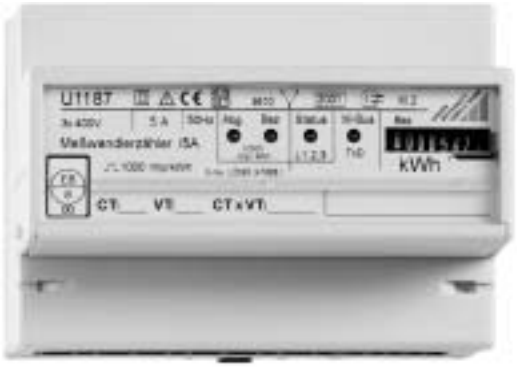
U1187 / U1189
Energy Meters for Active Energy with M Bus Interface

3-349-153-03
1/8.01

- Acquires active energy, even in distorted electrical systems
- Long distance transmission of energy import and export pulses (S0 compatible)
- Long distance transmission of meter readings, instantaneous power values and error conditions via M bus interface
- For household, industrial and commercial applications
- Class 1 or class 2, PTB approval (German Federal Institute of Physics and Metrology), can be certified for energy import
- Direct connection or via transformer (auto-recognition)
- Import energy is indicated at a 7-digit drum-type counter mechanism with anti-reversing device
- LED display for energy import and export
- LED display for incorrect phase sequence and phase failure



QUALITY MANAGEMENT SYSTEM
DQS Certified per
DIN EN ISO 9001, reg. no. 1262

Applications

The electronic energy meter acquires power consumption data in three-phase electrical systems. Its compact rugged design allows for universal use in industrial systems, at construction sites, in office buildings, in leisure facilities and in household applications. It can be installed in any desired position to top-hat rails in accordance with DIN EN 50022, or can be screw mounted to the wall.

Installation of energy meters at incoming supply lines, primary distribution lines or directly at power consumers facilitates recording of energy data, as well as targeted cost allocation and billing.
Energy import pulses are transmitted via the floating pulse output, enabling use in combination with automated billing systems, as well as for peak load optimization.

Momentary meter readings for energy import and export, as well as readings for a predetermined cutoff date, can be read out of internal data memory via the M bus interface (EN 61434-3). Instantaneous power and error status are also available for evaluation. The energy meter is linked to the bus by means of a reverse polarity protected 2-wire connection. Bus topology can be adapted to prevailing requirements in a flexible fashion.

Applicable Regulations and Standards

EN 61434-3	Heat meters, data exchange and interfaces (M bus)
IEC 61326-1 / EN 61326-1	EMC, interference emission: industrial environment
IEC 61326 / A1 EN 61326 / A1	EMC interference immunity: industrial environment
IEC 60529 / EN 60529 VDE 0470, part 1	Protection provided by enclosures (IP code)
DIN 43 856	Electrical power meters, multi-rate tariff switches and ripple-control receivers
DIN 43 864	Electrical interfaces for pulse transmission between impulsing meters and tariff rate devices
IEC 600068-2	Basic environmental testing procedures
IEC 60255-4	High-frequency disturbance test
IEC 61036 / EN 61036 / VDE 0418, part 7	Electronic, alternating current active energy meters (accuracy classes 1 and 2)

Description

Hall generator type energy meters are especially well suited for the performance of measurements in highly distorted low-voltage systems. Beyond this, they are well matched for all applications which previously made use of Ferraris meters or AC coupled, solid-state energy metering systems.

The meters demonstrate exceptional frequency response, which significantly expands their range of applications in distorted electrical systems.

U1187 / U1189
Energy Meters for Active Energy with M Bus Interface

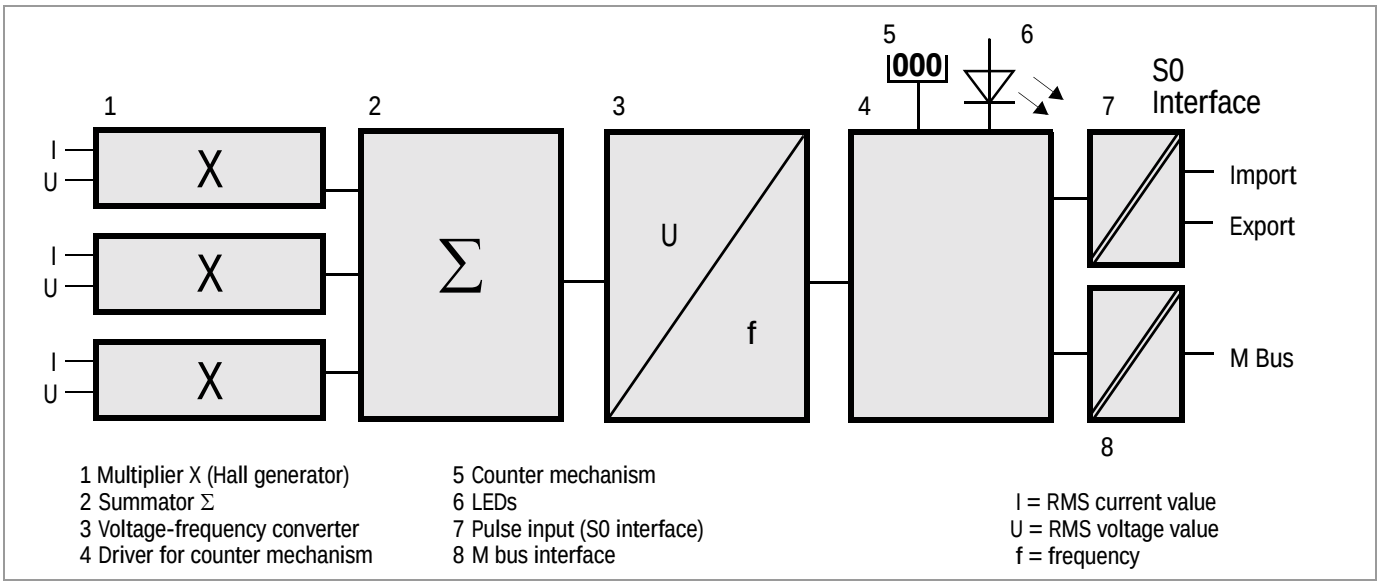


Figure 1 Schematic Diagram

Functional Principle

Active power is continuously ascertained by the 3 Hall generators (1) based upon input voltage and input current.

The three constituents are added up by the summator (2), and results are fed to a voltage-frequency converter (3).

The output frequency is directly proportional to the power ratio at the primary side. A pulse sequence, which is proportional to power, is subsequently fed to the counting mechanism (5), as well as to the appropriate import or export indicating LED (6) and the respective optocoupler (7).

The output signal from the optocoupler is potential-free and is in compliance with the S0 standard in accordance with DIN 43 864.

An M bus interface (8) is utilized for bus-compatible transmission of measured values.

Serial Plate Labeling

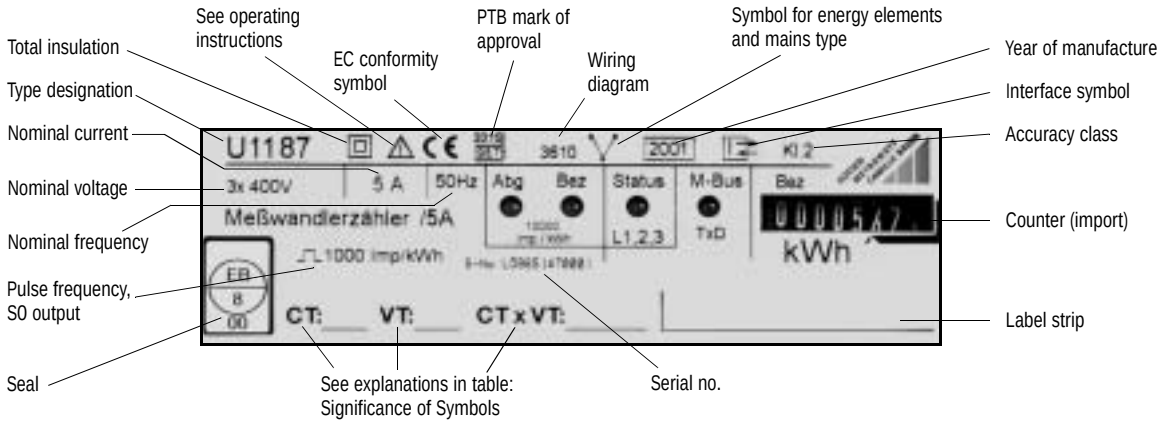


Figure 2 Serial Plate Labeling

Significance of Symbols

Symbol	Significance
CT	Current transformer transformation ratio
VT	Voltage transformer transformation ratio
CT × VT	Product of CT and VT

Technical Data

I_B = nominal current (basic current)
I_{max} = maximum current
U_r = rated input voltage

Measuring Ranges

Voltage		
Rated input voltage U_r	see Order Information	
Allowable deviation	+ 15% / – 20%	

Current		
Direct measured I_B	10 A	
Starting current	Class 2: 0.5% I_B	Class 1: 0.4% I_B
Direct measured I_{max}	63 A	
Current transformer I_B	5 A or 1 A	
Starting current	Class 2: 0.3% I_B	Class 1: 0.2% I_B
Current transformer I_{max}	6 A or 2 A	

Frequency Range	
Nominal frequency	50 Hz
Cutoff frequency	45 Hz ... 55 Hz

Accuracy Class	
Standard	1 or 2 per IEC 61036, as specified in purchase order

Overload Capacity

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

Pulse Output

The energy meters are furnished with a pulse output as standard equipment (see figure 3). The pulse output is electrically isolated from the measuring circuit with an optocoupler.

Electrical Values

Pulse duration	100 ms + 50%
Interpulse period	> 50 ms
U_{ext}	max. 40 V
Switching current	max. 27 mA

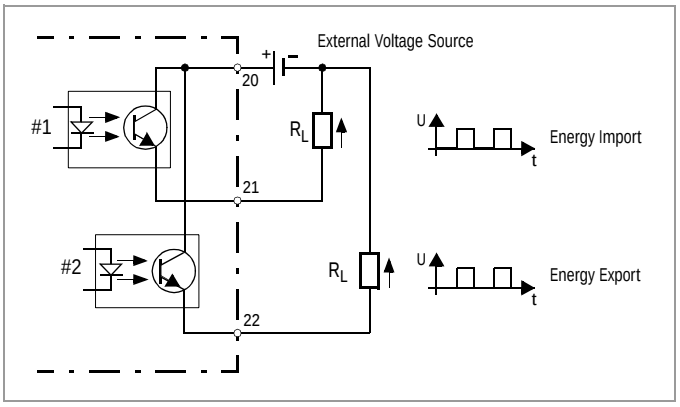


Figure 3 Pulse Output

M Bus Interface, M Bus Protocol

Applicable standard	EN 61434-3
Transmission speed	300, 2400 or 9600 bits per second
Addressing	Primary and secondary addressing with wildcard
Support functions	REQ_UD2, SND_UD
Data structure	Variable structure, low byte first (identifier 72h), length: 83 bytes 1. Current point in time 2. Next cutoff date 3. Momentary energy import 4. Momentary power import 5. Last cutoff date 6. Cutoff date energy import 7. Momentary energy export 8. Momentary power export 9. Cutoff date energy export 10. Company-specific supplement
Parameters configuring protocol	ID number, primary address, date and time, cutoff date and time, baud rate and a function for freezing meter readings can be configured with SND_UD via the M bus.
Physical characteristic	Closed-circuit current max. 1.5 mA / 1 standard load

Display

Counter Mechanism (secondary counter mechanism, kWh or kVarh)	
Direct connection	Stepped counter mechanism, 6 + 1 digits
Transformer connection	Stepped counter mechanism, 5 + 2 digits

LED	Indicates	
Abg	Export (meter with direct connection)	red LED, 1000 pulses per kWh
Bez	Import (meter with direct connection)	red LED, 1000 pulses per kWh
Abg	Export (meter with transformer connection, 5 A)	red LED, 10,000 pulses per kWh
Bez	Import (meter with transformer connection, 5 A)	red LED, 10,000 pulses per kWh
Abg	Export (meter with transformer connection, 1 A)	red LED, 20,000 pulses per kWh
Bez	Import (meter with transformer connection, 1 A)	red LED, 20,000 pulses per kWh
Status	Status (all meters)	red LED, pulse / counter step
	Phase failure (3 and 4-wire systems)	red LED
	Incorrect phase sequence (4-wire systems)	red LED, approx. 1 pulse per s
M bus	M bus mode, data transmission	red LED

Auxiliary Voltage

Auxiliary voltage is always generated from measuring voltage.

Internal Loss

Voltage Path	
3 and 4-wire meters	< 3 VA per phase

Current Path	
at I_{max}	< 1 VA
at I_B = 1 A	< 0.05 VA
at I_B = 5 A	< 0.5 VA
at I_B = 10 A	< 0.02 VA

U1187 / U1189
Energy Meters for Active Energy with M Bus Interface

Electrical Isolation

Nominal Insulation Voltage	
Inputs	300 V AC
Output	50 V DC

Insulation Test Voltage	
Input ↔ output / housing	4 kV AC
Output ↔ housing	500 V AC

Electrical Safety

Safety class	II
Overvoltage category	III per IEC 61036 / EN 61036
Allowable fouling factor	2

Electromagnetic Compatibility per IEC 61036	
Surge voltage	6 kV, 1.2 / 50 ms 10+ / 10– surges (IEC 255-4)
Burst	2 kV (IEC 61000-4-4 / EN 61000-4-4)
Electromagnetic fields	10 V / m (IEC 61000-4-3 / EN 61000-4-3)
Electrostatic discharge	8 kV (IEC 6100-4-2 / EN 61000-4-2)
Interference emission	IEC 61326-1 / EN 61326-1
Interference immunity	IEC 61326 / A1 / EN 61326 / A1

Ambient Conditions

Nominal operating temperature	– 10 ... + 45 °C
Maximum operating temperature	– 20 ... + 55 °C
Storage temperature	–25 ... + 70 °C
Relative humidity	< 75% annual average

Mechanical Data

Housing		
Material	Lexan polycarbonate per UL94 V0	
Dimensions	Height Overall depth Width	≤ 90 mm ≤ 75 mm 125.5 $^{+0.5}$ mm
Weight	< 0.5 kg	
Mounting	Top-hat rail per DIN EN 50 022 or wall mount	
Protection	IP 51 per IEC 60529 / EN 60529	

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 output / M bus	≤ 2.5 square mm with wire end ferrule ≤ 2 x 1.5 square mm without wire end ferrule
Protection	IP 20 per IEC 60529 / EN 60529

Dimensional Drawing / Installation

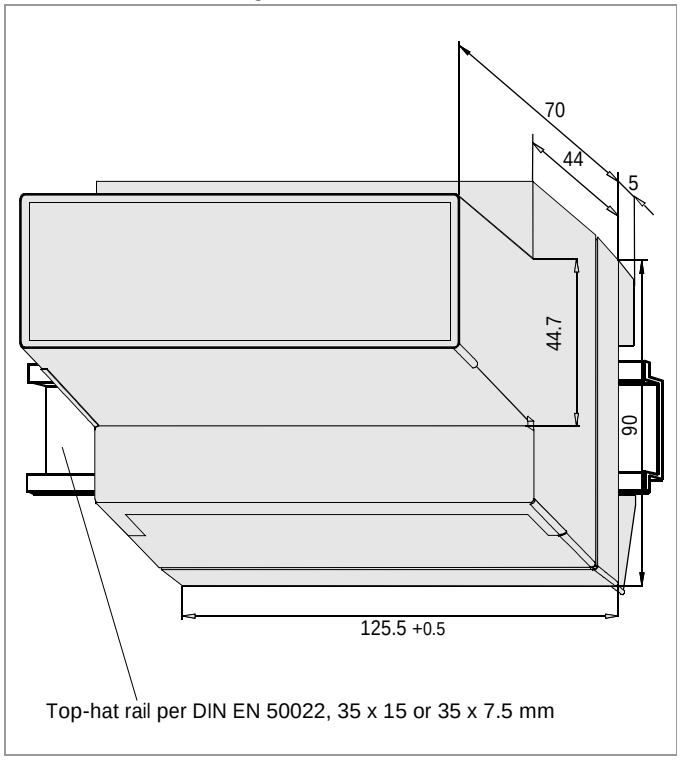


Figure 4 Dimensional Drawing for Top-Hat Rail Mounting (front and side view)

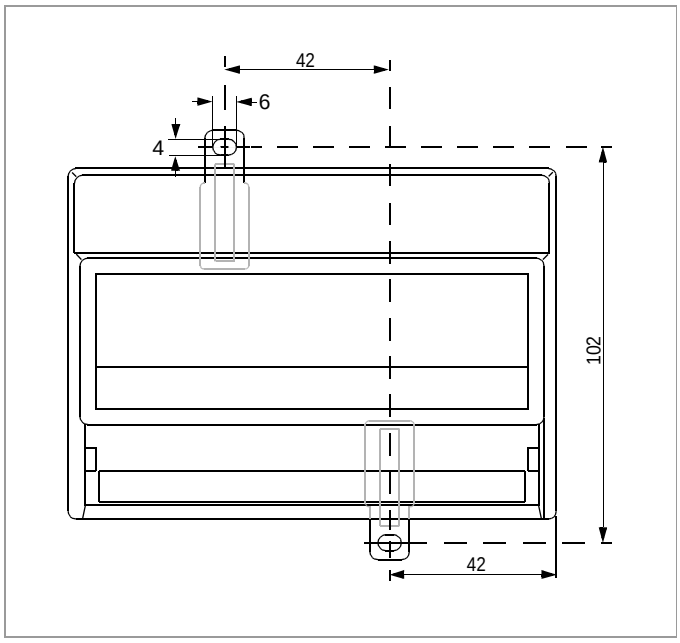


Figure 5 Dimensional Drawing for Wall Mounting (front view)

Terminal Covers

A terminal cover is used to provide contact protection, and can be sealed into place.

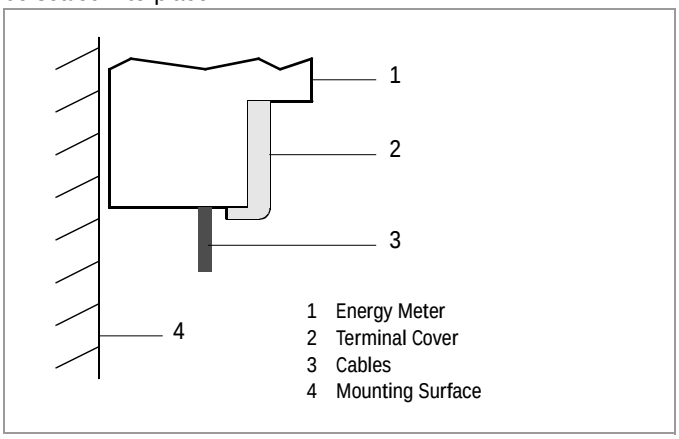


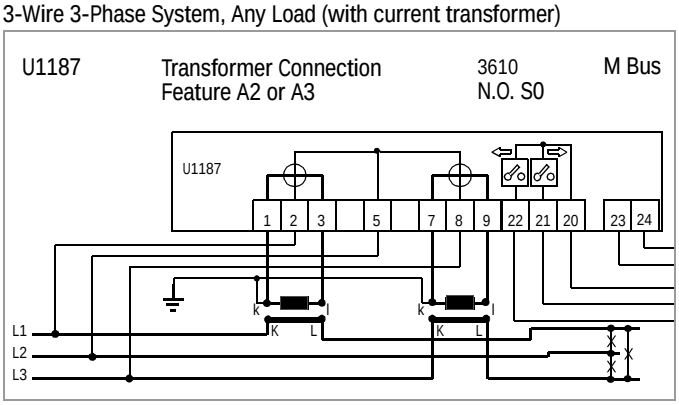
Figure 6 Terminal Cover

Terminal Assignments

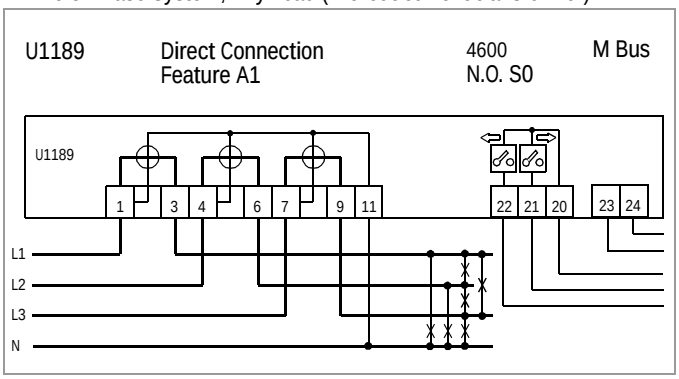
Self-locking screw terminals are utilized, and are protected with a tamper-proof cover as a standard feature.

Energy Meter for Active Energy

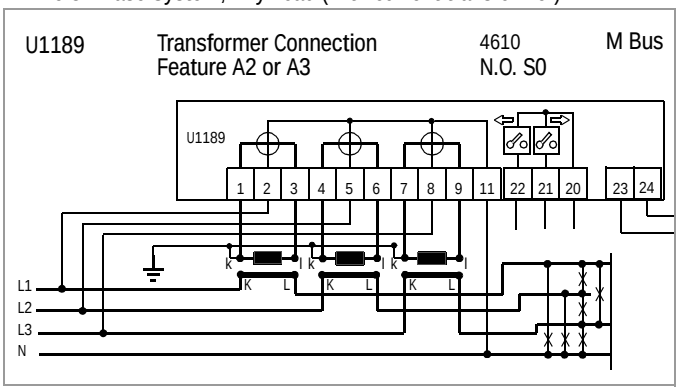
3-Wire 3-Phase System, Any Load (with current transformer)



4-Wire 3-Phase System, Any Load (without current transformer)



4-Wire 3-Phase System, Any Load (with current transformer)



List of Accessible Variables

Byte	Data Type	Unit of Measure	Comment
6	8 bit integer	–	Address
8 ... 11	32 bit integer	–	ID number
12, 13	16 bit integer	–	Manufacturer code
14	8 bit integer	–	Version
15	8 bit integer	–	Medium
16	8 bit integer	–	Number of read-outs
17	8 bit integer	–	Status
22 ... 25	Date, time	Time	Current point in time
29 ... 32	Date	Time	Next cutoff date
35 ... 38	32 bit integer	Wh	Energy import
41 ... 44	32 bit integer	W	Instantaneous power import
47 ... 50	Date	Time	Last cutoff date
53 ... 56	32 bit integer	Wh	Energy import on cutoff date
60 ... 63	32 bit integer	Wh	Energy export
67 ... 70	32 bit integer	W	Instantaneous power export
74 ... 76	32 bit integer	Wh	Energy export on cutoff date
79	8 bit integer	–	Features
80, 81	Date	Time	Date of manufacture

Cutoff Date and Clock Function

The energy meter's cutoff date function is realized by means of an internal real-time clock.
Date and time can be set via the M bus in the following format: DD.MM.JJ hh:mm. If this function is initialized, the meter saves current data regarding energy import and export to the appropriate cutoff date registers, and saves the momentary date and time values as the cutoff date. The value for the next cutoff date is increased by one year. All values are saved to non-volatile memory.

Freezing Meter Readings

The cutoff date function can also be initialized with a data frame via the M bus. As is also the case with the cutoff date function , momentary meter readings are saved to the cutoff date registers.

Order Information

Designation		Article Number / Feature		
Active energy meter with M bus				
3-wire system, any load		U1187		
4-wire system, any load			U1189	
Connection				
Direct connection, 10 A (63 A), with pulse frequency output	100 pulses per kWh		A1	
Transformer connection, 5 A, with pulse frequency output	1000 pulses per kWh	A2	A2	
Transformer connection, 1 A (2 A), with pulse frequency output	2000 pulses per kWh	A3	A3	
Input voltage				
Rated input voltage U_r	100 V	U3		
	400 V	U6	U6	
	500 V	U7		
Accuracy class				
	2	G0	G0	
	1	G1	G1	
Certification				
	no	P0	P0	
	yes	P1	P1	

Order example: Active energy meter with M bus, 3-wire system any load, 5 A transformer connection, 1000 pulses per kWh, 400 V input voltage, accuracy class 2, with certification

Article number / feature: U1187 A2 U6 G0 P1

Accessories

Designation	Article Number
Door mount kit (including dimensional drawing)	U270A

U1187 / U1189
Energy Meters for Active Energy with M Bus Interface

Printed in Germany • Subject to change without notice

GOSSEN-METRAWATT GMBH
Thomas-Mann-Str. 16-20
90471 Nürnberg, Germany
Phone: +49 911 8602-0
Fax: +49 911 8602-669
http://www.gmc-instruments.com
e-mail: info@gmc-instruments.com