ESM

smart meters

ESM smart meter operates as a revenue meter (IEC 62052-11), power quality analyzer (IEC 61000-4-30), and a multifunctional measuring device.

As a revenue meter, ESM measures four-quadrant active and reactive energy, and uses its built-in memory to store power demand and energy readings by time-of-use (TOU) tariffs.

As a power quality analyzer, ESM conforms to Classes A and S of IEC 61000-4-30:2008. ESM provides immediate data and automatically generated power quality reports.

As a multifunctional measuring device, ESM provides measurement data via standard communication protocols for integration with automation systems.

ESM supports IEC 61850 (ed. 2), the implementation of which is certified UCAiug Level A by DNV GL (KEMA).

Similar to ENIP-2, ESM can connect to ENMV-1 modules for digital input and output. ENMI display modules are used for visualization.

ESM is available in three modifications that differ in the type of connection to the measuring circuits. All modifications provide the same set of functions.

ESM-HV

Connects to conventional electromagnetic current and voltage transformers, as well as directly to the voltage circuits 230 V, 400 V.

ESM-ET

Connects to electronic current and voltage transformers: Rogowski coils, low-power current transformers, and voltage dividers.

ESM-SV

Connects to the process bus of the digital substation for receiving sampled values of current and voltage (IEC 61850-9-2) from digital current and voltage transformers or merging units.

ESM with ENMI-4m(e) display module

Specification

	ESM-HV	ESM-ET	ESM-SV
Connection type	to conventional instrument current and voltage transformers	to electronic instrument current and voltage transformers	to process bus network: 3 × 100Base-TX, PRP up 4 SV (SV256, SV288)
Rated (nominal) input values	I_{nom}: 1/5 A (I_{max} 10 A) (starts from $0.001I_{nom}$) U_{nom}: 57.7 (100) V; 230 (400) V; 400 (690) V	I: 150 mV; 200 mV; 225 mV; 333 mV; 1 V; 1.625 V; 2 V; 4 V U: 200 mV; 333 mV; 1 V; 1.625 V; 2 V; 3.25 V; 4 V	according IEC 61850-9-2
TOU revenue metering	in accordance with IEC 62052-11, IEC 62053-22, IEC 62053-23		
Energy class (active / reactive)	0.2S / 0.5 or 0.5S / 1	0.5S / 1	0.2S / 0.5
Time of use (TOU) metering	programmable TOU records (255 seasons, 255 days, 8 tariff zones per day)		
Power loads profile	dayli — 366 records, monthly — 120 records with configurable intervals (period from 1 s to 12 hours): profile 1 — 5094 records, profile 2 — 1536 records		
Storage of readings (total and TOU)	since reset, at the beginning and for the current day (previous 30 days), for the beginning and for the current month (12 previous months), for the beginning and for the current year (10 previous years); the duration of data storage — 20 years without external power supply		
Power quality monitoring	in accordance with GOST 32144-2013, GOST 30804.4.7-2013 (class I), GOST R 8.655-2009, GOST R 51317.4.15-2012, GOST 33073-2014 (reports), EN 50160 (reports)		
in accordance with IEC 61000-4-30	class A	class S	class A
Measured parameters and accuracy	The parameters of three-phase power grid: RMS, 1...50 harmonics		
Measurement accuracy	% Reading: voltage RMS (phase, line-to-line, average), and harmonics from 1 to 50: ± 0.1%, currents (phase and average) ± 0.1%, power (active, reactive, apparent) ± 0.5%		
	Frequency ± 0.01 Hz, power factor (phase and average) ± 0.1 °		
Fault Recorder	recording of instantaneous values: three current, three voltage (phase or linear); sampling 7.2 kHz; configurable trigger; recording time — 10 seconds of pre-history + 60 seconds of event		
Digital signals	up to 64 processed signals: statuses of inputs and outputs of up to 4 external ENMV-1 modules, logical expressions, GOOSE subscriptions, diagnostic signals		
Extension modules	display modules: ENMI-4m, ENMI-4e, ENMI-7; digital inputs/outputs: up to 4 modules ENMV-1		
Interfaces and protocols	2 × RS-485: Modbus RTU, IEC 60870-5-101, DLMS/COSEM USB 2(4) × 100Base-TX or 2 × 100Base-TX, 2 × 100Base-FX MM/SM (PRP, RSTP): IEC 61850 (ed. 2), IEC 60870-5-104, IEC 60870-5-101 (UDP), Modbus TCP, Modbus RTU, DLMS/COSEM, FTP, SNMP, web-console, RS-485 tunneling via TCP/IP; PRP, RSTP for 2/4 Ethernet ports modifications		
Power supply	18...36 VDC, 40...160 VDC, 120...370 VDC or 100...265 VAC (45...55 Hz), up to 12 VA (19 VA with ENMI)		
Operating conditions	−40...+70 °C		
Design	75 × 100 × 110 mm (IP40); transparent sealing cover; for ESM-ET and ESM-SV — lockable plug-out protection for RJ45 (RJ45PG) is optionally		
Mounting	DIN-rail TH35 mounting		

Certification

Conformance to IEC 61850 – UCAiug Level A Certificate IEC 61850 Ed.2 (DNV GL)

Conformance to LVS EN 61010-1:2011 (EN 61010-1:2010),
EN 61000-4-3, EN 61000-4-4, EN 61000-4-5,
EN 61000-4-6, EN 61000-4-8, EN 61000-4-11.

Ordering Information

ESM-☐☐**-**☐**-**☐**-**☐

Connection type
HV — conventional CT and VT
ET — electronic CT and VT
SV — according IEC 61850-9-2

Rated input values
ESM-HV — voltage phase (line)
100 – 57.7 (100) V
400 – 230 (400) V
690 – 400 (690) V
ESM-ET
— current, V: 1 – 0.15,   2 – 0.2,   3 – 0.225, 4 – 0.333,
              5 – 1.0,   6 – 1.625, 7 – 2,   9 – 4
— voltage, V: 2 – 0.2,   4 – 0.333, 5 – 1.0,
              6 – 1.625, 7 – 2.0,   8 – 3.25,   9 – 4

TOU revenue metering and PQM
ESM-HV
02A – energy class (active/reactive) 0.2S/0.5; PQM class A
05A – energy class (active/reactive) 0.5S/1.0; PQM class A
ESM-ET
05S – energy class (active/reactive) 0.5S/1.0; PQM class S
ESM-SV
02A – energy class (active/reactive) 0.2S/0.5; PQM class A

Interfaces
A2E2   – 2 × RS-485, 2 × 100Base-TX
A2E4   – 2 × RS-485, 4 × 100Base-TX
A2E2FX2 – 2 × RS-485, 2 × 100Base-TX, 2 × 100Base-FX MM
A2E2FS2 – 2 × RS-485, 2 × 100Base-TX, 2 × 100Base-FX SM

Power supply voltage
220 – 120...370 VDC or 100...265 VAC
110 – 40...160 VDC
24   – 18...36 VDC

Options and accessories

IEC 61850-8-1 activation — ES61850.esm
RS-485 splitter – EX...
Surge protection devices for RS-485 — ESP485-...
Surge protection devices for Ethernet — ESP-LAN
RJ45 plug lock-in and key — RJ45PG, RJ45PGK
USB 2.0 cable, male A to male B, 1 м — USB-A-B