



Datum:23.08.2019.

Proposal number: \_\_\_\_\_ Proposal date:\_\_\_\_\_

### Bussines proposal form Single-phase electricity meter PHOBOS 1

Bidder name:	Energy Trading and Investment		
Headquarters, street and number:	Dobropoljska 26-28, Beograd Tel. +381 62 815 19 45		
Registration number:	21293628		
Tax ID:	110080345		
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USD Bank Account:	285-2291209900592-79		
EUR Bank Account:	285-2291209900591-82		

Ordinal number	Name of the service	Unit of measure	Price without VAT per month in USD	Price without VAT per year in USD	VAT Price	Total price in USD with VAT per year
1.						

\*\*Offer validity period - 30 (thirty) days from the date of opening the offer.

Bidder

(signature of the authorized person)





### System payment options

Option 1	Option 2	Option 3	Option 4
Use	Dial a phone	Go to a website	Go to a point of sale
Mobile_Application	number from his	access his	where the remote control
on android or	mobile or landline	account and get	Keypad is fixed enter his
iPhone or windows	phone and enter his	list of his meters.	meter ID and PIN code
mobile. Scan the	meter ID and pin	Choose a meter	and enter the hidden
hidden QR code	Number then enter	and recharge it by	scratch card digits to
from the mobile and	the hidden Scratch	entering the	recharge his meter. Note
recharge his meter	card digits to	hidden scratch	that the remote control
	recharge his meter	card digits	unit does not require any
			internet connectivity as it
			is communicating with
			the system via the IoT
			network over the air.

\* All 4 options are included in our system. The end user is free to use any one of them any time anywhere. No need to access the basements or understair cases or the dangerous electicity rooms in the buildings to reach to his keypad in his meter to be able to load it.

You can do it even if he is far or outside or traveling... why to loose electricity and disconnect the fridge or other appliances or CCTV system or security systems if you forget to load his meter.

\*\* Meters are Smart to be simple, to really talk to you, to make your life easy

\*\*\* Option 2 including recharge by sending the hidden scratch card digits via SMS messages





# **TECHNICAL SPECIFICATIONS**

Three-phase electricity meter PHOBOS 3

This three phase PHOBOS 3 NB-Fi Connected Smart Meter offers multi-tariff metering, load limiting and remote control features via NB-Fi by WAVIoT Wireless Protocol.NB-Fi Protocol enables very-long-range wireless communications (up to 10 km in urban areas; up to 30 km in rural).

PHOBOS 3 NB-Fi Connected Smart Meter by WAVIoT and NB-Fi Wireless Network allowing you to deploy true low-cost Automatic Metering smart grid solution in any point of the world within days and even hours.







# **Key features**

- 10+ km range in the urban environment
- Remote power off & power on feature
- Backup power to keep network connectivity during power outages
- No Mobile Network or Internet connection are require
- No additional wires required

- 30+ km range in rural area
- Load limiting feature
- All readings is automatically uploaded into WAVIoT Cloud
- NB-Fi Ultra Narrow Band technology provides very good signal penetration through walls and hard-to-reach areas

### **Specifications**

Weight	1600g
Dimensions	290 x 180 x 90 mm
Frequency band	Any part of ISM band
Multi-tariff feature	Yes (up to 4 rates)
<b>Operating Temperature</b>	-40 +85 °C
<b>Operating Voltage</b>	110 VAC; 220 VAC
Interfaces	RS-485 9600 8N1
Backup Battery	<b>3.6 V Lithium AA-type Battery</b> (up to 10 years battery life)





# **Detailed Technical Specifications**

### Scope

Static three-phase electricity meter WAVIOT EM 3 (further referred as – meter) is intended for active and reactive electric energy measurements according to the requirements of IEC 62052-11:2016 (2003), IEC 62053-21:2016 (2003), IEC 62053-23:2016 (2003), power quality measurements according to the requirements of IEC 61000-4-30:2015 in AC three-phase four-wire electric networks of power frequency (50 Hz).

### Description and principle of operation

The principle of operation of the meters is based on the preliminary scaling of the input voltage and current with their further conversion into a digital code and processing, as well as subsequent display of measurement results and data on the monitor (display) of the reading device or remote display:

- the amount of electric active energy, not less than 4 tariffs, and the amount (consumption, generation), kWh;
- the amount of electric reactive energy, not less than 4 tariffs, and the amount (consumption, generation), kvar  $\cdot$  h;
- network parameters (AC phase voltage, AC line voltage, alternating current (AC) strength in each phase, active, reactive and total output (electric power) (for each phase and for all phases combined), power factor for each phase and combined, network frequency);
- power quality parameters of electric energy (optional, positive and negative voltage deviation, frequency deviation, voltage dip duration and depth, overvoltage duration);
- current time and date.

The meters are available in two designs – for indoor (further referred as – indoor meters) and for outdoor installation (further referred as – outdoor meters). Outdoor meter consists of two separated parts – a measuring unit and a remote display.

The construction of the meters (measuring unit for outdoor installation) consists of an enclosure and a transparent terminal block cover.

Inside the enclosure there are a printed circuit board, terminal block, the measuring elements with three current (strength) measurement circuits and three voltage measurement circuits in AC three-phase network, and also a circuit for current strength control in neutral conductor (optional), auxiliary circuits (including reserve power supply, interfaces, remote signaling inputs), built-in real-time clock (further referred as – RTC), independent power supply (lithium battery), the relay for the load breakaway or alarm relay (optional), LCD display (for indoor meters).





The access seal of the terminal block cover prevents access to the terminal block. The housing cover with the access seal prevents from access to the interior arrangement of the meter. On the cover of the indoor meter and on the enclosure of outdoor meter the connection scheme of the meters is placed.

Under the cover of the indoor meter's terminal block additionally, there are relay terminals for the external switching device control (for meters with transformer connection, optional), terminals for connecting reserve power supply, Ethernet connector (optional), remote signaling inputs (optional).

Under the cover of the upper part of the indoor meter's enclosure there are contacts of impulse electric outputs and contacts of RS 485 interface and its power supply (optional), as well as a terminal for connection of an external antenna (connected if necessary to improve the quality of communication via the radio interface).

On the front panel of the indoor meter there are two buttons for the data display control.

Communication between the remote display for outdoor meter and the meter measuring block is carried out via the radio interface. On the front panel of the remote display there are also two buttons for the data display control and an additional keyboard for the input of digital information.

For the transmission of measurement results and information in measuring systems and teleautomatics systems, communication with meters with the aim of their maintenance and settings in the operating process, the auxiliary circuits of the meter are used on the basis of which they may be implemented separately or together:

- radio module (optional);
- optical type interface (optical port, optional);
- RS-485 data interface (optional);
- Ethernet interface (optional);
- impulse output optical device;
- impulse output electric device (only for indoor meters, it may also be used as a remote control device in teleautomatics systems);
- relay for control of external switching device (for meters with transformer connection, including that as control device in teleautomatics systems, optional).
- alarm inputs (optional, up to 40 inputs).

In the meter with the radio interface a function of initiative communication with the measuring systems is realized, including:

- at opening of the terminal cover;
- when exposed to an excessive magnetic field;
- when reprogramming;
- when other programmable events occur, including those providing the functionality of teleautomatics systems.





The meters have built-in non-volatile real-time clock with the current time (seconds, minutes, hours) and calendar (date, month, year) support. The meters support up to 4 tariffs in accordance to DLMS. The meters have non-volatile memory that stores data when power is turned off for more than 30 years.

The metes provide the following auxiliary functions:

- control of opening the housing (enclosure) cover;
- control of opening the cover of the meter terminal block;
- temperature control inside the meter;
- control of the impact of excessive magnetic field;
- control of AC voltage network and voltage dropout (failure);
- power control of the connected load;
- control of reverse power flow;
- checking and measurements of the phase rotation;
- monitoring of the presence of phase voltages;
- control of the absence of voltage in the presence of current in the measuring circuits;
- control of deviation of power quality indicators;
- access control via interfaces;
- control of remote alarm input status;
- monitoring (control) of unbalance current in the phase and neutral conductors;
- remote switching control (disable/enable) of the connected load or external commutation device via the command from the measuring system (optional);
- automatic switching control (disable\enable) of the connected load or external commutation device according to the established criterion of the parameters controlled by the meter (optional);
- self-diagnosis of the meter.





	Ine	poss	ible mo	dific	ations	for w	AV	101	EM	3 meter is represented on Picture 1.
EM 3	Т	X	x(x)A	Q	O x	xx L	S	Ν	W	-X
<u>EM 3</u>	T T		x(x)A			xx L				<ul> <li>3 meter is represented on Picture 1.</li> <li>-X Accuracy class Variants: A, B, C, D (according to Table 2) Modification without radio module no symbol: meter with radio module Model (modification) for outdoor installation without remote display; no symbol: meter with display Housing for outdoor installation; no symbol: indoor meter</li> <li>Relay for the load breakaway is available (for meters with direct connection) or external commutation device (for meters with transformer connection) Auxiliary commutation interfaces are available (according to Table 2) Optical port is available</li> <li>Specified power quality parameters of electric energy measurements are available</li> <li>Current control in neutral conductor is available</li> <li>Nominal\base (maximum), current, A</li> </ul>
										Variants: according to Table 2
			L							Rated phase voltage, V. Variants:
										230 V: 3×230/400
										57,7 V: 3×57,7/100
										meter for transformer connection
										no symbol: meter for direct
										Type of the motor (title)
										Type of the meter (title)

тዞ ihl 1:0 .... WAVIOT EM 2 4 - 1 Diat

Picture 1. Modifications of WAVIoT EM 1 meter.

Note: if there is no option, there is no corresponding symbol in the modification. \_





General view and the scheme of access seals of the meters are represented on Picture 2.



a) Indoor meter WAVIOT EM 3

- 1. Place of the manufacturer's sealing
- 2. Place of the metrological service's sealing
- 3. Place of the maintaining company's sealing on the terminal block cover
- Place of the maintaining company's sealing on the cover providing access to the ports RS-485 and impulse outputs

b) Outdoor meter WAVIOT EM 3



c) remote display

Picture 2. General view and the scheme of sealing the meters.





The metes contain the event registration journal, which records events, time and date of their start/termination including:

- terminal cover opening;
- opening of the case (enclosure) of the meter;
- reprogramming;
- impact of excessive magnetic field;
- the fact of communication with the meter by means of the interface, which led to the data change:
- voltage deviations from the specified limits in the measuring circuits;
- relay status changes;
- changes of the current time and date values during the time synchronization;
- attempt to access the interface with an unauthorized password;
- remote signaling inputs status changes, as well as the results of self-diagnosis;
- measuring unit (block);
- computing unit (block);
- timer;
- power supply;
- display;
- memory block (calculation of check sum).





### Metrological and technical characteristics

The ranges of measured values and the limits of permissible measurement errors are represented in Table 2.

Parameters	Value
Town of an in (almost to and this a)	Direct or transformer
Type of voltage close-in (circuits switching)	connected
Turne of automate along in (sinewite antitabing)	Direct or transformer
Type of current close-in (circuits switching)	connected
Accuracy class for active electric energy measurements for the	
following modifications (with according IEC standard):	
– A (IEC 62053-22)	0,58
– B (IEC 62053-22)	0,5S
– C (IEC 62053-21)	1
– D (IEC 62053-21)	1
Accuracy class for reactive electric energy measurements for the	
following modifications (with according IEC standard):	
– A	0,5*
– B (IEC 62053-23)	1
– C (IEC 62053-23)	1
– D (IEC 62053-23)	2
Meter constant, imp./ kWh(imp./kvar * h)	from 800 to 10000
Rated phase / linear (system) voltage $U_{\text{nom}}$ , V:	
<ul> <li>for meters with direct and transformer connection</li> </ul>	3×230/400
<ul> <li>for meters with transformer connection</li> </ul>	3×57,7/100
Maximum operating voltage range, V	from $0,8 \cdot U_{\text{nom}}$ to
	$1,2 \cdot U_{\text{nom}}$
Base current I <sub>b</sub> , A	5, 10, 20
Rated current I <sub>nom</sub> , A	1, 2, 5, 10
Maximum current I <sub>max</sub> , A	2, 10, 60, 80, 100
Nominal value of network frequency, Hz	50±0,5
AC phase voltage measurement range, V	from 0,8 $U_{\text{nom}}$ to 1,2.
	Unom
Limits of permissible relative error of AC phase voltage	±0.5
measurement, %	
Alternating current (AC) strength range, A:	C 0.05 L . L
<ul> <li>for meters with direct connection</li> </ul>	from $0,05 \cdot I_b$ to $I_{max}$
- for meters with transformer connection	Irom $0,01 \cdot I_{nom}$ to $I_{max}$
Limits of permissible relative error of alternating current (AC)	$\pm 0.5$
strength, %	
Range of negative AC voltage deviation measurement $\delta U_{(-)}$ , %	trom -20 to 0
Range of positive AC voltage deviation measurement $\delta U_{(+)}$ , %	from 0 to $+20$





Table 2 (next page)

Parameters	Value
Limits of permissible absolute error of measurement of negative	+0.5
and positive AC voltage deviation, %	±0,5
Measuring range of AC frequency deviation $\Delta f$ , Hz	from 45,0 to 57,5
Limits of permissible absolute error of measurement of AC	+0.03
frequency deviation, Hz	10,05
Measuring range of AC frequency deviation $\Delta f$ , Hz	from -5,0 to +7,5
Limits of permissible absolute error of measurement of AC	$\pm 0.03$
frequency deviation, Hz	
Range of voltage dip and interruption duration measurement,	from 0,02 to 60
$\Delta t_i$ , S	,
interruption duration measurement s	$\pm 0,04$
(Voltage) dip threshold measurement range $\delta U_{d \text{ th}}$ , %	from 0 to 20
Limits of permissible absolute error of (voltage) dip threshold	0.5
measurement, %	$\pm 0,5$
Range of overvoltage duration measurement $\Delta t_{overvoltageU}$ , s	from 0,02 to 60
Limits of permissible absolute error of overvoltage duration	±0,04
measurement, s	<u> </u>
Measurement range of the power factor K <sub>P</sub>	trom -1 to $+1$
Limits of permissible absolute error of the power factor measurement	$\pm 0,02$
Range of active electric power measurement <i>P</i> , W	from $0, 8 \cdot U_{\text{nom}}$ to
	$1,2 \cdot U_{\text{nom}},$
	$0,25 \leq  K_P  \leq 1$
<ul> <li>for meters with direct connection</li> </ul>	
<ul> <li>for meters with transformer connection</li> </ul>	from $0,05 \cdot I_b$ to $I_{max}$
	from $0,01 \cdot I_{nom}$ to $I_{max}$
Limits of permissible relative error of active electric power	
measurement, %, for the following models (modifications):	
– A and B	$\pm 0,5$
– C and D	±1,0
Range of reactive electric power measurement $Q$ , var	from $0, 8 \cdot U_{\text{nom}}$ to
	$1,2 \cdot U_{\text{nom}},$
	$0,25 \le  K_Q  \le 1$
<ul> <li>for meters with direct connection</li> </ul>	
<ul> <li>for meters with transformer connection</li> </ul>	from $0,05 \cdot I_6$ to $I_{\text{max}}$
	from $0,01 \cdot I_{nom}$ to $I_{max}$
Limits of permissible relative error of reactive electric power	
measurement, %, for the following models (modifications):	10.5
-A	±0,5
- B and C	$\pm 1,0$ +2.0
– D	⊥ <i>∠</i> ,0





	0
Range of total output (electric power) measurement $S$ , V·A:	from $0,8 \cdot U_{\text{nom}}$ to $1,2 \cdot U_{\text{nom}}$ ,
<ul> <li>for meters with direct connection</li> <li>for meters with transformer connection</li> </ul>	from $0,05 \cdot I_{\rm b}$ to $I_{\rm max}$ from $0,01 \cdot I_{\rm nom}$ to $I_{\rm max}$
Table 2	

Parameters	Value
Limits of permissible relative error of total output (electric	
power) measurement, %, for the following models	
(modifications):	
– A	±0,5
– B and C	±1,0
– D	$\pm 2,0$
Limits of permissible absolute error of measurement of the	
current time,	$\pm 0,5$
s / day	
Limits of permissible additional absolute error of measurement	
of the current time due to ambient temperature change for each 1	$\pm 0,1$
°C, s per day	
Starting current for meters of the following accuracy classes, not	
less:	
- class 0,5S according to IEC 62053-22 and class 0,5 (with	0,001 · <i>I</i> <sub>nom</sub>
transformer connection)	
- class 1 according to IEC 62053-21 and IEC 62053-23	$0,004 \cdot I_{b}$
(with direct connection)	
Total output (electric power) consumed by the current circuit, at	
fundamental (rated) current, rated frequency and normal	0,1
temperature, V·A, not more	
Total (active) electric power (output) consumed by the voltage	
circuit (without additional communication modules) at rated	10.0 (2.0)
voltage, normal temperature and rated frequency, V A (W), not	10,0 (2,0)
more	
Number of tariffs, not less	4
Availability of additional interfaces for the following models	
(modifications)**:	
-R - RS-485, bit rate per second, bit/s, not less	9600
-E – Ethernet, bit rate per second, M bit/s, not less	10
-T(1-16) – remote indication (signaling) (1-16 inputs)	-
Supported exchange protocols:	
-via NB-Fi radio interface	
	NB-Fi, DLMS,
	IEC 60870-5-104:2016
-via optical port	
	DLMS;
-via RS-485	





	DLMS,
-via Ethernet	IEC 60870-5-101:2015
	DLMS, IEC 60870-5-
	104:2016
Maximum number of inputs of remote indication (signaling) type	40
«dry contact»	40
Characteristics of inputs of remote indication (signaling):	
– maximum voltage, V	30
– input resistance, kOhm	15

#### End of Table 2

Parameters	Value
Maximum number of inputs of remote indication (signaling)	2(1)1)
(solid state relay (SSR) \ «dry contact»)	2(1 1)
Characteristics of outputs of remote indication (signaling):	
- for solid state relay (SSR) (maximum voltage\current strength),	350\1
V/A	
- for outputs of «dry contact» type (maximum voltage\current	20\30
strength), V\mA:	200
– resistance in the open position, Ohm, not more	50
– resistance in the open position, kOhm, not less	
DC supply voltage from reserve power supply, V	from 8,0 to 16,0
DC current strength, consumed from reserve power supply, mA,	100
not more	100
Lifetime of the built-in battery, years, not less	16
Period of data storage when power is turned off, years, not less	30
Protection degree according to IEC 60529:2013, for meters of	
models (modifications):	
<ul> <li>for indoor installation</li> </ul>	IP51
<ul> <li>for outdoor installation</li> </ul>	IP54
<ul> <li>(mobile) remote display RD-2</li> </ul>	IP51
Overall dimensions (height; length; width), mm, not more, for	
meters of models (modifications):	
<ul> <li>for indoor installation</li> </ul>	
– for outdoor installation (without holder (bracket)	235×171×65
– (mobile) remote display RD-2 (without power supply	271×190×82
adapter)	150×105×30
Weight of meters, kg, not more:	
<ul> <li>for indoor installation</li> </ul>	
<ul> <li>for outdoor installation</li> </ul>	1,5
– (mobile) remote display RD-2 (without power supply	2,0
adapter)	0,3
Mean time between failures, h, not less	280000

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	0
Average lifetime of the meter, years, not less	30
Normal conditions:	
<ul> <li>ambient temperature, °C</li> </ul>	from +15 to +25
<ul> <li>relative humidity, %</li> </ul>	from 30 to 80
Operating conditions:	
<ul> <li>ambient temperature (except the remote display), °C</li> </ul>	
<ul> <li>ambient temperature for the remote display RD-2 , °C</li> </ul>	from -40 to +70
<ul> <li>relative humidity at ambient temperature +25 °C, %, not</li> </ul>	from 0 to +50
more	98
Notes	

\* - measurement ranges and limits of permissible errors for accuracy class 0,5 are represented in Tables 3-8;

\*\* - in the case of multiple interfaces, including the same type, the characters are specified the appropriate number of times.

Limits of permissible additional error (for AC phase voltage, alternating current (AC) strength, negative and positive AC voltage deviation, AC frequency, AC frequency deviation, voltage dip and interruption duration, voltage dip depth, overvoltage duration, power factor, active output (electric power), reactive output (electric power), total output (electric power), caused by the change of ambient temperature  $\pm 10 \square C$  make up ½ of the maximum permissible basic error.

Limits of permissible relative error for accuracy class 0,5 at reactive electric energy in normal conditions at symmetric three-phase loading correspond to the values specified in Table 3. Table 3

AC current strength	Ratio sin φ	Limits of permissible	
value, A	(at inductive and capacitive load)	relative error , %	
$0,01 \cdot I_{\text{nom}} \leq I <$		+1.0	
$0,05 \cdot I_{\text{nom}}$	1	±1,0	
$0,05 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$		$\pm 0,5$	
$0,02 \cdot I_{\text{nom}} \leq I <$		+1.0	
$0, 10 \cdot I_{\text{nom}}$	0,5	±1,0	
$0, 10 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$		±0,6	
$0, 10 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$	0,25	±1,0	

Limits of permissible relative error for accuracy class 0,5 during reactive electric energy measurements at single-phase loading and symmetric multiphase voltages applied to voltage circuits, correspond to the values, represented in Table 4 Table 4.

AC current strength value, A	Ratio sin φ (at inductive and capacitive load)	Limits of permissible relative error , %
$0,05 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$	1	±0,6
$0, 10 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$	0,5	±1,0





Limits of permissible additional relative error of reactive electric energy measurements of forward and reverse directions for accuracy class 0,5, caused by power supply voltage variation within the limits:

– from  $0.8 \cdot U_{nom}$  to  $1.2 \cdot U_{nom}$ , at symmetric loading correspond the values, represented in Table 5;

– from 0 to  $0.8 \cdot U_{\text{nom}}$ , at symmetric loading should be limited in the range from plus 10 to minus 100 %.

Table 5	
Table J.	

AC current strength value, A	Ratio sin $\varphi$ (at inductive and capacitive load)	Limits of permissible additional relative error, %	
$0,05 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$	1	±0,20	
$0, 10 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$	0,5	±0,40	

Limits of permissible additional relative error of reactive electric energy measurements of forward and reverse directions for accuracy class 0,5 network frequency deviation within  $\pm 2$  % from  $f_{\text{nom.}}$  correspond the values, represented in Table 6. Table 6

AC current strength value, A	Ratio sin $\varphi$ (at inductive and capacitive load)	Limits of permissible additional relative error, %	
$0,05 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$	1	+0.20	
$0, 10 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$	0,5	10,20	

The change in the error of the meters when measuring the reactive energy of forward and reverse directions for accuracy class 0,5, caused by the return to the normal switching after the earth fault of one of the three phases, corresponds to the values represented in Table 7.

Table 7

Meter accuracy class	Limits of error measurements, %		
0,5	±0,30		

The average temperature ratio of the meters in the temperature subranges from minus 40 to plus 70  $^{\circ}$ C when measuring the reactive energy of the forward and reverse directions for accuracy class 0,5 corresponds to the values represented in Table 8. Table 8

AC current strength value, A	Ratio sin φ (at inductive and capacitive load)	Average temperature ratio during reactive energy and power measurements, %/°C,	
$0,05 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$	1	$\pm 0,03$	
$0, 10 \cdot I_{\text{nom}} \leq I \leq I_{\text{max}}$	0,5	$\pm 0,05$	





# **Packing list**

Packing list for WAVIoT EM 3 is represented in Table 9.

Table 9					
Item	QTY				
Single-phase electricity meter WAVIoT EM 3 in package*	1				
Passport for the meter	1				
User guide for the meter**	1				
Remote display in package***	1				
Remote display secondary power adapter with mini USB cable***	1				
Battery AAA type***	4				
User guide for the remote display***	1				
Software «DLMS_client_waviot»**	-				
Notes:	·				
*Modification of the meter, availability of a set of mounting parts and acc	essories is				
determined by the supply contract.					
**In case of agreement with the customer it may be placed on the website of the					
manufacturer or supplier.					
***Only for outdoor meters					

# **Characteristics of NB-Fi communication module**

WAVIOT is an innovator in a Low Power Wide Area Network (LPWAN) technologies that power the M2M telemetry and Internet of Things. WAVIOT uses the NB-Fi standard that is based on Ultra Narrow Band (UNB) radio technology and operates in the license-free Sub-1 GHz frequency bands.

WAVIOT devices connected by the NB-Fi protocol use significantly less power and operate over large distances compared to Wi-Fi and Bluetooth connection protocols which require more power and work best in short range. Numerous devices send data through the WAVIOT bi-directional gateways. The gateways then detect, demodulate, and report the messages to the WAVIOT Cloud. The WAVIOT Cloud then exchanges these messages with the required customer servers and IoT applications platforms.





	~						-
Table 4.	Characteristics	of NB-Fi	communication	module.	modification	for	Europe
	011001000001000000	0110211	• • • • • • • • • • • • • • • • • • • •		1110 001110 0001011		

Parameter	Value
Wireless protocol	Bi-directional NB-Fi communications
	standard by wAvioi
Distance ranging	Up to 10 km (urban), up to 30 km (rural)
Network topology	Star
Uplink frequency	868.1 MHz
(for sending the NB-Fi messages to gateway)	DC 1%, TX power 25 mW
Downlink	
(for receiving the NB-Fi messages from gateway)	809.0 MHZ

# Normative documentation, containing requirements to WAVIoT EM 3

1. IEC 62052-11: 2016 / 2003 Electricity metering equipment (a.c.) - General requirements - Tests and test conditions - Part 11: Meters for electric energy (metering equipment)

2. IEC 62053-21: 2016 / 2003 Electricity metering equipment (a. c.) - Particular requirements - Part 21: Static meters for active energy (classes 1 and 2)

3. IEC 62053-22: 2016 / 2003 Electricity metering equipment (a. c.) - Particular requirements - Part 23: Static meters for reactive energy (0,2S and 0,5S)

4. IEC 62053-23: 2016 / 2003 Electricity metering equipment (a. c.) - Particular requirements - Part 23: Static meters for reactive energy (classes 2 and 3)

5. IEC 61000-4-30:2015 Electromagnetic compatibility (EMC) - Part 4-30: Testing and measurement techniques - Power quality measurement methods





### **WAVIoT Cloud**

ENERGY TRADING LLC +									
Timezone		Europe/Belgrade	2 +2:00		▼ Change				
Binded users:		<b>*</b>							
Goran Care 🔻	S Opstina La	apovo 👻 🖏							
Utility meter	rs consumption	data					Reports 🖈	Electricity meters settings	5
Poresko	o Test vodomer	o Test dubina 3m	o Biblioteka	Opstina 🦩 Electricity	f modem	y House <b>f</b> Electricity	Heat     Lapovo central -	kalolimetar 🕂	
(••) Modem: 76E	<b>39A4</b> 🖓		⊙ La	ast NB-Fi message: 23.08.201	9 11:17 CEST NSNR: 44 Good signal			🌣 Settir	ngs
Serial: 7780772 Phobos three-phas (hardware: 3.0.2.0;	se direct power software: 3.0.4.0)		( <b>X</b> ) ⊟	ase station: 9655 街 鱼 Onlin	ne				
778077 <b>5</b> A+ T	2 [1	7780772 <b>%</b> A+ T2	7780772 <b>%</b> A+ T3	7780772 <b>%</b> A+ T4	7780772 <b>%</b> Α+ ΣΤ	7780772 A <sup>-</sup> T1	7780772 A <sup>-</sup> T3	7780772 A- T4	
1 310,538 Ø 00:00 - 2	<b>kW-h</b> 84:00	0,000 kW-h	0,000 kW-h	0,000 kW-h	1 310,538 kW·h	0,226 kW·h	0,000 kW·h	0,000 kW-h	
778077 Α- Σ	2 T	7780772 A+ L1	7780772 A+ L2	7780772 A+ L3	<sup>7780772</sup> Α <sup>+</sup> ΣL	<sup>7780772</sup> cos(φ) L1	<sup>7780772</sup> cos(φ) L2	<sup>7780772</sup> cos(φ) L3	
0,226 kV	V-h	0,000 kWt	0,007 kWt	0,000 kWt	0,007 kWt				
<sup>778077</sup> cos(φ)	ΣL	<sup>7780772</sup> ΙΣL	7780772 I L1	7780772 I L2	7780772 I L3	7780772 Freqvencija	7780772 ∠ A-B	<sup>7780772</sup> ∠ B-C	
	<b>\$</b>								

Picture 1. Phobos info and serial number with active phases





4	08.2019	•	By hours By days By months	Period 🔚	III Lul 🗹 🕑
			At T1 Positivo activo	operation tariff T1	
			OBIS code: 1.0.1.8.1.25	55 (0100010801FF)	
Period				Readings for period	
			Begins, kW·h	Consumption, kW·h	Ends, kW·h
01.08.2019 Thursday			1 299,170	0,709	1 299,879
02.08.2019 Friday			1 299,879	0,700	1 300,579
03.08.2019 Saturday			1 300,579	0,633	1 301,212
04.08.2019 Sunday			1 301,212	0,775	1 301,987
05.08.2019 Monday			1 301,987	0,228	1 302,215
06.08.2019 Tuesday			1 302,215	0,752	1 302,967
07.08.2019 Wednesday			1 302,967	0,477	1 303,444
08.08.2019 Thursday			1 303,444	0,354	1 303,798
09.08.2019 Friday			1 303,798	0,581	1 304,379
10.08.2019 Saturday			1 304,379	0,983	1 305,362
11.08.2019 Sunday			1 305,362	0,834	1 306,196
12.08.2019 Monday			1 306,196	0,319	1 306,515
13.08.2019 Tuesday			1 306,515	0,859	1 307,374
14.08.2019 Wednesday			1 307,374	0,563	1 307,937
15.08.2019 Thursday			1 307,937	0,284	1 308,221
16.08.2019 Friday			1 308,221	0,339	1 308,560
17.08.2019			1 308.560	0.296	1 308.856

Picture 2. Readings for period







A Report a bug

#### Picture 3. Vector diagram of voltage (when click on refresh it updates diagram instantly)





<b>←</b> Back	Control of the section of the sectio														×										
Get the tariff schedule from the electricity meter <b>O</b> W What does all of this mean?																									
Number of tariffs:								¢/(€ 2 tariffs ¢/₽/€ 3 tariffs								¢\$									
OT1 — daily rate									<b>C</b> T2 — night rate																
🖃 T3 — semi-peak tariff												0	T4	— se	econ	d sei	ni-p	eak	tarif	f					
Day											4	<mark>⊘ H</mark> (	ours	1											
МО	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
TU	0	1	2	3	4	5	6	7			10	11	12	13	14	15	16	17	18	19		21	22	23	
WE	0	1	2	3	4	5	6	7			10	11	12	13	14	15	16	17	18	19		21	22	23	
тн	0	1	2	3	4	5	6	7			10	11	12	13	14	15	16	17	18	19		21	22	23	
FR	0	1	2	3	4	5	6	7			10	11	12	13	14	15	16	17	18			21	22	23	
SA	0	1	2	3	4	5	6	7			10	11	12	13	14	15	16	17	18	19		21	22	23	
SU	0	1	2	3	4	5	6	7			10	11	12	13	14	15	16	17	18	19		21	22	23	

Make different tariff schedules on different days of the week

ດ Support

🖋 Logs 🗎 Save to 🛛 🚔 Open from 📝 Edit manually

🖺 Save 🗘

A Report a bug

Picture 4. Tariff Schedule Management





#### Back U Power control and limitation 76B9A4 (7780772)

three-phase direct power; hardware: 3.0.2.0; software: 3.0.4.0;

	C Sync data	
	<b>ບ</b> Power supply	
🙂 Off	C Enabled	🙂 On

Load relay state transition mode
 1

- Description of load relay state transition modes 🔶
- 0 Auto/manual/remote 😃 power off / 😃 power on disabled
- 1 Auto/manual/remote 😃 power off & manual 😃 power on enabled
- 2 Auto/manual/remote 😃 power off & manual/remote 😃 power on enabled
- 3 Auto/remote 😃 power off & manual 😃 power on enabled
- 4 Auto/remote () power off & manual/remote () power on enabled
- 5 Auto/manual/remote () power off & auto () power on enabled, remote access to () power on is available
  6 Auto/remote () power off & local () power on enabled, remote access to () power on is available
- 7 Auto/manual/remote 😃 power off & manual/auto/remote 😃 power on enabled (this is recommended load relay state transition mode!)

#### 🚯 Max power, W

0	🖋 Change
---	----------

If the average power will exceed the "Max power" parameter during the Measurement period of power consumption, the electricity will be turned off automatically.

For example, if a "Max power" parameter was set to 100 W, and a "Measurement period of power consumption" parameter was set to 10 seconds, and the subscriber turns on the electric kettle, then after 10 seconds of switching on the kettle, electricity will be turned off.

#### O Measurement period of power consumption, seconds

_	-		-
	Ŀ.	61	61
	o		U
_	_	_	_

🖋 Change

The period during which average power is measured in the network.

If the average power will exceed the "Max power" parameter, electricity will be turned off. The greater the specified period, the lower the probability that electricity will be turned off in case of with a significant accidental voltage surge in the network.

The greater the specified period, the lower the probability that with a significant accidental voltage surge in the network, the subscriber will turn off the electricity.

#### O Time to switch on, seconds

60

🖋 Change

Time before the meter is turned on after its automatic shutdown.

For example, if you set the "Time to switch on" parameter to 60 seconds and electricity was turned off because of power limitation, the electricity will be turned on automatically after 60 seconds. If the electric kettle remains switched on, the cycle will be repeated.

⊖ Support / Action logs

A Report a bug

#### Picture 5. Power control (Turn of, turn on, set max power..)





← Back ∳ Instant readings and three-phase direct power; hardware: 3.0.2.0; software: 3	profile capture perio	d 76B9	<b>A4 (</b> 77	80772 <b>)</b>			×	
		C	hannel				Value	
	23.08.2019 12:15:40 CEST							
	-							
	∠ B-C, Angle between ph	nases L2	and L3				-	
	∠ A-C, Angle between ph	nases L1	and L3				-	
	ncy, Hz				-			
	-							
Ċ				40.000				
Dhase	14			2		12	51	
Voltage V	LI		L	2		LS	21	
L Current A						-	-	
A+. Active Power, kWt	-		-			-	-	
O <sup>+</sup> , Reactive Power, kVar	-			-		-	-	
S <sup>+</sup> , Full Power, kV·A	-			-		-	-	
cos φ, Power coefficient	-			-		-	-	
	Т	ariffs	T1	Т2	Т3	Т4	ΣΤ	
	A <sup>+</sup> , Positive active energy,	kW∙h	-	-	-	-	1310.575	
	A <sup>-</sup> , Negative active energy,	kW∙h	-	-	-	-	0.000	
Q	, Positive reactive energy, k	-	-	-	-	0.000		
Q-,	Negative reactive energy, k	Var∙h	-	-	-	-	13.568	
Profile capture period     Minutes	& Change	60						

Picture 6. Instant readings and profile capture period (Collect momentary readings and set profile capture period by your wish)





Report export										
Ad	Add the customer's account number to the report									
<b>Ava</b> Repo	lable reports rts by devices									
#	Report Format									
1	Electro daily report	excel								
2	Electro hourly report	excel								
3	Electro half-hourly report	excel								
4	Power Quality Report	excel								
		Close								

#### Picture 7. Report export

🖬 🕤 · 👌 · = daily_report_electro (Protected View) - Excel (Product Activation Failed)														ॼ –	o ×	
File Home Insert PageLayout Formulas Data Review View Acrobat 🖓 Tell me what you want to do														Sign in	₽ Share	
PROTECTED VIEW Be careful—files from the Internet can contain vinuses. Unless you need to edit, it's safer to stay in Protected View. Enable Editing														×		
A31 * : X    fr Total:																
A	В	С	D	E	F	G	н	1	J	к	L	М	N	0	Р	Q A
1 Electro report for the period from 01.0	08.2019 to 01.09.20	019	Full name:													
2																
3 Counter: Phobos, Modem id: 76B9A4,	Timezone: Europ	e/Belgrade														
4																_
5		A*T1			A*T2			A*T3			A*T4			А*Тсумм		
6 Date		Readings (kW*h	1)		Readings (kW*	h)		Readings (kW*)	1)		Readings (kW*h	)		Readings (kW*h	<u>1</u>	
7	Begins	Consumption	Ends	Begins	Consumption	Ends	Begins	Consumption	Ends	Begins	Consumption	Ends	Begins	Consumption	Ends	
8 01.08.2019 00:00	1 299.170	0.709	1 299.879	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 299.170	0.709	1 299.879	
9 02.08.2019 00:00	1 299.879	0.700	1 300.579	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 299.879	0.700	1 300.579	-
10 03.08.2019 00:00	1 300.579	0.633	1 301.212	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 300.579	0.633	1 301.212	
11 04.08.2019 00:00	1 301.212	0.775	1 301.987	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 301.212	0.775	1 301.987	
12 05.08.2019 00:00	1 301.987	0.228	1 302.215	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 301.987	0.228	1 302.215	-
13 06.08.2019 00:00	1 302.215	0.752	1 302.907	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 302.215	0.752	1 302.907	
14 07.08.2019 00:00	1 302.507	0.477	1 303.444	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 302.907	0.477	1 303.444	
15 08.08.2019 00:00	1 202 799	0.534	1 204 279	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 202 709	0.554	1 204 279	
10 05:08:2019:00:00	1 204 279	0.983	1 205 262	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 204 279	0.982	1 205 262	
18 11 08 2019 00:00	1 305 362	0.834	1 306 196	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 305 362	0.834	1 306 196	
19 12 08 2019 00:00	1 306 196	0.319	1 306 515	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 306 196	0.319	1 306 515	
20 13.08.2019.00:00	1 306.515	0.859	1 307.374	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 306.515	0.859	1 307.374	
21 14.08.2019 00:00	1 307.374	0.563	1 307.937	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 307.374	0.563	1 307.937	
22 15.08.2019 00:00	1 307.937	0.284	1 308.221	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 307.937	0.284	1 308.221	
23 16.08.2019 00:00	1 308.221	0.339	1 308.560	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 308.221	0.339	1 308.560	
24 17.08.2019 00:00	1 308.560	0.296	1 308.856	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 308.560	0.296	1 308.856	
25 18.08.2019 00:00	1 308.856	0.514	1 309.370	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 308.856	0.514	1 309.370	
26 19.08.2019 00:00	1 309.370	0.230	1 309.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 309.370	0.230	1 309.600	
27 20.08.2019 00:00	1 309.600	0.446	1 310.046	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 309.600	0.446	1 310.046	
28 21.08.2019 00:00	1 310.046	0.276	1 310.322	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 310.046	0.276	1 310.322	
29 22.08.2019 00:00	1 310.322	0.203	1 310.525	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 310.322	0.203	1 310.525	
30 23.08.2019 00:00	1 310.525	0.050	1 310.575	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 310.525	0.050	1 310.575	
31 Total:	1 299.170	11.405	1 310.575	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1 299.170	11.405	1 310.575	
32																
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<ul> <li>← 76B9A4 ⊕</li> </ul>									÷ •							Þ
Ready														III II II		+ 100%

Picture 8. Example of report export