GOSSEN METRAWATT

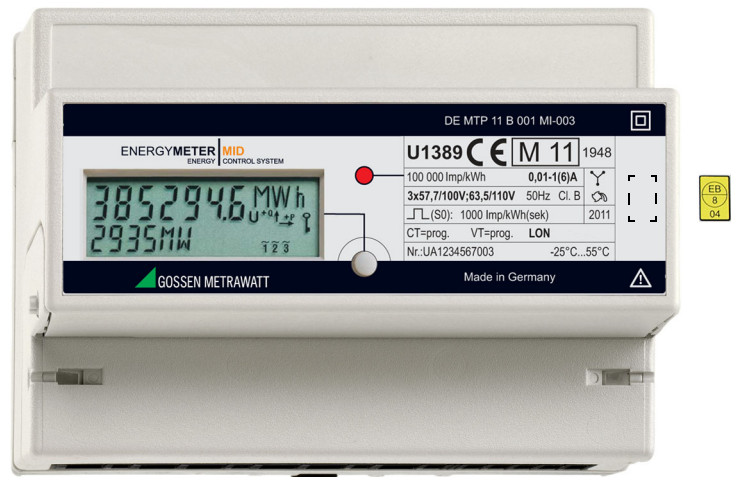# ENERGY**METER**|MID
U1281/U1289/U1381/U1387/U1389
Electronic Active and Reactive Energy Meters

- Professional energy meter for 2, 3, 4 wire systems with 65 A direct connection or 1 A, 5 A transformer connection

- Accuracy class B for commerce and industry and for enhanced requirements in private households

- Cost savings thanks to initial calibration ex factory, per MID, conformity evaluation procedure for modules B+D

- Configurable multifunctional versions for the acquisition of reactive energy and measured line quantities

- Indication of installation errors: phase sequence, phase failure, transformers with reversed polarity, overload

- Universal pulse output with adjustable pulse rate, pulse duration and selectable voltage range

- Flexible communication via integrated LON, M bus or L bus interface

- Possibility to maintain full functionality via fail-safe 24 V auxiliary voltage system even if disconnected from the mains

- Cover can be sealed, parameter configuration lock

- Quality product „Made in Germany"

LONWORKS®   M-Bus   L-Bus   EB 8

Applications

The calibrated energy meter can be used for the acquisition and billing of active energy in commerce and industry, households and facility management. The measured values are transmitted to data logging, billing and optimization systems as well as building automation and C&I systems via pulse output, LON, M bus or L bus interfaces. Installation is absolutely simple as the meter automatically recognizes false connections and signals them immediately. The active power display offers a maximum of operating convenience as it immediately informs about the momentary load of the electric circuit. And if you wish to have more information about your mains system, just extend the range of functions.

Applicable Regulations and Standards

IEC/EN 60529 VDE 0470, part 1	Degrees of protection provided by enclosures (IP code)
DIN 43856	Electrical power meters, multi-rate tariff switches and ripple-control receivers
DIN EN 62053-31 VDE 0418-3-31	Pulse output devices for electromechanical and electronic meters
DIN EN 50470-1 VDE 418-0-1 DIN EN 50470-3 VDE 418-0-3	Electricity metering equipment Part 1: General requirements, tests and test conditions – Metering equipment – EMC requirements Part 3: Particular requirements – Static meters for active energy (class indexes A, B and C)
DIN EN 62053-23	Electricity metering equipment (a.c.) - Particular requirements - Part 23: Static meters for reactive energy (classes 2 and 3)

Multifunctional Design

Depending upon the type of multifunctional design, the meter is also capable of acquiring reactive energy and of indicating up to 26 additional measured quantities.

With a simple keystroke and without the use of additional measuring equipment, it is thus possible to evaluate the voltage level, the capacity utilization of the individual phases, the reactive power component and the function of reactive power compensation equipment at any time. Please refer to the table below for details.

Measuring function		Feature			
Measured quantity	Accuracy	M0	M1	M2 [2]	M3 [2]
Active energy (kWh) [1]	1 %	•	•	•	•
Reactive energy (kVArh) [1]	2 %	—	—	•	•
Voltage (V)	0.5 % ±1 D	—	•	—	•
Current (A)	0.5 % ±1 D	—	•	—	•
Active power (kW)	1 % ±1 D	—	•	—	•
Reactive power (kVAr)	1 % ±1 D	—	•	—	•
Apparent (kVA)	1 % ±1 D	—	•	—	•
Power factor (cos phi)	1 % ±1 D	—	•	—	•
Frequency (Hz)	0.05 % ±1 D	—	•	—	•

[1] The associated total power is shown in the auxiliary display: active power (kW) and/or reactive power (kVAr)

[2] Not approved in Switzerland

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Technical Data

Measuring Ranges

Voltage	
See order information	100 V … 500 V
Allowable deviation	+ 15% / − 20%

Current	Directly measured	Current transformer
I_{ref}	5 A	1 A
Starting current	20 mA	2 mA
I_{min}	0.1 A	0.01 A
I_{max}	65 A	6 A

Frequency range	
Nominal frequency	50 Hz
Cutoff frequency	45 Hz … 65 Hz

Accuracy	
Active energy	Class B per DIN EN 50470-3
Reactive energy	Class 2 per DIN EN 62053-23

Sampling rate   continuous 32/period

LCD

Type   7-segment characters,
7-digit main display, height: 6 mm
8-digit auxiliary display, height: 5 mm

Display range   0 … 9999999 digits

Refresh   approx. 6 per second

Pulse Output

The energy meters are furnished with a pulse output as standard equipment (see below). The pulse output is electrically isolated from the measuring circuit by means of an optocoupler.

Electrical Values

Pulse generator constants with direct connection	1000 pulses per kWh (adjustable for feature V2, V4)
Pulse generator constants with transformer connection	1000 pulses per kWh (adjustable for feature V2, V4)
Pulse duration	30 ms (adjustable up to 3 s for feature V2, V4)
Interpulse period	> 30 ms
U_{ext}	max. 40 V (375 V for feature V3, V4)
Switching current	max. 27 mA (100 mA for feature V3, V4)

Terminal
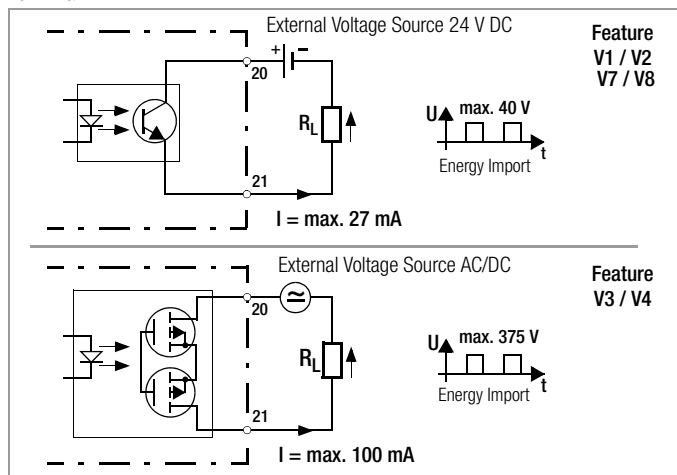
Power Supply, Auxiliary Power Supply

Internal supply	from measuring voltage: 80 up to 115 % Ur
External supply (Feature H1)	Auxiliary voltage: 24 V ±10%
	Current consumption: < 1 W

Power Failure Backup

Meter parameters and meter readings are retained by an EEPROM in the event of power failure.

If an external auxiliary power supply is utilized (feature H1), meter readings and parameters can also be queried during power failures.

Power Consumption

Voltage path	
4-wire meter	< 1 VA per phase (including supply power)
2 or 3-wire meter	< 2 VA

Current path	
At I_{max}	< 1 VA (direct) < 0.03 VA (transformer)
At I_{ref}	< 0.02 VA (direct) < 0.001 VA (transformer)

Electrical Safety

Safety class	II per DIN EN 50470

Nominal insulation voltage	
Inputs	300 V AC
Output	Feature V1, V2: DC 50 V (S∅ and bus) Feature V3, V4: AC 230 V (pulse)

Insulation test voltage	
Input ↔ output / housing	4 kV AC
Output ↔ housing	Feature V1, V2: 500 V (S∅ und bus) Feature V3, V4: 4 kV (pulse)

Overload Capacity

All meters	Unlimited at 1.15 U_r and I_{max}
Direct connection	5 times 3 sec.: U_r and 100 A (interval: 5 min.)
Direct connection	1 times 1 sec.: U_r and 250 A
Transformer connection	0.5 sec.: 20 times I_{max}; continuous: 10 times I_{max}.

EMC

Electromagnetic Compatibility per DIN EN 50470	
Surge voltage	6 kV, 1.2 / 50 µs 10+ / 10− surges (DIN EN 50470-1)
Electrostatic discharge	15 kV (DIN EN 61000-2-4)
Electromagnetic fields	30 V/m (DIN EN 61000-4-3) open circuit
	10 V/m (DIN EN 61000-4-3) under load
Burst	2 kV (DIN EN 61000-4-4)
Conducted interference	10 V (DIN EN 61000-4-6)
Interference emission	EN 55022

Interfaces

A detailed description of the LON, M bus and L bus interfaces is available on the internet at www.gossenmetrawatt.com.

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Ambient Conditions

|	
Operating temperature range	−25 ... +55° C
Storage temperature range	−25 ... +70° C
Relative Humidity	< 75% annual average
Elevation	to 2000 m
Deployment	indoors

Mechanical Data

Housing	
Material	Lexan polycarbonate per UL94 V0
Dimensions	Height ≤ 90 mm Overall depth ≤ 75 mm Width 125.5 $^{+0.5}$ mm
Weight	< 0.5 kg
Installation	Top-hat rail per DIN EN 50022 or wall mounting
Protection	IP 51 (dust protection, vertically dripping water)

Terminals	
Current input	≤ 16 square mm without wire end ferrule
Voltage input	≤ 2.5 square mm with wire end ferrule ≤ 2 x 1.5 square mm without wire end ferrule
S0 pulse input / LON	≤ 2.5 square mm with wire end ferrule ≤ 2 x 1.5 square mm without wire end ferrule
Protection	IP 20 (Protection against entry of foreign objects ≥ 12.5 mm dia. without protection against the penetration of water)

Dimensional Drawing / Installation

Top-hat rail per DIN EN 50022, 35 x 15 or 35 x 7.5 mm
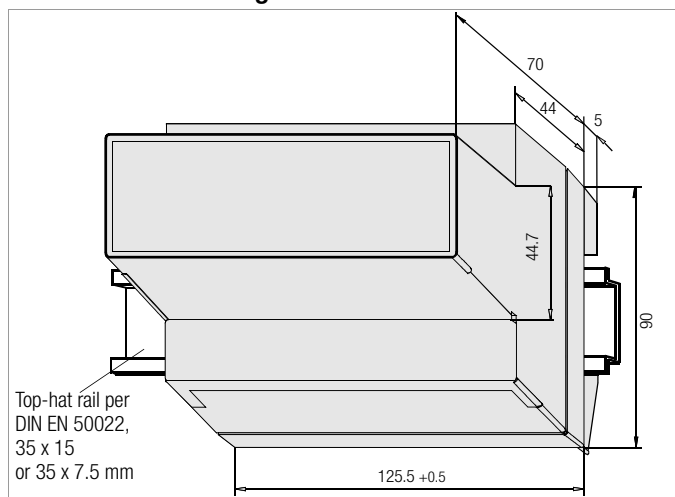
Symbols and Their Meanings

| Symbol	Meaning
CT	Current transformer transformation ratio
CT × VT	Product of CT and VT
f	Frequency
I	RMS current value
I_{max}	Limit current
I_{min}	Minimum current rating
I_{ref}	Reference current (rating)
U	RMS voltage value
U_n	Reference voltage
VT	Voltage transformer transformation ratio

Terminal Assignments

Self-locking screw terminals are utilized, and are protected with a tamper-proof terminal cover as a standard feature.
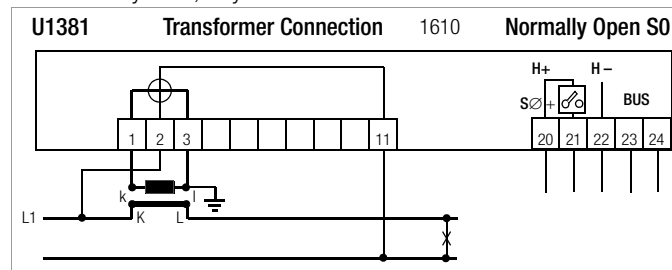
Terminal Circuit Diagrams
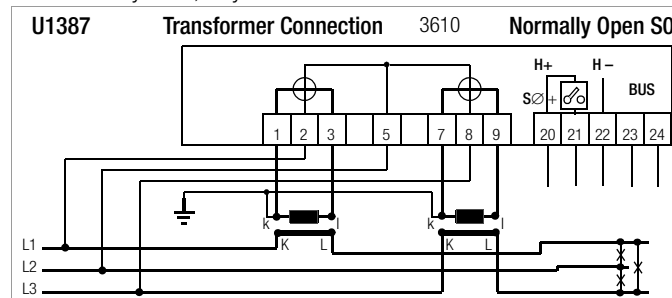
2-wire AC system, any load
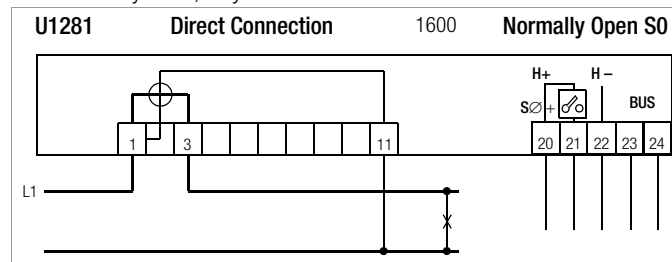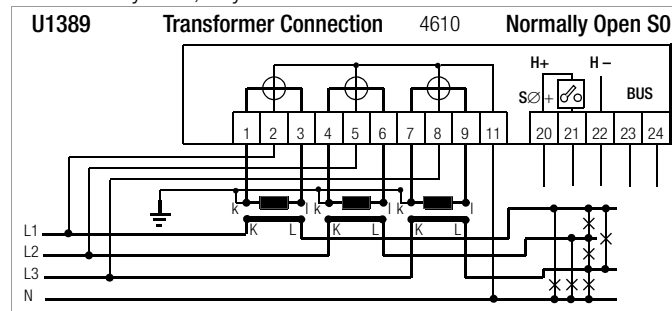

4-wire AC system, any load
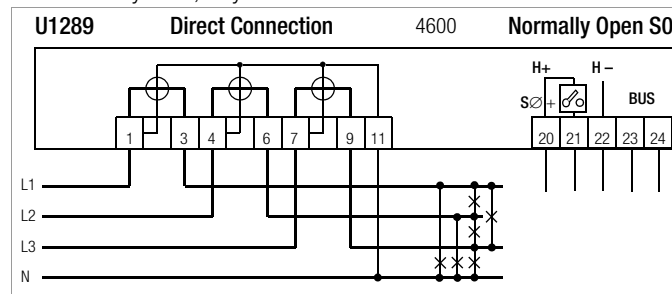
2-wire AC system, any load

3-wire AC system, any load

4-wire AC system, any load

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Order Information

Designation		Article Number / Feature				
Active energy meter for 2-wire system, direct		U1281				
Active energy meter for 4-wire system, direct, with any load			U1289			
Active energy meter, 2-wire system, transformer				U1381		
Active energy meter, 3-wire system, transformer, with any load					U1387	
Active energy meter, 4-wire system, transformer, with any load						U1389
24 V DC external auxiliary power	without	H0	H0	H0	H0	H0
	with	H1	H1	H1	H1	H1
Multifunctional design	without	M0	M0	M0	M0	M0
	with U, I, P, Q, S, PF, f	M1	M1	M1	M1	M1
	with reactive energy [2]	M2	M2	M2	M2	M2
	with U, I, P, Q, S, PF, f and reactive energy [2]	M3	M3	M3	M3	M3
Referenzspannung U_n	100 … 110 V	—	—	—	U3	U3
	230 V	U5	—	U5	—	—
	400 V	—	U6	—	U6	U6
	500 V	—	—	—	U7	—
Approval	MID	P8	P8	P8	P8	P8
	MID and calibration certificate	P9	P9	P9	P9	P9
Pulse output						
1000 pulses/kWh [1]	S0 standard, calibrated	V1	V1	V1	V1	V1
Programmable rate 1 … 1000 pulses/kWh s [1]	S0 programmable	V2	V2	—	—	—
Programmable rate 1 … 10000 pulses/kWh s [1]	S0 programmable	—	—	V2	V2	V2
Switching output up to 230 V, 1000 pulses per kWh [1] (not possible with feature H1)	230 V standard, calibrated	V3	V3	V3	V3	V3
Switching output up to 230 V, programmable rate [1] (not possible with H1)	Programmable 230 V	V4	V4	V4	V4	V4
Can be calibrated 100 pulses/kWh	S0 130 ms, 100 pulses/kWh	V7	V7	—	—	—
Can be calibrated 100 pulses/kWh, for Q9 depending on CT x VT	S0 130 ms, 100 pulses/kWh	—	—	V7	V7	V7
Can be calibrated 1000 pulses/kWh, not with Q9	S0 130 ms, 1000 pulses/kWh	—	—	V8	V8	V8
Calibrated 2000, 5000, 10000 pulses per kWh	S0 customer-specific			V9	V9	V9
Bus connection	without	W0	W0	W0	W0	W0
	LON	W1	W1	W1	W1	W1
	M-Bus	W2	W2	W2	W2	W2
	L-Bus	W3	W3	W3	W3	W3
Transformer ratios						
Current/voltage fixed, Main display calibrated	CT=VT=1	—	—	Q0	Q0	Q0
Current/voltage programmable, auxiliary display calibrated	CT, VT programmable (CTxVT ≤ 100000)	—	—	Q1	Q1	Q1
Current/voltage fixed, Main display calibrated CT=1 … 10000, VT=1 … 1000, CT x VT ≤ 1 million	CT, VT fixed	—	—	Q9 CT = _____ VT = _____	Q9 CT = _____ VT = _____	Q9 CT = _____ VT = _____

[1] for **U138x** and **Q9** the pulse rates are indicated as a function of the primary side:

Pulse Rate Table	For V1 and V3, calibrated	For V2 and V4, not calibr.
CT x VT	Fixed	Programmable
1 … 10	1000 pulses per kWh	1 … 1000 pulses per kWh
11 … 100	100 pulses per kWh	0.1 … 100 pulses per kWh
101 … 1000	10 pulses per kWh	0.01 … 10 pulses per kWh
1001 … 10000	1 pulse per kWh	1 … 1000 pulses per MWh
10001 … 100000	0.1 pulses per kWh	0.1 … 100 pulses per MWh
100001 … 1000000	0.01 pulses per kWh	0.01 … 10 pulses per MWh

[2] not approved in Switzerland

Feature Q1 (only auxiliary display calibrated)
For billing purposes, only the auxiliary display (small digits) is to be used.

Sample order

4-wire system, any load, without external auxiliary power, with reactive energy measurement, with MID approval, programmable transformation ratio, input voltage: 400 V, with standard S∅ pulse output, no bus connection

Designation: U1389 H0 M2 P8 Q1 U6 V1 W0

Accessories

Designation	Article number
Door mount kit (including dimensional drawing)	**U270A**

Standard types with MID approval and initial calibration (available from stock)

Designation	Feature	Article Number
Energy meter for direct connection 5 (65) A, class B (or 1)		
for 4-wire system, 3x 230 / 400 V, S0 1000 pulses/kWh	U1289 U6 P8 V1	**U1289-V011**
for 4-wire system, 3x 230 / 400 V, S0 pulse rate programmable	U1289 U6 P8 V2	**U1289-V012**
for 4-wire system, 3x 230 / 400 V, S0 pulse rate programmable, LON	U1289 U6 P8 V2 W1	**U1289-V013**
for 4-wire system, 3x 230 / 400 V, S0 pulse rate programmable, M-Bus	U1289 U6 P8 V2 W2	**U1289-V014**
Energy meter for transformer connection 5 (6) A and 1 (6) A, class B (or 1)		
for 3-wire system, 3x 100 V, 1 (6) A, S0, CT / VT / pulse rate programmable	U1387 U3 P8 V2 Q1	**U1387-V011**
for 3-wire system, 3x 400 V, 1 (6) A, S0, CT / VT / pulse rate programmable	U1387 U6 P8 V2 Q1	**U1387-V012**
for 4-wire system, 3x 230 / 400 V, 1 (6) A, S0, CT / VT / pulse rate programmable	U1389 U6 P8 V2 Q1	**U1389-V011**
for 4-wire system, 3x 230 / 400 V, 1 (6) A, S0, 1000 pulses/kWh, CT = VT = 1	U1389 U6 P8 V1 Q0	**U1389-V012**
for 4-wire system, 3x 230 / 400 V, 1 (6) A, S0 pulse rate programmable, CT = VT = 1, LON	U1389 U6 P8 V2 Q0 W1	**U1389-V013**
for 4-wire system, 3x 230 / 400 V, 1 (6) A, S0, 1000 pulses/kWh, CT = VT = 1, LON	U1389 U6 P8 V1 Q0 W1	**U1389-V014**
for 4-wire system, 3x 230 / 400 V, 1 (6) A, S0, CT / VT / pulse rate programmable, M-Bus	U1389 U6 P8 V2 Q1 W2	**U1389-V015**
for 4-wire system, 3x 230 / 400 V, 1 (6) A, S0, CT / VT / pulse rate programmable, LON	U1389 U6 P8 V2 Q1 W1	**U1389-V016**

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