High Performance Revenue Socket Meter
Cutting Edge Power Quality Analyzer
Fast Transient & Fault Recorder
Advanced Metering Infrastructure (AMI) has reached new heights with SATEC’s latest introduction in energy and power quality measurements for smart grid deployments.

The SATEC Model EM920 eXpertmeter™ is an advanced energy analyzer in a socket meter with precise measurement and expansion capabilities.

The EM920’s unique “Add-On” modularity is the key to its remarkable versatility and unprecedented effort to add intelligence, control and communications to electrical metering. SATEC’s “Add-On” module concept allows you to configure the meter to your changing needs, thus saving valuable time in the field or future costly replacements. Technological advancements revitalize legacy applications to rapidly and cost-efficiently respond to changing market conditions.

The Model EM920 eXpertmeter™ is an advanced energy meter that exceeds Class 0.2S class revenue billing requirement. It provides long term memory for load & trend profiles, and includes advanced power quality analysis to detect and record waveform events and fault currents harmful to power systems.

The Model EM920 eXpertmeter™ provides a real-time view into a greater volume of data than a standard energy meter, leading to faster analysis and better decision-making all around. Customers benefit from better access to information—while providing better service that costs less.

Applications

The EM920 eXpertmeter™ Series is used in electric utility inter-ties, any electrical substation where precise information is required for planning purposes, and monitoring primary customers on the service entrance to provide a higher service in quality of power.

- Install at legacy substations where little to no information is currently provided. Just replace existing socket meter and instantly provide information previously unattainable.
- Long term monitoring and storing capabilities allow for many months of information storage. Record Time Of Use (TOU), load profile, Min/Max, custom reports etc.—essential information used for planning and maintenance engineers.
- Multiple simultaneous communications allow communication via MODBUS, DNP3.0, and MV90 while retrieving power quality events such as SAG/SWELL and transient detections.
- View Harmonic conditions locally to determine the cause of problems by utilizing its unique “Directional” Harmonics Power flow.
- View real time Oscillography and determine quality of power
- Multiple levels of password protection to prevent unauthorized access
- Time synchronization (IRIG-B, Ethernet SNTP) with 1 mSec accuracy
Features

- **Modularity:** Add-On module support to configure and change with your growing needs, instead of requiring complete assemblies that can only be changed at the factory.
- **Add on I/O slots.** Add inputs to count other pulses or add outputs to generate energy pulse.
- **Real Time Oscillography.** View quality of power (waveform) in real time.
- Internal memory for long term data storage—16 MB.
- Optional Remote Display Module (RDM) LED front panel display.
- True Power Quality EN 50160 Standard.
- Precise measurement 0.05% revenue grade accuracy.
- Advanced Power Quality waveform recording (4 waveform recorders).
- Selectable 32-1024 samples per cycle.
- High Speed Transient detection as little as 17 μs @ 60Hz.
- Exceeds EN 50160 Standards.
- Exceeds IEC 61000-4-7; IEC 61000-4-15 and IEC 61000-30.
- ITI (CBEMA) curves.
- Transformer Line/Loss compensation and up to 8 points Transformer correction (VT, CT).

### METER SETUP

<table>
<thead>
<tr>
<th>Wiring Mode</th>
<th>4LN3</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT Ratio</td>
<td>1.0</td>
</tr>
<tr>
<td>CT Primary</td>
<td>5000 A</td>
</tr>
<tr>
<td>Nom. Voltage, L-L</td>
<td>120 V</td>
</tr>
<tr>
<td>Nom. Frequency</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Power Dmd Period</td>
<td>1x15 min</td>
</tr>
<tr>
<td>Volt Dmd Period</td>
<td>900 s</td>
</tr>
<tr>
<td>Amp. Dmd Period</td>
<td>900 s</td>
</tr>
</tbody>
</table>

### DEVICE CONFIGURATION

- Performance resolution quality graphical screen.
- Easy interface with any existing SCADA or EMS system.
- Rigid design for use in harsh environments.
- Anti-tampering and self test functions.
- Standard USB, RS485 and IR port.
- MODBUS, DNP3.0 and MV90 compatible.
- Time synchronization—IRIG-B or Ethernet (SNTP).
High Performance Revenue Meter

The EM920 is a high precision, multi-purpose 4 quadrant meter used for active, reactive, and apparent energy / demand measurement and recording. The meter is ideal for grid applications in generation, transmission and distribution utilities. Designed for major industrial and commercial consumers as well. Accuracy class 0.2S approved according to ANSI C12.20 class 10/20 and to IEC 62053-22 class 0.2S, and designed according to even more rigorous SATEC standards.

The meter delivers precision, reliability and long-term stability. An all in one meter, the EM920 is the answer to precise metering of large energy quantities. The EM920 provides Time Of Use (TOU) tariffs to meet any billing requirements (8 tariffs, 4 seasons). The instrument also provides multi-functional three phase power metering with voltage, current (including measured neutral current), power, energy, power factor, frequency, voltage/current unbalance, load profile, and other measurements on-board. More than 100 parameters can be logged with real time stamps.

The EM920 is equipped with high resolution 4” LCD display operating in wide range temperature, offering Real Time measurements, waveforms, Phasor and Harmonics spectrum display.

The EM920 is equipped with anti-vandalism and anti-tampering features. All necessary communication applications are covered by a modular architecture. This modularity also offers a full freedom of choice for deployment of new technologies. The device supports multiple communication protocols.

- Meets 0.1% Revenue Accuracy (tested to 0.05%)
- Active energy: class 0.2S precision ANSI C12.20 class 10/20
- Advanced Time Of Use (TOU) tariffs to meet any billing requirements (8 tariffs, 4 seasons)
- Data trend recorder and load profile
- Anti-vandalism and anti-tampering features
- Transformer/Line Compensation (TLC) and PT/CT errors correction (up to 8 points)
- Built-in self accuracy test
- Energy and power demand meter
- Block and sliding demands
- Accumulation of energy pulses from external watt-meters
- High precision 3-phase power meter
  - Voltage
  - Current
  - Power
  - Power factor
  - Voltage/current unbalance
  - Neutral current
  - Energy
  - Frequency
  - Load profile
High Performance Revenue Meter

PRESENT PERIOD Reg 1/Total

115.2 kWh del
<03/03/10 15:48:31>

MAX 328.333 kW del
<03/03/10 15:45:00>

CUM 0.000 kW del
<03/03/10 14:59:23>

03/03/10 15:48:31 NORM T1 ABC H 3/10 1

ENGINEERING Power Total

P 600.489 kW
Q -0.413 kvar
S 600.489 kVA
PF 1.000

03/03/10 15:38:39 NORM T1 ABC H 4/8 6

ENGINEERING Volts L-L

Vab 173.0 Volt
Vbc 174.0 Volt
Vca 172.7 Volt

03/03/10 15:35:34 NORM T1 ABC H 2/8 6

ENGINEERING Currents

Ia 2000.9 Amp
Ib 3001.2 Amp
Ic 999.76 Amp
In 1735.1 Amp

03/03/10 15:36:57 NORM T1 ABC H 3/8 6
The EM920 is among the most advanced power quality analyzer and recorder on the market. The instrument is a product of SATEC’s 20 years of experience in the creation of power quality instruments. The EM920 is designed to fully comply with the most demanding industry standard, IEC 61000-4-30 Class A. It provides power quality reports and statistics according to EN 50160, complimented by comprehensive power quality event/data log with waveforms (3 voltage and 4 current inputs for waveform recording) available for detailed Power Quality event analysis. The individual harmonics and inter-harmonics are analyzed according to IEC 61000-4-7. The instrument also supports directional power harmonics analysis. The flicker is measured and analyzed according to IEC 61000-4-15.

- Power quality analysis and reading
- Sags/swells (dips/overvoltages), interruptions, frequency variations
  - Flicker, voltage unbalance, harmonic and interharmonic voltages with high resolution
  - Programmable thresholds and hysteresis
- Built-in EN 50160 power quality statistics & reports
- Auxiliary power supply for recording major dips & interruptions
- Harmonics & Inter-harmonics according to IEC 61000-4-7
- Directional power harmonics and power factor phasors
- Voltage and current THD components
- Harmonic energies to determine quality of power received or delivered
- Symmetrical components
- Flicker measurement according to IEC 61000-4-15
- Waveform recording
  - Selectable sampling rate up to 1024 samples/cycle
  - Settable up to 20 cycles of pre-fault and any length of post fault cycles
- Power quality event recorder as per EN 50160.
- Event recorder for logging internal diagnostic events, control events and I/O operations
Power Quality Events
Via PAS Software
Fault & Transient Recorder

The EM920 provides state-of-the-art fast transient recording capability. Transient pulses as short as 17 microseconds can be reliably recorded and analyzed. The EM920 can record such short pulses by a separate electronic channel with a sampling rate of 1024 samples/cycle. The transient amplitude is recorded relative to the ground in accordance with the strict definitions of power quality standards (EN 50160). The instrument can measure transient pulses with an amplitude of up to 2 kV (withstands up to 6 kV). Four voltage waveforms (3 phases and neutral relative to the ground) are recorded at 1024 samples/cycle to complement the waveforms recorded by the power quality channel.

The fault recorder provides 4 measured and recorded currents (including measured neutral current) up to 50A (10xIn). The event log is complemented by a fault log and full length waveform recording.

- Reliable recording of short transients—20μs at 50Hz (17μs at 60Hz)
- Measures up to 2kV impulses. Withstands up to 6kV
- 4 fast waveform recorders: Sampling rate of up to 1024 samples per cycle, 3 phase and neutral voltage waveforms
- Digital Fault Recorder
  - Fault detection using default limits
  - Programmable fault thresholds and hysteresis
  - Up to 50 amp fault currents (10xIn)
  - Zero-sequence current and voltage calculations
  - Current and voltage unbalance
  - Under voltage, neutral current
  - Ready for use fault reports — fault current magnitude and duration, coincident voltage magnitude, fault waveforms and RMS trace
COMMUNICATION

- Reads 5 simultaneous independent communication ports (3 standard):
  - Infrared port (Modbus RTU/ASCII and DNP3.0 protocols). Supports IEC 62056-21/61 standard—hardware and protocol specifications for local meter data exchange
  - USB 2.0 full speed device port (Modbus RTU protocol, 12 Mbps) for fast local communications and data retrieval
  - RS485 universal serial communications port (up to 115,200 bps, Modbus RTU/ASCII and DNP3.0 protocols)

OPTIONAL ADD-ON I/O & COMMUNICATION MODULES

State-of-the-art communication abilities enabled by the EM920 concept:

- Ethernet 10/100 Base-T port (Modbus/TCP or DNP3.0/TCP protocols), up to five non-intrusive simultaneous connections, Telnet service port and RS232/485 user versatile port
- 1-ms satellite-synchronized clock—IRIG-B format timecode input
- Supports SNTP synchronization and cross trigger of events
- Dial Up modem module, (Modbus & DNP3.0 protocol) up to 56 kb/s

- Optional module cellular GPRS modem (Modbus/TCP or DNP3.0/TCP protocols)
- Optional IEC 61850 protocol
- Instrument firmware easy upgrade, using SATEC Power Analysis Software (PAS) via any communication port
- Master/Slave feature—reading of other meter registers or pass-through feature. Connect to other meters via RS485 and connect to SCADA master

INPUT/OUTPUT

- Two (2) independent digital inputs for Synchronization/Breaker Status/Counter functions—includes fast 1 kHz sampling rate
- KYZ relay output (Form C contact)
- Optional module with 8 digital inputs used for breaker status or pulse counting
- Optional Module for 6 relay outputs. 2 Form A (5A @ 250V AC/0.2A @ 250V AC) & 4 FORM C (0.15A @ 250V AC/DC)
- Optional 4CH Analog output module. 0-20mA, 4-20mA, ±1mA and 0-1mA
- AC/DC AUX. PS module: 50-288V AC, 90-290V DC
- DC/DC AUX. PS module: 24-48V DC
Standards Compliance Specifications

ACCURACY
- ANSI C12.20: Class 10/20: 0.2S
- IEC 62053-22: Class 0.2S

POWER QUALITY
- Harmonics and interharmonics measurement: IEC 61000-4-7 class I
- Flicker measurement: IEC 61000-4-15
- Power quality measurement methods: IEC 61000-4-30 class A/EN 50160
- Real-time clock backup and accuracy: IEC 61038

POWER CONSUMPTION
- 5W or 20VA on each voltage input: ANSI C12.1-2008

EMC IMMUNITY
- AC Line Surge: IEEE/ANSI C62.41-2002
  - 100kHz ring wave @ 6kV/0.5kA
  - 1.2/50 μs – 8/20 μs Impulse @ 6kV / 3kA
- Magnetic Field: ANSI C12.1
- EFT/B: IEC 61000-4-4: level 4—4kV AC lines and 2kV I/O and COM lines
- SWC: IEEE/ANSI C37.90.1—2.5kV—measuring inputs, I/O and COM
- ESD: IEC 61000-4-2: level 4—15kV air discharge
- Radiation Susceptibility: ANSI C12.1

RADIO FREQUENCY EMISSION
- Radiation and Conducted emission: CFR47/FCC p.15 class B
- Construction, FORM 95/A
- According to ANSI C12.1, ANSI C12.10

SAFETY
- UL/CSA 61010-1: 2006

INSULATION
- Insulation: ANSI C12.1—2.5kV AC @ 1mn
### Measurement Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Full Scale@ Input Range</th>
<th>Accuracy</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% Reading</td>
<td>% FS</td>
</tr>
<tr>
<td>Voltage V1-V3</td>
<td>120/207 x PT ratio @ 120V</td>
<td>0.05</td>
<td>±0.05</td>
</tr>
<tr>
<td>Voltage V1-V3</td>
<td>69/120 x PT ratio</td>
<td>0.1</td>
<td>±0.05</td>
</tr>
<tr>
<td>Voltage V4 (calculated)</td>
<td>69/120 x PT ratio</td>
<td>±0.5</td>
<td></td>
</tr>
<tr>
<td>Line current l1-l4</td>
<td>CT primary current</td>
<td>±0.06</td>
<td>±0.06</td>
</tr>
<tr>
<td>Fault current l1-l4</td>
<td>CT primary current</td>
<td>±0.5</td>
<td></td>
</tr>
<tr>
<td>Active power</td>
<td>3xV FSxCT/1000</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Reactive power</td>
<td>3xV FSxCT/1000</td>
<td>0.3</td>
<td>0.04</td>
</tr>
<tr>
<td>Apparent power</td>
<td>3xV FSxCT/1000</td>
<td>0.2</td>
<td>0.02</td>
</tr>
<tr>
<td>Power factor</td>
<td>1.000</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>50 Hz</td>
<td>-</td>
<td>±0.02</td>
</tr>
<tr>
<td></td>
<td>60 Hz</td>
<td>-</td>
<td>±0.02</td>
</tr>
<tr>
<td>Total harmonic distortion, THD</td>
<td>999.9</td>
<td>1.5</td>
<td>0.1</td>
</tr>
<tr>
<td>Total demand distortion, TDD, %</td>
<td>100</td>
<td>1.5</td>
<td>TDD≥1%, I≥10% FSI</td>
</tr>
<tr>
<td>Active energy import &amp; export</td>
<td>ANSI C12.20 Class 20, Class 0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reactive energy import &amp; export</td>
<td>Class 0.25 under conditions as per IEC 62053-22:2003 @ 0≤</td>
<td>PF</td>
<td>≤0.9</td>
</tr>
<tr>
<td>Apparent energy</td>
<td>Class 0.25 under conditions as per IEC 62053-22:2003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symmetrical components</td>
<td>Voltage FS</td>
<td>1.0</td>
<td>10%-120% FS</td>
</tr>
<tr>
<td></td>
<td>Current FS</td>
<td>1.0</td>
<td>10%-120% FS</td>
</tr>
<tr>
<td></td>
<td>Current FS</td>
<td>3.0</td>
<td>200%-1000% FS</td>
</tr>
<tr>
<td>Phasor angles</td>
<td>1 degree</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

* @80% to 120% of voltage FS, 2% to 200% of current FS and frequency 50/60 Hz.

### Physical Dimensions

- **Diameter:** 6.020” [152.91mm]
- **Height:** 6.957” [176.70mm]
- **Diagonal:** 8.437” [214.31mm]
- **Top Diameter:** 8.205” [208.41mm]
- **Inside Diameter:** 6.535” [166.00mm]
- **Height:** 7.831” [198.91mm]
# Technical Specifications

## AC Voltage Inputs

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference voltage ( U_N )</td>
<td>57.73V up to 120V L-N (standard) (via PT)</td>
</tr>
<tr>
<td>Voltage rating</td>
<td>57.73 up to 120 Volts (L-N), 100 to 207 Volts (L-L)</td>
</tr>
<tr>
<td>Voltage range</td>
<td>( 0-144 \text{ V r.m.s}, \text{peak up 288V (for PQ)} )</td>
</tr>
<tr>
<td>Crest factor ( &gt;2 )</td>
<td>( \sqrt{V_{p-p} \times 1.2 \times 2} )</td>
</tr>
<tr>
<td>Maximum Line to Line voltage</td>
<td>( 240 \text{ V r.m.s} )</td>
</tr>
<tr>
<td>Transient over voltage between live conductors and earth (optional, from 15 μs up to ms)</td>
<td>( 240 \text{ V r.m.s} )</td>
</tr>
<tr>
<td>Starting voltage</td>
<td>( \text{0.1%} U_N )</td>
</tr>
<tr>
<td>Burden per phase</td>
<td>( &lt; 0.2 \text{ VA} )</td>
</tr>
<tr>
<td>Overload withstand for 1 minute phase-to-ground (ANSI C12.1 &amp; IEC 62053-22, protective class II)</td>
<td>( 4000 \text{V AC} )</td>
</tr>
<tr>
<td>Rated impulse voltage (ANSI C12.1 &amp; IEC 62052-11, protective class II)</td>
<td>( 6000 \text{V peak} )</td>
</tr>
<tr>
<td>Terminals for wires size</td>
<td>Blades (Socket meter standard—C12.10)</td>
</tr>
</tbody>
</table>

## Reference voltage \( U_N \)

- **277V L-N (future option) (without PT)**
  - **Voltage rating:** 277 Volts (L-N), 480 Volts (L-L)
  - **Voltage range:** \( 0-332 \text{ V r.m.s}, \text{peak up 665V (for PQ)} \)
  - **Crest factor:** \( >2 \)
  - **Maximum Line to Line voltage:** \( 1152 \text{ V r.m.s} \)
  - **Transient over voltage between live conductors and earth (optional, from 15 μs up to ms):** \( 1.5 \text{ kV r.m.s} \)
  - **Starting voltage:** \( \text{0.1%} U_N \)
  - **Burden per phase:** \( < 0.5 \text{ VA} \)
  - **Overload withstand for 1 minute phase-to-ground (IEC 62053-22, protective class II):** \( 4000 \text{V AC} \)
  - **Rated impulse voltage (ANSI C12.1 & IEC 62052-11, protective class II):** \( 6000 \text{V peak} \)
  - **Terminals for wires size:** Blades (Socket meter standard—C12.10)

## Ground input

- **Terminals for wires size:** According to Socket meter standard—C12.10

## AC Current Inputs

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference current</td>
<td>( \text{Basic model In = 5A (TA = 2.5A)} )</td>
</tr>
<tr>
<td>Current class ( \text{Imax} )</td>
<td>( 10 \text{A} &amp; 20 \text{A} )</td>
</tr>
<tr>
<td>Maximum measurable short circuit current ( (Isc) )</td>
<td>( 10 \times I_n )</td>
</tr>
<tr>
<td>Burden per phase ( (\text{In = 5 A}) )</td>
<td>( &lt; 0.2 \text{ VA} )</td>
</tr>
<tr>
<td>Starting current ( (I1, I2, I3) )</td>
<td>( 0.1 % I_n )</td>
</tr>
<tr>
<td>Over current withstand for 1 s non-recurring</td>
<td>( 50 \times I_n )</td>
</tr>
<tr>
<td>Isolation</td>
<td>( 4000 \text{V AC} )</td>
</tr>
<tr>
<td>Terminals for wires size</td>
<td>Blades (Socket meter standard – C12.10)</td>
</tr>
</tbody>
</table>

## 3 (4 optional) Galvanic isolated inputs

1. Starting voltage, interruptions and dips measurement applicable only with installed APS
# Technical Specifications

**Fast Status Input**

<table>
<thead>
<tr>
<th>2DI (standard)</th>
<th>8DI Optional module</th>
</tr>
</thead>
<tbody>
<tr>
<td>8DI</td>
<td>8DI</td>
</tr>
<tr>
<td>8DI</td>
<td>Optional module</td>
</tr>
<tr>
<td>Dry contacts, internally wetted</td>
<td>24V DC</td>
</tr>
<tr>
<td>Resistance of open contact sensing</td>
<td>&gt; 1MΩ</td>
</tr>
<tr>
<td>Resistance of closed contact sensing</td>
<td>&lt; 100Ω</td>
</tr>
<tr>
<td>Sampling rate</td>
<td>1 ms</td>
</tr>
<tr>
<td>Insulation Dielectric withstand</td>
<td>2500V AC @ 1mn</td>
</tr>
<tr>
<td>Terminals for wires size</td>
<td>10 x 2.5 mm² cable</td>
</tr>
</tbody>
</table>

**Digital Input optically isolated**

<table>
<thead>
<tr>
<th>2DI (standard)</th>
<th>8DI Optional module</th>
</tr>
</thead>
<tbody>
<tr>
<td>8DI</td>
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</tr>
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</tr>
<tr>
<td>Dry contacts, internally wetted</td>
<td>24V DC</td>
</tr>
<tr>
<td>Resistance of open contact sensing</td>
<td>&gt; 1MΩ</td>
</tr>
<tr>
<td>Resistance of closed contact sensing</td>
<td>&lt; 100Ω</td>
</tr>
<tr>
<td>Sampling rate</td>
<td>1 ms</td>
</tr>
<tr>
<td>Insulation Dielectric withstand</td>
<td>2500V AC @ 1mn</td>
</tr>
<tr>
<td>Terminals for wires size</td>
<td>10 x 2.5 mm² cable</td>
</tr>
</tbody>
</table>

**RELAY OUTPUT**

<table>
<thead>
<tr>
<th>Relay Output—KYZ (Standard)</th>
<th>Digital output – SSR optically isolated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 relay (Form C)</td>
<td>1 relay (Form C)</td>
</tr>
<tr>
<td>Operation time</td>
<td>0.5A @ 250V AC/DC</td>
</tr>
<tr>
<td>Release time</td>
<td>1 ms</td>
</tr>
<tr>
<td>Insulation Dielectric withstand</td>
<td>2500V AC @ 1mn</td>
</tr>
<tr>
<td>Terminals for wires size</td>
<td>Blades (Socket meter standard—C12.10)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relay Output</th>
<th>Digital output—combined SSR + EMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>6DO</td>
<td>2 x FORM C + 4 FORM A</td>
</tr>
<tr>
<td>SSR—4 relays (FORM C)</td>
<td>0.15A @ 250V AC/DC</td>
</tr>
<tr>
<td>Operation time</td>
<td>1 ms</td>
</tr>
<tr>
<td>Release time</td>
<td>1 ms</td>
</tr>
<tr>
<td>Insulation Dielectric withstand</td>
<td>2500V AC @ 1mn</td>
</tr>
<tr>
<td>EMR—2 relays (FORM A)</td>
<td>5A @ 250V AC</td>
</tr>
<tr>
<td>Operation time</td>
<td>5-7 ms</td>
</tr>
<tr>
<td>Release time</td>
<td>5-7 ms</td>
</tr>
<tr>
<td>Insulation resistance of open contacts</td>
<td>&gt; 2MΩ or 1000V @ 1mn</td>
</tr>
<tr>
<td>Insulation Dielectric withstand</td>
<td>2500V AC @ 1mn</td>
</tr>
<tr>
<td>Terminals for wires size</td>
<td>16 x 2.5 mm² cable</td>
</tr>
</tbody>
</table>

**Analog Outputs**

<table>
<thead>
<tr>
<th>Analog output galvanic isolated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Outputs</td>
</tr>
<tr>
<td>4AO</td>
</tr>
<tr>
<td>Optional module</td>
</tr>
<tr>
<td>4-20 mA default</td>
</tr>
<tr>
<td>0-20 mA option</td>
</tr>
<tr>
<td>0-1 mA (2mA max.) option</td>
</tr>
<tr>
<td>± 1 mA (±2mA max.) option</td>
</tr>
<tr>
<td>Non-linearity</td>
</tr>
<tr>
<td>Load for 20 mA</td>
</tr>
<tr>
<td>Accuracy</td>
</tr>
<tr>
<td>Power supply</td>
</tr>
<tr>
<td>Insulation Dielectric withstand</td>
</tr>
<tr>
<td>Terminals for wires size</td>
</tr>
</tbody>
</table>
## Technical Specifications

### Communication Ports

<table>
<thead>
<tr>
<th>Port</th>
<th>Type details</th>
</tr>
</thead>
</table>
| **COM1** | Built-in Infra Red communication port  
IR port (Standard)  
RS232 communication, TTL level, max baud rate 19.2 kb/s  
Protocols Modbus RTU/ASCII and DNP3.0  
Optically isolated 2500V AC @ 1mn  
Optical port per ANSI C12.18 Type 2 |
| **COM2** | Plug-in modules communication port  
GSM/GPRS module—Optional  
RS232 communication, TTL level, max baud rate 115.2 kb/s  
GSM/GPRS module Quad Band GPRS class 10  
Protocols Modbus/TCP or DNP3.0/TCP  
Isolation 2500V AC @ 1mn  
SMA connector External antenna |
| Dial UP MODEM module—Optional (future option) | Wired line Dial-Up Modem module  
RS232 communication, TTL level, max baud rate 115.2 kb/s  
Protocols Modbus RTU/ASCII and DNP3.0  
Isolation 2500V AC @ 1mn  
MODEM module connector  
Cable terminated with RJ-11 connector |
| **COM3** | Built-in serial communication port  
Standard RS-485 isolated 115.2 kb/s  
Isolation 2500V AC @ 1mn  
Protocols MASTER (Phase II) / SLAVE Modbus RTU/ASCII and DNP3.0  
Terminals for wires size 2 x 2.5 mm² shielded twisted cable |
| **COM4** | Plug-in modules isolated communication port  
ETH-TX, DUP MODEM Optional module  
Versatile RS-232/RS-422-485  
Max. Baud rate 115.2 kb/s  
Isolation 2500V AC @ 1mn  
Protocols Modbus RTU/ASCII and DNP3.0  
Terminals for wires size 2 x 2.5 mm² shielded twisted cable |
| 10/100Base-T | Plug-in modules network communication port  
ETHERNET-TX module—Optional  
Wired LAN communication port with auto-negotiation IEEE 802.3  
Ethernet port Baud rate 10/100 Mb/s  
Protocols Modbus/TCP or DNP3.0/TCP protocols, up to five non-intrusive simultaneous connections, Telnet service port  
ETH port Isolation 2500V AC @ 1mn  
ETH connector ETH cable terminated with Standard RJ-45 connector |
| **USB** | I/O and Communication port  
FS device (Standard)  
USB communication port  
Full speed Device  
USB port Baud rate 12 Mb/s  
Protocols Modbus RTU/ASCII and DNP3.0  
USB connector  
Cable terminated with USB type A |
## Technical Specifications

<table>
<thead>
<tr>
<th>Display Unit</th>
<th>4&quot; Graphic LCD Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy LED Pulsing</td>
<td>2 x RED (WATT &amp; VAR)</td>
</tr>
<tr>
<td>IR port</td>
<td>ANSI C12.18</td>
</tr>
<tr>
<td>Accessible Buttons—SCROLL, SELECT/ENTER</td>
<td>2</td>
</tr>
<tr>
<td>Sealed Button—DEMAND RESET</td>
<td>1</td>
</tr>
<tr>
<td>Under cover Button—TEST mode</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Real-Time Clock</th>
<th>Programmable RTC, Error per month &lt;15 s</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Non-Volatile Memory</th>
<th>For energy and tariff registers logging, EV-PQ-DATA-WV log</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16 MB</td>
</tr>
</tbody>
</table>

### Power Supply

#### Supplied from monitored voltage inputs

- **Low Voltage (standard)**
  - Three Phase PS, Rated Inputs 50/60 Hz
  - Insulation Dielectric withstand: 2500V AC @ 1mn
  - Operating Temperature range: -40°C to + 85°C
  - Output voltage: +12V DC ± 5%
  - Output power: 7.5W maximum

- **High Voltage (future option)**
  - Three Phase PS, Rated Inputs 50/60 Hz
  - Insulation Dielectric withstand: 2500V AC @ 1mn
  - Operating Temperature range: -40°C to +85°C
  - Output voltage: +12V DC ± 5%
  - Output power: 7.5W maximum

#### Auxiliary AC/DC Power Supply

- **AC/DC Optional module**
  - Operating Temperature range: -40°C to + 85°C
  - Rated Input, 0-70 Hz: 50-288V AC, 90-290V DC
  - Insulation: 2500V AC @ 1mn
  - Output voltage: +12V DC ± 5%
  - Output power: 7.5W maximum
  - Terminals for wires size: 2 x 2.5 mm² pig-tail cable

- **24/48 VDC (Phase II) Optional module (future option)**
  - Operating Temperature range: -40°C to + 85°C
  - Rated Input: 18.5-58V DC
  - Insulation Dielectric withstand: 3000V DC @ 1mn
  - Output voltage: +12V DC ± 5%
  - Output power: 7.5W maximum
  - Terminals for wires size: 2 x 2.5 mm² pig-tail cable

#### Battery for RTC and SRAM

- Minimum operation reserve 48 h.—if no use of battery (According to AS 1284.7/IEC 1038)
- Total reserve capacity shall be not less than 2000h—with use of battery. (According to AS 1284.7/IEC 1038)
- More than 10 years service battery life (According to AS 1284.7/IEC 1038)

#### Environment Temperature

- Operational temperature: -40°C to 75°C
- Optional LCD Operational temperature: -20°C to 70°C
- Storage temperature: -40°C to 85°C
### EM920 ORDER STRING

**MODEL**

EM920—Form 95 (includes 2DI, 1KYZ relay, USB, RS485 port)  

**CALIBRATION AT**

- 60 Hz 60HZ
- 50 Hz 50HZ

**OPTIONAL MODULES (Max 4 per instrument total)**

**TRANIENT OPTION**

- No Transient 0
- Transient (not yet available) TRM

**COMMUNICATION OPTIONS (Max. 1 per instrument)**

- No Communication 0
- Ethernet—RS232/485—IRIG-B ETH
- GPRS/GSM GPRS

**INPUT/OUTPUT OPTIONS (Max. 1 per instrument)**

- No Input/Output 0
- 6 Relay Outputs—2 Form A & 4 Form C* 6RLY
- 8 Digital Inputs 8DI
- 4 Analog Outputs ±1 mA 4AO1
- 4 Analog Outputs 0-1 mA 4AO2
- 4 Analog Outputs 0-20 mA 4AO3
- 4 Analog Outputs 4-20 mA 4AO4

**AUXILIARY POWER SUPPLY (Max. 1 per instrument)**

- No auxiliary power supply 0
- 50-288V AC and 90-290V DC ACDC

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* Form A (0.5A@250V AC/0.2A@250V DC), Form C (0.15A@250V AC/DC)