clear and detailed instructions help minimize the risk of errors in connection and software configuration, which in turn reduces the likelihood of malfunctions.

4. Unification of processes: the work instruction standardizes the software configuration process, which allows different users to perform the work in the same way, regardless of their experience and qualifications.

Thus, the work instruction for setting up and connecting the BLE FLS software is an important document that ensures correct and safe operation of the equipment.



2 Connection to BLE FLS

Before trimming the BLE FLS to the required height for installation in the tank, it is necessary to connect to the sensor via the mobile app to check its functionality. To connect to the BLE FLS via a mobile device, you need to enable Bluetooth and location on your phone. Bluetooth on the sensor is already enabled.

After that, open the «RFL» application pre-installed on the mobile device, as shown in Figure 1.



Figure 1 - Application on mobile device «RFL»

In the «RFL» application find the BLE FLS by its name and connect to it by pressing «CONNECT» according to figure 2. The sensor name is taken from the BLE FLS housing.



15:15		0,1 КБ/с	¥ LTE , ≑ 30 •
RFL			\$
RKT_FL	JEL_C9:AB:0E:0	DA:C8:8A	CONNECT
TEMP:	30.92	LVL:	8686
RSSI:	-61	BATTERY:	95%
Frequency:	8686	TIME:	1
Status:	Unknown error		
RKT_FU	UEL_FE:DE:02:0)4:B4:9A	CONNECT
TEMP:	30.19	LVL:	50406
RSSI:	-96	BATTERY:	98%
Frequency:	50406	TIME:	300
Status:	The sensor i	is calibrated to er	npty
RKT_FI	JEL_EC:33:8C:5	58:BE:EE	CONNECT
TEMP:	30.36	LVL:	8752
RSSI:	-80	BATTERY:	91%
Frequency:	8752	TIME:	230
Status:	Normal		
RKT_F	UEL_C9:C5:28:1	IF:B7:7F	CONNECT
E	≡	0	<

Figure 2 - Connecting to the BLE FLS

If the BLE FLS is correct and it is possible to connect to it, the «RFL» application will open the sensor configuration window according to Figure 3.



15:11	10 5/c ≯ V₀ ⁴⁶ LTE , ₀ [[31])
RFL	\$
FLS name:	RKT_FUEL_C9:AB:0E:0A:C8:8A
MAC:	C9:AB:0E:0A:C8:8A
Hardware version	0.14
Hardware revision name	hw.833.v1
FLS operating time since battery install	ation 168611
Sensor re	eadings REFRESH
fuel_level	8686
Period	921
Frequency	8686
Temperature	30.64
Battery charge	96%
Flags	3
	Update completed!
	DISCONNECT
≡	0 <

Figure 3 - BLE FLS setup window

After making sure the sensor is good and responding you can trim the «BLE FLS» to the desired tank height.



3 Software customizations

Once the BLE FLS has been trimmed to the correct height for installation in the tank, the BLE FLS must be initially set up.

3.1 Initial setup

The initial setup is to calibrate the BLE FLS to full and empty. To do this, in the mobile application «RFL» find the column «Calibration» and click on «AUTOMATIC CALIBRATION», according to Figure 4.

15:04	10 Б/с	¥ LTE , ₀ 32.
RFL		\$
coconcia		OHANOL
EXT	RA OPTIONS	
	Calibration	
Frequency with empty FLS	0	CHANGE
Frequency at full FLS	0	CHANGE
Indications for empty DUT	0	CHANGE
Indications for full FLS	0	CHANGE
CALIBRATE EMPTY	CALIBR	ATE FULL
AUTOMA	TIC CALIBRATION	
VIEW CA	LIBRATION TABLE	
READ AGAIN	SAVE CHA	NGES
DI	SCONNECT	
=	0	<





After pressing the button, a window will appear, in which it is necessary to enter the sensor readings at maximum fuel level, according to Figure 5. Enter the value «1023» and press «OK».



Figure 5 - Entering the sensor reading at maximum fuel level

Then click on «SAVE CHANGES», as shown in Figure 6.

14:59	3,2 КБ/с	¥ LTE , ; □3	
RFL		\$	
		OHANGE	
EXT	RA OPTIONS		
c	Calibration		
Frequency with empty FLS	8686	CHANGE	
Frequency at full FLS	4362	CHANGE	
Indications for empty DUT	0	CHANGE	
Indications for full FLS	1023	CHANGE	
CALIBRATE EMPTY	CALIBRATE EMPTY CALIBRATE FULL		
AUTOMA	TIC CALIBRATION		
VIEW CA	LIBRATION TABLE		
READ AGAIN	SAVE CHA	NGES	
DI	SCONNECT		
≡	0	<	

Figure 6 - Saving the automatic calibration



The next step is to cover the hole on the body of the BLE FLS with duct tape and pour fuel into the sensor tube until it is full. Then, in the mobile application, open the «Sensor readings» column and press «REFRESH», as shown in Figure 7.

14:39	0,1 КБ/с ≯ Ите III ÷ В4
RFL	\$
FLS name: RK	(T_FUEL_C9:AB:0E:0A:C8:8A
MAC:	C9:AB:0E:0A:C8:8A
Hardware version	0.14
Hardware revision name	hw.833.v1
FLS operating time since battery installation	n 166708
Sensor readi	ngs REFRESH
fuel_level	0
Period	921
Frequency	8686
Temperature	30.58
Battery charge	95%
Flags	3
FLS	parameters
DIS	CONNECT
≡	0 <

Figure 7 - Updating sensor readings

After updating in the column «Sensor readings» it is necessary to take the value from the position «Frequency», according to Figure 8, and then manually enter the value in the column «Calibration» in the position «Frequency at full FLS».



14:39	0,1 KБ/c ≯ ^{Vo} ^{43†} ₀ 34	
RFL	\$	
FLS name:	RKT_FUEL_C9:AB:0E:0A:C8:8A	
MAC:	C9:AB:0E:0A:C8:8A	
Hardware version	0.14	
Hardware revision name	hw.833.v1	
FLS operating time since battery installa	ation 166708	
Sensor re	eadings REFRESH	
fuel_level	987	
Period	1802	
Frequency	4439	
Temperature	30.58	
Battery charge	95%	
Flags	3	
FLS parameters		
	DISCONNECT	
=	0 <	

Figure 8 - Frequency readings with full FLS

Note - if after clicking on «REFRESH» the data do not change, then you should click on «DISCONNECT» and in the start window of the program find the sensor and take frequency readings, according to Figure 9. The data update frequency is five seconds, which can also be observed in the application window.



14:39		0 Б/с	≵ ^{V0} ⁴⁶¹ 184
RFL			\$
RKT_FL	JEL_C9:AB:0E:0A	A:C8:8A	CONNECT
TEMP:	30.92	LVL:	0
RSSI:	-75	BATTERY:	91%
Frequency:	4439	TIME:	2
Status:	Unknown error		
RKT_F	UEL_FE:DE:02:04	:B4:9A	CONNECT
TEMP:	29.74	LVL:	50406
RSSI:	-89	BATTERY:	98%
Frequency:	50406	TIME:	69
Status:	The sensor is	calibrated to er	npty
RKT_FI	JEL_EC:33:8C:58	B:BE:EE	CONNECT
TEMP:	30.36	LVL:	8762
RSSI:	-75	BATTERY:	91%
Frequency:	8762	TIME:	3
Status:	Normal		
RKT_F	UEL_C9:C5:28:1F	:B7:7F	CONNECT
=	≡ (C	<

Figure 9 - Reading of frequency readings at full FLS in the start window of the mobile application «RFL»

After the data has been updated, click on «CONNECT» and go to the sensor settings. Go to the «Calibration» column, to the position «Frequency at full FLS» and press «CHANGE». A window will appear, where it is necessary to enter the frequency value that we have obtained, according to Figure 10.

Enter	value
ок	CANCEL

Figure 10 - Entering frequency value at full FLS In our case, it is the number «4439», enter it and click «OK» and then click «SAVE CHANGES»..



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The next step is to completely drain the fuel from the sensor. Then open the «Sensor readings» column in the mobile application and press «Refresh».

After updating in the column «Sensor readings» it is necessary to take the value from the position «Frequency», according to Figure 11, and then manually enter the value in the column «Calibration» in the position «Frequency with empty FLS».

14:26	0 6/c ≯ ↓ ↓ ↓ ↓ ■5		
RFL	\$		
FLS name:	RKT_FUEL_C9:AB:0E:0A:C8:8A		
MAC:	C9:AB:0E:0A:C8:8A		
Hardware version	0.14		
Hardware revision name	hw.833.v1		
FLS operating time since battery installat	ion 165786		
Sensor rea	idings REFRESH		
fuel_level	0		
Period	921		
Frequency	8686		
Temperature	30.42		
Battery charge	93%		
Flags	3		
FL	ELS parameters		
	ISCONNECT		
≡	0 <		

Figure 11 - Frequency readings with empty FLS

Note - if after clicking on «REFRESH», the data do not change, then click on «DISCONNECT» and in the start window of the program find the sensor and take frequency readings, according to Figure 12.



14:26		0 Б/с	¥ LTE ,III : ■5
RFL			\$
RKT_FU	IEL_C9:AB:0E:0	A:C8:8A	CONNECT
TEMP:	30.53	LVL:	0
RSSI:	-63	BATTERY:	93%
Frequency:	8686	TIME:	2
Status:	Unknown error		
RKT_FL	JEL_FE:DE:02:04	4:B4:9A	CONNECT
TEMP:	29.4	LVL:	50406
RSSI:	-92	BATTERY:	98%
Frequency:	50406	TIME:	3
Status:	The sensor is	s calibrated to er	npty
RKT_FL	JEL_EC:33:8C:5	8:BE:EE	CONNECT
TEMP:	29.97	LVL:	8810
RSSI:	-73	BATTERY:	91%
RSSI: Frequency:	-73 8810	BATTERY: TIME:	91% 3
RSSI: Frequency: Status:	-73 8810 Normal	BATTERY: TIME:	91% 3
RSSI: Frequency: Status: RKT_FL	-73 8810 Normal JEL_C9:C5:28:1	BATTERY: TIME: F:B7:7F	91% 3 CONNECT

Figure 12 - Reading of frequency readings with an empty FLS in the start window of the «RFL» mobile application

After the data has been updated, click on «CONNECT» and go to the sensor settings. Go to the «Calibration» column, to the position «Frequency at empty FLS» and press «CHANGE». A window will appear, where it is necessary to enter the frequency value that we received, according to Figure 13.

_	Enter	r value
	ОК	CANCEL

Figure 13 - Entering the frequency value when the FLS is empty.

In our case, it is the number «8695», enter it and click «OK» and then click «SAVE CHANGES».



3.2 Calibrating the sensor

After having calibrated the BLE FLS for empty and full, it is necessary to install it in the tank. After installing the sensor, it is necessary to drain all fuel from the tank, if any.

After that we start calibrating the BLE remote control. To do this, feed fuel into the tank in equal portions and record the level values. It is necessary to record the values in excel table, indicating the number of liters in the tank and the corresponding level value from the mobile application «RFL».

Knowing the approximate amount of fuel in the tank, it is necessary to divide this value in liters by a number from 20 to 30 to get the amount of fuel supplied in one portion. So, we feed fuel into the tank and record its level value at each portion and enter the obtained data into the table.

After the calibration is completed, in the «RFL» application in the «FLS parameters» column, check the «Escort emulation» box, as shown in Figure 14.



RFL		\$								
Period		1960								
Frequency		4081								
Temperature	Temperature									
Battery charge	95%									
Flags		1								
FLS parameters										
FLS length, mm	0	CHANGE								
Escort emulation										
escort_id		CHANGE								
EXT	RA OPTIONS									
C	Calibration									
Frequency with empty FLS	4075	CHANGE								
Frequency at full FLS	2000	CHANGE								
DI	SCONNECT									

Figure 14 - Setting emulation «escort»

Then click on «CHANGE» against «escort_id» and in the window that appears specify «1» and click on «OK», if one BLE FLS is used, according to Figure 15. In case two or more sensors will be used, set an individual «escort_id» for each sensor, starting from one and ascending.



RFL		\$
Temperature		29.91
Battery charge		95%
Flags		1
FLS	parameters	
FLS length, mm	0	CHANGE
Escort emulation		
escort_id	1	CHANGE
EXT	RA OPTIONS	
c	alibration	
Frequency with empty FLS	4075	CHANGE
Frequency at full FLS	2000	CHANGE
Indications for empty DUT	0	CHANGE
Indiantions for Dis	SCONNECT	

Figure 15 - Setting escort_id

Then click on «EXTRA OPTIONS» and in the window that appears in the column «Data averaging» enter the value «50», according to Figure 16.





Figure 16 - Entering data averaging

After entering, press «OK» and press «SAVE CHANGES». Then press «DISCONNECT» and you will see the «BLE FLS» configured in green, as shown in Figure 17.



RFL			¢						
	TD_00000	1	CONNECT						
TEMP:	31.0	LVL:	0						
RSSI:	-72	BATTERY:	3.5V						
Frequency:	8695	TIME:	2						
hw_id 1	fw_version 14	mode 128 t	tc_mode 129						
Status:	Normal								
RKT_FI	RKT_FUEL_EC:33:8C:58:BE:EE								
TEMP:	30.19	LVL:	8859						
RSSI:	-83	BATTERY:	91%						
Frequency:	8859	TIME:	1						
Status:	Normal								
RKT_F	UEL_C9:C5:28:1	F:B7:7F	CONNECT						
TEMP:	29.85	LVL:	4083						
RSSI:	-93	BATTERY:	95%						
Frequency:	4083	TIME:	1						
Status:	The sensor i	s calibrated to e	empty						

Figure 17 - Configured BLE FLS

Then it is necessary to connect the BLE FLS to the tracker and write the table with calibration values into it.



4 Connecting the BLE FLS to the tracker

In order to connect the BLE FLS to the tracker, you must first turn on the laptop with the «NTC Configurator» software installed, according to Figure 18, and connect the cable from the laptop to the tracker.



Figure 18 - NTC Configurator laptop software

Open the software on the laptop and check the tracker device type and its IMEI. Data from the tracker case and data from «NTC Configurator» software should match, according to Figure 19.



Figure 19 - Starting the «NTC Configurator» software

Open «Read device configuration», according to Figure 20.



Figure 20 – Reading device configuration

In the window that appears, click the «Bluetooth» tab, as shown in Figure 21.



🛞 S-2423: Devi	ce										×
S CAN bus	RS-485	1-Wire Temperature Sensors	Inputs	Accelerometer	Outputs	Subscribers	TouchMemory (iBut	tons) Security Modes	EcoDriving	Bluetooth	
		Use bluetooth module Bluetooth device scan mode Scan List of available devices: Device	nning works i	in parallel with the r	main function	s of GSM Search Add Cancel	Connected device Device: MAC address: Password:	No	× •		
Save to file		Save to device		<< Previou	Switch to s	simplified mode Select 💌 Ne	xt page >>		Close	Help	

Figure 21 - The «Bluetooth» tab

Then find «Connected device» in the «Device» type, select «Sensors» and click on «Search» as shown in Figure 22.

<u>B</u> :	-2423: Dev	ice												Х
3	CAN bus	RS-485	1-Wire Temperature	Sensors	Inputs	Accelerometer	Outputs	Subscribers	TouchMemory (iBu	uttons) Secur	ity Modes	EcoDriving	Bluetooth	
	Use blue	tooth module	2											
	Bluetooth de	vice scan mo	ode Scanning works in	n parallel wi	th the main	functions of GSM							\sim	
	List of ava	ilable devices	5:											
	Device MAC address			(Sei	arch	Connected de	evice						
								A	dd	Device:	Senso	rs	\sim	
								Ca	incel	MAC address	s: :::	::		
										Password:				
									- I.					
							Г		Searchin	ig for active devic	tes			
	Sensors													
														~
	Save to file		Save to device			<< Previo	Switch to s	simplified mode	ext page >>			Close	Help	
						C. C. C.	a hage							

Figure 22 - Searching for BLE FLS



When the search is completed, we will observe devices in the vicinity with «Bluetooth» enabled. Among the list of available devices find our BLE FLS by name and MAC-address. Select the BLE remote control to be connected to the tracker and click «Add» as shown in Figure 23.

3	S-2423: Device								_		×
\$	CAN bus RS-485	1-Wire Temperature Sensors	Inputs	Accelerometer	Outputs	Subscribers	TouchMemory (iButtons) Security Mo	des EcoDriving	Bluetooth	• >
	🗹 Use bluetooth modu	le									^
	Bluetooth device scan m	node Scanning works in parallel wi	th the main	functions of GSM						~	
	List of available device	es:									
	Device		М	AC address			Search	nnected device			
	Redmi LE-Headset	7c:d6:61:37:23:b2 70:5d:f5:d1:1b:4e					Add D	evice:	Sensors	\sim	
	RKT_FUEL ADM31	c9:c5:28:1f:b7:7f d9:2a:8d:cb:5f:71					Cancel	AC address:	c9:ab:0e:0a:c8:8a		
	RKT_FUEL TD_000001	c9:ab:0e:0a:c8:8a					р	assword:			
	Sensors							Search comple Devices found	ted. 1: 6		*
	Save to file	Save to device		<< Previou	Switch to s us page	simplified mode	xt page >>		Close	Help	

Figure 23 - Adding a BLE FLS

In the «Bluetooth» tab, go down to the «Sensors» column and in the «Sensor 1» item configure BLE FLS, according to Figure 24.

First, select «Fuel level sensor» in the «Sensor TYPE» field and enter the MAC address in the «MAC address» field. Then in the additional settings set «ESCORT TD» and «Fuel level sensor 1» for the fields «Fuel level sensor type» and «Transfer as» espectively.



3	S-2423: Dev	ice								_		×
\$	CAN bus	RS-485	1-Wire Temperature	Sensors Inpu	s Accelero	meter Outputs	Subscribers	TouchMemory (iButtons)	Security Modes	EcoDriving	Bluetooth	4 >
												^
	Sensors	1										
		Senso	r type	MAC add	ress			Sensor name				
	Fuel le	el sensor	~	c9:ab:0e:0a:c8:8								
	Advar	nced settings										
	E	Fuel	level sensor type	✓ Fuel leve	Transf	er as	Sen:	sitivity threshold to form nts on the graph 50	Igno threshold	pre in motion		
	Sensor	2 Senso	r type	MAC add	ress			Sensor name				
	No		~	:::::								
	Advar	nced settings										
	Sensor	3 Senso	r type	MAC add	ress			Sensor name				~
	Save to file		Save to device		<-	Switch	to simplified mode	lext page >>		Close	Help	,

Figure 24 - Setting BLE FLS in the «Sensors» column

After configuring the BLE FLS, click «Save to device» and in the first window that appears click «Yes» and in the second window click «OK», according to Figure 25.

🕙 Activ	vation X	1	MTC_Configurator	×
1	Do you want to activate the loaded settings? Activation will disconnect the connection and restart the device		Attention File has been successfully downly Device will be rebooted automat	oaded. ically.
	Yes No		01	K

After loading the settings go to the «Protocol settings» tab and open «Fuel level sensor RS-485/BT». In the window that appears, at the intersection of the line «Sensor 1» and the column «Level and temperature» check the boxes according to Figure 26. When the configuration is completed, click on «Save to device».



🕙 S-2423: Device									-		×
Data Transmission	Protocol Settings	Track Settings	System Settings	CAN bus	RS-485	1-Wire Temperature Se	nsors Inputs	Accelerometer	Outputs	Subscribers	
Data transfer protocol	version FLEX 3.0	~	TMI stor	ed buffer size:	107 byte	e (maximum 512)					
Basic Navigation	Fuel level sensor i	RS-485 / BT C	AN Acceleromet	er / Driving qua	lity Adva	anced					
			RS-485 / B	π	harlow						
				te	mperature	Frequency					
			Sensor 1								
			Sensor 2		\checkmark						
			Sensor 3		\checkmark						
			Sensor 4		\checkmark						
			Sensor 5		\checkmark						
			Sensor 6		\checkmark						
Save	Save			Swi	tch to simplif	ied mode					
to file	to device		<	< Previous pag	e Select	t Next page >>		0	Close	Help	
				, and pog						_	

Figure 26 - Configuring the display of BLE FLS parameters

The next step is to open "Telemetry" in the program "NTC Configurator", according to Figure 27.



Figure 27 – Telemetry

In the window that appears, open the «Fuel level sensors» tab, where you can observe fuel level and temperature readings, according to Figure 28.



🛞 Telemetry / S-2423 / 540922 / 02.00.42 / 86205906022	23651				– 🗆 X
Event Record No. 4722 Type: 40962 Request for the object's curr Basic Input/output interfaces Accelerometer/Driv	Time and date: 10:46:47.0000 1 ent state	6.07.2024 (UTC +3)	Operating mode:	Surveillance	Operating mode selection Surveilance Security
	RS-485 / BT Fuel level sensor 1 0 Fuel level sensor 2 65530 Fuel level sensor 3 65530 Fuel level sensor 4 65530 Fuel level sensor 5 65530 Fuel level sensor 6 65531	Temperature 34 0 0 0 0 0	Frequency n/a n/a n/a n/a n/a		
Main packet Current Previous Next	TM keys packet RFID packet Current Current	Timezone:	3h 主	Tools Clos	se Help

Figure 28 - Checking BLE FLS operation

