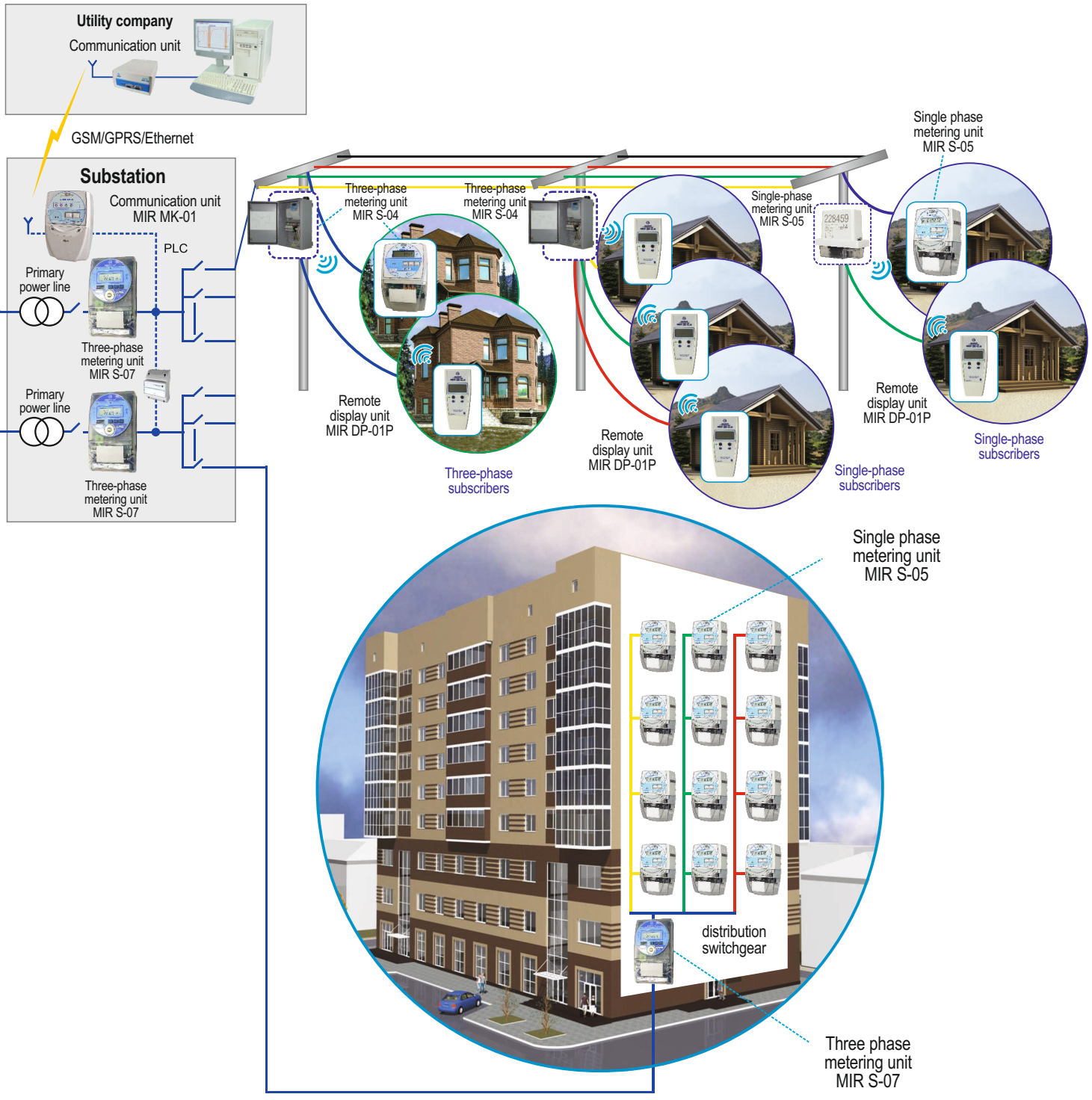
Anti-tamper advanced metering infrastructure for communities

For low and medium voltage applications in commercial, light industrial and residential. Electricity metering, anti-tampering, power quality, security, outage support. Improving efficiency of utility companies on emerging markets



Certified by Russian Register

2008

2013

Functions:

– Measurement of power grid parameters and electricity metering;
– Automatic data collection;
– Data verification;
– Subscriber's load management and power limitation;
– Network status reporting and visualization;
– Unauthorized access protection.

Features:

– **Safety and reliability**
  - Robust communication: wired (PLC) and radio (ZigBee or RF868MHz);
  - DLMS/COSEM protocol support;
  - Unauthorized access limitation and information security;
  - Self-diagnostics through all units.
– **Anti-tamper**
  - Load balance calculation;
  - Additional measuring channels in neutral for direct connected meters;
  - Active energy absolute values measurement;
  - Voltage monitoring while the subscriber is disconnected
  - Opening sensors for the metering unit's terminal cover;
  - Magnetic field sensor with measuring the magnetic flux magnitude;
  - Non-dismountable unit housing.
– **Impact on violators**
  - Local and remote power disconnection for violating subscriber.

The system includes:

– Three-phase outdoor or indoor installation subscriber's metering unit MIR S-04;
– Single-phase outdoor or indoor installation subscriber's metering unit MIR S-05;
– Substation's metering unit MIR S-07;
– Data concentrator MIR MK-01;
– Remote display unit MIR DP-01P;
– RF communication unit MIR MB-02.

THREE-PHASE ELECTRICITY METERING UNIT MIR S-04

MIR S-04 is a smart direct-connected commercial electricity meter suitable for low voltage applications.

The meter provides extensive functionality in key areas of metering: power quality, anti-tampering, security, billing data protection and outage support. This version is intended for indoor installation.

Purpose

– measurement of active, reactive energy for forward and reverse directions in three-phase AC circuits;
– operating autonomously or as part of the AMI.

Measured parameters

– active and reactive electrical energy of forward and reverse directions;
– active, reactive and apparent demand for each phase and total for three phases;
– RMS (effective) current and voltage values for each phase;
– RMS (effective) values of linear voltages;
– power factor for each phase and total;
– instrumentation values (U, I, f, ...).

Interfaces and communication

– Optical port;
– RS-485 (optional);
– PLC (optional);
– ZigBee 2.4 GHz with internal/external antenna (optional);
– Self-organizing mesh network for PLC and ZigBee interfaces;
– 868 MHz RF with internal/external antenna (optional);
– 1 mechanical relay output (optional);
– One pulse input (optional).

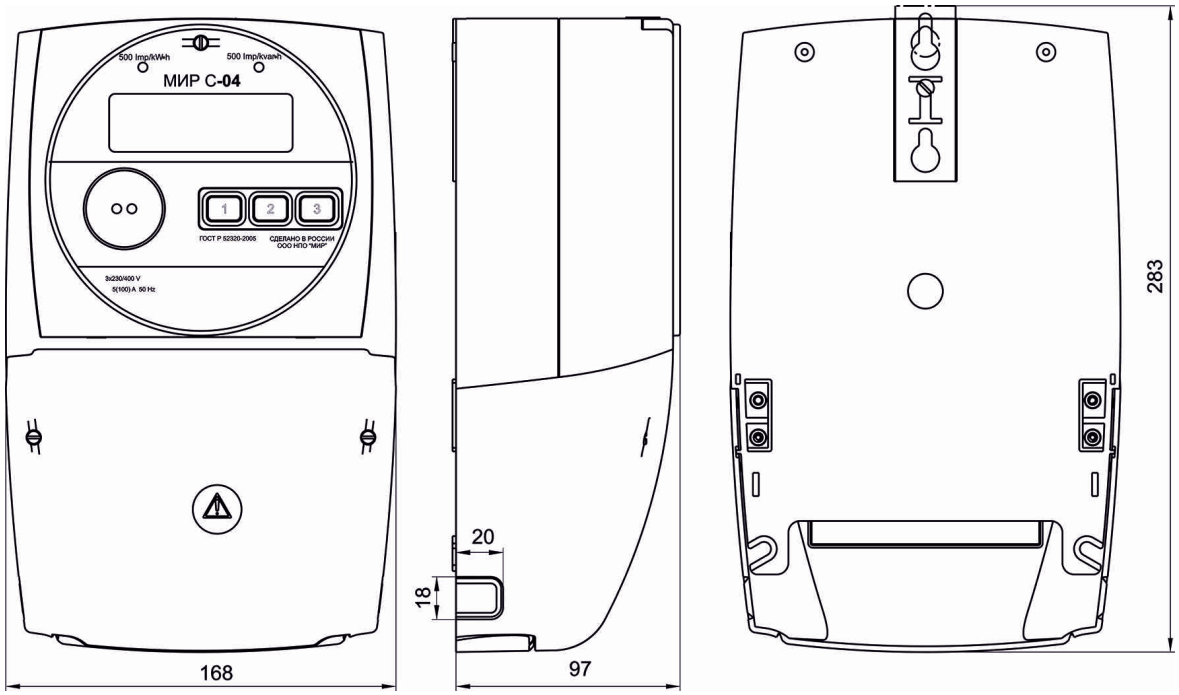
Anti-tamper capabilities

– configurable outage capability (by remote command or by exceeding internal setting);
– subscriber disconnection when the voltage is exceeded, or if there is an external magnetic field, or if the temperature inside is critically high;
– visual magnetic field impact indicator;
– main/terminal cover removal detection;
– anti-tamper built-in 3D magnetic field sensor;
– self-diagnostics.

Specifications

Parameter name	Value
Electricity metering	
Accuracy class for measuring active /reactive energy in both directions	1/1
Rated voltage Urated, V	3 x 230/400 or 1 x 230
Normal voltage range when measuring power and energy	From 0.8 to 1.2Urated
Basic (maximum) current, Ib. (Imax.), A	5 (100)
Phase voltage measurement range, V	From 0.8 to 1.2Urated
Phase current measurement range, A	From 0.05Ib. to Imax
Network frequency rated value, Hz	50
Frequency measurement range, Hz	From 47.5 to 52.5
Other parameters	
Active (total) power, consumed by each voltage circuit, not more than, W (V▪A)	2,0 (10)
Total power, consumed by each current circuit, not more than, V▪A	1.0
Number of tariffs/tariff zones	up to 4 tariffs in 12 tariff zones
Calibration interval (in Russian Federation), years:	16
Warranty period, years	5
Mean time between failures, h, not less than	290000
Mean service life, years, not less than	30
Protection degree	IP51
Dimensions, mm	283×168×97
Weight, kg	1.8
Operating temperatures range, °C	from minus 40 to plus 60

Dimensions



Numbering system

MIR S-04.X – X – X – X – X – X – X – X

Data exchange protocol

D – DLMS/COSEM protocol

Additional functions 1

E – meter for outdoor installation
Z – connector for ZigBee external antenna
F – connector for RF external antenna
G – connector for GSM external antenna

Function 2

K – power relay
S1 – one additional relay
S3 – three additional relays
T1 – one pulse input
B – indicator backlit
Q – electric power quality indices measurement

Type of interface 2

R – RS-485 interface
P – PLC interface
P1 – PLC interface (option)
Z – ZigBee interface
F – RF interface
G – GSM interface

Rated maximum current

5(100) – rated current 5 A (maximum current 100 A)

Rated voltage

230 – rated phase/line voltage 3 x 230/400 V

Accuracy class for measuring active/reactive energy

10 - 1/1

1. If there is no "E" symbol, the unit is intended for indoor installation
2. If there are several functions or interfaces in the unit, their codes are written sequentially, for example, a meter featuring PLC, ZigBee interfaces and the radio interface will have a PZF code

THREE-PHASE ELECTRICITY METERING UNIT MIR S-04 FOR OUTDOOR INSTALLATION

MIR S-04 is a smart direct-connected commercial electricity meter suitable for low voltage applications.

The meter provides extensive functionality in key areas of metering: power quality, anti-tampering, security, billing data protection and outage support. This version is intended for installation on power lines supports.

Portable remote display unit is available.

Purpose

– multi-tariff metering of active and reactive energy for forward and reverse directions in three-phase AC circuits;
– operating autonomously or as part of the AMI.

Measured parameters

– active and reactive electrical energy of forward and reverse directions;
– active, reactive and apparent power for each phase and total for three phases;
– RMS (effective) current and voltage values for each phase;
– RMS (effective) values of linear voltages;
– power factor for each phase and total;
– instrumentation values (U, I, f, ...).

Interfaces and communication

– optical port;
– PLC (optional);
– ZigBee 2,4 GHz (optional);
– GSM (optional);
– self-organizing mesh network for PLC and ZigBee interfaces;
– 866 MHz RF for communication with a remote display unit;
– portable remote display unit available.

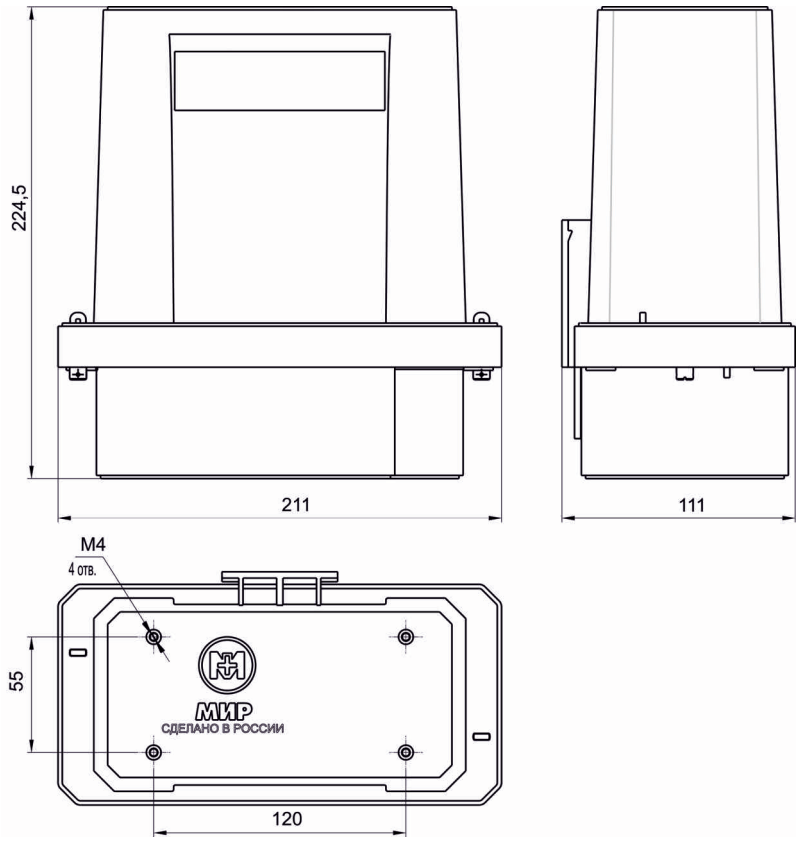
Anti-tamper capabilities

– configurable disconnection capability (by remote command or by exceeding internal setting);
– disconnection when the voltage is exceeded, or if there is an external magnetic field, or if the temperature inside is critically high;
– visual magnetic field impact indicator;
– main/terminal cover removal detection;
– non-dismountable unit housing;
– anti-tamper built-in 3D magnetic field sensor;
– transparent terminal cover;
– self-diagnostics.

Specifications

Parameter name	Value
Accuracy class for measuring active/reactive energy	1/1
Rated phase/line voltage V	3 x 230/400
Base (maximal) current, A	5 (100)
Network rated frequency, Hz	50
Number of tariffs/tariff zones	4/12
Calibration interval (in Russian Federation), years:	16
Warranty period, years	5
Mean service life, years	30
Protection degree	IP54
Weight, kg	1.8
Operating temperatures range, °C	from minus 40 to plus 70
Dimensions, mm	224,5x211x111

Dimensions



Numbering system

MIR S-04.X – X – X – X – X – E – X

Data exchange protocol

D – DLMS/COSEM protocol

Additional functions 1

E – uint for outdoor installation

Functions 2

K – power relay
N – current control in neutral
Q – electric power quality indices measurement

Type of interface 2

P – interface
PLC P1 – interface
PLC (option)
Z – ZigBee interface
F – RF interface
G – GSM interface

Rated maximum current

5(100) – rated current 5 A (maximum current 100 A)

Rated voltage

230 - rated phase/line voltage 3 x 230/400 V

Accuracy class for measuring active/reactive energy

10 - 1/1

1. If there is no "E" symbol, the uint is intended for indoor installation
2. If there are several functions or interfaces in the meter, their codes are written sequentially, for example, a meter featuring PLC, ZigBee interfaces and the radio interface will have a PZF code

Remote display unit MIR DP-01 (01P) is required for subscriber for reading indications.

SINGLE-PHASE ELECTRICITY METERING UNIT MIR S-05

MIR S-05 is a smart direct-connected commercial electricity meter suitable for low voltage applications.

The meter provides extensive functionality in key areas of metering: power quality, anti-tampering, security, billing data protection and outage support.

Purpose

– multi-tariff metering of active and reactive electric energy for forward and reverse directions in single-phase AC circuits;
– operating autonomously or as part of the AMI.

Measured parameters

– Active and reactive energy of forward and reverse directions;
– Active, reactive and total power;
– RMS (effective) current and voltage values;
– Active power factor;
– Instrumentation values (U, I, f, ...).

Features

– Self-organizing mesh network for PLC and ZigBee interfaces;
– configurable outage capability (by remote command or by exceeding internal setting);
– current sensors in phase and in neutral

Interfaces and communication

– Optical port;
– RS-485 (optional);
– PLC (optional);
– ZigBee 2.4 GHz (optional).

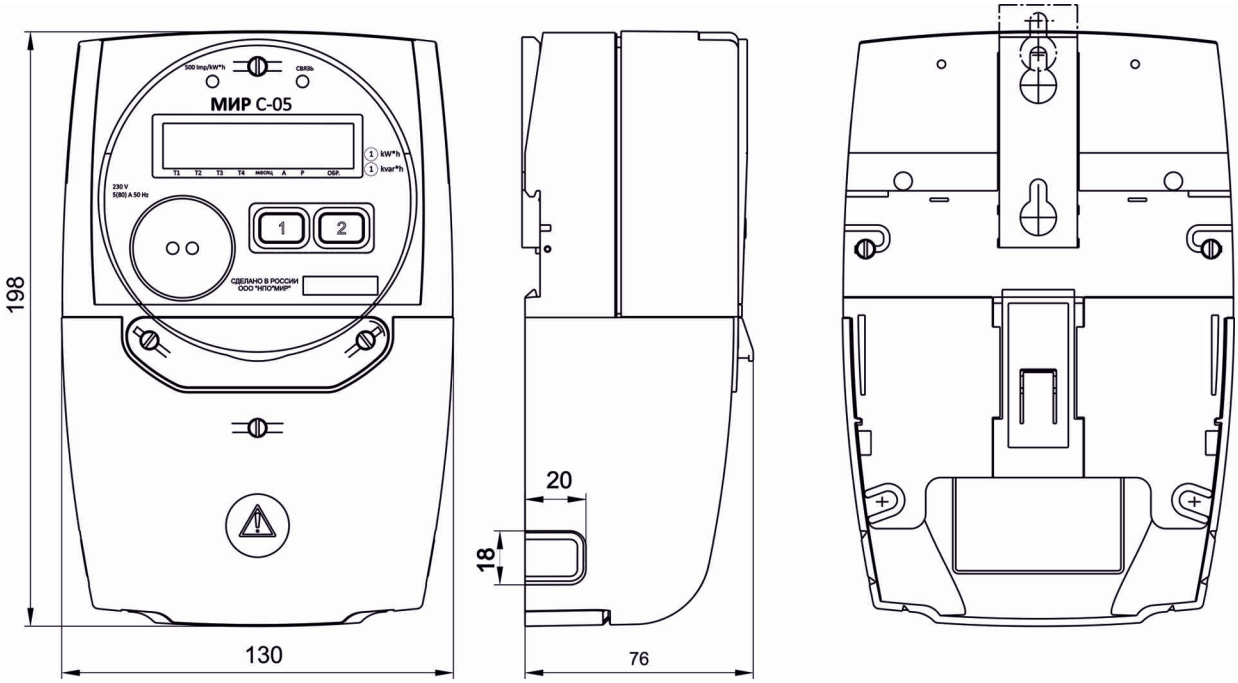
Anti-tamper capabilities

– 3D magnetic field sensor;
– visual magnetic field impact indicator;
– opening sensors for housing covers and terminal compartment;
– non-dismountable housing;
– transparent terminal cover;
– differential current monitoring;
– self-diagnostics.

Specifications

Parameter name	Value
Accuracy class for measuring active/reactive energy	1/1
Rated phase/line voltage V	230
Base (maximal) current, A	5 (80)
Network rated frequency, Hz	50
Number of tariffs/tariff zones	4/12
Calibration interval (in Russian Federation), years:	16
Warranty period, years	5
Mean service life, years	30
Protection degree	IP51
Weight, kg	1.0
Operating temperatures range, °C	from minus 40 to plus 60
Dimensions, mm	198×130×76

Dimensions



Numbering system

MIR S-05.X – X – X – X – X – E – X

Exchange protocol

D – DLMS/COSEM protocol

Additional functions 1

E – meter for outdoor installation

Function 2

K – power relay
N – current control in neutral
Q – measurement quality indices of electric energy

Type of interface 2

P – PLC interface
P1 – PLC interface (option)
Z – ZigBee interface
F – radio interface

Rated maximum current

5(100) – rated current 5 A (maximum current 80 A)

Rated voltage

230 - 230 V

Accuracy class for measuring active/reactive energy

10 - 1/1 (active/reactive energy) 1A - 1/- (active energy)

1. If there is no "E" symbol, the meter is intended for indoor installation
2. If there are several functions or interfaces in the meter, their codes are written sequentially, for example, a unit featuring PLC, ZigBee interfaces and the radio interface will have a PZF code

SINGLE-PHASE ELECTRICITY METER MIR S-05 FOR OUTDOOR INSTALLATION

MIR S-05 is a smart direct-connected commercial electricity meter suitable for low voltage applications.

The meter provides extensive functionality in key areas of metering: power quality, anti-tampering, security, billing data protection and outage support.

Purpose

– installation at the consumer on a power line pole or on wires;
– multi-tariff metering of active and reactive electric energy for forward and reverse directions in single-phase AC circuits;
– operating autonomously or as part of the AMI.

Measured parameters

– Active and reactive energy of forward and reverse directions;
– Active, reactive and total power;
– RMS (effective) current and voltage values;
– Active power factor;
– Instrumentation values (U, I, f, ...).

Features

– portable remote display unit available
– self-organizing mesh network for PLC and ZigBee interfaces
– load management capability with built-in relay
– current sensors in phase and in neutral

Interfaces and communication

– Optical port;
– PLC (optional);
– ZigBee 2,4 GHz (optional);
– 866 MHz radio interface for communication with a consumer display;
– Data transfer protocol is DLMS/COSEM compatible.

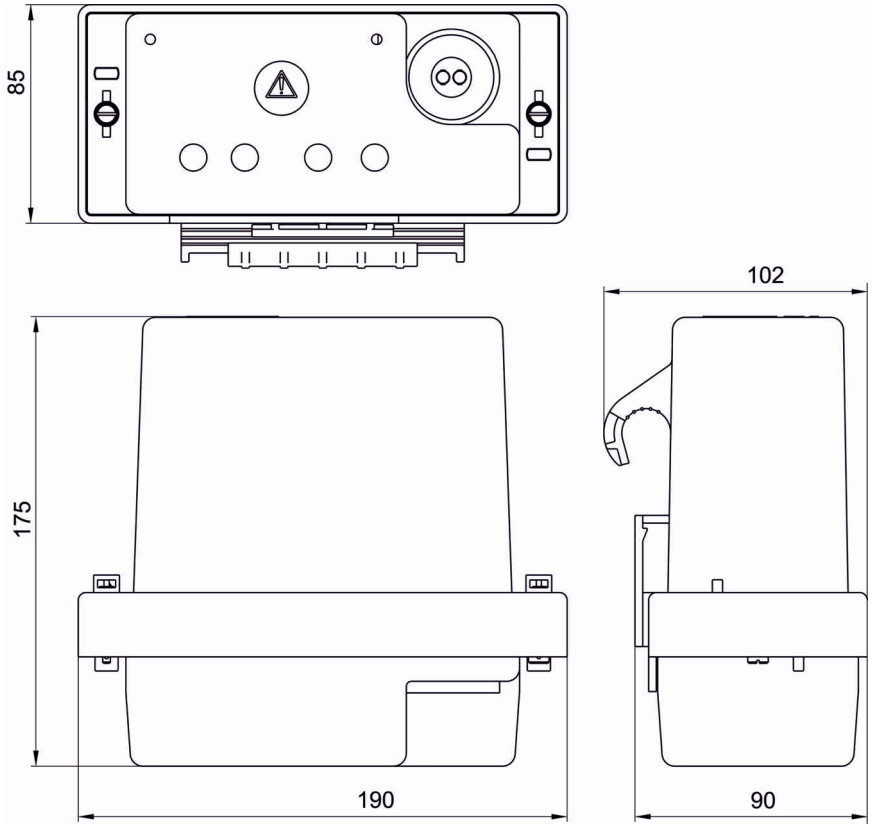
Anti-tamper capabilities

– 3D magnetic field sensor and the indicator of magnetic field impact;
– opening sensors for housing covers and terminal compartment;
– non-dismountable housing;
– transparent terminal cover;
– differential current monitoring;
– self-diagnostics.

Specifications

Parameter name	Value
Accuracy class for measuring active/reactive energy	1/1
Rated phase/line voltage V	230
Base (maximal) current, A	5 (80)
Network rated frequency, Hz	50
Number of tariffs/tariff zones	4/12
Calibration interval (in Russian Federation), years:	16
Warranty period, years	5
Mean service life, years, not less than	30
Protection degree	IP54
Meter weight, kg	1.0
Operating temperatures range, °C	from minus 40 to plus 70
Dimensions, mm	175x190x102

Dimensions



Numbering system

MIR S-05.X – X – X – X – X – E – X

Exchange protocol

D – DLMS/COSEM protocol

Additional functions 1

E – meter for outdoor installation

Function 2

K – power relay
N – current control in neutral
Q – measurement quality indices of electric energy

Type of interface 2

P – PLC interface
P1 – PLC interface (option)
Z – ZigBee interface
F – radio interface

Rated maximum current

5(100) – rated current 5 A (maximum current 80 A)

Rated voltage

230 - 230 V

Accuracy class for measuring active/reactive energy

10 - 1/1 (active/reactive energy) 1A - 1/- (active energy)

1. If there is no "E" symbol, the meter is intended for indoor installation
2. If there are several functions or interfaces in the meter, their codes are written sequentially, for example, a meter featuring PLC, ZigBee interfaces and the radio interface will have a PZF code

Remote display unit MIR DP-01 (01P) is required for subscriber for reading indications.

THREE-PHASE ELECTRICITY METERING UNIT MIR S-07

MIR S-07 is a smart indirect-connected commercial electricity meter suitable for low and medium voltage applications.

It is intended to be a balance power meter on the transformer substation as part of AMI or as a three-phase subscriber's metering unit.

Purpose

– multi-tariff metering of active and reactive energy for forward and reverse directions in three-phase AC circuits;
– instrumentation values (U, I, f, ...) measurement;
– operating autonomously or as part of the AMI metering system.

Measured parameters

– active and reactive energy of forward and reverse directions;
– active, reactive and apparent power for each phase and total for three phases;
– RMS (effective) current and voltage values for each phase;
– RMS (effective) values of linear voltages;
– power factor for each phase and total;
– instrumentation values (U, I, f, ...).

Features

– additional mechanical relay outputs;
– self-organizing MESH network for PLC and ZigBee interfaces;
– backup power supply (optional).

Interfaces and communication

– optical port;
– RS-485 (optional);
– PLC (optional);
– ZigBee 2.4 GHz with internal/external antenna (optional);
– 868 MHz radio interface with external antenna (optional).

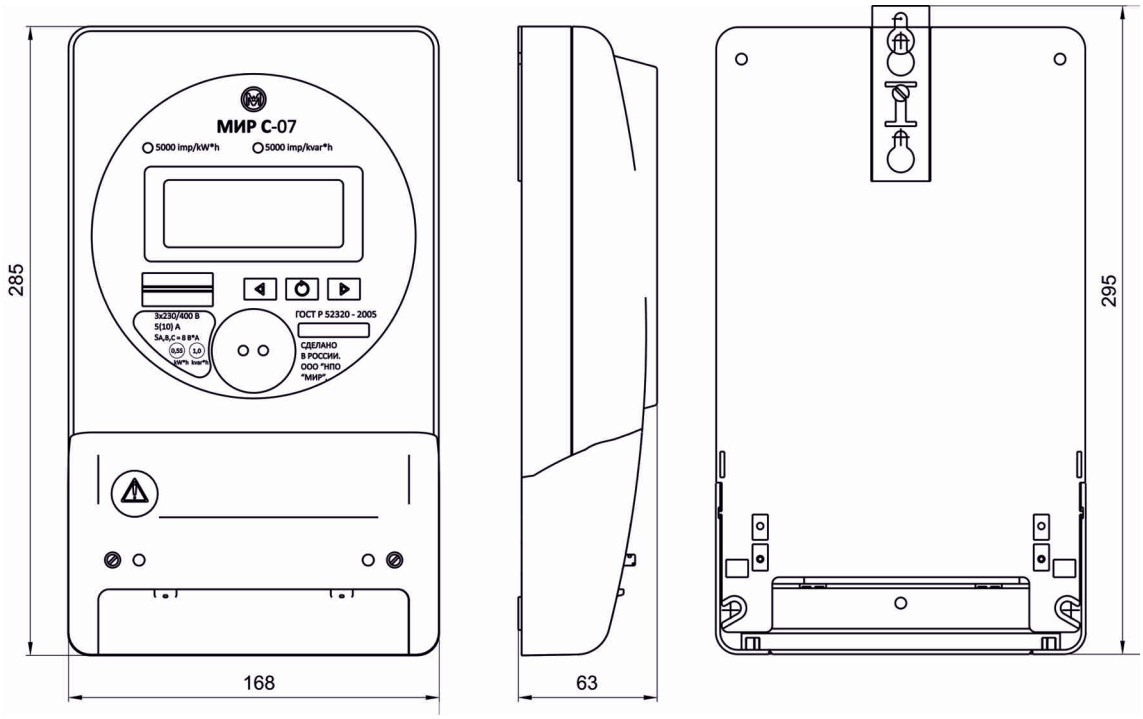
Anti-tamper capabilities

– 3D magnetic field sensor and the indicator of magnetic field impact;
– electronic seals for opening the housing covers and the terminal compartment;
– non-dismountable unit housing;
– transparent terminal cover;
– self-diagnostics;

Specifications

Parameter name	Value
Type of voltage circuits connection	Direct or via transformer
Type of current circuits connection	Via transformer
Accuracy class for measuring active/reactive energy	0.5S/1
Rated phase/line voltage, V	3x57,7/100 or 3x230/400
Rated (maximal) current, A	1(2) or 5(10)
Network rated frequency, Hz	50
Number of tariffs/tariff zones	4/12
Backup power supply source rated voltage, V	230B AC/DC
Calibration interval (in Russian Federation), years:	16
Warranty period, years	5
Protection degree	IP51
Operating temperatures range, °C	From minus 40 to plus 55
Dimensions, mm	285×168×63

Dimensions



Numbering system

MIR S-07. 05S – X – X – X – X – X – X

Data exchange protocol

P – proprietary DLMS-based
D – DLMS/COSEM protocol
M – MODBUS protocol

Additional functions

Z – connector for ZigBee external antenna
F – connector for radio modem external antenna

Function 1

K – power relay
S1 – additional relay
S3 – three additional relays
B – indicator backlit
L – backup power supply 12 V
H – backup power supply 220 V
Q – electric power quality indices measurement

Type of interface 1

R – RS-485 interface
P – PLC interface
P1 – PLC interface (modification)
Z – ZigBee interface
F – RF interface

Rated/maximum current

1(2) – rated current 1 A (maximum current 2 A)
5(10) – rated current 5 A (maximum current 10 A)

Rated voltage

57 – rated phase/line voltage 3 x 57.7 / 100 V
230 – rated phase/line voltage 3 x 230/400 V

Accuracy class for measuring active/reactive energy

05S - 0,5S/1

1. If there are several functions or interfaces, their codes are written sequentially, for example, a meter featuring PLC, ZigBee and radio interfaces will have a PZF code.

Data concentrator MIR MK-01

MIR MK-01 is an intelligent data concentrator
for meter reading and controlling applications.

Features

– simultaneous operation with several data collection centers (up to 4);
– arranging self-organized mesh networks using PLC, ZigBee, RF;
– automatic search for optimal data delivery routes in PLC, ZigBee, RF networks;
– PLC data transmission through low and medium voltage lines;
– simultaneous operation of several PLC (ZigBee or RF) networks without affecting each other;
– reservation of PLC, ZigBee (main - PLC, backup - ZigBee or vice versa) communication channels;
– automatic collection and storage of profiles, daily and monthly readings of electricity metering devices;
– time synchronization of electricity metering devices based on the unit's system time;
– protection against unauthorized access and data security.

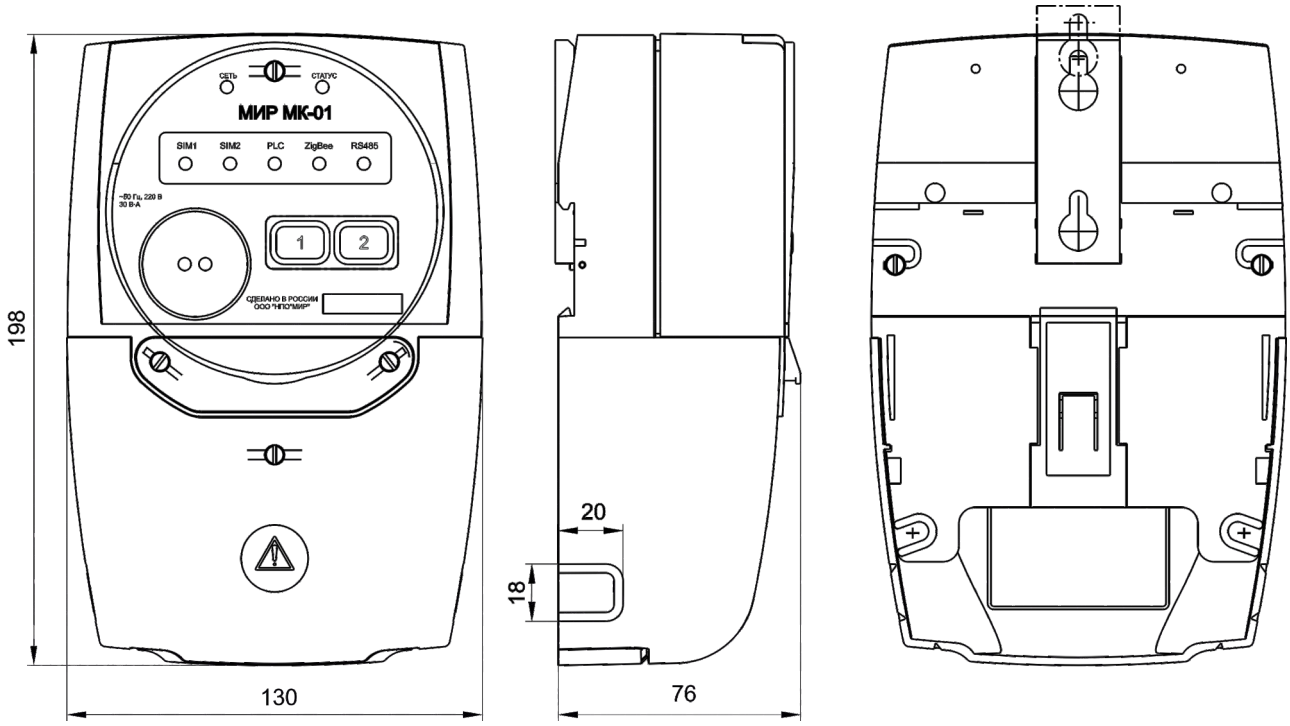
Interfaces and communication

– Optical port for configuration and servicing;
– GSM;
– Ethernet;
– RS-485;
– PLC;
– ZigBee;
– RF.

Specifications

Parameter name	Value
Optical port	
Data transmission rate, bps	9600
RS-485	
Number of interfaces	2
Data transmission rate, bps	9600 – 115200
GSM	
Mobile communication standards	GSM 900/1800 (CSD and GPRS)
Number of SIM-cards	2
Work with static IP-address SIM cards	Supported
Number of simultaneously outgoing TCP/IP-connections	4
Ethernet	
Data transmission rate, Mbps	100
Number of simultaneously incoming TCP/IP-connections	4
PLC	
Number of interfaces	2
Operation mode	As base or as remote station
Number of logical networks	1023
Number of devices in logical network	2047
Data transmission rate (automatic selection), kbps	0.625; 2.5; 33.4
Operating frequency range (optional), kHz	20 – 80 ; 95 – 125; 31 – 95
The PLC output signal level on the equivalent of the power network with a resistance of 5 ohms, V	1.0
The PLC output signal level, ensuring reception, mV, not more than	1.0
ZigBee	
Operation mode	As coordinator or as router
Data transmission rate, kbps	250
Operating frequency range, MHz	2400 – 2483.5
ZigBee transmitter carrier frequency power, mW	100
RF	
Operation mode	Switch
Operating frequency range, MHz	868.7 – 869.2
Transmitter carrier frequency power, mW	25
Data transmission rate, kbps	50 or 10
Receiver sensitivity, dBm: - at data transmission rate of 50 kbps - at data transmission rate of 10 kbps	 - 107 - 107

Dimensions


СЕТЬ
СТАТУС
МИР МК-01
SIM1
SIM2
PLC
ZigBee
RS485
1
2
198
130
20
18
76

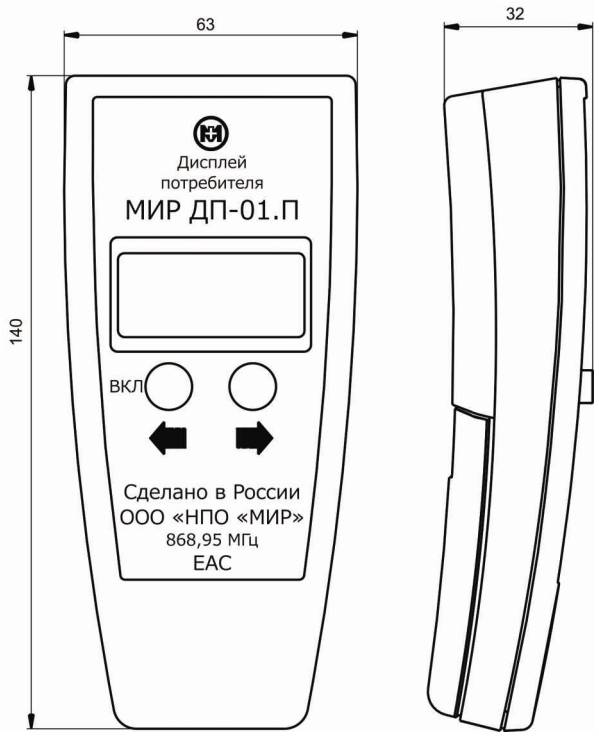
REMOTE DISPLAY UNIT MIR DP-01P

The remote display unit MIR DP-01P is designed to work as a remote device for indicating and controlling metering units MIR S-04 and MIR S-05

Specifications

Parameter name	Value
Communication range in direct visibility conditions, m, not less	100
Operating frequency, MHz	868.95
Transmitter's power, mW, not more than	12
The number of displayed LCD positions	8
Type of power supply elements	2 AA-type elements
The duration of operation with a daily readings	not less than 2 years
Mean service life, years	30
Dimensions	140×63×32 mm
Operating temperatures range	from minus 20 to plus 70°C
Weight, kg	0.12

Dimensions



RF COMMUNICATION UNIT MIR MB-02

RF communication unit MIR MB-02 is designed to arrange a wireless communication channel between power metering units and a laptop. The unit can be used for configuring the remote display device MIR DP-01 over the wireless channel.

Specifications

Parameter name	Value
Communication range in direct visibility conditions, m, not less	50
Operating frequency, MHz	868.95
Transmitter's power, mW, not more than	12
Power supply	From USB port
Mean time between failures, h, not less	160000
Average service life, years	30
Dimensions	70x23x8 mm
Operating temperatures range	from minus 20 to plus 70°C

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