Continuous measurements and the Ethernet

Power analysers of the UMG 507 product family are suitable for use at all network levels. The continuous measurement enables the collection of various measurement parameters, the identification of short-term interruptions, a fault recorder function and harmonic analysis. Extensive communication options e.g. Ethernet (TCP/IP), Modbus, Profibus, RS232, RS485, HTTP, SMTP, UTP or DNS allow affordable and quick integration in existing communication networks. Worldwide access to the embedded web server can be gained through a web browser. This means that the extensive opportunities offered by the UMG 507 are available without any additional software. The large number of digital and analogue inputs and outputs enable incorporation in monitoring systems, control tasks, information reports, the communication of measurement data (e.g. energy consumption) to a central control point and incorporation in extensive energy management systems. Extensive logic functions allow the analysis of measurement data and the introduction of concrete measures.

Areas of application
- For measuring, monitoring and control of electrical parameters in energy distribution systems
- For recording load profiles (energy consumption) for energy management systems (cost centre data collection)
- For monitoring power quality (harmonics, short term interruptions, inrush currents…)
- Control tasks e.g. depending upon the achieved measurement values or limit values
- Data logging (electricity, gas, water, cooling …)
- Remote monitoring via onboard homepage
Chapter 2
Power analyser

UMG 507 power analyser

Multi-function power analyser

The use of energy measurement technology in energy distribution has moved dynamically towards digital universal measuring instruments in the past few years. The advantages are obvious: lower equipment costs for more information and functionality. In addition, digital measuring technology is more accurate, even all along the entire lifespan.

Clear cost advantages also result from the construction of the cabinet which results in lower installation costs and less wiring efforts in comparison to analogue measuring technology. Power analysers of the UMG 507 product family are designed for use at all network levels.

Due to the continuous measurement, short-term interruptions are registered and the fault recorder function provides more information about the event. A rapid, cost-optimised and reliable communication system can be developed through the Ethernet connection. The instrument’s own homepage offers you the opportunity to call up the data or configure the instrument directly using the embedded web server. The large number of digital and analogue inputs and outputs offers a variety of communication possibilities and allow connection to PLC controls and independent control tasks. The integrated harmonic analysis becomes more significant with increasing network pollution (increasing THD-U values).

Main features

- Continuous measurement
- Data collection of short-term interruptions
- Ethernet and embedded web server
- Harmonics analysis
- 6 digital inputs, 6 digital outputs, 2 analogue outputs, 1 analogue input
- 1 temperature input
- Integrated logic for control tasks and alarm signals
- Modbus master, Ethernet / Modbus gateway

Applications

The three-phase electronic measuring instrument collects and digitalises the effective values of currents and voltages (True RMS) in a 50/60Hz network. The integrated microprocessor calculates the electrical parameters from the sampling values. All measurement values are continuously measured and recorded at intervals of 200ms over 10 periods (50 Hz).

This allows the safe identification of short-term interruptions with the fault recorder function. For short-term events, the effective values are recorded over 128 periods with 64 pre-trigger periods and with the transient memory over 5 periods with 2 pre-trigger periods. The reaction time of the internal outputs is < 10ms and the external bus outputs < 200ms.
GridVis software

The UMG 507 power analysers already contain the GridVis software upon delivery. On one hand, this software enables simple and complete parameterisation of the respective measurement instruments and on the other hand, can analyse the measurement value memory in the unit. In GridVis, the data is stored in a database and can be processed in MS Excel for example. GridVis also allows online presentation of the measurement values. More information is available in chapter 5 – “software”.

Embedded web server / e-mail

Worldwide access to the UMG 507 can be gained through a web browser. In order to provide access, the web address and access authorisations must be set up. The complete parameterisation software is filed as an HTML page on the flash memory. The open architecture of the UMG 507 allows the user to apply own ideas to design Java-Applets and Active X-components and file them on the UMG507. If limit value violations or events occur, they can be automatically sent to the set up e-mail address. Data from the memory storage can be sent by e-mail (attachment) at preset times and processed with the GridVis software.

Protocols: HTTP, SMTP, UTP, DNS, NTP, MOD TCP, Modbus over TCP, DHCP/BootP

Connection to an ISDN router / DSL router

The unit can be connected to the internet using an external router (e.g. ISDN router or DSL router).

The SMTP authentication enables you to store mails on the internet provider’s mailbox using the Plain/Login/Cram-MDS (newest encryption methods).

Data collection and recording

The UMG 507 has an internal memory of 256 KB RAM and, depending on the version, an additional memory of 16 MB flash is available for continuous recording of the measured data. This measurement value memory can be freely configured with reference to the measurement values which are to be saved and the recording intervals. In addition, the highest and lowest actual values (200 ms average time) can also be saved within these intervals. The recording of events is prompted by triggers. Events such as excess currents, under voltage or overvoltage can be safely collected from a half period duration. Events are recorded over 128 periods as effective value recorders.
Transformer monitoring, k-factor

The maximum permitted current can be monitored in transformers, fuses or motors by entering the k-factor. The data from transformer manufacturers such as the current and k-factor (1= 100%) can be programmed on the digital output using the comparator. In addition, the temperature input can be used for transformer monitoring.

Inputs and outputs

Depending upon the product variant, the UMG 507 has a large number of internal digital and analogue inputs and outputs (refer to design versions). The top versions of the UMG 507 (AD, P, E and EP) have six digital inputs, six digital outputs, two analogue outputs (0/4-20mA), a temperature input and an analogue input (0/4-20mA). The digital inputs can be used as pulse inputs, synchronisation inputs or signal inputs. The digital outputs can be defined as limit value outputs, pulse outputs, time switch outputs or logic outputs. Both analogue outputs can be applied as measurement value transducers or for analogue control of generators (0-20mA). Transformer temperature data can be collected using the temperature input. Any process signals can be allocated to the analogue input.

Integrated logic

The 128 programmable logic links provide connections between inputs and outputs, measurement values and internal functions of the UMG 507. The standard operators AND, NAND, OR, XOR, EQU, rising edge and falling edge are available. The events are allocated to free flags which can also be linked with other flags. The incoming information through the Modbus RTU or the Profibus can also be incorporated in the logic links.

Trigger events, the virtual weekly time switch channels and Emax channels, the limit value comparator and signals received through the field bus are available as operands. These flags can then prompt the switchover of digital outputs, tariff changes, measurement value synchronisation, the time setting or the despatch of an e-mail. Measurement values can also be added, subtracted, multiplied or divided.

Modbus RTU master function / Modbus gateway

The RS485 of the UMG 507E/EP can also be used as a Modbus RTU master. This means that the measurement instruments UMG 90S, UMG 503, UMG 507L, UMG 505 and Prodata with RS485, protocol Modbus RTU can be connected to the RS485 of the UMG 507E/EP and, in full functionality, can be illustrated on the Ethernet TCP/IP for example. In addition, the instrument inputs and outputs can be decentralisedly expanded using the WAGO module. For the Modbus data of other bus users, a minimum of 32 and a maximum of 64 three Modbus data points are available such as in the topology view of the GridVis.
UMG 507

**Interfaces**
- Ethernet
- RS232
- RS485

**Highlights**
- The despatch of e-mails including ring buffer contents
- Web server
  - JAVA Applets
  - Active X components
  - Macromedia FLASH in MX
  - Modbus master function
- Supports WAGO I/O using the RS 485 and Modbus TCP/IP**
- Capturing short term interruption >=10ms for U and I
- Measurement value recorder
  (1 measurement value every 200 ms)
- Connection to DSL/ISDN router

* Special software is necessary on the WAGO coupler - available from us.

**Protocols**
- Profinet DP V0
- Modbus RTU
- Modbus TCP/IP (port 502)
- UTP
- Modbus over TCP/IP (port 8000)
- SMTP
- HTTP
- DNS
- NTP

**1 temperature input**
- PT 100 / PT 1000 / KTY 83 or 84

**6 digital inputs**
- Pulse input
- HT/LT switchover
- Clock synchronisation
- Signal input logic

**6 digital outputs**
- Limit value output for I, U, P etc.
- Remote using Modbus / Profibus
- Pulse output effective energy / reactive energy
- Signal output short term interruption reaction time <=10ms
- Logic output

**2 analogue outputs**
- Settings: 0...20mA or 4...20mA

**16Mbyte memory**
- For 1000k events and measurement values

**256Kbyte RAM memory**
- For 18k events and measurement values

**Weekly time switch**
- 24 channels
- Digital output
- Nominal value switchover HT / LT
- Send e-mail

**Limit value programming with 16 comparators**
- Within window
- Within window with hysteresis
- Outside of window
- Outside of window with hysteresis
- Over limit value
- Over limit value with hysteresis
- Under limit value
- Under limit value with hysteresis, setting: lead/follow-up time

**Ethernet / Modbus gateway**
- Simple connection of Modbus devices

---

**Modem**

**PLC**

**Software**
Product variants and technical data

Overview of product variants
Three/four-phase universal measurement instruments 50/60Hz; current transformer...1/5A; including GridVis programming and analysis software

<table>
<thead>
<tr>
<th>Auxiliary voltage</th>
<th>Interfaces</th>
<th>Type</th>
<th>Item number</th>
</tr>
</thead>
<tbody>
<tr>
<td>85...250V AC, 80...370V DC</td>
<td>-</td>
<td>UMG 507 L</td>
<td>52.15.004</td>
</tr>
<tr>
<td>40...165V AC, 55...200V DC</td>
<td>-</td>
<td>UMG 507 L</td>
<td>52.15.009</td>
</tr>
<tr>
<td>5...50V AC, 12...70V DC</td>
<td>-</td>
<td>UMG 507 EL</td>
<td>52.15.021</td>
</tr>
<tr>
<td>256k RAM memory</td>
<td>-</td>
<td>UMG 507 EL</td>
<td>52.15.022</td>
</tr>
<tr>
<td>Additional 1.6MB flash memory</td>
<td>-</td>
<td>UMG 507 AD</td>
<td>52.15.003</td>
</tr>
<tr>
<td>6 digital inputs</td>
<td>-</td>
<td>UMG 507 AD</td>
<td>52.15.008</td>
</tr>
<tr>
<td>6 digital outputs</td>
<td>-</td>
<td>UMG 507 P</td>
<td>52.15.002</td>
</tr>
<tr>
<td>1 temperature input</td>
<td>-</td>
<td>UMG 507 P</td>
<td>52.15.007</td>
</tr>
<tr>
<td>1 analogue input</td>
<td>-</td>
<td>UMG 507 E</td>
<td>52.15.001</td>
</tr>
<tr>
<td>2 passive analogue inputs</td>
<td>-</td>
<td>UMG 507 E</td>
<td>52.15.006</td>
</tr>
<tr>
<td>RS 232</td>
<td>-</td>
<td>UMG 507 E</td>
<td>52.15.011</td>
</tr>
<tr>
<td>RS 485</td>
<td>-</td>
<td>UMG 507 EP</td>
<td>52.15.005</td>
</tr>
<tr>
<td>Ethernet 10baseT</td>
<td>-</td>
<td>UMG 507 EP</td>
<td>52.15.010</td>
</tr>
<tr>
<td>Profibus DP V0</td>
<td>-</td>
<td>UMG 507 EP</td>
<td>52.15.015</td>
</tr>
</tbody>
</table>

- = Not possible  ● = Included

General technical data

<table>
<thead>
<tr>
<th>Operating voltage L-N, AC</th>
<th>Refer to order details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overvoltage category</td>
<td>600V CAT III</td>
</tr>
<tr>
<td>Quadrants</td>
<td>4</td>
</tr>
<tr>
<td>Measurement</td>
<td>Per channel</td>
</tr>
<tr>
<td>Weight</td>
<td>1kg</td>
</tr>
<tr>
<td>Dimensions</td>
<td>W= 144mm x H= 144mm x D=66.5mm</td>
</tr>
<tr>
<td>Mounting</td>
<td>Front panel installation</td>
</tr>
<tr>
<td>Working temperature range</td>
<td>-10...55 °C</td>
</tr>
<tr>
<td>Connectable conductors (U/I)</td>
<td>Single wire, multi-wire, fine-wire, pin cable lugs, ferrule</td>
</tr>
<tr>
<td></td>
<td>0.08 - 2.5mm²</td>
</tr>
<tr>
<td></td>
<td>1.5mm²</td>
</tr>
<tr>
<td>Protection class (front/reverse)</td>
<td>According to EN60529</td>
</tr>
<tr>
<td></td>
<td>IP 50/20</td>
</tr>
</tbody>
</table>

Measurement range

| Voltage L-N, AC (without voltage transformer) | 50...500VAC |
| Voltage L-L, AC (without voltage transformer) | 80...870VAC |
| Current (transformer: x/1 and x/5 A) | 0.005..6A |
| Frequency of mains | 45...65Hz |
| Grid types | TN, TT, (IT) |
| Measurement in single and multi-phase networks | 1ph, 2ph, 3ph and up to 3x1ph |
### Measurement values

<table>
<thead>
<tr>
<th>Measurement parameter</th>
<th>Display range</th>
<th>Measurement range at scaling factor 1</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>Error</th>
<th>Lowest value</th>
<th>Maximum value</th>
<th>Average value ±</th>
<th>Maximum value</th>
<th>Date/Time</th>
<th>Measurement accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current ... (1)5A</td>
<td>0.000 .. 9999 A</td>
<td>0.005 .. (1)16A</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
</tr>
<tr>
<td>Current, N</td>
<td>0.000 .. 9999 A</td>
<td>0.060 .. 15 A</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
<td>● ± 0.6 %</td>
<td>● ± 0.6 %</td>
<td>● ± 0.6 %</td>
<td>● ± 0.6 %</td>
</tr>
<tr>
<td>Voltage L-N</td>
<td>0.0 .. 999.9 MV</td>
<td>50 .. 500 V</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
</tr>
<tr>
<td>Voltage L-L</td>
<td>0.0 .. 999.9 MV</td>
<td>90 .. 870 V</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
</tr>
<tr>
<td>Pos./neg./zero sequence</td>
<td>0.0 .. 999.9 MV</td>
<td>50 .. 500 V</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
</tr>
<tr>
<td>Frequency (U)</td>
<td>45.00 .. 65.00 Hz</td>
<td>45.00 .. 65.00 Hz</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td></td>
<td>●</td>
<td>●</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
<td>● ± 0.2 %</td>
</tr>
<tr>
<td>Effective power +/-</td>
<td>-0.0 W .. 9999 MW</td>
<td>0.05 W .. 2.5 kW</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
</tr>
<tr>
<td>Apparent power</td>
<td>0.0 VA .. 9999 MVA</td>
<td>0.05 VA .. 2.5 kVA</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
</tr>
<tr>
<td>Reactive power</td>
<td>0.00 kvar .. 9999 Mvar</td>
<td>0.05 var .. 2.5 kvar</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
</tr>
<tr>
<td>Power factor</td>
<td>0.00 kap .. 1.00 . 0.00 ind. . 0.00 kap .. 1.00 . 0.00 ind.</td>
<td></td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
</tr>
<tr>
<td>Effective energy +/−</td>
<td>0.0 Wh .. 9999 GWh</td>
<td>0.05 Wh .. 9999 GWh</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
</tr>
<tr>
<td>Effective energy −/±</td>
<td>-0.0 Wh .. 9999 GWh</td>
<td>-0.05 Wh .. 9999 GWh</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
</tr>
<tr>
<td>Reactive energy +/−</td>
<td>0.0 .. 9999 Gvarh</td>
<td>0.05vars .. 9999 Mvarh</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
<td>● ± 0.5 %</td>
</tr>
</tbody>
</table>

*1: start time, 2: run time, + supply, - purchase, 1: integration over time: 5, 10, 15, 30 seconds, 1, 5, 10, 15, 30 and 60 minutes.

*2: memory period – 60 minutes

### Power quality

<table>
<thead>
<tr>
<th>Harmonics, 1st to 20th harmonics, uneven</th>
<th>Current, voltage L1, L2, L3</th>
<th>Accuracy ± 0.5%</th>
<th>Distortion factor THD-U in %</th>
<th>L1, L2, L3</th>
<th>Accuracy ± 0.5%</th>
<th>Distortion factor THD-I in %</th>
<th>L1, L2, L3</th>
<th>Accuracy ± 0.5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage positive/negative/zero system</td>
<td>10ms</td>
<td>Accuracy ± 0.5%</td>
<td>Short-term interruptions</td>
<td>10ms</td>
<td>Yes</td>
<td>Initial current</td>
<td>10ms</td>
<td>Yes</td>
</tr>
<tr>
<td>Recorder for limit value events</td>
<td></td>
<td></td>
<td>Recorder for limit value events</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Measurement accuracy

<table>
<thead>
<tr>
<th>Accuracy VA</th>
<th>± 0.2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive energy kvarh</td>
<td>Class</td>
</tr>
<tr>
<td>Effective energy kWh</td>
<td>Class</td>
</tr>
</tbody>
</table>

### Features

<table>
<thead>
<tr>
<th>Memory size</th>
<th>256kB/16MB – refer to order details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clock</td>
<td>± 2 minutes per month</td>
</tr>
<tr>
<td>Integrated logic</td>
<td>128 links, 16 comparators</td>
</tr>
<tr>
<td>Weekly time switch</td>
<td>24 channels</td>
</tr>
</tbody>
</table>

### Periphery

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>As a status input or pulse input</th>
<th>6 – refer to order details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital outputs</td>
<td>As a switch output or pulse output</td>
<td>6 – refer to order details</td>
</tr>
<tr>
<td>Analogue outputs</td>
<td>0(4)…20mA</td>
<td>2 – refer to order details</td>
</tr>
<tr>
<td>Temperature measurement input</td>
<td>Pr100, Pr1000, KTY83, KTY84</td>
<td>1 – refer to order details</td>
</tr>
<tr>
<td>Analogue input</td>
<td>0(4)…20mA</td>
<td>1 – refer to order details</td>
</tr>
<tr>
<td>Password protection</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Software GridVis</td>
<td>Refer to chapter 5</td>
<td>Yes</td>
</tr>
</tbody>
</table>
# UMG 507

## Communication

<table>
<thead>
<tr>
<th>Interfaces</th>
<th>Protocols</th>
<th>Protocols</th>
<th>Protocols</th>
<th>Protocols</th>
<th>Protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 232</td>
<td>RS 485 (Modbus/Profibus)</td>
<td>Ethernet 10 Base-T</td>
<td>Modbus RTU</td>
<td>Profinbus DP V0</td>
<td>Modbus gateway</td>
</tr>
<tr>
<td>38.4 kbps</td>
<td>9.6, 38.4, 115.2 kbps up to 1.5 Mbps (Sub D 9 pole)</td>
<td>RJ45</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes, refer to order details</td>
<td>Yes, refer to order details</td>
<td>Yes, refer to order details</td>
<td>Yes, refer to order details</td>
<td>Yes, refer to order details</td>
</tr>
</tbody>
</table>

## Dimensional drawing

Switchboard cut-out:
139x139 mm

All dimensions stated in this drawing are in mm.

## Connection illustration

Typical connection options (e.g. UMG 507EP)