Smart Energy &
Power Quality Solutions

UMG 503–Digital measurement

Janitza®

UMG 503 – Digital measurement

Power analysers of the UMG 503 product family are mainly designed for use in low and medium voltage distribution systems. The large display in 144 x 144mm housing, the higher accuracy level and the extended measurement range allows universal applications. Additional functions such as the measurement of harmonics, the recording of minimum and maximum values, the relay outputs, pulse and analogue outputs, the bi-metallic strip function, password protection and many more offer an effective tool for fault analysis and for monitoring power quality.

The interface and field bus features (Modbus) enable communication of the measurement data and incorporation in extensive energy management systems. The integrated logic enables the analysis of measurement data and the introduction of concrete measures.

Areas of application

- Measurement, monitoring and controlling of electrical parameters in energy distribution systems
- Recording of load profiles for energy management systems
- Collection of energy consumption data for cost centre analysis
- Measurement value generator for building management systems or PLC (Modbus)
- Monitoring of harmonics, limit value monitoring

UMG 503

The universal 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 due to lower installation costs and less wiring efforts in comparison to analogue measuring technology. Universal measuring instruments of the UMG 503 product family are mainly designed for use in low and medium voltage distribution systems.

Main features

- Large measurement and display range
- A large display in 144x 144mm housing
- RS232, RS485 interface
- Field bus: Modbus
- Harmonics display
- 2 relay outputs (mechanical relay)
- Digital I/O and analogue outputs
- Integrated logic for alarm signals
- High reliability and long lifespan

In addition to the large quantity of electrical measurement values, this series also offers a number of additional functions such as the recording of minimum and maximum values, the bi-metallic strip function, password protection and many more. Due to the large display, the wide measurement range and the high accuracy level, the UMG 503 power analyser is very popular in low voltage main distribution panels. The possibility for communication through various field buses enables incorporation in more complex energy management systems as well as the connection to PLC controls or central building control systems. The integrated harmonics analysis becomes more significant with increasing network pollution (increasing THD-U values).

Applications

The UMG 503 is a digital flush-mounted measurement instrument which is suitable for measuring and recording electrical parameters (True-RMS) in low and medium voltage networks. The measurement is suitable for 1- and 3-phase systems with and without neutral conductors. At a mains frequency of 50 Hz, the scanning frequency of random measurements, which takes place twice per second, is 6.4 kHz. It is characterised by the high accuracy level, the compact construction and the measurement of harmonics in each phase.

In order to achieve the functional diversity of the universal measurement instrument, you would need around 13 analogue units such as an ampere meter, volt meter, volt meter switch, power meter (kW, kVA, kvar, cos φ), an effective and reactive energy meter (kWh/kvarh), a clock, a frequency meter and a harmonic analyser. This means that the planning, installation, wiring and storage costs are significantly reduced for the UMG 503 in comparison to analogue measuring instruments. Another advantage is the more accurate and better legibility. Selected measurement values and power failure/power return are recorded in a ring buffer with time stamp.

Data memory
A ring buffer for 80,000 or 320,000 measurement values (depending on the variant) is available for storing the selected average values. With the factory settings, average values of U1, U2, U3, I1, I2, I3, P1, P2 and P3 are stored using an average time of 15 minutes for approximately 1 year for variants with 512 k RAM (approximately 3 months for types with 128k RAM).

A total of six limit value windows for storing measurement values can be programmed. The upper and lower limit values can be freely selected. The recording can take place within or outside of the range.

Measurement value displays and automatic display rotation
The extremely well legible LCD data field in connection with the function keys informs the user about the selected measurement values (current, low, high and average values). With the UMG 503, three measurement values can be simultaneously displayed in the LCD data field and up to 140 data fields can be individually designed with the GridVis software. A cycle between 1 and 9999 seconds can be set and a selection of measurement values can be made.

Power values and cos φ

Currents

THD-U

Voltage transformer

Bi-metallic strip function
The bi-metallic strip function is recreated for the three external conductor currents. These values can be integrated in the stated times and be recorded as highest average values.

Summer/winter time switch
The following options can be selected:

a) No switchover
b) Own switchover point
c) EU listed switching

Event memory
The following events can be registered in the event memory:

- Deletion of the event memory
- Relay outputs on/off
- Failure and return of the auxiliary voltage
- Failure and return of the measurement voltage

Interfaces
The communication interfaces of the UMG 503 which are configured in accordance with the EIA RS485 standard (half duplex) support the Modbus RTU in integer format. The communication protocol can be selected by using the menu.

In the Modbus RTU mode, baud rates from 9.6 kBit/s to 115 kBit/s are supported (depending on the design version). The register addresses are available to the PLC user in integer format.

Pulse output[*4]
The pulse output delivers the effective or reactive energy in current pulses. The minimum pulse length is 50ms.

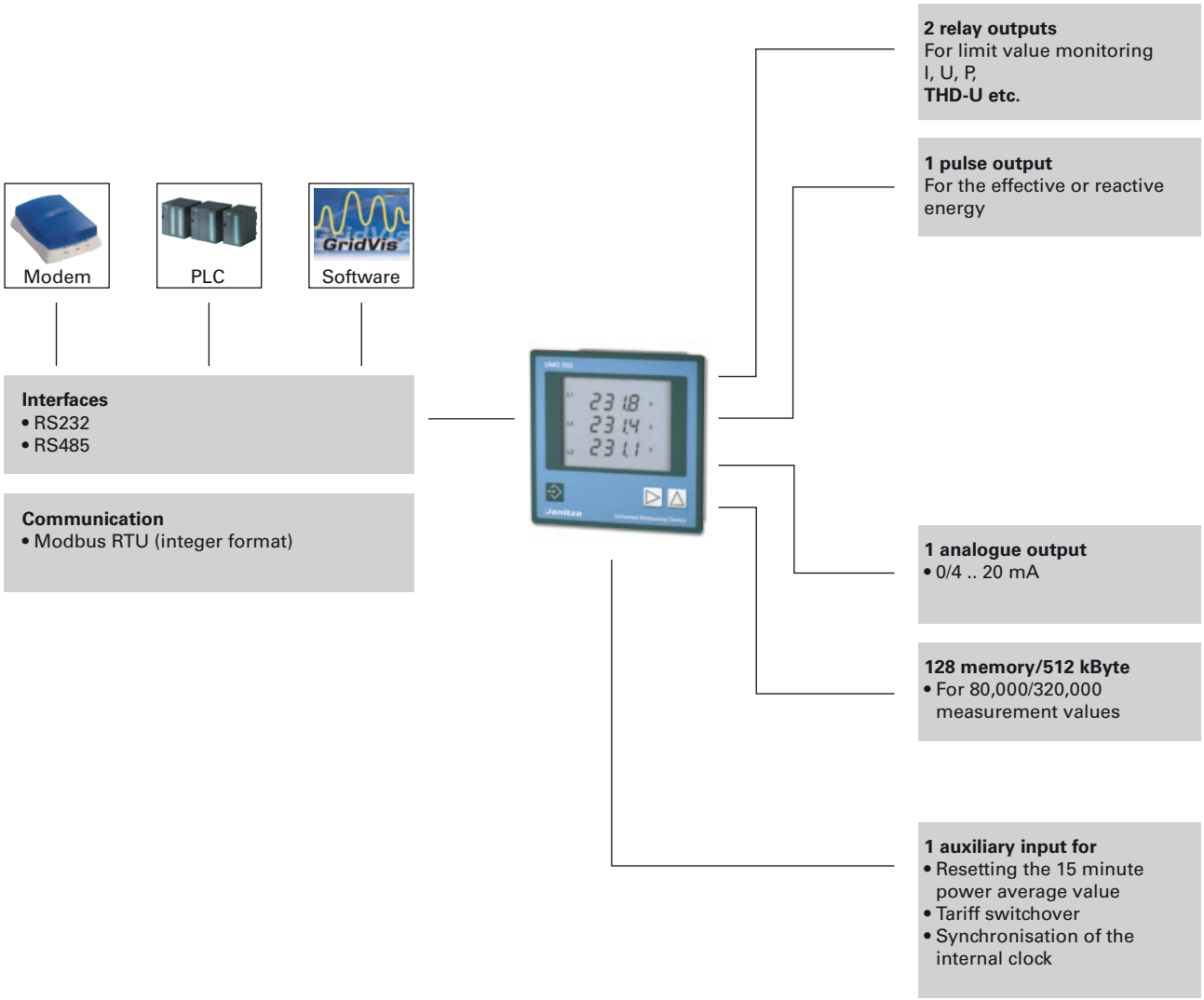
Relay outputs[*4]
The relay outputs K1 and K2 can be used for monitoring limit values. Each relay output can be linked with a measurement value and (recorded with date and time) can be stored if the value is not achieved or is exceeded. A minimum initialisation time can be programmed for each relay output to avoid excessively frequent switching.

Auxiliary input[*4]
The auxiliary input can be programmed for the following functions:

OFF = auxiliary input is not used
1 = reset of the 15 minutes power average value
3 = synchronisation of the internal clock

*4 refer to product variant

Scope of operation and types of variants



Overview of product variants

Three/four-phase universal measurement instruments 50/60Hz; current transformer...1/5A;including GridVis programming and analysis software													
Auxiliary voltage								Interfaces					
85 .. 250V AC, 80 .. 370V DC	40 .. 115V AC, 55 .. 165V DC	15 .. 55V AC, 20 .. 80V DC	Memory 128k RAM	Memory 512k RAM	Relay output	Pulse output	Analogue output 0(4) -20mA	RS 232	RS 485	Auxiliary input	3-phase measurement	Type	Item number
•	-	-	•	-	-	-	-	•	-	-	o	**UMG 503 L**	**52.07.017**
•	-	-	•	-	-	-	-	-	•	-	o	**UMG 503 LS**	**52.07.028**
•	-	-	•	-	-	-	-	-	•	-	o	**UMG 503 S**	**52.07.008**
•	-	-	-	•	•	•	•	•	•	•	•	**UMG 503 V**	**52.07.001**
-	•	-	-	•	•	•	•	•	•	•	•	**UMG 503 V**	**52.07.014**
-	-	•	-	•	•	•	•	•	•	•	•	**UMG 503 V**	**52.07.005**
•	-	-	-	•	o	o	o	•	•	o	o	**UMG 503 OV**	**52.07.006**

• = Contained – = Not possible o = Option which can be supplied with the unit (each option is only possible once)

Options for the units (release code)

Relay outputs (min/max)	OV	**52.07.051**
Pulse output for effective or reactive energy	OV	**52.07.052**
Analogue output 0(4) – 20mA	OV	**52.07.053**
Auxiliary input	OV	**52.07.056**
Three-phase measurement	L/LG/LS/S/OV	**52.07.058**

GridVis software

The UMG 503 power analysers contains 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, it can download the measurement value memory in the unit where available. In GridVis, the data is stored in a database and can be processed in MS Excel for example. More information is available in chapter 5 – "software".

General technical data

Operating voltage L-N, AC		Refer to order details
Overvoltage category		600V CAT III
Quadrants		4
Scanning rate 6 channel	Per channel	6.4 / 7.68 kHz
Weight		1kg
Dimensions		W=144mm x H=144mm x D=66.5mm
Mounting		Front panel installation
Working temperature		-10…55 °C
Connectable conductors (U/I)	Single wire, multi-wire, fine-wire, pin cable lugs, ferrule	0.08 - 2.5mm^2 1.5mm^2
Protection class (front/reverse)	According to EN60529	IP 50/20

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, 3 ph and up to 3 x 1ph

Measurement values

Measurement parameter	Display range	Measurement range at scaling factor 1	L1	L2	L3	Sum	Lowest value	Average value *1	Maximum value	Date/Time	Measure-ment accuracy
Current .. /5A	0.000 .. 9999 A	0.005 .. 6 A	•	•	•		•	•	•	•	+-0.2 %
Current .. /1A	0.000 .. 9999 A	0.005 .. 1 A	•	•	•		•	•	•	•	+-0.2 %
Current, neutral wire	0.000 .. 9999 A	0.060 .. 15 A				•	•	•		•	+-0.6 %
Voltage L-N	0.0 .. 999.9 MV	50 .. 500 V	•	•	•		•	•	•	•	+-0.2 %
Voltage L-L	0.0 .. 999.9 MV	80 .. 870 V	•	•	•		•	•	•	•	+-0.2 %
Frequency (U)	45.00 .. 65.00 Hz	45.00 .. 65.00 Hz						•		•	+-0.2 %
Effective power +/-	0.00 W .. 9999 MW	0.05 W .. 2.5 kW	•	•	•	•	•	•	•	•	+-0.5 %
Apparent power	0.00 VA .. 9999 MVA	0.05 VA .. 2.5 kVA	•	•	•	•	•	•	•	•	+-0.5 %
Reactive power	0.00 kvar .. 999 Mvar	0.05 var .. 2.5 kvar	•	•	•	•	kap.	•	ind.	•	+-0.5 %
Power factor	0.00 kap. .. 1.00 .. 0.00 ind.	0.00 kap. .. 1.00 .. 0.00 ind.	•	•	•	•	kap.	•	ind.	•	+-0.5 %
Effective energy + Effective energy -	0.0 Wh .. 9999 GWh -0.0 Wh .. -9999 GWh	0.05 Wh .. 9999 GWh*2 -0.05 Wh .. -9999 GWh*2				•		•		t^1/t^2	*3
Reactive energy +/-	0.0 .. 9999 Gvarh	0.05vars .. 9999 Mvarh*2				•		•		t^1/t^2	*3

t^1: start time, t^2: runtime, + purchase, - supply, *1 - integration over time: 5, 10, 15, 30 seconds, 1, 5, 10, 15, 30, 60 minutes, *2 memory period 60 minutes, *3 accuracy class according to EN61036:1996, VDE0418 part 7: May 1997, IEC1036:1996, with current transformer ../5A : class 1, with current transformer ../1A : class 2

Power quality

Harmonics, 1st to 20th harmonics, even/uneven	Current, voltage L1, L2, L3	Accuracy: ± 0.5%
Distortion factor THD- U in %	L1, L2, L3	Accuracy: ± 0.5%
Distortion factor THD- I in %	L1, L2, L3	Accuracy: ± 0.5%
Recorder for limit value events		yes

Measurement accuracy

Reactive energy kvarh	Class	1
Effective energy kWh	Class	1

Periphery

Digital inputs (auxiliary input)	As a status input	1, refer to order details
Relay outputs	As a switch output	2, refer to order details
Pulse outputs		1, refer to order details
Analogue outputs	(0) 4...20mA	1, refer to order details
Password protection		yes
Software GridVis	**Refer to chapter 5**	**yes**

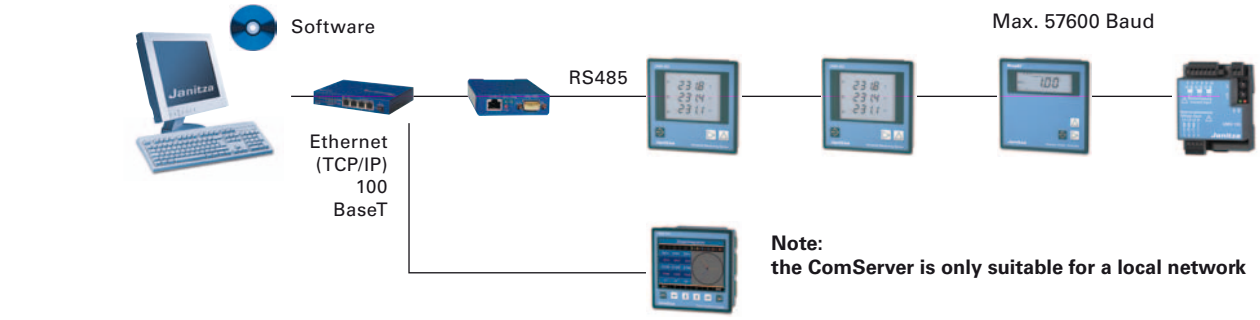
Communication

Interfaces		
RS 232	9.6, 19.2, 38.4 kbps	Yes, refer to order details
RS 485	9.6, 19.2, 38.4, 57.6, 115,2 kbps, 1.5 Mbs	Yes, refer to order details
Protocols		
Modbus RTU	Up to 115,2 kbps	yes

PLC communication example ... 31 units (up to 255 units can be added using star repeater)

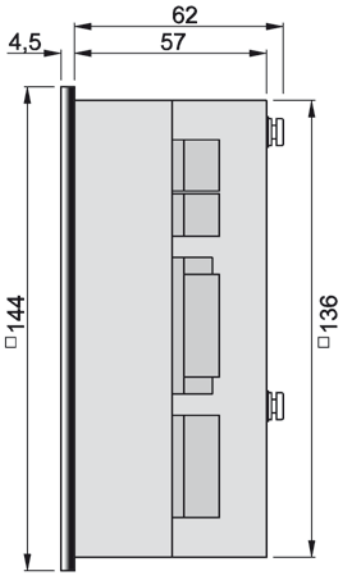
PC communication example ... 31 units (can be extended up to 255 units by star repeater)

Com server (TCP/IP) example for local networks ... 31 units per ComServer

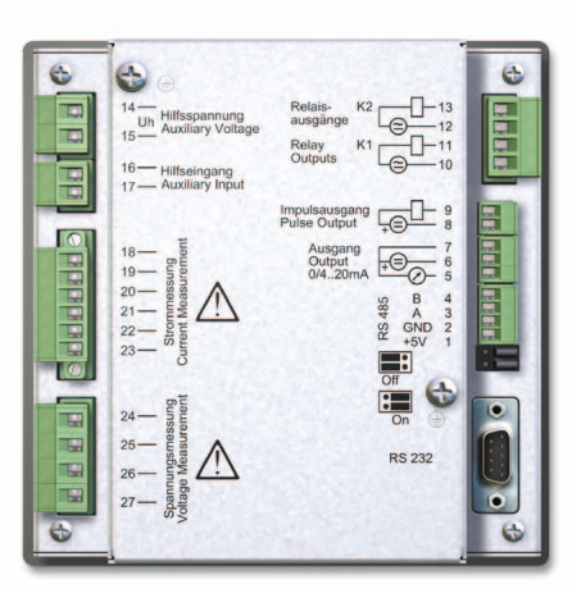


Fibre optic connection example ... 31units per line

Dimensional drawing



Connection illustration



Switchboard cut-out 139 x 139mm

Typical connection option