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DIN EN ISO 9001 : 2000


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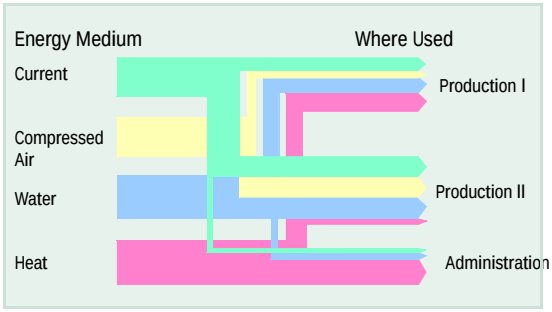
How can available energy be used efficiently?

Efficient use of existing energy sources is becoming more and more important for companies of all types.
Basic energy media including electricity, natural gas, water, steam and compressed air are utilized in almost all industrial facilities.
In some cases more than 15 different media are utilized for complex production processes.

Creating Clarity with Figures

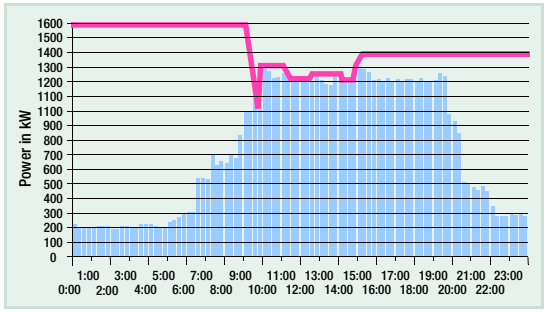
Recording energy and consumption figures provides the basis for an initial examination of how efficiently energy is being used or consumed.
Excessive deviation amongst energy consumption figures for similar devices, processes or systems is a unfailing indicator that action is required.

Clarity for Energy Distribution



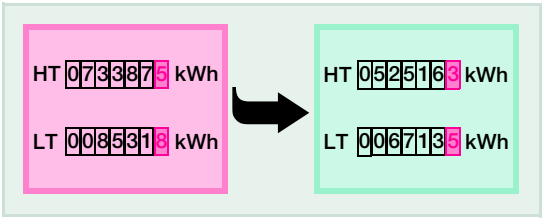
Intelligent approaches to reducing energy costs cannot be developed until energy distribution and consumption habits are identified throughout the entire company. Each division must be accurately informed concerning the composition of its energy costs to this end, and the results of energy saving attempts must be made known immediately.

Clarity for Energy Consumption Habits



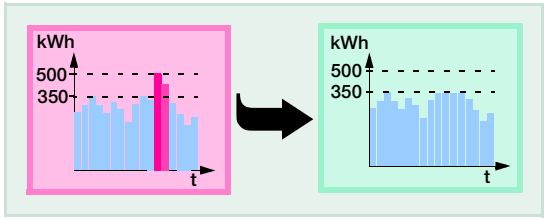
The load or consumption profile represents power, work or consumption relative to time. It clearly demonstrates the occurrence of extreme values, and can be compared with process sequences.
A continuous load structure analysis allows for immediate recognition of changes to the operating sequence.

Reduced Energy Consumption



Weak points and sources of waste can be detected immediately with the help of a load or consumption profile. Consumption during idle time is a plain indicator of energy waste or leaks. Obtained figures make it possible to determine whether or not equipment is functioning efficiently, or if it needs to be replaced with new, low energy consumption equipment.

Reduced Peak Load



Enormous cost saving potential can be realized by reducing or suppressing peak loads. Adequate acceptance of load limiting consumption habits can be achieved by invoicing responsible company divisions for peak loads in accordance with the “guilty-party-pays” principle. However, this presumes transparent consumption habits for each respective division, in order to assure that the necessity for corrective measures and their effectiveness can be substantiated.

Process Energy Optimization

If the load or consumption profile is related to production quantities, industrial engineering is provided with ideal prospects for optimizing energy use within the process. The effects of modifications on energy use become immediately apparent after they are implemented. Optimization is complete after the most economical working level has been achieved.

Automated Billing

Remote meter reading makes all energy and consumption values available to the user at any desired point in time. These can be transferred to an automated billing system in an error-free fashion. Logging of load and consumption profiles for a multitude of measuring points is only possible with the help of remote meter reading. Defective meters are detected by means of plausibility checks. All energy media are billed in accordance with definable allocation policies for individual cost centers in consideration of various tariffs. The transfer of billing data to the in-house computer system is the basis for internal company billing.

Visualization of Energy and Process Data

All measured values are available at each data logger within an energy monitoring system. It is thus possible to display values which are relevant to the process in a clear-cut fashion, to store them to memory and to monitor them against limit values. The causes of errors can be analyzed in advance from a central location, and personnel required for troubleshooting can then be deployed in a targeted fashion.

4 Step Concept for the Implementation of Energy Saving Measures:

- Step 1: Analyze current situation
- Step 2: Target-setting or concept development
- Step 3: Project reports with analysis results
- Step 4: Implementation phase and substantiation of success

Energy Control System

What types of demands are placed upon energy monitoring systems?

- Data loggers must be capable of processing a wide variety of output signals generated by the utilized energy and consumption meters.
- Data loggers should pre-process and save measured values in order to eliminate the possibility of data loss in the event of a network error or a problem with the analysis computer.
- The selected system must be expandable, and must be able to manage the required number of meters after final expansion has been completed.
- Load profile, daily, monthly and annual figures, and tariffs should be acquired by the data logger.
- In order to assure that energy and consumption figures can be queried on-site, it must be possible to access all system data from any station within the network, and the user must be able to program the data logger without difficulty.
- If peak load optimizations are to be performed in a decentralized fashion, the data logger must be programmable, must have access to all data and must be equipped with suitable switching outputs.
- In order to minimize costs, the network should make use of communications cables which have already been installed in the building, and must therefore allow for ideal adaptation to prevailing local circumstances.
- It must be possible to transmit values from distant network stations or other locations via public telephone lines.
- Logging of energy and consumption data must be consistently isolated from other existing control systems in order to assure that resulting influences on energy consumption are recorded in the event of their failure.

Management

All energy and consumption data are centrally evaluated and processed at the management level. The management level includes applications for peak load reduction, reduced consumption, cost center billing and data visualization.

Consolidation

All energy and consumption data acquired at the data logging level are evaluated and transmitted at the consolidation level. Consolidation is implemented by means of interconnected data loggers.

Data Logging

The use of energy and consumption meters creates a basis for the precise allocation of costs and a willingness to use energy efficiently.

Data Logger Interfaces

A current interface for pulse transmission in accordance with DIN 43864 is the least expensive way to transmit data from energy or consumption meters.
However, data may also exist in the form of standard signals, i.e. 0/4 to 20 mA or 0 to 10 V. Bus compatible meters which significantly reduce wiring costs have also established themselves, e.g. for use with a LON bus.

Energy Meters: Overview, Type Approvals, Calibration Requirements

Designation		Article Number / Feature											
Energy meter for 2-wire system		U3681											
Energy meter for 3-wire system			U3687										
Energy meter for 4-wire system				U3689	U3089	U3589							
Energy meter for 3-wire system, any load, with M bus							U1187						
Energy meter for 4-wire system, any load, with M bus								U1189					
Energy meter for 2-wire system with LON bus									U1681				
Energy meter for 3-wire system with LON bus										U1687			
Energy meter for 4-wire system with LON bus											U1689		
Energy meter for 3-wire system, reactive energy												U2688	
Energy meter for 4-wire system, reactive energy													U2690
Connection													
Direct connection: 10 A (63 A), pulse output: 100 pulses per kWh		A1	A1	A1	A1	A1	A1	A1	A1	A1	A1	–	–
Transformer: 5 A (6 A), pulse output: 1000 pulses per kWh		A2	A2	A2	–	A2	A2	A2	A2	A2	A2	–	–
Transformer: 1 A (2 A), pulse output: 2000 pulses per kWh		A3	A3	A3	–	A3	A3	A3	A3	A3	A3	–	–
Transformer: 1 A/5 A (6.3 A), pulse output: 1000 pulses per kWh		–	–	–	A2	–	–	–	–	–	–	A23	A23
Input voltage													
Rated value, input voltage Ur	57.7 V	U1	–	–	–	–	–	–	U1	–	–	–	–
	63.5 V	U2	–	–	–	–	–	–	U2	–	–	–	–
(L1-N for U3681/U1681, L1-L2 for all other types)	100 V	–	U3	U3	–	U3	U3	–	–	U3	U3	U03	U03
	110 V	–	U4	U4	–	U4	–	–	–	U4	U4	–	–
	230 V	U5	–	–	–	–	–	–	U5	–	–	–	–
	400 V	–	U6	U6	●	U6	U6	U6	–	U6	U6	U07	U07
	500 V	–	U7	U7	–	U7	U7	–	–	U7	U7		
Accuracy class													
	2	G0	G0	G0	●	G0	G0	G0	G0	G0	G0	G2	G2
	1	G1	G1	G1	–	G1	G1	G1	G1	G1	G1		
Calibration	Country												
without	Germany	P0	P0	P0	–	P0	P0	P0	P0	P0	P0	P2	P2
with	Germany	P1	P1	P1	–	❑	P1	P1	P1	P1	P1	–	–
with, including calibration certificate	Germany	P2	P2	P2	–	❑	P2	P2	P2	P2	P2	–	–
Approval	Switzerland	–	P3	P3	–	–	P3	P3	–	P3	P3	–	–
	Austria	–	–	P4	–	–	–	P4	–	–	P4	–	–
	Czech Rep.	P5	P5	P5	–	–	–	–	P5	P5	P5	–	–
Serial plate	Great Britain	P6	P6	P6	–	❑	P6	P6	P6	P6	P6	–	–
Change pulse rate at pulse output		❍	❍	❍	–	❍	❍	❍	❍	❍	❍	–	–

Type Approvals Overview

Country	Germany	Austria	Switzerland	Czech Republic
Test authority	PTB Physikalisch Technische Bundesanstalt	BEV Bundesamt für Eich- und Vermessungswesen	metas metrologie und akkreditierung schweiz	CMI Cesky Metrologicky Institut
Approval no.	20.15 98.78	OE 01 E 070	EC2 474	TCM 221/99
U1187	●		●	
U1189		● (feature U3/U6 only)	●	
U1681	●			●
U1687	●		●	●
U1689	●	● (feature U3/U6 only)	●	●
U3681	●			●
U3687	●		●	●
U3689	●	● (feature U3/U6 only)	●	●

● † standard / ❍ † option / ❑ † in preparation

Calibration Requirements

Calibration requirements for energy meters used in business or official applications are based upon calibration legislation (consumer protection law).
This law regulates approval and calibration requirements for meters used in business or official applications.

In which cases must this law be adhered to?
Whenever logging of electrical energy data is used as a basis for billing energy costs to a third party or parties.
Company internal cost allocation is exempt from this law.

Meters and Calibration Services from a Single Source

GOSSEN-METRAWATT is a federally recognized testing laboratory for electricity measuring instruments.

U3681

Energy meter for active energy, alternating current, 2-wire, can be calibrated

The U3681 energy meter acquires active energy in AC systems.
Import and export energy are transmitted to the logging system via separate pulse outputs (S0).
Energy import can be read directly from a 7-digit drum-type counter mechanism. Type approval and calibration allow for utilization in billing electrical energy costs to third parties.

- Acquires active energy
- Pulse outputs (S0) for energy import and export
- Direct or transformer connection, 7-digit drum-type counter mechanism with anti-reversing device for energy import
- Can be installed in any position, compact dimensions, rugged design
- Complies with IEC 1036 meter standard
- DIN rail mounting per EN 50022
- Industrial and building management applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U3681-V001	U3681A1U5G0P0	3-348-862-03
U3681-V002	U3681A2U5G0P0	3-348-862-03

U3687

Energy meter for active energy, 3-phase current, 3-wire, can be calibrated

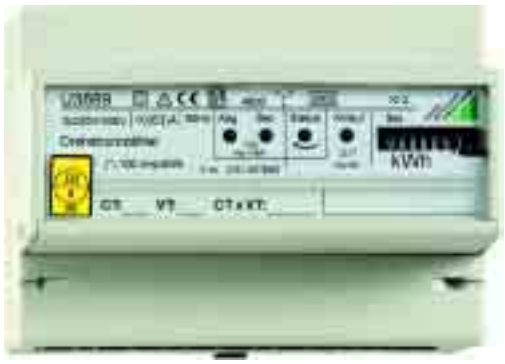
The U3687 energy meter acquires active energy in 3-wire 3-phase systems.
Import and export energy are transmitted to the logging system via separate pulse outputs (S0).
Energy import can be read directly from a 7-digit drum-type counter mechanism. Faulty measurements resulting from installation errors are avoided by optical error indication, and missing phases are automatically recognized and displayed. Type approval and calibration allow for utilization in billing electrical energy to third parties.

- Acquires active energy, PTB approval
- Pulse outputs (S0) for energy import and export
- Indication of installation errors with LED
- Direct or transformer connection, 7-digit drum-type counter mechanism with anti-reversing device for energy import
- Can be installed in any position, compact dimensions, rugged design
- Complies with IEC 1036 meter standard, DIN rail mounting per EN 50022
- Industrial and building management applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U3687-V001	U3687A2U3G0P0	3-348-862-03
U3687-V002	U3687A2U3G1P0	3-348-862-03
U3687-V003	U3687A2U6G0P0	3-348-862-03
U3687-V004	U3687A2U7G0P0	3-348-862-03

U3689

Energy meter for active energy, 3-phase current, 4-wire, can be calibrated



The U3689 energy meter acquires active energy in 4-wire 3-phase systems.
Import and export energy are transmitted to the logging system via separate pulse outputs (S0).
Energy import can be read directly from a 7-digit drum-type counter mechanism. Faulty measurements resulting from installation errors are avoided by means of optical error indication, and incorrect phase sequence or missing phases are automatically recognized and displayed. Type approval and calibration allow for the billing of electrical energy to third parties.

- Acquires active energy, PTB approval
- Pulse output (S0) for energy import and export, installation errors indicated with LED
- Direct or transformer connection, 7-digit drum-type counter mechanism with anti-reversing device for energy import
- Can be installed in any position, compact dimensions, rugged design
- Complies with IEC 1036 meter standard, DIN rail mounting per EN 50022
- Industrial and building management applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U3689-V001	U3689A1U6G0P0	3-348-862-03
U3689-V002	U3689A2U6G0P0	3-348-862-03
U3689-V003	U3689A2U6G1P0	3-348-862-03

U3589

Energy meter for active energy, 3-phase current, 4-wire, can be calibrated

The U3589 energy meter acquires active energy in 4-wire 3-phase systems.
Import energy is transmitted to the logging system via a pulse output (S0) and can be read directly from a 7-digit drum-type counter mechanism. Faulty measurements resulting from installation errors are avoided by means of optical error indication, and incorrect phase sequence or missing phases are automatically recognized and displayed. Type approval and calibration allow for the billing of electrical energy to third parties.

- Acquires active energy, PTB approval
- Pulse output (S0) for energy import, installation errors indicated with LED
- Direct or transformer connection, 7-digit drum-type counter mechanism with anti-reversing device for energy import
- Can be installed in any position, compact dimensions, rugged design
- Complies with IEC 1036 meter standard, DIN rail mounting per EN 50022
- Industrial and building management applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U3589-V001	U3589A1U6G0P0	3-349-224-01
U3589-V002	U3589A2U6G0P0	3-349-224-01

U3089

Energy meter for active energy, 3-phase current, 4-wire

The U3089 energy meter acquires active energy in 4-wire 3-phase systems. Import energy is transmitted to the logging system via a pulse output (S0) and can be read directly from a 7-digit drum-type counter mechanism. Faulty measurements resulting from installation errors are avoided by means of optical error indication, and incorrect phase sequence or missing phases are automatically recognized and displayed.

- Acquires active energy
- Pulse output (S0) for energy import
- Indication of installation errors with LED
- Direct or transformer connection, 7-digit drum-type counter mechanism with anti-reversing device for energy import
- Can be installed in any position, compact dimensions, rugged design
- DIN rail mounting per EN 50022
- Industrial and building management applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U3089-V001	U3089A1	3-349-081-03
U3089-V002	U3089A2	3-349-081-03

U1681

Energy meter for active energy, alternating current, 2-wire, can be calibrated, LON

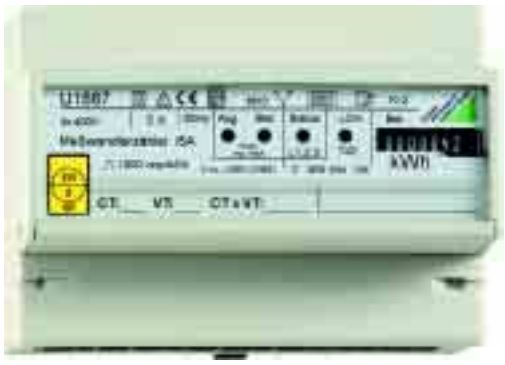
The U1681 energy meter acquires active energy in AC systems. The LON interface with FTT-10A transceiver allows for transmission of energy import and export, instantaneous power and error messages as standard network variables. A time-stamp function is utilized for synchronizing the meter reading procedure, which saves meter readings to memory at the point in time at which reading is triggered. Imported active energy can be read directly from a 7-digit drum-type counter mechanism. Type approval and calibration allow for the billing of electrical energy to third parties.

- Acquires active energy, PTB approval, LON interface with FTT-10A transceiver
- Network variables for energy import and export, instantaneous power and error messages
- Pulse outputs (S0) for energy import and export
- Direct or transformer connection, 7-digit drum-type counter mechanism with anti-reversing device for energy import
- Can be installed in any position, compact dimensions, rugged design
- Complies with IEC 1036 meter standard, DIN rail mounting per EN 50022
- Industrial and building management applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U1681-V001	U1681A1U5G0P0	3-348-862-03
U1681-V002	U1681A2U5G0P0	3-348-862-03

U1687

Energy meter for active energy, 3-phase current, 3-wire, can be calibrated, LON



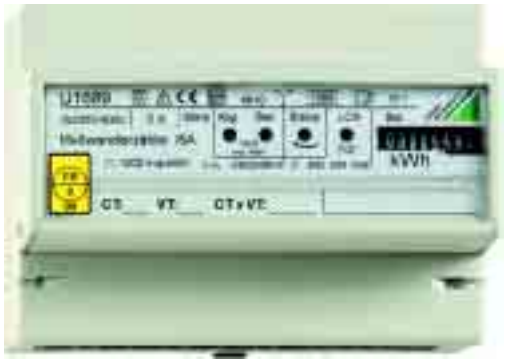
The U1687 energy meter acquires active energy in 3-wire 3-phase systems.
The LON interface with FTT-10A transceiver allows for transmission of energy import and export, instantaneous power and error messages (phase failure) as standard network variables. A time-stamp function is utilized for synchronizing the meter reading procedure, which saves meter readings to memory at the point in time at which reading is triggered. Imported active energy can be read directly from a 7-digit drum-type counter mechanism. Faulty measurements resulting from installation errors are avoided by means of optical error indication, and missing phases are automatically recognized and displayed. Type approval and calibration allow for utilization in billing electrical energy to third parties.

- Acquires active energy, PTB approval
- LON interface with FTT-10A transceiver
- Network variables for energy import and export, instantaneous power and error messages
- Pulse outputs (S0) for energy import and export
- Indication of installation errors with LED
- Direct connection or via transformer
- 7-digit drum-type counter mechanism with anti-reversing device
- Can be installed in any position, compact dimensions, rugged design
- Complies with IEC 1036 meter standard
- DIN rail mounting per EN 50022
- Industrial and building management applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U1687-V001	U1687A2U3G0P0	3-348-862-03
U1687-V002	U1687A2U3G1P0	3-348-862-03
U1687-V003	U1687A2U6G0P0	3-348-862-03
U1687-V004	U1687A2U7G0P0	3-348-862-03

U1689

Energy meter for active energy, 3-phase current, 4-wire, can be calibrated, LON



The U1689 energy meter acquires active energy in 4-wire 3-phase systems.
The LON interface with FTT-10A transceiver allows for transmission of energy import and export, instantaneous power and error messages (phase sequence and phase failure) as standard network variables. A time-stamp function is utilized for synchronizing the meter reading procedure, which saves meter readings to memory at the point in time at which reading is triggered. Imported active energy can be read directly from a 7-digit drum-type counter mechanism. Faulty measurements resulting from installation errors are avoided by means of optical error indication, and incorrect phase sequence and missing phases are automatically recognized and displayed. Type approval and calibration allow for the billing of electrical energy to third parties.

- Acquires active energy, PTB approval
- LON interface with FTT-10A transceiver
- Network variables for energy import and export, instantaneous power and error messages
- Pulse outputs (S0) for energy import and export
- Indication of installation errors with LED
- Direct connection or via transformer
- 7-digit drum-type counter mechanism with anti-reversing device
- Can be installed in any position
- Compact dimensions, rugged design
- Complies with IEC 1036 meter standard
- DIN rail mounting per EN 50022
- Industrial and building management applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U1689-V001	U1689A1U6G0P0	3-348-862-03
U1689-V002	U1689A2U6G0P0	3-348-862-03
U1689-V003	U1689A3U6G0P0	3-348-862-03

U1187

Energy meter for active energy, 3-phase current, 3-wire, can be calibrated, M bus

The U1187 energy meter acquires active energy in 3-wire 3-phase systems and displays imported energy at a drum-type counter mechanism. Missing phases and installation errors are automatically recognized and displayed. Current energy import and export, as well as import and export values for a previously determined cutoff date, are read out via the M bus. The cutoff date function is activated separately with a special data frame. Instantaneous power and error status are also available for evaluation. Type approval and calibration allow for utilization in billing electrical energy costs to third parties.

- Acquires active energy
- Drum-type counter mechanism for energy import
- Pulse outputs (S0) for energy import and export
- Indication of phase failure
- Can be calibrated for billing applications
- Tamper-proof seal
- Complies with IEC 1036 meter standard
- M bus interface per EN 61434-3
- Transmission of energy values, instantaneous power and error status
- Cutoff date and clock Function
- Installation in any desired position to DIN rail per EN 50022
- Consumption metering and billing system applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U1187-V001	U1187A2U3G0P0	3-349-153-03
U1187-V002	U1187A2U3G1P0	3-349-153-03
U1187-V003	U1187A2U6G0P0	3-349-153-03

U1189

Energy meter for active energy, 3-phase current, 4-wire, can be calibrated, M bus

The U1189 energy meter acquires active energy in 4-wire, three-phase systems and displays imported energy at a drum-type counter mechanism. Incorrect phase sequence and missing phases are automatically recognized and displayed as an installation error. Current energy import and export, as well as import and export values for a previously determined cutoff date, are read out via the M bus. The cutoff date function can be activated separately with a special data frame. Instantaneous power and error messages are also available for evaluation. Type approval and calibration allow for the billing of electrical energy to third parties.

- Acquires active energy
- Drum-type counter mechanism for energy import
- Pulse outputs (S0) for energy import and export
- Indication of incorrect phase sequence and phase failure
- Can be calibrated for billing applications
- Tamper-proof seal
- Complies with IEC 1036 meter standard
- M bus interface per EN 61434-3
- Transmission of energy values, instantaneous power and error messages
- Cutoff date and clock Function
- Installation in any desired position to DIN rail per EN 50022
- Consumption metering and billing system applications
- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U1189-V001	U1189A1U6G0P0	3-349-153-03
U1189-V002	U1189A2U6G0P0	3-349-153-03

U2688

Energy meter for reactive energy, 3-phase current, 3-wire

The U2688 electrical energy meter acquires reactive energy in 3-wire 3-phase systems.
A blinking LED indicates energy import, for which the current value can be read directly from a 7-digit drum-type counter mechanism. A pulse output (S0) is provided for connection to an analysis system. Its compact design allows for the use of smaller, and thus less expensive control cabinets. Rapid installation is facilitated by installation in any desired position, as well as power supply to the meter from the measuring signal without the need for additional auxiliary power connections. Trouble-free operation is assured through strict adherence to the IEC 1036 meter standard, which requires correct functioning of the 3-phase current meter even if one phase fails, long operating durations right on up to meter overflow, housing with tamper-proof seal and lockable terminal covers.

- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U2688-V001	U2688A23U07G2P2	12978
U2688-V002	U2688A23U03G2P2	12978

U2690

Energy meter for reactive energy, 3-phase current, 4-wire, can be calibrated

The U2690 electrical energy meter acquires reactive energy in 4-wire 3-phase systems.
A blinking LED indicates energy import, for which the current value can be read directly from a 7-digit drum-type counter mechanism. A pulse output (S0) is provided for connection to an analysis system. Its compact design allows for the use of smaller, and thus less expensive control cabinets. Rapid installation is facilitated by installation in any desired position, as well as power supply to the meter from the measuring signal without the need for additional auxiliary power connections. Trouble-free operation is assured through strict adherence to the IEC 1036 meter standard, which requires correct functioning of the 3-phase current meter even if two phases fails, long operating durations right on up to meter overflow, housing with tamper-proof seal and lockable terminal covers.

- Dimensions (W x H x D): 126 x 90 x 75 mm, weight: approx. 0.5 kg

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U2690-V001	U2690A23U07G2P2	12978
U2690-V002	U2690A23U03G2P2	12978

U270A

Accessories: door mount kit

U118X, U16XX, U26XX, U30XX and U36XX energy meters can be mounted to switch cabinet doors or control panels with the U270A installation kit.
The meter is snapped onto a DIN rail per EN 50022 included in the installation kit to this end, and is fastened behind the control panel cutout with two bolts. A stencil is included with the kit for the panel cutout and the drill-holes.

Designation	Article Number / Features	Data Sheet No.
U270A door mount kit	U270A	–

U1600

Summator, 24 metering channels

The U1600 summator processes pulse-shaped signals and is capable of acquiring digital states. This allows for logging, visualization, optimization and cost center related billing of all electrical and non-electrical energy media. Up to 24 pulse-shaped signals can be connected, which originate from, for example, flow meters, energy meters and heat meters. 32 processing channels determine work, power or consumption based upon these signals. These data are summated over specified periods of time using a programmable interval, and are saved to memory along with the respective maximum values. 4 relays (changeover contacts) are provided for controlling external processes, which can be driven either directly with a user-specific background program at the summator, or by a PC via the interface. Data exchange with the PC or remote querying via modem is made possible with the RS 232 interface (19.2 kBit/s). An additional RS 232 interface is used to connect a radio controlled clock for synchronizing system time, or a report printer.
Individual summators can be interconnected over great distances via the multi-master compatible ECS LAN with free network topology, and have unrestricted access to all data available from each network user. Thanks to its own intrinsic intelligence and the ECL system-specific programming language, the U1600 summator is also suitable for the performance of customer-specific calculations, analyses, monitoring and optimization – independent of the energy control system.

- 32 processing channels for calculating energy, power and costs from the freely assignable physical input signals
- Energy control language for programming, analysis, monitoring and optimization sequences
- 24 pulse inputs for floating contacts or S0 interface per DIN 43864
- 24 V_{DC} auxiliary power
- 4 relays for controlling external processes
- 2 RS 232 interfaces (19.2 kBit/s) for connecting PC, modem, printer and radio controlled clock
- 2 ECS LAN interfaces for interconnection of individual summators over great distances

Article Number (standard devices)	Article Number / Features	Data Sheet No.
GTU1600000E0001	U1600H1Z1S1E0	3-348-874-03
GTU1600000E0002	U1600H2Z1S1E0	3-348-874-03

U1601

Summator, 12 universal inputs, LON

The U1601 summator expands the energy control system to allow for processing of analog values and simplified connection of energy meters via the LON bus. This enables logging, visualization, optimization and cost center related billing of all electrical and non-electrical energy media.
Up to 24 pulse-shaped signals can be connected, which originate from, for example, flow meters, energy meters and heat meters. Beyond this, up to 63 GOSSEN-METRAWATT series U168X electrical energy meters can be connected to the U1601 summator via the LON interface.
64 processing channels calculate work, power or consumption from the above mentioned, freely assignable physical input signals. These data are summated over specified periods of time using a programmable interval, and are saved to memory along with the respective maximum values.
2 electrically isolated analog outputs, 4 MOS switches and 2 relays (changeover contacts) are provided for controlling external processes, which can be driven either directly with a user-specific background program at the summator, or by a PC via the interface.
Data exchange with the PC or remote querying via modem is made possible with the high-speed RS 232 interface (115 kBit/s). An additional RS 232 interface is used to connect a radio controlled clock for synchronizing system time, or a report printer.
Individual summators can be interconnected over great distances via the multi-master compatible ECS LAN with free network topology, and have unrestricted access to all data available from each network user. Thanks to its own intrinsic intelligence and the ECL system-specific programming language, the U1601 summator is also suitable for the performance of customer-specific calculations, analyses, monitoring and optimization – independent of the energy control system.

- 64 processing channels for calculating energy, power and costs from the freely assignable physical input signals
- Energy control language for programming, analysis, monitoring and optimization sequences
- 12 universal inputs: ±5 mA, ±20 mA, ±10 V, S0 pulse
- 24 V DC auxiliary power
- LON interface for U168X energy meters and additional U1660/U1661 modules
- 2 analog outputs: ±20 mA or ±10 V
- 2 relays and 4 MOS switches for controlling external processes
- 2 RS 232 interfaces (115 kBit/s) for connecting PC, modem, printer and radio controlled clock
- 2 ECS LAN interfaces for interconnection of individual summators over great distances
- Simple software updates via the serial interface (EEPROM)

Article Number	Article Number / Features	Data Sheet No.
U1601 (AC/DC 85 V … 264 V)	U1601H1W1	3-348-844-03
U1601 (DC 20 V … 72 V)	U1601H2W1	3-348-844-03

U1602

Micro-summator, LON

The U1602 micro-summator is used as a PC adapter or a LON interface for the ECS LAN, and has no display or controls of its own. All relevant energy or consumption data are acquired over predefined periods of time at a programmable interval using 64 processing channels, and are stored as a load profile along with respective maximum values.
Up to 63 U168X electrical energy meters can be connected to the U1602 micro-summator via the electrically isolated LON interface. Transformers can be utilized for digital and analog input signals.
Communication with external devices, e.g. PC, report printer, modem or a radio controlled clock for synchronizing system time, takes place via two RS 232 interfaces (115 kBit/s). Parameters are configured and data are analyzed at a PC with ECSwin software.
The summator can be interconnected over great distances via the multi-master compatible ECS LAN, and assures unrestricted access to all data at each network user. Thanks to its own intrinsic intelligence and the ECL system-specific programming language, it is also suitable for customer-specific, decentralized solutions as a data logging, monitoring and optimizing module.

- 64 processing channels for calculating energy, power and costs from the freely assignable physical input signals
- Energy control language for programming, analysis, monitoring and optimization sequences
- 24 V_{DC} auxiliary power
- LON interface for U168X energy meters and additional U1660/U1661 modules
- 2 RS 232 interfaces (115 kBit/s) for connecting PC, modem, printer and radio controlled clock
- 2 ECS LAN interfaces for interconnection of individual summators over great distances
- Simple software updates via the serial interface (EEPROM)

Article Number	Article Number / Features	Data Sheet No.
U1602 (AC/DC 85 V … 264 V)	U1602H1W1	3-349-045-03
U1602 (DC 20 V … 72 V)	U1602H2W1	3-349-045-03

U1603

Mini-summator, 6 inputs, LON

The U1603 mini-summator is used as a PC adapter or a LON interface for the ECS-LAN, and has no display or controls of its own. With its inputs and outputs, the mini-summator is expanded to function as a compact data logging and optimizing module. All relevant energy or consumption data are logged over predefined periods of time at a programmable interval using 64 processing channels, and are stored as a load profile along with respective maximum values. Beyond this, the U1603 mini-summator also provides users with the capability of processing analog or pulse-shaped signals using six programmable universal input channels.
The U1603 is furnished with two floating analog inputs, four MOS switches and 2 relays (changeover contacts) for controlling external. Up to 63 U168X electrical energy meters can be connected to the U1603 mini summator via the electrically isolated LON interface. Transformers can be utilized for digital and analog input signals.
Communication with external devices, e.g. PC, report printer, modem or a radio controlled clock for synchronizing system time, takes place via two RS 232 interfaces (115 kBit/s). Parameters are configured and data are analyzed at a PC with ECSwin software.
The summator can be interconnected over great distances via the multi-master compatible ECS LAN, and it has unrestricted access to all data at each network user. Thanks to its own intrinsic intelligence and the ECL system-specific programming language, it is also suitable for customer-specific, decentralized solutions as a data logging, monitoring and optimizing module.

- 64 processing channels for calculating energy, power and costs from the freely assignable physical input signals
- Energy control language for programming analysis, monitoring and optimization sequences
- 24 V DC auxiliary power
- LON interface for U168X energy meters and additional U1660 / U1661 modules
- 2 RS 232 interfaces (115 kBit/s) for connecting PC, modem, printer and radio controlled clock
- 2 ECS LAN interfaces for interconnection of individual summators over great distances
- Simple software updates via the serial interface (EEPROM)
- 6 universal inputs: ±5 mA, ±20 mA, ±10 V, S0 pulse
- 2 analog outputs: ±20 mA or ±10 V
- 2 relays and 4 MOS switches for controlling external processes

Article Number	Article Number / Features	Data Sheet No.
U1603 (AC/DC 85 V … 264 V)	U1603H1W1	3-349-045-03
U1603 (DC 20 V … 72 V)	U1603H2W1	3-349-045-03

Additional Components for Summators

U1613-B

Star connector for ECS LAN

All energy control system components are equipped with two ECS LAN interfaces which allow for implementation of a bus topology or a ring topology (open ring), although star topologies are not possible. The U1613 star connector makes it possible to couple a given bus segment to up to three additional segments using 4-wire ECS LAN interfaces.
Each of the three outputs is equipped with a booster, thus increasing transmission distance to approximately 4 km if ECS LAN boosters are utilized at the other end. ECS LAN frames are routed automatically by the star connector, i.e. frames are only forwarded to the next segment if the recipient is actually present in the next segment, or a subsequent segment.

Designation	Article Number / Features	Data Sheet No.
U1613-B	U1613-B	–

U1615

Analog adapter for ECS LAN

Analog signals from measuring transducers or orifices which represent non-electrical energy (steam, heat, gas or compressed air) or other process quantities can be integrated into the energy control system with the analog adapter. All analog inputs generate a 1 second mean value. In addition to the performance features of a PC adapter, up to 7 modules of any type can be installed to the analog adapter. The remaining 25 channels can be used as virtual channels. All measuring circuits are electrically isolated from one another. The following modules are available and can be combined as desired:
Analog input module with 0 to ±10 V, 0 to ±20 mA, 0 to ±5 mA or S0 compatible input (input option is selected with a jumper), accuracy: 0.25%, resolution: ±11 bit, electrically isolated.
Analog output module with 0 to +20 mA output signal, accuracy: 0.25%, resolution 16 bit, electrically isolated.
Relay output module with mechanical make contact or AC semiconductor relay, load capacity: 50 V / 300 mA.
Power supply module with 24 V DC at 60 mA for supplying power to S0 interfaces at interconnected meters

Designation	Article Number / Features	Data Sheet No.
U1615 basic unit	U1615	–
U1615 analog input module: -20...0...+20 mA	U1615AEM1	–
U1615 analog output module	U1615AAM1	–
U1615 digital output module	U1615BAM1	–
Power pack for U1615 meter, 24 V/60 mA	U1615MOD24V	–

U1650

ECS LAN Booster

Two U1650 ESC LAN boosters are required in order to extend maximum transmission distance between components of the energy control system to 4 km.

Designation	Article Number / Features	Data Sheet No.
U1650	U1650	–

Additional Components for Summators, Accessories

PJ7

Optoelectronic sensor for electrical meters

The PJ7 miniature optoelectronic sensor scans the red disc markings on Ferraris meters and is equipped with a pulse output which can be directly connected to U1600 and U1601 summators, or to the U1615 analog adapter.

Designation	Article Number / Features	Data Sheet No.
PJ7 miniature optoelectronic sensor	PJ7	–

DCF77-1600 / DCF77-1601

Radio controlled clock with Y cable for U1600/U1601 summator

The radio controlled clock is connected to the COM2 port at the summator with a COM1/COM2 Y cable. COM2 must be configured for use with the radio controlled clock.
Summator time is synchronized automatically as long as reception is good (always at xhxx:05). Deviations ≤ 1 second are corrected once per hour. An accuracy level of ± 1 second is obtained.

Switching to and from daylight savings and standard time is initiated by an H program (command: SUWI), because continuous reception is not assured, even with the radio controlled clock.

Time synchronization of several summators is controlled by the summator with the radio controlled clock.

Designation	Article Number / Features	Data Sheet No.
DCF77-1600 radio clock with Y cable for U1600	DCF77-1600	–
DCF77-1601 radio clock with Y cable for U1601	DCF77-1601	–

Connector Cable

Connector cable for PC or terminal

Accessories for all U160X summators for connection to a PC or a terminal

Designation	Article Number / Features	Data Sheet No.
Connector cable for PC or terminal	GTZ 5232 000 R0001	–

Additional Components for Summators

U1660

LON meter reading module

The U1660 meter reading module processes data from up to 8 energy meters with pulse output (S0) or floating contact. The active inputs do not require any additional power supply, thus minimizing wiring expenses. The additional components expand the functions of U1601 summators, U1602 micro-summators and U1603 mini-summators with external inputs via the LON interface.

Designation	Article Number / Features	Data Sheet No.
U1660	U1660	3-349-113-03

U1661

LON analog input module

The U1661 six channel analog input module with FPL210 filter is used for the following standard signals: 0 to 20 mA or 4 to 20 mA.
The additional components expand the functions of U1601 summators, U1602 micro-summators and U1603 mini-summators with external inputs via the LON interface.

Order other variants with complete order code (U1661 ..) in accordance with the data sheet.

Article Number (standard devices)	Article Number / Features	Data Sheet No.
U1661-V001	U1661B2	3-349-196-03

U1662 / U1664

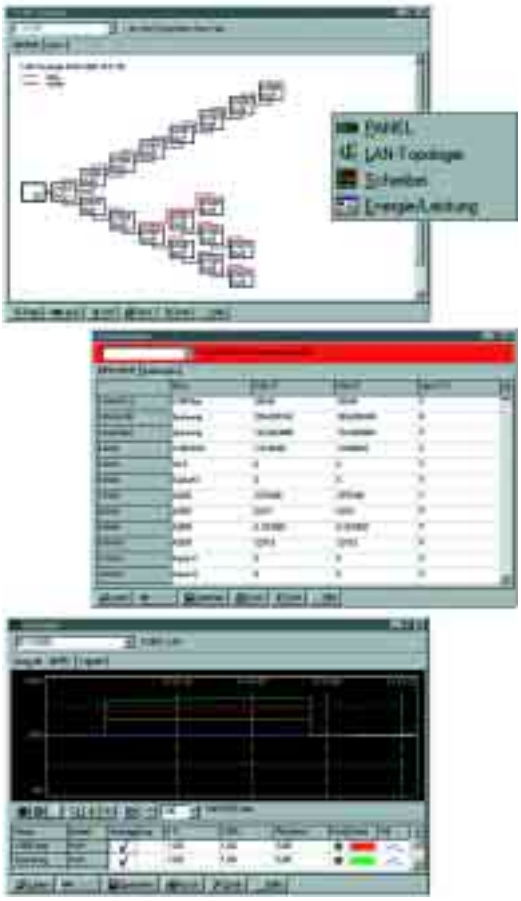
LON repeater / LON bus terminator

U1662 Repeater:
The U1662 repeater is used to extend maximum allowable cable lengths in the LON bus system. Cable length can be doubled with the repeater.
U1664 Bus Terminator:
The U1664 bus terminator is required for LON bus topologies in order to terminate the bus with a resistance of 105 Ω. An integrated 105 Ω bus terminator is included at the beginning of the bus in the summator. In the case of free topologies, the integrated 52.3 Ω bus terminator is utilized.
This applies analogously to extended segments where repeaters are used.

Designation	Article Number / Features	Data Sheet No.
U1662	U1662	3-349-113-03
U1664	U1664	3-349-113-03

ECSwin

Parameters configuring and data transfer software for U16xx summators



Parameters configuration and data visualization for all ECS summators in MS Windows

Program features:

The ECSwin program described below is used primarily for configuring parameters at U1600, U1601, U1602 and U1603 summators, as well as the U1610 star connector and the U1615 analog adapter within the energy control system (ECS-LAN). Beyond this, read-in of energy consumption data and visualization of acquired data in the form of measured value tables and graphic representations are supported as well. The program can be used with the Windows 3.1, 95 or NT operating systems.

The software provides the following functions:

- A terminal window
- A window for configuring summator parameters
- A window for configuring channel parameters
- A window for setting meter readings
- A window for generating virtual channels
- Free transmission of commands to summators which have been stored to files (complete parameters configurations)
- Display of the summator control panel
- Graphic representation of the ECS LAN network topology
- Querying and display of intervalic, daily, monthly and annual energy, and power data which have been stored to memory at the summator

Data exchange with the summator connected to the PC via the RS 232 interface is managed by a special program (FELAN.EXE), which makes itself available to all DDE clients (several simultaneously as well) as a DDE server (dynamic data exchange).

This program, which is equipped with a very minimal user interface, configures and operates the RS 232 interface (the summator can also be dialed up via modem if required), by administering queries received from DDE clients (e.g. queue administration or assurance of data transmission reliability through the use of a checksum), forwarding them to the summator and informing the client as soon as a response is available.

Designation	Article Number / Features	Data Sheet No.
ECSwin	–	–

U1600 Excel Macro

Macro for MS Excel for data transfer from U16xx summators

The U1600.XLM macro is used in combination with MS Excel (as of version 4.x) for Windows 3.x, 95 or NT. It is used for reading out data from one or several U1600 summators within the ECS-LAN, and representing these data in numeric form in an Excel table.

Additional, customer-specific analyses can be performed with the Excel table. A link is established between Excel and the summators with the help of a dynamic link library (DLL) whose functions are utilized by the U1600.XLM macro.

The following data can be read out according to the memory structure of the U1600:

- Energy per interval from the summators during a time period specified by means of date and time
- Maximum energy values per interval (11 absolute maximum values)
- Energy and maximum measured interval value per day for the last 10 days and the current day
- Energy and maximum measured interval value per month for the last 12 months and the current month
- Energy and maximum measured interval value per year for the last 2 years and the current year

(All data defined here as “energy” quantities can also be made available as power quantities if desired.)

It is also possible to configure serial interface parameters for communication with the U1600 summator using modem initialization and de-initialization strings only if required. Access to “data transmission” and “interface setup” macros is made available via the symbols integrated into the Excel user interface.

Designation	Article Number / Features	Data Sheet No.
U1600 Excel Macro	–	–

A2000

Multifunctional power meter for heavy current quantities

The A2000 power meter is utilized for the analysis of alternating current systems and is used wherever conventional analog measuring instruments can no longer meet the growing demands of electrical distribution systems. This applies in particular where not only current, voltage and power are important, but rather harmonic distortion and harmonics as well. The power meter can also be used to replace conventional recorders and fault indicators, along with measuring instruments, with a single unit.
In combination with current and voltage transformers, the instrument is capable of performing all important measurements in low and medium-voltage systems. Analog outputs, limit values and interfaces are available for monitoring and processing measured values. The time characteristics of up to 12 measured values are recorded simultaneously by the variant equipped with data memory. Important measured values can either be recorded continuously over a long period of time, or recording can be triggered for a specified period of time by an event. If event controlled recording is utilized, pre-event history can also be recorded at the same speed. The user is thus provided with an adequate overview of pre-event history if a disturbance should occur. The power meter is thus much better suited for recording disturbances than paper chart recording instruments.

- Measurement of current and voltage, active, reactive and apparent power, power factor, active and reactive energy, harmonic distortion and harmonics
- Accurate measured values with error limits of less than 0.25% for U and I
- RS 232 and RS 485 interfaces included
- Depending upon variant: capable of communicating via Profibus DP, LONWORKS interface or RS 485 interface with Modbus RTU and other protocols
- Front panel dimensions: 144 x 144 mm
- Minimal installation depth of less than 60 mm
- Good legibility with high-contrast 14 mm LED displays
- Continuous recording of selected measured values for load profile and statistical analysis (optional)
- Disturbance recording function with high speed recording of events and pre-event history (optional)
- Electrically isolated current inputs
- Two limit values can be assigned to any desired measured value

Configuration

Designation		Configuration Options Article Number / Feature		
Multifunctional power meter		A2000	A2000	A2000
Serial interface	with RS 232 and RS 485	L0	–	–
	with LON and RS-232	–	L1	–
	with Profibus DP and RS 232	–	–	L2
Analog output	2 analog outputs	A0	A0	–
	4 analog outputs	A1	–	–
	no analog output	–	–	A2
Data logger	no data logger	R0	R0	R0
	with data logger (only with feature P1)	R1	R1	R1
Pulse output / synchronizing input	no pulse output / synchronizing input	P0	–	P0
	2 pulse outputs and 1 synchronizing input	P1	P1	P1
Supply power	230 / 115 V AC	H0	H0	H0
	20 … 69 V AC / 20 … 72 V DC	H1	H1	H1
	73 … 264 V AC / 73 … 276 V DC	H2	H2	H2
Manufacturer's certificate and test report	no certificate	U0	U0	U0
	with certificate and test report	U1	U1	U1
Operating instructions	German (standard)	W0	W0	W0
	English	W1	W1	W1
	French	W2	W2	W2

Article Number (standard devices)	Article Number / Features	Data Sheet No.
A2000-V001	A2000H0A0P0R0L0U0W0	3-348-980-03
A2000-V002	A2000H0A1P1R0L0U0W0	3-348-980-03
A2000-V003	A2000H0A1P1R1L0U0W0	3-348-980-03
A2000-V004	A2000H0A0P1R0L1U0W0	3-348-980-03
A2000-V005	A2000H0A2P1R0L2U0W	3-348-980-03
Accessories: RS 232 interface cable	GTZ3241000R0001	–

A210

Multifunctional power meter for heavy current quantities

MODBUS

Measuring instrument and display module for all important 3-phase quantities.

The new A210 power meter measures all important quantities in 3-phase systems and replaces a multitude of analog indicators. Current and voltage, active, reactive and apparent power, power factor, frequency, neutral conductor current and active and reactive energy can all be measured with the A 210. Measurement is performed at all 4 quadrants.

Any two measured quantities can be monitored via two digital outputs. If current and voltage are selected to this end, the A 210 automatically monitors the corresponding values at all three phase conductors. The two digital outputs can be alternatively utilized as energy value pulse outputs.

With front panel dimensions of 96 x 96 mm and an installation depth of 46 mm, the A210 can be installed to any control cabinet door. With its high-contrast 14 mm LED display, good legibility is assured even in dark rooms at considerable distances.

Even the simplest variant can be upgraded with communications capabilities be retrofitted with a data storage module – without opening the instrument. Modules are simply snapped onto the back of the meter.

In order to assure maximum possible safety, the current inputs are electrically isolated from each other as well as from all other electrical circuits. The voltage inputs, auxiliary power terminals and limit value outputs are also electrically isolated from one another. All applicable European regulations are complied with.

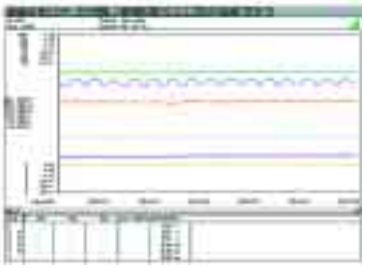
A module for communication via RS 485 and RS 232 (selectable) with optional memory module for recording load profile will be available soon.

- Measurement of current and voltage, active, reactive and apparent power, active and reactive energy, power factor and frequency
- Accurate measured values with error limits of less than 0.5% for U and I
- Good legibility with high-contrast 14 mm LED displays
- 5 freely programmable intervals for mean power values
- 2 S0 outputs for pulse or limit value can be assigned as desired
- Electrically isolated current inputs
- 4 quadrant operation
- Connection options: single-phase, 3 and 4-wire, balanced or unbalanced load
- Plug-in module for communication via R232 or RS 485 (MODBUS RTU), as well as data logger function
- One digital input for synchronization or tariff switching
- Input voltage: phase-to-phase: 500 V / phase-to-neutral: 290 V
- Nominal input current: 5 A (1 A upon request)
- Dimensions: 96 x 96 x 46 mm, panel cutout: 92 x 92 mm

Designation (standard devices)	Auxiliary power	Article Number / Features	Data Sheet No.
A210	85-230V AC/DC	149 783	A210 Dd/e
A210	20-70V AC/DC	150 300	A210 Dd/e
A210 with test report	85-230V AC/DC	150 318	A210 Dd/e
A210 with test report	20-70V AC/DC	150 326	A210 Dd/e

METRAwin 10 / A2000

METRAwin® 10/A2000 with adapter –
Measured value data transfer and instrument configuring software



Software for reading out and processing current measured values and data from the memory module of the A2000 multifunctional power meter with data logger, and for configuring parameters at the A2000.
Software can be run with Windows 95, 98, ME, NT and 2000.

- Read out values from the power meter's data memory
- Continuously record measured values for a specified period of time
- Display measured values – as a function of time in recorder format
  – in tabular form
  – as individual values in digital format
  – in analog format as a bar graph
- Freely selectable time intervals
- Labeling of curves for identification of individual measured value sequences
- Simple, clear-cut parameters configuration for the A2000
- Parameter settings can be saved for frequently used configurations
- Measured value export to other Windows programs
- Mathematical functions

Software Functions:

Acquiring and Displaying Data

METRAwin® 10/A2000 displays a clear-cut overview of the contents of the memory module at the A2000 power meter. Alternatively, the software is capable of continuously querying measured values from the power meter, and storing them to memory.
METRAwin® 10/A2000 generates a table with values from the memory module or acquired by means of online recording, and documents respective minimum and maximum values with time and date as well.
All measured values can be read in a clear-cut fashion as a function of time in a Yt diagram. The time scale can be expanded or compressed allowing for optimized display. For highly accurate reading, the cursor can be moved to the corresponding position along the time scale.
Measured values can also be displayed in digital format, in which case up to four measured values can be read from a single window.

Instrument Configuration with METRAwin® 10/A2000

METRAwin® 10/A2000 provides a clear-cut display of all functions and configuration options offered by the multifunctional power meter in various windows. Desired parameter values are entered to the corresponding fields, and are subsequently transmitted to the power meter.

Designation	Article Number / Features	Data Sheet No.
METRAwin 10/A2000 with adapter	Z305A	3-348-980-03

A201A

Link module, A2000 to SUCOnet K bus

A2000 multifunctional power meters can be connected to the SUCOnet K bus with the link module. Each link module can handle 32 A2000 meters.

- Autonomous data frame processing between the link module and the A2000
- Requests for measurement data from the power meter (current, voltage, power, cosj, energy), format conversion and availability of data in SIGNED WORD or SIGNED DWORD format for transferred to the SPC via SUCOnet K
- Energy meter resetting and min-max memory
- Each meter can be addressed as a genuine SUCOnet slave by means of the address which is additionally transmitted by the SPC.
- Display of link module operating mode and function status with LEDs
- Dimensions (B x H x T): 106 x 90 x 58 mm, weight: approx. 0.5 kg

Designation	Article Number / Features	Data Sheet No.
Link module, A2000 to SUCOnet K bus	A201A	3-349-090-03

MAVOWATT®45

Portable energy and power disturbance analyzer for stationary or mobile use

This portable device is designed for the measurement of electrical quantities in DC systems, as well as in single and 3-phase AC systems at any load with frequencies of up to 400 Hz.
Measurement at frequency converter outputs (motor controllers) is also possible with the TCM option. The spectrum of functions ranges from acquisition, display and recording of measured quantities by means of recognition and evaluation of fluctuations and other power supply interference factors (optional harmonics and power disturbance analysis), right on up to analysis and recording of energy consumption. In industry as well, a wide range of potential applications exists. For example, the analyzer can serve as an accurate measuring instrument with recording functions for the determination of characteristic quantities from power consumers or generators in steady-state, as well as during dynamic processes. Or it can function as a tester with the FFT option, by means of which it compares harmonic current from consumers with prescribed limit values. Its compact, rugged design makes the MAVOWATT 45 suitable for stationary operation as well as mobile applications.

Options: MAVO-FFT: harmonic analysis firmware
MAVO-PDA: power disturbance analysis firmware
MAVO-TCM: firmware for acquiring transients and for frequency converter measurements
MAVO-FSA: flicker measurement in accordance with EN 61000-4-15

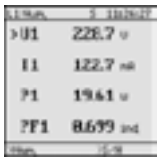
- Dimensions: 150 x 290 x 290 mm, weight: 4.7 kg
- Batteries: 4 ea. 1.5 V IEC LR 6 (AA mignon) if operated with batteries

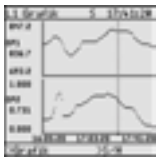
Standard equipment included with the MAVOWATT 45L:
Energy and power disturbance analyzer, 3-phase, with RS 232 interface, slot for memory card, includes 3 pairs of measurement cables with test probes and plug-in alligator clips, 4 short measurement cables with plugs for safety sockets, power cable, RS 232 interface cable, floppy disk with firmware, F2000 universal carrying pouch and operating instructions

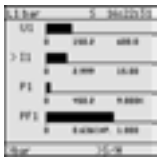
Standard equipment included with the MAVOWATT 45S:
Same as MAVOWATT 45 L, plus enabling of FFT, PDA, TCM and FSA options and three Z823B clip-on current-voltage transformers, in K45 test case

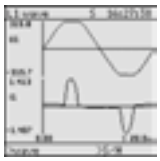
Type	Article Number	Data Sheet No.
MAVOWATT 45L	M815C	3-348-795-03
MAVOWATT 45S	M815E	3-348-795-03
K45 hard case	Z845C	3-348-795-03

Clear text display at large dot matrix LCD

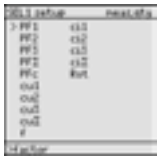




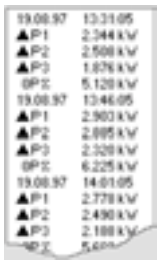




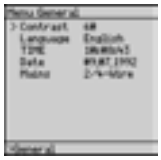
Display modes for power and energy analysis measurements



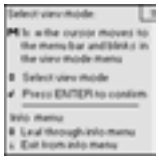
Selection menus for 75 power and energy quantities and 6 measuring modes

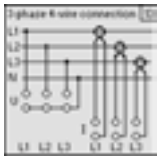


Measurement data can be recorded to the plug-in memory card or to recording chart paper at the integrated printer module.



Menu-driven instrument configuration in a variety of languages

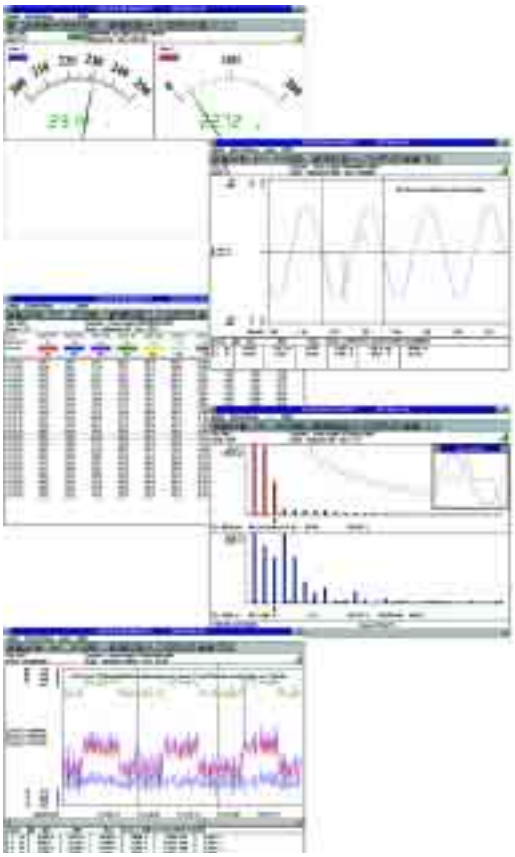




Integrated help function with condensed instructions and connection diagrams

METRAwin® 45

Analysis software for MAVOWATT 45



METRAwin 45 Windows software allows for read-out, display and processing of measurement data from the MAVOWATT 45 at a PC. Data is transferred online (does not apply to FFT/PDA measurements), or from the memory card via the RS 232 interface or an interconnected modem. Measurement data can be represented and printed out numerically in tabular form, as a Yt graph or as an FFT frequency spectrum, and exported to other Windows applications. Limit value marker lines from various standards or individually defined limit values, as well as voltage and current signal waveshapes, can be displayed in the representation of FFT measurements.

Yt Recorder

Acquired measured values from up to four freely selectable channels are displayed at the monitor as a line diagram with a horizontal time axis and can be gauged with two pointers. Stored signals can be expanded or compressed along amplitude or time axes (zoom function).

High Speed Yt Recorder

Voltage and current signals recorded at the MAVOWATT 45 with the PDA/TCM graph function can be analyzed with a time resolution of up to 20 µs.

Multimeter

Transmitted measured values from up to four freely selectable channels are displayed at the monitor in the online mode in digital format with an additional analog scale, or as an analog indicator with additional digital display.

Table

Acquired measured data from up to 10 channels are displayed numerically in clear-cut tabular format. Measured values can be exported to other programs via the clipboard.

FFT Frequency Spectrum

Harmonic measurement data recorded at the MAVOWATT 45 with the FFT Tab function are displayed as a frequency spectrum with vertical bars. Limit value marker lines for various standards can be displayed, as well as reconstructed waveshapes.

Type	Article Number	Data Sheet No.
METRAwin 45	Z852B	3-348-795-03

RC 8 Memory Card

Plug-in measured value memory for long-term recording

Measurements from all of the MAVOWATT 45 analysis functions can be stored to a PCMCIA flash RAM module. Stored values can be viewed at the display. However, METRAwin 45 software is recommended for the analysis of long-term measurement value recordings.
The RC 8 memory card has 8 MByte of storage capacity (approximately 2 million measured values).

Type	Article Number	Data Sheet No.
MAVO-RC8	Z845D	3-348-795-03

SECUTEST PSI Printer Module

Integratable printer-memory module for rapid on-site report generation

Test results are transmitted to the PSI module, which can be integrated into the instrument's lid, where they are printed out onto a recording chart. Test results can be printed out on-site in the form of concise, documented reports which can be furnished with date, time and text entered at the keypad.

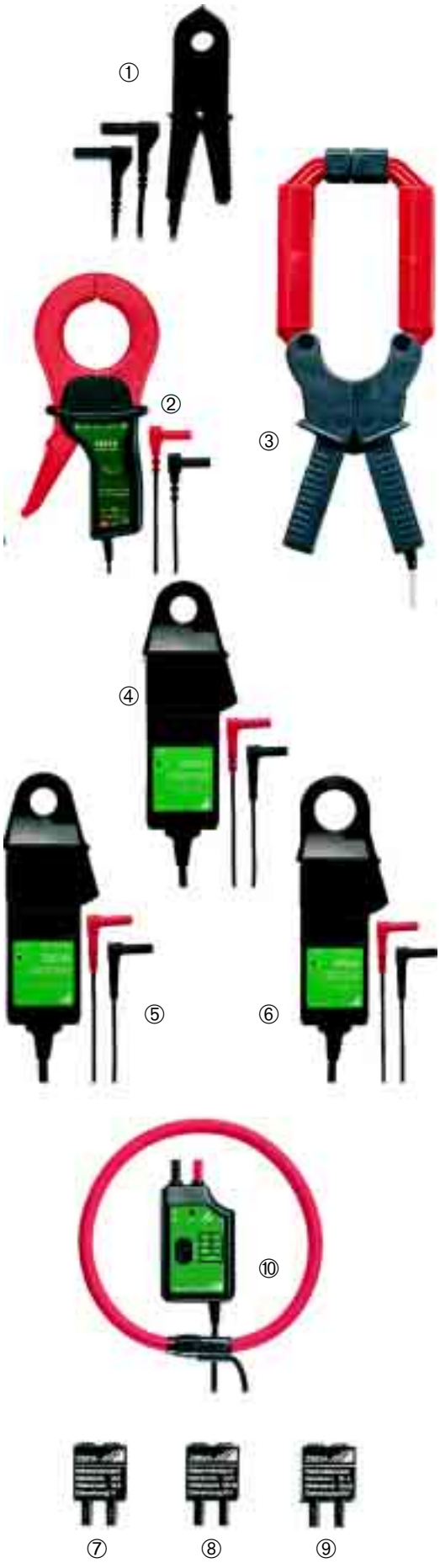
Consumable materials: PS-10P = pack of 10 recording charts, Z3210 = pack of 10 printer ribbon cartridges

- Dimensions: 240 mm x 81 mm x 40 mm (without knurled screws and ribbon cables)
- Weight: approx. 0.8 kg
- Batteries: 4 ea. 1.5 V IEC LR 6 (AA mignon) if operated with batteries

Type	Article Number	Data Sheet No.
SECUTEST PSI	GTM5016000R0001	3-348-785-03
PS-10P	GTZ3229000R001	3-348-785-03
Z3210	GTZ3210000R001	3-348-785-03

Current Accessories for MAVOWATT 45

Clip-on current-voltage transformers, current sensors, shunt resistors



WZ12E: mini clip-on current sensor 0.2 ... 150 A
WZ12F: mini clip-on current sensor 0.02 ... 15 A
Z202A: active clip-on current-voltage transformer with battery,
0 ... 30/300 A⎓, 0 ... 20/200 A~, 10 mV/A or 1 mV/A, frequency range: DC ... 10 kHz
Z203A: active clip-on current-voltage transformer with battery,
0 ... 300/1000 A ⎓, 0 ... 200 / 1000 A~, 1 mV / A, frequency range: DC ... 10 kHz
Z823B: passive clip-on current-voltage transformer,
1 ... 1000 A~, output: 0 ... 1 V, frequency range: 45 Hz ... 10 kHz
Z821B: passive clip-on current-voltage transformer,
1 ... 3000 A~, output: 0 ... 1 V, frequency range: 30 Hz ... 5 kHz
AF033A: Ampflex flexible current sensor, 0.5 ... 30/300 A~, 100 mV/A or 10 mV/A
AF33A: Ampflex flexible current sensor, 0.5 ... 300/3000 A~, 10 mV/A or 1 mV/A
AF101A: Ampflex flexible current sensor, 5 ... 1000/10000 A~, 1 mV/A or 0.1 mV/A
AF11A: Ampflex flexible current sensor, 5 ... 1000 A~, 1 mV/A
Z860A: shunt resistor, 20 mA / 1 V (class 0.2)
Z861A: shunt resistor, 1 A / 1 V (class 0.2)
Z862A: shunt resistor, 5 A / 250 mV (class 0.2)
Z863A: shunt resistor, 16 A / 160 mV (class 0.2)

Ranges of use for measuring accessories:

Type	Suitable for *	Measuring range **		Figure
		Nominal Value	Usable Range with MAVOWATT 45	
WZ12F	A, (C)	AC: 15 A_{eff}	approx. 0.02 to 15 A_{eff}	①
WZ12E	A, (C)	AC: 150 A_{eff}	approx. 0.2 to 150 A_{eff}	①
Z201A	B, C	AC: 20 A_{eff} DC: 30 A	approx. 0.1 to 17 A_{eff} approx. 0.1 to 24 A	④
Z202A	B, C	AC: 20 A_{eff} / AC: 200 A_{eff} DC: 30 A / DC: 300 A	approx. 0.1 to 20 A_{eff} / approx. 1 to 200 A_{eff} approx. 0.1 to 30 A / approx. 1 to 300 A	⑤
Z203A	B, C	AC: 200 A_{eff} / AC: 1000 A_{eff} DC: 300 A / DC: 1000 A	approx. 1 to 200 A_{eff} / approx. 1 to 1000 A_{eff} approx. 1 to 300 A / approx. 1 to 1000 A	⑥
Z823B	A, B, (C)	AC: 1000 A_{eff}	approx. 1 to 1200 A_{eff}	②
Z821B	A, B, (C)	AC: 3000 A_{eff}	approx. 1 to 3000 A_{eff}	③
AF033A	(A), B, C	AC: 30 A_{eff} / AC: 300 A_{eff}	approx. 0.5 to 17 A_{eff} / approx. 0.5 to 170 A_{eff}	⑩
AF33A	(A), B, C	AC: 300 A_{eff} / AC: 3000 A_{eff}	approx. 0.5 to 170 A_{eff} / approx. 0.5 to 1700 A_{eff}	⑩
AF101A	(A), B, C	AC: 1000 A_{eff} / AC: 10 kA_{eff}	approx. 5 to 1000 A_{eff} / approx. 5 to 10 kA_{eff}	⑩
AF11A	(A), B, C	AC: 1000 A_{eff}	approx. 5 to 1000 A_{eff}	⑩
Z860A	A, B	AC: 20 mA_{eff} DC: 20 mA	approx. 0.05 to 32 mA_{eff} approx. 50 µA to 48 mA	⑦
Z861A	A, B	AC: 1 A_{eff} DC: 1 A	approx. 1 mA_{eff} to 1 A_{eff} approx. 1 mA to 1.2 A	⑧
Z862A	A, B	AC: 5 A_{eff} DC: 5A	approx. 0.02 to 5 A_{eff} approx. 0.02 to 5A	⑨
Z863A	A, B	AC: 16 A_{eff} DC: 16 A	approx. 0.1 to 16 A_{eff} approx. 0.1 to 16 A	⑨

*) A = long-term measurements (up to 1 week) / B = harmonics measurements / C = frequency converter measurements (f > 30 Hz)
**) For AC ranges: with peak factor < 1.5

Type	Article Number	Data Sheet No.
WZ12F miniature clip-on current sensor	Z823E	3-348-795-03
WZ12E miniature clip-on current sensor	Z823D	3-348-795-03
Z201A clip-on I-U transformer	Z201A	3-348-795-03
Z202A clip-on I-U transformer	Z202A	3-348-795-03
Z203A clip-on I-U transformer	Z203A	3-348-795-03
Z823B clip-on I-U transformer	Z823B	3-348-795-03
Z821B clip-on I-U transformer	Z821B	3-348-795-03
Ampflex AF033A flexible current sensor	Z207A	3-348-795-03
Ampflex AF33A flexible current sensor	Z207B	3-348-795-03
Ampflex AF101A flexible current sensor	Z207C	3-348-795-03
Ampflex AF11A flexible current sensor	Z207D	3-348-795-03
Z860A shunt resistor	Z860A	3-348-795-03
Z861A shunt resistor	Z861A	3-348-795-03
Z862A shunt resistor	Z862A	3-348-795-03
Z863A shunt resistor	Z863A	3-348-795-03

MAVO-FFT

Harmonic analysis software option

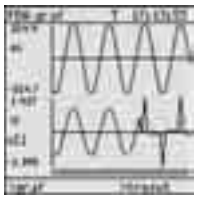
This option expands the MAVOWATT 45 with simultaneous acquisition, display and analysis of voltage and/or current harmonics.

DC components, fundamental components and current and voltage harmonics (up to the 50th harmonic relative to a fundamental frequency of 15 to 400 Hz) are continuously and uninterruptedly acquired and calculated by means of the fast fourier transformation process in real-time at all three phases, and are represented as numeric values or as a bar graph for the selected phase.
As an alternative, measurement values for respective THD (total harmonic distortion) for all three phases for voltage and current can be simultaneously numerically displayed or statistically classified.

Type	Article Number	Data Sheet No.
MAVO-FFT	Z850B	3-348-795-03

MAVO-PDA

Power disturbance software option

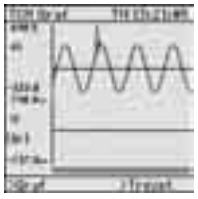


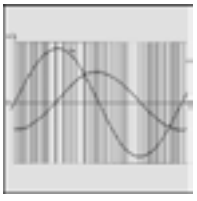
Power disturbance analysis methods which allow for uninterrupted monitoring and classification of disturbances within electrical supply lines are utilized by the MAVOWATT 45.
Measured quantities (RMS voltage and current values, frequency, THD) which have been acquired during 2, 4, 8 or 16 signal periods at all phases, or at selected phases only, are continuously compared with the respective, individually preset trigger criteria (upper limit for U/I/THDU/ THDI/f, lower limit for U/I//f, fluctuation value for U/I). Individual or simultaneously occurring events are recorded uninterruptedly and are combined and represented in three different tables: number and type of voltage and frequency disturbance events within an adjustable interval period, number and type of current disturbance events within an adjustable interval period, events list including time, cause and measurement value. If uninterrupted data logging is not required, the voltage and current signal pattern can be displayed as well with high time-resolution when an event occurs. In this way, important line voltage characteristics as required by EN 50160 can be documented, and power consumer making-operations can, for example, be analyzed.

Type	Article Number	Data Sheet No.
MAVO-PDA	Z851B	3-348-795-03

MAVO-TCM

Software option for transient capture and frequency converter measurements





The MAVO-TCM expands the scope of functions included with the MAVOWATT 45 to encompass two special facilities for mains power measuring technology:

- On the one hand, brief transient events can be captured which occur in alternating or direct current power supply lines, as well as at power consumers connected to them.
- On the other had, the instrument is capable of acquiring measured quantities for power and energy analysis at frequency converter outputs.

Transient Measurement

Voltage transients with a duration of at least 20 µs can be acquired, and measured at levels of up to 1500 V_S. Trigger conditions for events recording are derived from a comparison of the absolute level of a sampled value and the selected trigger level (Up or Ip). A rate of change trigger is active as well. The sampling interval (20 µs to 640 µs) and the pre-trigger can also be adjusted. The event display mode can be used for recording rapidly occurring, successive events. This allows for recording of up to 40 events per second listed in the order in which they occur along with time stamp, cause of triggering, measured quantity and sampled or rate-of-change measured value.

Measurements at Frequency Converters

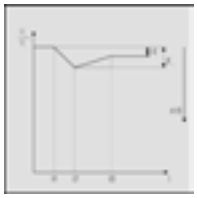
Modern frequency converters used for controlling electric motor speed usually have a high frequency square-wave output voltage which is pulse-width modulated via motor frequency.
This type of measurement signal requires a special measuring process, by means of which the converter switching frequency is filtered out, and the effective modulation frequency at the motor (fundamental frequency) is determined.

- Switching frequency must be greater than 1.2 kHz, and fundamental frequency within a range of 10 to 100 Hz.
- Motor current is acquired in an electrically isolated fashion, e.g. with a clip-on ammeter.

Type	Article Number	Data Sheet No.
MAVO-TCM	Z851C	3-348-795-03

MAVO-FSA

Flicker measurement software option



The MAVO-FSA function expands the MAVOWATT 45 to include a flicker meter function.
Flicker is defined as the subjective impression made by fluctuations in brightness at lighting appliances caused by fluctuations in the power supply.
Fluctuations of this sort can be acquired and evaluated with the help of a flicker meter.
EN 61000-4-15 defines the basic functional principle of a flicker meter, which simulates the complex chain of events which takes place at the lamp, the eye and the brain, and which correlates measurement results to an experimentally determined limit value curve (perceptual limits). Values for the resulting measured quantities, Pst (short-term flicker intensity, 10 min.) and Plt (long-term flicker intensity, 2 hours), are simultaneously determined for all three phase voltages on an individual basis. An evaluation of line voltage quality as regards flicker can be carried out in accordance with EN 5016 based upon these measured values.
Furthermore, the function also acquires the largest relative voltage fluctuation (dmax) which occurs during the short-term measuring interval, relative to constant voltage fluctuation (dc) and, for voltage changes of less than 3%, the maximum deviation duration (dt>3%). These measured quantities are required for type testing for electrical devices per EN 61000-3-3. Observance of the limit values set forth in this standard is required as of 1 January 2001 for application of the CE mark to electrical and electronic equipment and devices with an input current of up to 16 A.

Type	Article Number	Data Sheet No.
MAVO-FSA	Z851D	3-348-795-03

Voltage Quality Analyzers: Range of Applications

Applications

Comprehensive Voltage Quality Monitoring

As a result of liberalization of energy markets, various qualities of electrical power offered at correspondingly higher or lower prices will certainly become available in the future. This necessitates continuous voltage quality monitoring. As a rule, quality data are acquired, saved to a central database and managed in a decentralized fashion upon delivery to the customer. These data substantiate the quality of supplied electrical power and thus serve as a basis for accurate billing.

The following aspects are of special importance with respect to long-term recording of measured data for voltage quality from many, widely distributed measuring points:

- All quality relevant parameters must be simultaneously acquired and recorded over a long period of time in accordance with a single standard (EN 50160).
- Adequate synchronization of points in time at which recording occurs is required in order to allow for a comparison of data from different measuring points.
- It must be feasible to utilize common communications technologies, including wireless transmission, for long distance data transmission.
- The volume of data to be transmitted and managed must be kept as small as possible. For this reason, targeted preprocessing of measurement data must take place in the measuring instrument prior to transfer to the analysis software.
- Periodic querying of recorded data should take place in an automated fashion.
- It must be possible to export data to other databases.

The EN 50160 Standard

EN 50160, “Voltage Characteristics in Public Distribution Networks”, is intended to assure the identification of supply voltage characteristics including waveshape, voltage value, frequency, and symmetry of the three phase voltages at the point of delivery to the customer. The standard specifies limit values for “normal operating conditions” for these parameters.

Only the values which may not be fallen short of or exceeded during 95% of the monitored period are defined as limit values. Voltage dips or failures, e.g. resulting from defects within the system, cannot be sensibly defined by means of limit values. Parameters for values of this type can thus be freely configured in the analysis software.

Applications Range

Measured quantities derived from prevailing voltages are usually sufficient for the analysis of voltage quality. However, devices which are also capable of acquiring current have proven themselves especially useful, in particular in industrial applications. This added feature opens up innumerable additional applications:

- Recording phase current and power quantities as mean and maximum values allows the user to recognize critical load conditions and to quantify remaining reserves within the electrical system.
- Tariffs are generally assigned to industrial customers by the utilities based upon 15 minute power peaks. By recording the corresponding periodic power values, the user can determine his own characteristic load profile in order to realize energy cost reductions by means of diminished load peaks.
- Energy consumption measurements within several distribution branches provide the user with greater energy consumption clarity, and assure correct billing of costs to the appropriate departments or cost centers.
- The effectiveness of utilized compensation equipment can be tested, and associated cost saving potential can be determined with the help of reactive energy measurements.
- A greatly increased and ever growing number of non-linear power consumers such as PCs, frequency converters and electronic energy-saving lamps is increasing the occurrence of line voltage distortion (harmonics). Increased losses at power transmission equipment and certain types of consumers, as well as overloading of compensation equipment and neutral conductors represent additional consequences. This can be prevented by measuring harmonic voltages and currents, and neutral conductor current.
- Simultaneous logging of the load current profile in the event of voltage failures allows the user to draw conclusions regarding the cause of this most common type of disturbance in industrial electrical networks. This provides the user with a basis for the clarification of guarantee issues, e.g. in the event of machine and equipment malfunctions or for the implementation of corrective measures.

Voltage Quality Criteria per EN 50160

Feature	Requirement	Measuring Interval	Observation Duration
Line frequency	50 Hz ± 0.5 Hz for 95% of a given week, 50 Hz + 4% / – 6% for 100% of a given week	10 second mean value	1 week
Voltage fluctuation	Un ± 10% for 95% of a given week, Un + 10 / – 15% for 100% of a given week	10 minute mean value	1 week
Flicker	Long-term flicker intensity Plt < 1 for 95% of a given week	2 h (per EN 61000-4-15)	1 week
Asymmetry	Relationship U (negative phase-sequence system) / U (positive phase-sequence system), < 2% for 95% of a given week	10 minute mean value	1 week
Harmonics	U_{H2} ... U_{H25} < limit value per table, THD < 8%	10 minute mean value for each harmonic (per EN 61000-4-7)	1 week
Voltage dips	< 10 ... 1000 / year, of which > 50% have a duration < 1 s	10 ms TRMS value 40% Un ≤ $U_{10\ ms}$ ≤ 90% Un	1 year
Brief voltage failures	< 10 ... 1000 / year, of which > 70% have a duration < 1 s	10 ms TRMS value $U_{10\ ms}$ ≤ 1% Un	1 year
Long voltage failures	< 10 ... 50 / year with a duration of > 3 min		1 year
Transient overvoltage	(L - N) < 6 kV / µs ... ms		
Sub-harmonics and signal voltages	In progress		

MAVOLOG 10L/N/S

3-phase voltage quality analyzer and test instrument for testing per EN 50160 in standard combination housing

3-phase voltage quality analyzer and test instrument for testing per EN 50160 in standard combination housing including harmonic and flicker analysis

- Monitors voltage quality and simultaneously records 3-phase alternating quantities, records 3-phase AC quantities
- Internal analysis of voltage quality for short-term, daily and long-term intervals per EN 50160 and other industrial standards
- 640 k internal memory, memory can be partitioned for various measuring and test tasks in a user-specific fashion.
- RS 485 fieldbus with multi-drop connection for up to 32 devices, alarm output for events indication
- Dimensions: 100 x 75 x 105 mm, weight: 360 g

Analyzer Variants

MAVOLOG series instruments have been designed to allow for the selection of ideal configurations for all types of applications, from power generation to consumer applications, in combination with multiple instruments or as a stand-alone.

Even the basic model, the MAVOLOG 10L+FFT/FSA, provides for comprehensive disturbance recording and line voltage quality analysis with integrated harmonic analysis (FFT) and flicker measurement (FSA). Equipped with an LCD and additional current inputs, the top of the line MAVOLOG 10S+FFT/FSA is a universal measuring instrument which can be used for recording the characteristics of almost any conceivable measured quantities in 3-phase systems, and simultaneously acquires power disturbances and characteristics for the analysis of voltage quality.

MAVOLOG 10 Mobile Set

A practical solution for occasional mobile use: The MAVOLOG Mobile Set consisting of the following components:

- MAVOLOG 10S+FFT/FSA voltage analyzer
- MAVOLOG PS/C power pack and interface converter
- MAVOLOG BP battery pack

Wired and installed in a sturdy carrying case (46 x 16 x 35 cm)

Included accessories:

- Connector cables for mains power and voltage measurement inputs including alligator clips and RS 232 interface
- METRAwin 10 for MAVOLOG: parameters configuring and analysis software

The case also provides space for storing optional clip-on current transformers, e.g. 3 each Z3512 (1000/1 A).

Features	MAVOLOG			
	10L+FFT/FSA	10N+FFT/FSA	10S+FFT/FSA	10S
Voltage				
Measurement inputs	3 x U_{L-L} / U_{L-N} & U_{N-PE}			
Dips, failures	>10 ms	>10 ms	>10 ms	>10 ms
Swells	>10 ms	>10 ms	>10 ms	>10 ms
Asymmetry	●	●	●	●
Frequency	●	●	●	●
Harmonics	1 - 40 & THD	1 - 40 & THD	1 - 40 & THD	–
Flicker (Pst, Plt)	●	●	●	
EN 50160 analysis	●	●	●	
Current				
Measurement inputs	–	–	3xI_L & I_N	3xI_L & I_N
Characteristics for voltage dips	–	–	Resolution: 10 ms	Resolution: 10 ms
Harmonics	–	–	1 - 40 & THD	–
Power / Energy				
Active power P1, P2, P3, PΣ	–	–	●	●
Apparent power SΣ	–	–	●	●
Reactive power QΣ	–	–	●	●
Power factor PFΣ	–	–	●	●
Active energy WPΣ	–	–	●	●
Reactive energy WQΣ	–	–	●	●
Alphanumeric LCD				
Measured values, analyses	–	10, selectable	10, selectable	10, selectable
Parameters Configuration	–	●	●	●

Type	Article Number	Data Sheet No.
MAVOLOG 10L+FFT/FSA	M830S	3-349-028-03
MAVOLOG 10N+FFT/FSA	M830P	3-349-028-03
MAVOLOG 10S+FFT/FSA	M830R	3-349-028-03
MAVOLOG 10S	M830V	3-349-028-03
MAVOLOG 10 Mobil-Set	M830W	–

MAVOLOG PS/C

V~/24 V power pack for MAVOLOG instruments and the MAVOLOG BP, additionally integrated RS 485-232 interface converter

The MAVOLOG PS/C module (PS = power supply / C = converter) includes a mains power pack with a 24 V DC output for supplying power to as many as five MAVOLOG 10 instruments and one MAVOLOG BP, as well as a bidirectional RS 232–RS 485 interface converter for communication between a PC using MAVOLOG control software, and each individual instrument.
Up to 32 MAVOLOG 10 instruments can be connected to the RS 485 bus, which can have a length of up to 1 km, and which functions at a maximum data transmission rate of 115 kBaud.
The standard version is laid out for an input voltage of 230 V AC.
- Dimensions: 75 mm x 55 mm x 111 mm (H x W x D), weight: approx. 800 g

The MAVOLOG PS/C universal variant (shown above) has a broad range input for 60 to 230 V AC / DC.
- Dimensions: 75 mm x 100 mm x 111 mm (H x W x D), weight: approx. 350 g

Type	Article Number	Data Sheet No.
MAVOLOG PS/C	Z863D	–
MAVOLOG PS/C universal	Z863G	–

MAVOLOG BP

Battery pack as emergency backup for MAVOLOG instruments in the event of power failure

The MAVOLOG BP (BP = battery pack) is an uninterruptible DC power supply which, in combination with the MAVOLOG PS/C, automatically supplies power to connected MAVOLOG 10 instruments in the event of mains power failure.
Depending upon the number and type of instruments, they can be operated with a fully charged backup battery for up to 10 hours. Integrated electronics regulate and monitor the charging process, assuring reliable availability of supply power and long backup battery service life.
- Dimensions: 75 mm x 55 mm x 109 mm (H x W x D), weight: approx. 480 g

Type	Article Number	Data Sheet No.
MAVOLOG BP	Z863E	–

MAVOLOG Dial-Up

Analog modem for long distance data transmission in standard combination housing

The MAVOLOG analog dial-up modem connects the installed MAVOLOG mains monitoring system to a master computer via public telephone lines for remote parameters configuration, control and data queries.
An SMS message can be transmitted to a cell phone, a fax machine etc. in the event of power disturbance.
- Dimensions: 75 mm x 45 mm x 110 mm (H x W x D), weight: approx. 200 g

Type	Article Number	Data Sheet No.
MAVOLOG Dial-Up	Z864C	–

MAVOLOG C232/485

RS 232–485 interface converter

The MAVOLOG C232/485 is designed for use with MAVOLOG 10 series instruments.
It includes an RS 232–RS 485 interface converter for communications between a PC with METRAwin control software and each individual instrument.
Up to 32 MAVOLOG instruments can be connected to the RS 485 bus.
The battery powered interface converter is bidirectional with automatic switching, although the communications direction is not electrically isolated.
If a MAVOLOG PS/C is not used, it can be utilized for supplying power to the MAVOLOG 10, if the MAVOLOG 10 is only read out occasionally with a notebook, for example after the occurrence of power disturbances.
- Dimensions: 102 mm x 61.5 mm x 26 mm (H x W x D), weight: approx. 200 g with batteries
- 9 V flat cell, IEC 6 LF 22

Type	Article Number	Data Sheet No.
MAVOLOG C232/485	Z863F	–

METRAwin 10 / MAVOLOG

Parameters configuration and visualization software

METRAwin for MAVOLOG 10 software is used for configuring parameters and visualizing data from the MAVOLOG 10. It includes the following functions:

- Configuration of device parameters (hook-up configuration, memory parameters)
- Memory mode initialization
- Read-out and print-out of complete statistics, as well as daily statistics
- Read-in and graphic representation of interval data
- Read-in and representation of events data in list format, as well as graphic representation of 10 ms RMS values from respective event curves
- Read-in and graphic representation of harmonics
- Online visualization of selected measured quantities
- Interval data or measurement series recorded online are displayed at the monitor as a line diagram or a bar graph with horizontal time axis and can be analyzed with the help of two pointers.
- The data logger display shows time and measured values numerically in an easy to read table, and allows for data export to other programs with the Windows clipboard.
- Events data which have been read out from one or several MAVALOGs are listed in the order in which they occurred, and can be printed as an events list.
- In the event of voltage dips, failure or swells, these are displayed in a time sequence which can be measured off with cursors. If the current signal is simultaneously available, conclusions can be drawn regarding the cause of the disturbances.
- Complete statistics and daily maximum values provide information concerning all important factors at a single glance.
- Menu driven parameters configuration of interconnected instruments for measuring circuit, recording parameters, memory configuration etc.
- In the online mode, up to ten selectable measured quantities can be scanned and recorded once every second.

Type	Article Number	Data Sheet No.
METRAwin10/MAVOLOG	Z852D	–

PC.doc-ACCESS / MAVOLOG

Software for the generation of reports and graphics

PC.doc-ACCESS for MAVOLOG 10 is a database program based on Microsoft Office products including WinWord, Excel und Access for the management, presentation and documentation of data recorded with the MAVOLOG 10. The database software allows for the management of data from any number of MAVOLOG 10 instruments, and for interactive or automatic, time-controlled querying with the help of a scheduler.
The software allows for comprehensive, detailed, long-term analysis of voltage quality within a supply network including multiple measuring stations.

Graphics Processing with MS Excel

- Sorting of measured values according to time of occurrence, size (ascending/descending) and frequency distribution
- Data analysis (with minimum values / mean values / 95% / maximum values) in compliance with EN 50160, and with adjustable limit values
- Time sorted lists of recorded events from several MAVOLOG 10 instruments during an adjustable observation period
- Analysis of voltage dips relative to standard limits / classes (ITIC, NRS048)
- Print-out of events list with explanatory remarks
- Analysis of statistical data with reference to EN 50160 and adjustable limit values
- Report printing with Go/No-Go evaluation in MS WORD
- Scheduler for time controlled remote read-out from MAVOLOG 10 instruments with the help of METRAwin 10 software via RS 232 interface or modem, or via Ethernet with a slave PC as gateway

Type	Article Number	Data Sheet No.
PC.doc-ACCESS/MAVOLOG	Z852F	–

Multi-Transducers for Heavy Current Quantities

SINEAX / EURAX multi-transducers acquire all measured quantities in power systems in a highly accurate fashion.
Complete monitoring of low and medium-voltage systems is thus made possible.
All system types are supported an can be easily selected with the appropriate software with direct connection of up to 690 V.
The transducers can be used in all applications which require comprehensive, accurate information regarding electrical systems at the distribution or the consumer side.
The transducers are alternatively available with Profibus®, LON, Ethernet and MODBUS® interface.

Measurement of All Important Parameters in Heavy Current Systems

Measured quantities	Current and voltage (RMS), and active, reactive and apparent power, cosφ, sinφ, power factor, RMS current value with long response time (bimetallic measuring function), slave-pointer function for the measurement of IBs, frequency, mean current value with preceding active power sign (line only), energy meter for all four quadrants
System type	Single-phase alternating current 4-wire, 3-phase, balanced load 3-wire, 3-phase, balanced load 3-wire, 3-phase, balanced load, superposed circuit: U_{L1-L2} / I_{L1} 3-wire, 3-phase, balanced load, superposed circuit: U_{L3-L1} / I_{L1} 3-wire, 3-phase, balanced load, superposed circuit: U_{L2-L3} / I_{L1} 3-wire, 3-phase, unbalanced load 4-wire, 3-phase, unbalanced load 4-wire, 3-phase, unbalanced load, open Y
Nominal input current	1 to 6 A
Nominal input voltage	57.7 to 400 V (phase voltage) or 100 to 693 V (line-to-line voltage)

Functions Overview

Variant		Device Type							
		DME400	DME401	DME406	DME408	DME424	DME440	DME442	M563
Module type	SINEAX surface mount housing	●	●	●	●	●	●	●	●
	EURAX plug-in module					●	●	●	
Number of measurement outputs	Analog					2	4	4	3
	Digital					4		2	
Interface / protocol	RS 232	●	●	●	●	●	●	●	●
	RS 485 / MODBUS		●				●		
	FTT 10 / LON	●							
	RS 485 / PROFIBUS			●					
	Ethernet / HTTP, FTP, SMTP, TCP/IP				●				
Accuracy	Class	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5
Limit value monitoring					32	4		2	
Power supply	Power pack for DC or 50 to 60 Hz	●	●	●	●	●	●	●	●
	Power pack for 45 to 65 Hz	●		●		●		●	

SINEAX M563

Programmable industrial multi-transducer for heavy current quantities

For simultaneously acquiring 3 freely selectable measured quantities in electrical systems.
Equipped with 3 electrically isolated current outputs.

- 3 analog outputs
- Programmable application (type of electrical system)
- Current to 10 A, voltage to 830 V
- Programmable universal analog outputs
- Accuracy: class 0.5
- Password protected software for programming, data analysis and simulation
- AC-DC power pack with large tolerance range
- Top-hat rail mounting
- RS 232 interface

Article Number	Measurement Outputs		Interface	Auxiliary Power
	Analog	Digital		
146 440	3	–	RS 232	85 to 230 V AC, DC
146 458	3	–	RS 232	24 to 60 V AC, DC

Order other variants with complete order code (563-4... ....) in accordance with the data sheet. See data sheet for default configuration. See pages 62 and 63 for configuration software and programming cable.

Designation (standard devices)	Article Numbers/ Features	Data Sheet No.
SINEAX M563 with default configuration	146 440 / 146 458	M 563-4 Le

SINEAX DME400

Programmable multi-transducer with RS 232 and LON interfaces

Programmable multi-transducer for querying up to 47 measured quantities in heavy current systems

- Accurate measurement (class 0.2) of voltage and current, active, reactive and apparent power, power factor and frequency, as well as special current functions (bimetallic, slave pointer, mean value with or without preceding plus or minus sign)
- Current to 10 A, voltage to 830 V
- 4 programmable energy meters for Ah, kVAh, kWh and kvarh
- AC-DC power pack with large tolerance range, or AC only
- User-friendly customer software
- Top-hat rail or wall mounting

Article Number	Measurement Outputs		Interfaces		Auxiliary Power
	Analog	Digital			
138 380	–	–	RS 232	LON	230 V, 45 to 65 Hz
138 398	–	–	RS 232	LON	85 to 230 V AC, DC
142 191	–	–	RS 232	LON	24 to 60 V AC, DC

Order other variants with complete order code (400-1... ..) in accordance with the data sheet.
See data sheet for default configuration. See pages 62 and 63 for configuration software and programming cable.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX DME400 with default configuration	138 380 / 138 398 / 142 191	DME 400 Le

SINEAX DME401

Programmable multi-transducer with RS 232 and RS 485 / MODBUS interfaces

Programmable multi-transducer for querying up to 47 measured quantities in heavy current systems

- Data transfer via MODBUS interface
- 4 programmable energy meters for Ah, kVAh, kWh and kvarh
- Programmable application (type of electrical system)
- Current to 10 A, voltage to 830 V
- Accuracy: 0.2% (under reference conditions)
- Password protected software for programming, data analysis and simulation
- AC-DC power pack with large tolerance range
- Top-hat rail or wall mounting

Article Number	Measurement Output		Interfaces		Auxiliary Power
	Analog	Digital			
146 515	–	–	RS 232	RS 485 MODBUS	85 ... 230 V AC, DC
146 523	–	–	RS 232	LON	24 ... 60 V AC, DC

Order other variants with complete order code (401-1... ..) in accordance with the data sheet. See data sheet for default configuration. See pages 62/ and 63 for configuration software and programming cable.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX DME401 with default configuration	146 515 / 146 523	DME 401-1 Le

SINEAX DME406

Programmable multi-transducer with RS 232 and PROFIBUS interfaces

Programmable multi-transducer for querying up to 47 measured quantities in heavy current systems

- Bus connection per EN 50 170
- 4 programmable energy meters for Ah, kVAh, kWh and kvarh
- Programmable application (type of electrical system)
- Current to 10 A, voltage to 830 V
- Password protected software for programming, data analysis and simulation
- AC-DC power pack with large tolerance range, or AC only
- Top-hat rail or wall mounting

Article Number	Measurement Outputs		Interfaces		Auxiliary Power
	Analog	Digital			
146 903	–	–	RS 232	PROFIBUS DP	230 V, 45 to 65 Hz
146 911	–	–	RS 232	PROFIBUS DP	85 to 230 V AC, DC
146 896	–	–	RS 232	PROFIBUS DP	24 to 60 V AC, DC

Order other variants with complete order code (406-1... ..) in accordance with the data sheet. See data sheet for default configuration. See pages 62 and 63 for configuration software and programming cable.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX DME406 with default configuration	146 903 / 146 911 / 146 896	DME 406-1 Le

SINEAX DME408

Programmable multi-transducer with RS 232 and Ethernet interfaces

Programmable multi-transducer for querying up to 51 measured quantities in heavy current systems. The DME 408 Ethernet provides users with all data necessary for monitoring energy consumption. In addition to current measurement values, meter readings and 15 minute values with trend indicator can be queried as well. Minimum and maximum values can be monitored with 32 configurable limit values, and limit value violations trigger the transmission of e-mails to a selected address. Data can be visualized at a web browser with cyclical display refreshing. All measured data can be queried via FTP.

- Web server: communications via Ethernet, intranet and Internet
- Energy consumption analysis and monitoring
- Remote energy monitoring via www
- Limit values and alarms via e-mail
- 15 minute mean values with time-stamp and archiving
- Trend analysis for 15 minute mean values
- TCP/IP, FTP, SMTP and HTTP
- Accurate measurement (class 0.2) of voltage and current, active, reactive and apparent power, power factor and frequency, as well as special current functions (bimetallic, slave pointer, mean value with or without preceding plus or minus sign)
- Current to 10 A, voltage to 830 V
- 4 programmable energy meters for Ah, kVAh, kWh and kvarh
- AC-DC power pack with large tolerance range, or AC only
- User-friendly customer software
- Top-hat rail or wall mounting

Article Number	Measurement Outputs		Interfaces		Auxiliary Power
	Analog	Digital			
149 329	–	–	RS 232	Ethernet	85 to 230 V AC, DC

Order other variants with complete order code (408-1... ..) in accordance with the price list.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX DME408 with default configuration	149 329	–

SINEAX / EURAX DME424

Programmable multi-transducer, 2 analog and 4 digital outputs, 4 meters, RS 232

SINEAX DME424

EURAX DME424

Programmable multi-transducer for simultaneously acquiring several quantities in heavy current systems. The output quantities of the analog outputs can be configured as load-independent direct current or direct voltage signals.
The digital outputs are suitable for limit value monitoring or energy metering.

- With 2 analog and 4 digital outputs
- 4 programmable energy meters for Ah, kVAh, kWh and kvarh
- Programmable application (type of electrical system)
- Current to 10 A, voltage to 830 V
- Programmable universal analog outputs
- Accuracy: U/I 0.2%, P 0.25% under reference conditions
- Universal digital outputs: meter transmitter, limit values
- Password protected software for programming, data analysis and simulation
- AC-DC power pack with large tolerance range, or AC only
- SINEAX: top-hat rail or wall mounting
- EURAX: plug-in module for 19" rack

Article Number	Measurement Outputs		Interface	Auxiliary Power
	Analog	Digital		
129 181	2 x 20 mA	4	RS 232	230 V, 45 to 65 Hz
129 199	2 x 20 mA	4	RS 232	85 to 230 V AC, DC
142 167	2 x 20 mA	4	RS 232	24 to 60 V AC, DC
127 242	2 x 20 mA	4	RS 232	230 V, 45 to 65 Hz
127 250	2 x 20 mA	4	RS 232	85 to 230 V AC, DC

Order other variants with complete order code (424-1... ..) in accordance with the data sheet. See data sheet for default configuration. See pages 62 and 63 for configuration software and programming cable.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX DME 424 with default configuration	129 181 / 129 199 / 142 167	DME 424/442-1 Le
EURAX DME 424 with default configuration	127 242 / 127 250	DME 424/442-2 Le

SINEAX / EURAX DME440

Programmable multi-transducer with RS 232 and RS 485 MODBUS interfaces, 4 analog outputs, 4 meters

SINEAX DME440

EURAX DME440

The programmable multi-transducer simultaneously acquires several quantities in heavy current systems and processes them into 4 analog output quantities.
The MODBUS interface allows for querying up to 47 measured quantities.

- 4 analog outputs
- 4 programmable energy meters for Ah, kVAh, kWh and kvarh
- Programmable application (type of electrical system)
- Current to 10 A, voltage to 830 V
- Programmable universal analog outputs
- Accuracy: U/I 0.2%, P 0.25% under reference conditions
- Password protected software for programming, data analysis and simulation
- AC-DC power pack with large tolerance range
- SINEAX: top-hat rail or wall mounting
- EURAX: plug-in module for 19" rack

Article Number	Measurement Outputs		Interfaces		Auxiliary Power
	Analog	Digital			
138 372	4 x 20 mA	–	RS 232	RS 485 MODBUS	85 to 230 V AC, DC
142 183	4 x 20 mA	–	RS 232	RS 485 MODBUS	24 to 60 V AC, DC
440-2181 1111 00	4 x 20 mA	–	RS 232	RS 485 MODBUS	85 to 230 V AC, DC
440-2171 1111 00	4 x 20 mA	–	RS 232	RS 485 MODBUS	24 to 60 V AC, DC

Order other variants with complete order code (401-1... ..) in accordance with the data sheet. See data sheet for default configuration. See pages 62 and 63 for configuration software and programming cable.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX DME440 with default configuration	138 372 / 142 183	DME 440-1 Le
EURAX DME440 as requested by customer	440-2181 / -2171 1111 00	DME 440-2 Le

SINEAX / EURAX DME 442

Programmable multi-transducer, 4 analog and 2 digital outputs, 2 meters, RS 232

SINEAX DME 442

EURAX DME 442

Programmable multi-transducer for simultaneously acquiring several quantities in heavy current systems. The output quantities of the analog outputs can be configured as load-independent direct current or direct voltage signals.
The digital outputs are suitable for limit value monitoring or energy metering.

- With 4 analog and 2 digital outputs
- 2 programmable energy meters for Ah, kVAh, kWh and kvarh
- Programmable application (type of electrical system)
- Current to 10 A, voltage to 830 V
- Programmable universal analog outputs
- Accuracy: U/I 0.2%, P 0.25% under reference conditions
- Universal digital outputs: meter transmitter, limit values
- Password protected software for programming, data analysis and simulation
- AC-DC power pack with large tolerance range, or AC only
- Top-hat rail or wall mounting
- Plug-in module for 19" rack

Article Number	Measurement Outputs		Interface	Auxiliary Power
	Analog	Digital		
129 206	4 x 20 mA	2	RS 232	230 V, 45 to 65 Hz
129 214	4 x 20 mA	2	RS 232	85 to 230 V AC, DC
142 175	4 x 20 mA	2	RS 232	24 to 60 V AC, DC
127 135	4 x 10 mA	2	RS 232	230 V, 45 to 65 Hz
127 268	4 x 20 mA	2	RS 232	230 V, 45 to 65 Hz
127 276	4 x 20 mA	2	RS 232	85 to 230 V AC, DC

Order other variants with complete order code (406-1... ..) in accordance with the data sheet. See data sheet for default configuration. See pages 62 and 63 for configuration software and programming cable.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX DME442 with default configuration	129 206 … 127 135	DME 424/442-1 Le
EURAX DME442 with default configuration	127 268 … 127 276	DME 424/442-2 Le

Measuring Transducers for Heavy Current Quantities

SINEAX / EURAX series 530 measuring transducers convert an alternating input voltage or current, which is generated as a standard signal by a current or a voltage transformer, or which originates directly from the heavy current system, into a load-independent output current or voltage.

The various instruments included in the 530 series make it possible to acquire all measured quantities which are required for monitoring and controlling electrical systems and power consumers, and to display output quantities or transfer them to other measuring and control devices.

The instruments are designed to continuously assure the safety of personnel involved in measuring heavy current quantities in accordance with EN 61 010.

Measuring Functions / Features		Device Type														
		I538	I542	552	UI505	1I/U1	U539	U543	U553	U554	P530	Q531	F534	F535	G536	G537
Module type	SINEAX surface mount	●	●	●			●	●	●	●	●	●	●	●	●	●
	EURAX plug-in module				●	●							●	●	●	●
Number of channels	Single-channel	●	●	●			●	●	●	●	●	●	●	●	●	●
	3-channel				●	●										
Aux. power	via measurement input		●		●			●	●		●	●	●	●	●	●
	separate terminal	●		●		●	●		●	●	●	●	●	●	●	●
Alternating current	arithmetic mean value	●	●		●	●										
	RMS			●												
Alternating voltage	arithmetic mean value						●	●								
	RMS								●	●						
Active power											●					
Reactive power												●				
Frequency													●			
Frequency difference														●		
Phase angle / power factor															●	
Phase angle difference																●

SINEAX I538

Measuring transducer for alternating current

Measuring transducer for the conversion of sinusoidal alternating current

- Measuring method: rectifier measuring method
- Measurement input: sinusoidal alternating current, arithmetic mean value measurement, RMS calibrated
- Measuring range limit values: 0 … 0.8 to 0 … 1.2 A or 0 … 4 to 0 … 6 A
- Measurement output: unipolar and live-zero output quantities from 0 … 1.0 to 0 … 20 mA or live-zero from 0.2 … 1 to 4 … 20 mA or 0 … 1 to 0 … 10 V or live-zero from 0.2 … 1 to 2 … 10 V
- Also available with 2-wire connection and auxiliary power via the output circuit
- Power supply: AC or DC auxiliary power, or integrated AC-DC power pack with large tolerance range
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- P8/35 housing for top-hat rail mounting

Article Number	Nominal Frequency	Measuring Range	Output Signal	Auxiliary Power
136 516	50/60 Hz	0 to 1 A	0 to 20 mA	230 V AC
137 431			4 to 20 mA	
136 524		0 to 5 A	0 to 20 mA	
137 449			4 to 20 mA	
136 558		0 to 1 A	0 to 20 mA	24 V DC
146 979			4 to 20 mA	
136 566		0 to 5 A	0 to 20 mA	
146 987			4 to 20 mA	
136 590		0 to 1 A	4 to 20 mA	12 to 32 V DC,
136 607		0 to 5 A	2-wire connection	Power supply via output circuit

Order other variants with complete order code (538-41.. ...) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX I538	136 516 … 136 607	I 538 Le

SINEAX I542

Measuring transducer for alternating current, auxiliary power via the measurement input

Measuring transducer for the conversion of sinusoidal alternating current

- Measuring method: rectifier measuring method
- Measurement input: sinusoidal alternating current, arithmetic mean value measurement, RMS calibrated
- Measuring range: 1/5 A or 1.2/6 A, selectable at terminals
- Measurement output: unipolar output quantities from 0 … 1, 0 … 5, 0 … 10 or 0 … 20 mA, or 0 … 1 to 0 … 10 V
- Power supply: no auxiliary power terminals, minimal wiring expense
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- P8/35 housing for top-hat rail mounting

Article Number	Nominal Frequency	Measuring Range, Selectable	Output Signal
129 595	50/60 Hz	0 to 1.0 A / 5 A	0 to 5 mA
129 602		0 to 1.0 A / 5 A	0 to 10 mA
129 610		0 to 1.0 A / 5 A	0 to 20 mA
136 417		0 to 1.2 A / 6 A	0 to 5 mA
136 425		0 to 1.2 A / 6 A	0 to 10 mA
136 433		0 to 1.2 A / 6 A	0 to 20 mA

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX I542	129 595 … 136 433	I 542 Le

SINEAX I552

Measuring transducer for alternating current, RMS value measurement

Measuring transducer for the conversion of sinusoidal or distorted alternating current

- Measuring method: logarithmic measuring method
- Measurement input: sinusoidal or distorted alternating current, TRMS measurement
- Measuring range: 1/5 A or 1.2/6 A, selectable at terminals
- Measurement output: unipolar and live-zero output quantities from 0 … 1.0 to 0 … 20 mA or live-zero from 0.2 … 1 to 4 … 20 mA, or from 0 … 1 to 0 … 10 V or live-zero from 0.2 … 1 to 2 … 10 V
- Power supply: integrated AC-DC power pack with large tolerance range
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- P13/70 housing for top-hat rail mounting

Article Number	Nom. Frequency	Measuring Range	Output Signal	Auxiliary Power
133 752	50/60 Hz	0 to 1.0 A / 5 A	0 to 20 mA	85 to 230 V DC/AC
133 760		0 to 1.0 A / 5 A	4 to 20 mA	
133 778		0 to 1.2 A / 6 A	0 to 20 mA	
133 786		0 to 1.2 A / 6 A	4 to 20 mA	

Order other variants with complete order code (552-4... ...) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX I552	133 752 … 133 786	I 552 Le

SINEAX U539

Measuring transducer for alternating voltage

Measuring transducer for the conversion of sinusoidal alternating voltage

- Measuring method: rectifier measuring method
- Measurement input: sinusoidal alternating voltage, arithmetic mean value measurement, RMS calibrated
- Measuring range limit values: 0 … 50 to 0 … 600 V
- Measurement output: unipolar and live-zero output quantities
  from 0 … 1.0 to 0 … 20 mA or live-zero from 0.2 … 1 to 4 … 20 mA, or
  from 0 … 1 to 0 … 10 V or live-zero from 0.2 … 1 to 2 … 10 V
- Also available with 2-wire connection and power supply via the output circuit
- Power supply: AC or DC auxiliary power, or integrated AC-DC power pack with large tolerance range
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- P8/35 housing for top-hat rail mounting

Article Number	Nominal Frequency	Measuring Range	Output Signal	Auxiliary Power
136 532	50/60 Hz	0 to 100 V	0 to 20 mA	230 V AC
146 995			4 to 20 mA	
136 540		0 to 250 V	0 to 20 mA	
147 000			4 to 20 mA	
126 963		0 to 500 V	0 to 20 mA	
147 018			4 to 20 mA	
136 574		0 to 100 V	0 to 20 mA	24 V DC
147 026			4 to 20 mA	
136 582		0 to 250 V	0 to 20 mA	
147 034			4 to 20 mA	
136 699		0 to 100 V	4 to 20 mA, 2-wire connection	12 to 32 V DC, Power supply via the output circuit
136 706		0 to 250 V		
126 971		0 to 500 V		

Order other variants with complete order code (542-4... . in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX U539	136 532 … 126 971	U 539 Le

SINEAX U543

Measuring transducer for alternating voltage, auxiliary power via the measurement input

Measuring transducer for conversion of sinusoidal alternating voltage, w/o auxiliary power terminals

- Measuring method: rectifier measuring method
- Measurement input: sinusoidal alternating voltage, arithmetic mean value measurement, RMS calibrated
- Nominal input voltage: 0 … 20 to 0 … 600 V
- Meas. output: unipolar output quantities: 0 … 1, 0 … 5, 0 … 10 or 0 … 20 mA, or 0 … 1 to 0 … 10 V
- Power supply: no auxiliary power terminals, minimal wiring expense
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- P8/35 housing for top-hat rail mounting

Article Number	Nominal Frequency	Measuring Range	Output Signal
129 701	50/60 Hz	0 to 100/$\sqrt{3}$ V	0 to 5 mA
129 727		0 to 100/$\sqrt{3}$ V	0 to 20 mA
129 735		0 to 110/$\sqrt{3}$ V	0 to 5 mA
129 751		0 to 110/$\sqrt{3}$ V	0 to 20 mA
129 769		0 to 100 V	0 to 5 mA
129 785		0 to 100 V	0 to 20 mA
129 793		0 to 110 V	0 to 5 mA
129 818		0 to 110 V	0 to 20 mA
137 134		0 to 120 V	0 to 5 mA
137 142		0 to 120 V	0 to 20 mA
129 826		0 to 250 V	0 to 5 mA
129 842		0 to 250 V	0 to 20 mA
136 441		0 to 500 V	0 to 5 mA
136 459		0 to 500 V	0 to 20 mA

Order other variants with complete order code (542-4... ...) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX U543	129 701 … 136 459	U 543 Le

SINEAX U553

Measuring transducer for alternating voltage, RMS value measurement

Measuring transducer for the conversion of sinusoidal or distorted alternating voltage

- Measuring method: logarithmic measuring method
- Measurement input: sinusoidal or distorted alternating voltage, TRMS measurement
- Nominal input voltage: 0 … 20 to 0 … 690 V
- Measurement output: unipolar and live-zero output quantities
  from 0 … 1.0 to 0 … 20 mA or live-zero from 0.2 … 1 to 4 … 20 mA, or
  from 0 … 1 to 0 … 10 V or live-zero from 0.2 … 1 to 2 … 10 V
- Power supply: integrated AC-DC power pack with large tolerance range
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- P13/70 housing for top-hat rail mounting

Article Number	Nominal Frequency	Measuring Range	Output Signal	Auxiliary Power
133 835	50/60 Hz	0 to 100 V	0 to 20 mA	85 to 230 V DC or 40 to 400 Hz
133 843		0 to 100 V	4 to 20 mA	
133 851		0 to 120 V	0 to 20 mA	
133 869		0 to 120 V	4 to 20 mA	
126 989		0 to 250 V	0 to 20 mA	
126 997		0 to 250 V	4 to 20 mA	
133 877		0 to 500 V	0 to 20 mA	
133 885		0 to 500 V	4 to 20 mA	

Order other variants with complete order code (542-4... .) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX U553	133 835 … 133 885	U 553 Le

EURAX UI505

Multi-channel measuring transducer for alternating current and voltage, auxiliary power via the measurement input

Measuring transducer for the conversion of 1 to 3 sinusoidal alternating currents or voltages. Load-independent direct current signals which are proportional to the measured quantity are utilized as output signals.

- Up to 3 measurement inputs (may be mixed): sinusoidal alternating currents and/or voltages, arithmetic mean value measurement, calibrated to RMS value for sinusoidal waveshape
- Current to 10 A, voltage to 660 V
- Up to 3 measurement outputs: direct current signals (load-independent) or direct voltage signals (not load-independent)
- No auxiliary power terminals, minimal wiring expense
- Plug-in module (7 standard width units) for 19" rack

Order measuring transducers with complete order code (505-2... ... .. in accordance with the data sheet.

Designation	Article Numbers/Features	Data Sheet No.
EURAX UI505	505-2...	UI 505 Le

EURAX 1I/U1

Multi-channel measuring transducer for alternating current and voltage

Measuring transducer for the conversion of 1 to 3 sinusoidal alternating currents or voltages. Load-independent direct current signals which are proportional to the measured quantity are utilized as output signals.

- Up to 3 measurement inputs (may be mixed): sinusoidal alternating currents and/or voltages, arithmetic mean value measurement, calibrated to RMS value for sinusoidal waveshape
- Current to 10 A, voltage to 650 V
- Up to 3 measurement outputs: unipolar and live-zero output quantities
- Normal, live-zero output characteristics, available with variable sensitivity or as expanded scale ammeter or voltmeter
- Power supply: AC or DC auxiliary power
- Plug-in module (11 standard width units) for 19" rack

Order measuring transducers with complete order code (579-2... .... ..) in accordance with the data sheet.

Designation	Article Numbers/Features	Data Sheet No.
EURAX 1I/U1	579-2...	59-1I/U1 Le

SINEAX P530

Measuring transducer for active power

Measuring transducer for the conversion of active power in single phase alternating current or 3-phase systems with balanced or unbalanced load.
A load-independent direct current or direct voltage is used as an output signal, which is proportional to the measured active power value.

- Measuring method: TDM method
- Measurement inputs: sinusoidal nominal input current (1 or 5 A) and nominal input voltage (100 to 690 V)
- Nominal input frequency: 50 Hz
- Measuring range: 0 to 4 kW
- Measurement output: unipolar, bipolar or live-zero output quantities
- Power supply: integrated AC-DC power pack with large tolerance range for universal use
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- P13/70 housing for single-phase alternating current
- P18/105 housing for 3-phase current
- Top-hat rail mounting

Article Number	Applications	Inputs	Output Signal	Auxiliary Power
530-4113 2231 1	3-wire, balanced load	400 V and 5 A	4 to 20 mA	86 to 230 V DC/AC
530-4213 2231 1	3-wire, unbalanced load			
530-4313 2231 1	4-wire, unbalanced load			

See data sheet for other measuring ranges, inputs, frequencies, outputs signals and power supplies.
Order other variants with complete order code (552-4... ...) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX P530	530-4113 … 530-4313 2231 1	P530/Q531 Le

SINEAX Q531

Measuring transducer for reactive power

Measuring transducer for the conversion of reactive power in single phase alternating current or 3-phase systems with balanced or unbalanced load.
A load-independent direct current or direct voltage is used as an output signal, which is proportional to the measured reactive power value.

- Measuring method: TDM method
- Measurement inputs: sinusoidal nominal input current (1 or 5 A) and nominal input voltage (100 to 690 V)
- Nominal input frequency: 50 Hz
- Measuring range: 0 to 2 kVar
- Measurement output: unipolar, bipolar or live-zero output quantities
- Power supply: integrated AC-DC power pack with large tolerance range for universal use
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- P13/70 housing for phase-phase alternating current
- P18/105 housing for 3-phase current
- Top-hat rail mounting

Article Number	Application	Inputs	Output Signal	Auxiliary Power
531-4113 2231 1	3-wire, balanced load	400 V and 5 A	4 to 20 mA	86 to 230 V DC/AC
531-4213 2231 1	3-wire, unbalanced load			
531-4313 2231 1	4-wire, unbalanced load			

See data sheet for other measuring ranges, inputs, frequencies, outputs signals and power supplies.
Order other variants with complete order code (552-4... ...) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX Q531	531-4113 … 531-4313 2231 1	P530/Q531 Le

SINEAX / EURAX F534

Frequency measuring transmitters

SINEAX F534

EURAX F534

Transducer for the conversion of frequency into a direct current or voltage signal, which is proportional to the measured value

- Measurement input for sinusoidal, square-wave or distorted nominal input voltage with dominant fundamental wave
- Input voltage: 10 to 690 V
- Measuring range limits ≥10 Hz to ≤1.5 kHz
- Auxiliary power: 85 to 230 V AC/DC
- Input frequency response time periods: 4
- Measurement output available with unipolar, bipolar or live-zero output quantities
- Measuring method: digital period of oscillation measurement
- Power supply: integrated AC-DC power pack with large tolerance range for universal use
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- SINEAX: P13/70 housing for top-hat rail mounting
- EURAX: plug-in module (7 standard width units) for 19" rack

Article Number	Nominal input voltage	Measuring Range	Output Signal
130 013	10 to 230 V	45 to 55 Hz	0 to 20 mA
130 021		45 to 55 Hz	4 to 20 mA
127 044		48 to 52 Hz	0 to 20 mA
130 039		48 to 52 Hz	4 to 20 mA
127 052	230 to 690 V	45 to 55 Hz	0 to 20 mA
127 078		45 to 55 Hz	4 to 20 mA
127 060		48 to 52 Hz	0 to 20 mA
127 086		48 to 52 Hz	4 to 20 mA
534-2111 110	10 to 230 V	45 to 55 Hz	0 to 20 mA
534-2112 110		45 to 55 Hz	4 to 20 mA
534-2141 110		48 to 52 Hz	0 to 20 mA
534-2142 110		48 to 52 Hz	4 to 20 mA
534-2211 110	230 to 690 V	45 to 55 Hz	0 to 20 mA
534-2212 110		45 to 55 Hz	4 to 20 mA
534-2241 110		48 to 52 Hz	0 to 20 mA
534-2242 110		48 to 52 Hz	4 to 20 mA

Order other variants with complete order code (542-4... .) in accordance with the data sheet.
See data sheet for other measuring ranges, inputs, frequencies, outputs signals and power supplies.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX F534	130 013 … 127 086	F 534 Le
EURAX F534	534-2111 … 534-2242 110	F 534-2 KLe

SINEAX / EURAX F535

Measuring transducer for frequency difference

SINEAX F535

EURAX F535

Transducer for the conversion of the difference in frequency from two electrical systems requiring synchronization into a direct current or voltage signal which is proportional to the measured value

- Measurement inputs for sinusoidal, square-wave or distorted nominal input voltages with dominant fundamental wave
- Input voltage: 10 to 690 V
- Auxiliary power: 85 to 230 V AC/DC
- Input frequency response time periods: 4
- Measuring range limits: df ± 1% f_S to ± 80% f_S, f_S and f_G ≥10 Hz to ≤1.5 kHz
- f_S = bus bar frequency, f_G = generator frequency
- Measurement output available with unipolar, bipolar or live-zero output quantities
- Measuring method: digital period of oscillation measurement
- Power supply: integrated AC-DC power pack with large tolerance range for universal use
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- SINEAX: P13/70 housing for top-hat rail mounting
- EURAX: plug-in module (7 standard width units) for 19" rack

Article Number	Nominal input voltage	Measuring Range	Output Signal
535-4131 110	10 to 230 V	± 10% fn f_S 50 Hz, f_G 45 … 50 … 55 Hz	0 to 20 mA
535-4132 110			4 to 20 mA
535-4231 110	230 to 690 V		0 to 20 mA
535-4232 110			4 to 20 mA
535-2131 110	10 to 230 V		0 to 20 mA
535-2132 110			4 to 20 mA
535-2231 110	230 to 690 V		0 to 20 mA
535-2232 110			4 to 20 mA

Order other variants with complete order code (542-4... .) in accordance with the data sheet.
See data sheet for other measuring ranges, inputs, frequencies, outputs signals and power supplies.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX F535	535-4131 … 535-4232 110	F 535 Le
EURAX F535	535-2131 … 535-2232 110	F 535-2 KLe

SINEAX / EURAX G536

Measuring transducer for phase angle / power factor

SINEAX G536

EURAX G536

Transducer for the measurement of phase angle or power factor in single-phase or 3-phase electrical systems with symmetrical load

- Measurement input for sinusoidal, square-wave or distorted nominal input voltage with dominant fundamental wave
- Input voltage: 10 to 690 V
- Input current: 0.5 to 6 A
- Nominal input frequency: 50 Hz
- Output: cosφ linear
- Auxiliary power: 85 to 230 V AC/DC
- Input frequency response time periods: 4
- Measuring range (for import): 0.5 … cap … 1 … ind … 0.5 cosφ linear
- Measuring range limits: min. span 20 °el, max. span 360 °el
- Measurement output available with unipolar, bipolar or live-zero output quantities
- Measuring method: acquires distance between zero-crossings
- Power supply: integrated AC-DC power pack with large tolerance range for universal use
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- SINEAX: P13/70 housing for top-hat rail mounting
- EURAX: plug-in module (7 standard width units) for 19" rack

Article Number	Application	Measurement Input	Output Signal
127 094	Single-phase	230 V L–N and 5 A/L	0 to 20 mA
126 830			4 to 20 mA
127 101	3-wire, balanced load	400 V L1–L2 and 5 A/L1	0 to 20 mA
126 848			4 to 20 mA
536-2211 2221 110	Single-phase	230 V L–N and 5 A/L	0 to 20 mA
536-2211 2222 110			4 to 20 mA
536-2221 3221 110	3-wire, balanced load	400 V L1–L2 and 5 A/L1	0 to 20 mA
536-2221 3222 110			4 to 20 mA

See data sheet for other measuring ranges, inputs, frequencies, outputs signals and power supplies.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX G536	127 094 … 126 848	G 536 Le
EURAX G536	536-2211 … -2221 3222 110	G 536-2 KLe

SINEAX / EURAX G537

Measuring transducer for phase angle difference

SINEAX G537

EURAX G537

Transducer for the conversion of the difference in phase angle from two electrical systems requiring synchronization into a direct current or voltage signal which is proportional to the measured value

- Measurement inputs for sinusoidal, square-wave or distorted nominal input voltages with dominant fundamental wave
- Generator and bus bar input voltage: 10 to 690 V
- Nominal input frequency: 50 Hz
- Auxiliary power: 85 to 230 V AC/DC
- Input frequency response time periods: 4
- Measuring range limits: ± 10° to < ± 180° el
- Measurement output available with unipolar, bipolar or live-zero output quantities
- Measuring method: acquires distance between zero-crossings
- Power supply: integrated AC-DC power pack with large tolerance range for universal use
- Standard GL (Germanischer Lloyd) / suitable for use on ocean-going vessels
- SINEAX: P13/70 housing for top-hat rail mounting
- EURAX: plug-in module (7 standard width units) for 19" rack

Article Number	Nominal Input Voltage, Generator and Bus Bar	Measurement Input	Output Signal
537-4111 1110	100 V	–120 … 0 … 120 °el	0 to 20 mA
537-4111 2110			4 to 20 mA
537-4121 1110	230 V		0 to 20 mA
537-4121 2110			4 to 20 mA
537-2111 1110	100 V		0 to 20 mA
537-2111 2110			4 to 20 mA
537-2121 1110	230 V		0 to 20 mA
537-2121 2110			4 to 20 mA

Order instruments with complete order code (537-.... ...) in accordance with the G 537 price list.
See data sheet for other measuring ranges, inputs, frequencies, outputs signals and power supplies.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX G537	537-4111 … 537-4121 2110	G 537 Le
EURAX G537	537-2111 … 537-2121 2110	G 537-2 KLe

SINEAX U554

Measuring transducer for alternating voltage with various characteristics

Measuring transducer for the conversion of sinusoidal or distorted alternating voltage into an output signal which is proportional to the measured value. Depending upon the variant, the crucial portion of the measuring range can be extended at the beginning or the end (various characteristics). The less crucial or non-crucial portion is suppressed.

- Measuring method: logarithmic measuring method
- Measurement input: sinusoidal or distorted alternating voltage, TRMS measurement
- Input voltage: 0 … 20 to 0 … 690 V
- Measurement output: unipolar and live-zero output quantities
  from 0 … 1.0 to 0 … 20 mA or live-zero from 0.2 … 1 to 4 … 20 mA, or
  from 0 … 1 to 0 … 10 V or live-zero from 0.2 … 1 to 2 … 10 V
- Characteristics as expanded voltage scale or expanded primary value scale at the lower or upper range
- Power supply: AC auxiliary power, or integrated AC-DC power pack with large tolerance range
- P13/70 housing for top-hat rail mounting

Order measuring transducers with complete order code (554-4... .... ..) in accordance with the data sheet.

Designation	Article Numbers/Features	Data Sheet No.
SINEAX U554	554-4...	U 554 Le

Functions Overview

Variant		Device Type								
		V608	VK616	VK626	VK636	V624	PT602	VC603	V604	V644
Temperature measurement	Resistance measurement, Pt 100*	●	●	●	●	●	●	●	●	●
	Resistance thermometer, Ni 100*	●	●	●	●	●		●	●	●
	Thermocouples Types B, E, J, K, N, R, S and T per IEC 60 584-1 Types L and U per DIN 43 710 Types W5 Re/W26 Re and W3 Re/W25 Re per ASTM E 988-90	●	●	●	●	●		●	●	●
Resistance change with remote sensor / potentiometer	0 … 8 to 0 … 5000	●				●		●	●	●
Direct current	0 … 80 µA to 0 … 100 mA ± 40 µA to –50 … 0 … 100 mA							●	●	●
Direct voltage	0 … 2 mV to 0 … 40 V ± 1 mV to ±40 V							●	●	●
	0 … 2 mV to 0 … 100 mV ± 1 mV to ± 50 mV	●				●				
Module type	K housing for rail mounting	●								
	43 mm housing diameter, 16.8 mm high		●							
	43 mm housing diameter, 30.8 mm high		●	●	●					
	P12/17 housing for rail mounting					●				
	S17 housing for rail or wall mounting						●		●	
	S35 housing for rail or wall mounting							●		
	Plug-in module, 4 standard width units (EURAX)							●	●	
	Plug-in module (SIRAX)									●
Number of channels	Single-channel	●	●	●	●	●	●	●	●	●
	2-channel						●			
Measurement output	Direct current	●	●	●		●	●	●	●	●
	Direct voltage					●	●	●	●	●
Interface / protocol	RS 232 (serial interface)	●	●			●		●	●	●
	HART			●						
	PROFIBUS PA				●					
Relay output for open-circuit sensor and short-circuit monitoring								●	●	●
With 2 limit contact devices for monitoring 2 limit values								●		
Auxiliary power	12 … 30 V DC, supplied via the output circuit	●	●	●						
	Via common bus couplers per IEC 61 158-2				●					
	Integrated AC-DC power pack					●	●	●	●	●

* Other sensor types can be configured as well

SINEAX V608

Programmable temperature transmitter without electrical isolation for RTD and TC inputs

The SINEAX V 608 converts the measured quantity (i.e. signal from a thermocouple or a resistance thermometer) into a proportional, analog output quantity.

- Measured quantity and measuring range can be programmed with a PC: facilitates planning and project work, short lead-times, minimal inventory
- Integrated cold junction compensation
- Measuring transducer with 2-wire connection for field use in close proximity to the process
- Measurement output: 4 to 20 mA
- Open-circuit sensor and short-circuit monitoring / defined output performance in the event of disturbance
- With or without auxiliary power terminals (programmable from 12 to 30 V)
- Small and compact for optimized space utilization
- Available with “intrinsically safe” explosion protection per EEx ia IIC T6
- Serial interface
- K17 housing for top-hat rail mounting

Article Number	Variant
141 515	Standard, without electrical isolation
141 523	EEx ia IIC T6, without electrical isolation

Order other variants with complete order code (608-8.1. ....) in accordance with the data sheet.
See data sheet for default configuration. See pages 62 and 63 for configuration software and accessories.

Designation	Article Numbers/Features	Data Sheet No.
SINEAX V608 with default configuration	141 515 / 141 523	V 608-8 Le

SINEAX VK616

Programmable temperature transmitter for installation into terminal housings at temperature sensors per DIN 43 729, type B

The SINEAX VK 616 converts the measured quantity (i.e. signal from a thermocouple or a resistance thermometer) into a proportional, analog output quantity.

- Measured quantity and measuring range can be programmed with a PC: facilitates planning and project work, short lead-times, minimal inventory
- Integrated cold junction compensation
- Measurement output: 4 to 20 mA, 2-wire connection
- Optionally available with or without electrical isolation between input and output: prevents measurement value distortion caused by potential transfer
- Open-circuit sensor and short-circuit monitoring / defined output performance in the event of disturbance
- With or without auxiliary power terminals (programmable from 12 to 30 V)
- Terminals with captive screws
- Available with “intrinsically safe” explosion protection per EEx ia IIC T6
- Serial interface

Article Number	Variant	Dimensions
137 845	Standard, without electrical isolation	43 mm dia. / 16.8 mm high
137 861	Standard, with electrical isolation	43 mm dia. / 30.8 mm high
137 853	EEx ia IIC T6, without electrical isolation	43 mm dia. / 16.8 mm high
137 879	EEx ia IIC T6, with electrical isolation	43 mm dia. / 30.8 mm high

Order other variants with complete order code (616-7.1. ....) in accordance with the data sheet.
See data sheet for default configuration. See pages 62 and 63 for configuration software and accessories.

Designation	Article Numbers/Features	Data Sheet No.
SINEAX VK616 with default configuration	137 845 … 137 879	VK 616 Le

SINEAX VK626

Programmable temperature transmitter with HART protocol

For use in process control systems (SPC, PLC). The SINEAX VK 626 converts the measured quantity (i.e. signal from a thermocouple or resistance thermometer) into a proportional, analog output quantity.

- Digital communication and power supply via the 2-wire output line
- Measured quantity, measuring range and other parameters programmable with PC, suitable HART interface and appropriate software
- Electrical isolation between input and output: prevents measurement value distortion caused by potential transfer
- Measurement output: 4 to 20 mA, 2-wire connection
- Open-circuit sensor and short-circuit monitoring / defined output performance in the event of disturbance
- Terminals with captive screws
- Available with “intrinsically safe” explosion protection per EEx ia IIC T6
- Interface: output terminals

Article Number	Variant	Dimensions
141 424	Standard, with electrical isolation	43 mm dia. / 30.8 mm high
141 432	EEx ia IIC T6, with electrical isolation	43 mm dia. / 30.8 mm high

Order other variants with complete order code (626-7.1. ....) in accordance with the data sheet.
See data sheet for default configuration. See pages 62 and 63 for configuration software and accessories.

Designation	Article Numbers/Features	Data Sheet No.
SINEAX VK626 with default configuration	141 424 / 141 432	VK 626 Le

SINEAX VK 636

Programmable temperature transmitter with PROFIBUS PA protocol

For use in PROFIBUS automation systems. The SINEAX VK 636 converts the measured quantity (i.e. signal from a thermocouple or resistance thermometer) to PROFIBUS PA.

- Measuring transducer with bus connection per EN 50 170 and IEC 61 158-2
- Digital communication and power supply via the bus line
- Measured quantity, measuring range and other parameters programmable with class 2 master
- Profibus profile version 3.0
- Minimal current consumption (< 12 mA)
- Open-circuit sensor and short-circuit monitoring
- Terminals with captive screws
- Available with “intrinsically safe” explosion protection per EEx ia-ib IIC T6
- Interface: output terminals

Article Number	Variant	Dimensions
141 937	Standard, with electrical isolation	43 mm dia. / 30.8 mm high
141 945	EEx ia IIC T6, with electrical isolation	43 mm dia. / 30.8 mm high

Order other variants with complete order code (626-7.1. ....) in accordance with the data sheet.
See data sheet for default configuration. See pages 62 and 63 for configuration software and accessories.

Designation	Article Numbers/Features	Data Sheet No.
SINEAX VK 636 with default configuration	141 937 / 141 945	VK 636 Le

SINEAX V624

Programmable temperature transmitter for RTD and TC inputs

The SINEAX V 624 converts measured quantities (i.e. signal from a thermocouple or a resistance thermometer) into a proportional, analog output quantity.

- Measured quantity and measuring range can be programmed with a PC: facilitates planning and project work, short lead-times, minimal inventory
- Integrated cold junction compensation
- Electrically isolated between input, 2.3 kV output and 3.7 kV auxiliary power / compliant with EN 61 010
- Power supply: integrated AC-DC power pack with large tolerance range
- Open-circuit sensor and short-circuit monitoring / defined output performance in the event of disturbance
- With or without programmable auxiliary power connection
- The following parameters can also be programmed: data related to the measured quantity (e.g. 2, 3 or 4-wire connection for resistance thermometer, “internal” or “external” cold junction compensation for thermocouple etc.), response characteristics, signal flow direction (measured quantity / output quantity “rising/rising, normal” or “rising/falling, inverse” and details regarding open-circuit sensor monitoring (output quantity as a predetermined fixed value between – 10 and 110%) / greatest possible flexibility for the realization of measuring tasks
- Output calibration, lower and upper value can be trimmed via software
- Digital measured value information available at the programming interface: facilitates initial start-up, measured values can be displayed at the programming PC
- Available with “intrinsically safe” explosion protection per [EEx ia] IIC
- Serial interface
- P12 housing for top-hat rail mounting

Article Number	Measurement Output*	Auxiliary Power	Screw-Type Terminal Clamps
Standard (non-Ex) variants (measuring circuit not intrinsically safe)			
141 896	4 to 20 mA programmable from 0 to 20 or 20 to 0 mA, minimum span: 2 mA	24 to 60 V AC/DC	non-pluggable
141 903		85 to 230 V AC/DC	
143 412		24 to 60 V AC/DC	pluggable
143 420		85 to 230 V AC/DC	
143 371	0 to 10 V programmable from 0 to 10 or 10 to 0 V, minimum span: 1 V	24 to 60 V AC/DC	non-pluggable
143 389		85 to 230 V AC/DC	
143 454		24 to 60 V AC/DC	pluggable
143 462		85 to 230 V AC/DC	
[EEx ia] IIC variants (intrinsically safe measuring circuit)			
141 911	4 to 20 mA programmable from 0 to 20 or 20 to 0 mA, minimum span: 2 mA	24 to 60 V AC/DC	non-pluggable
141 929		85 to 230 V AC / 85 to 110 V DC	
143 438		24 to 60 V AC/DC	pluggable
143 446		85 to 230 V AC / 85 to 110 V DC	
143 397	0 to 10 V programmable from 0 to 10 or 10 to 0 V, minimum span: 1 V	24 to 60 V AC/DC	non-pluggable
143 404		85 to 230 V AC / 85 to 110 V DC	
143 470		24 to 60 V AC/DC	pluggable
143 488		85 to 230 V AC / 85 to 110 V DC	

* The output signal type (current or voltage) cannot be reprogrammed.
Order other variants with complete order code (624-.... ....) in accordance with the data sheet.
See data sheet for default configuration. See pages 62 and 63 for configuration software and accessories.

Designation	Article Numbers/Features	Data Sheet No.
SINEAX V624 standard variant	141 896 … 143 462	V 624 Le
SINEAX V624 [EEx ia] IIC variant	141 911 … 143 488	V 624 Le

SINEAX / SIRAX PT602

Configurable measuring transducer for Pt 100, single or 2-channel

SINEAX PT602

SIRAX PT602

Measuring transducer for the conversion of the resistance value from a Pt 100 sensor into a linear temperature output signal. Depending upon utilized variant, 2, 3 or 4-wire connection can be used for the Pt 100 sensor. Measuring ranges can be set as desired with DIP switches and potentiometers.

- Measuring ranges can be configured as desired with DIP switches and potentiometers
- Indication of open-circuit sensor or short-circuit with red LED
- Electrical isolation between measurement input, measurement output and auxiliary power
- Power supply: integrated AC-DC power pack with large tolerance range
- SINEAX: S17 housing for top-hat rail or wall mounting
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Standard variants with 1 input and 1 output
Input set to 0 ... 100 °C, output set to 4 ... 20 mA. 3-wire connection.
Setting for 2-wire connection with DIP switch S1 and additional jumper, cable resistance of up to 50 Ω is possible. Additional temperature ranges from – 170 to + 800 °C can be configured with DIP switches, fine balancing with "Zero" and "Span" potentiometers.

Article Number	Input	Output	Auxiliary Power
602-1112 1010	0 to 100 °C	0/4 to 20 mA	24 to 60 V AC/DC
602-1122 1010			85 to 230 V AC/DC
125 915			24 to 60 V AC/DC
125 923			85 to 230 V AC/DC

Devices same as above but with 2 inputs and 2 outputs

Article Number	Inputs 1 and 2	Outputs 1 and 2	Auxiliary Power
602-1212 1110	0 to 100 °C	0/4 to 20 mA	24 to 60 V AC/DC
602-1222 1110			85 to 230 V AC/DC
125 931			24 to 60 V AC/DC
125 949			85 to 230 V AC/DC

Order other variants with complete order code (602-.... ....) in accordance with the data sheet.
See data sheet for default configuration.

Designation	Article Numbers/Features	Data Sheet No.
SINEAX PT602	602-1112 1010 … 125 923	PT 602-1 Le
SIRAX PT602	602-1212 1110 … 125 949	PT 602-6 Le

SINEAX/EURAX VC603

Programmable combination measuring transducer-limit monitor

SINEAX VC603

EURAX VC603

These devices convert the measured quantity (i.e. direct current or voltage, or the signal from a thermocouple, a resistance thermometer, a remote sensor or a potentiometer) into a proportional analog output quantity.

2 limit contact devices are also available for monitoring the measured quantity.

- Measured quantity (temperature, resistance change, DC quantities) and all measuring ranges can be programmed with a PC.
- Integrated cold junction compensation
- Output quantity range can also be programmed with a PC, and the type of output quantity (current or voltage signal) can be selected with a DIP switch.
- Electrical isolation between measured quantity, analog and digital output quantities and auxiliary power / compliant with EN 61 010
- Digital measured value information available at the programming interface: facilitates initial start-up, measured values can be displayed at the programming PC
- 2 limit contact devices
- Serial interface
- SINEAX: S35 housing for top-hat rail or wall mounting
- EURAX: plug-in module for 19" rack

Article Number	Variant	Measurement Output	Auxiliary Power
987 670	Standard	0 to 20 mA programmable from 0 to 5 or 0 to 22 mA ± 2.5 and ± 20 mA	24to 60 V AC/DC
987 852			85 to 230 V AC/DC
987 894	[EEx ia] IIC intrinsically safe circuit		24to 60 V AC/DC
987 935			85 to 110 V DC/85 to 230 V AC
997 455	Standard		24 to 60 V AC/DC
997 471			85 to 230 V AC/DC
997 497	[EEx ia] IIC intrinsically safe circuit		24to 60 V AC/DC
997 512			85 to 110 V DC/85 to 230 V AC

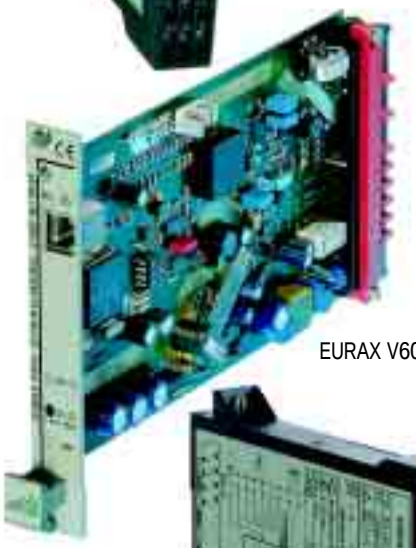
Order other variants with complete order code (602-.... ....) in accordance with the data sheet.
See data sheet for default configuration. See pages 62 and 63 for configuration software and accessories.

Designation	Article Numbers/Features	Data Sheet No.
SINEAX VC603	987 670 … 987 935	VC 603-1 Le
EURAX VC603	997 455 … 997 512	VC 603-2 Le

SINEAX / EURAX V604, SIRAX V644

Programmable measuring transducers for temperature and DC quantities

SINEAX V604



EURAX V604

SIRAX V644

These devices convert the measured quantity (i.e. direct current or voltage, or the signal from a thermocouple, a resistance thermometer, a remote sensor or a potentiometer) into a proportional analog output quantity.

- Measured quantity (temperature, resistance change, DC quantities) and all measuring ranges can be programmed with a PC.
- Output quantity range can also be programmed with a PC, and the type of output quantity (current or voltage signal) can be selected with a DIP switch.
- Electrical isolation between measured quantity, analog output quantity and auxiliary power / in compliance with EN 61 010
- Digital measured value information available at the programming interface: facilitates initial start-up, measured values can be displayed at the programming PC
- Serial interface
- SINEAX: S17 housing for top-hat rail or wall mounting
- EURAX: plug-in module for 19" rack
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Article Number	Variant	Measurement Output	Auxiliary Power
Integrated cold junction compensation			
973 059	Standard	0 to 20 mA programmable from 0 to 5 or 0 to 22 mA ± 2.5 and ± 20 mA	24to 60 V AC/DC
973 083			85 to 230 V AC/DC
973 116	[EEx ia] IIC intrinsically safe measuring circuit		24to 60 V AC/DC
973 140			85 to 110 V DC/85 to 230 V AC
No cold junction compensation			
997 588	Standard	0 to 20 mA programmable from 0 to 5 or 0 to 22 mA ± 2.5 and ± 20 mA	24to 60 V AC/DC
997 603			85 to 230 V AC/DC
997 629	[EEx ia] IIC intrinsically safe measuring circuit		24to 60 V AC/DC
997 645			85 to 110 V DC/85 to 230 V AC
No cold junction compensation			
998 809	Standard	0 to 20 mA programmable from 0 to 5 or 0 to 22 mA ± 2.5 and ± 20 mA	24to 60 V AC/DC
107 913			85 to 230 V AC/DC
107 921	[EEx ia] IIC intrinsically safe measuring circuit		24to 60 V AC/DC
107 939			85 to 110 V DC/85 to 230 V AC

Order other variants with complete order code (6xx-.... ....) in accordance with the data sheet.
See data sheet for default configuration. See pages 62 and 63 for configuration software and accessories.

Designation	Article Numbers/Features	Data Sheet No.
SINEAX V604	973 059 … 973 140	V 604-1 Le
EURAX V604	997 588 … 997 645	V 604-2 Le
SIRAX V644	998 809 … 107 939	V 644-6 Le

Measuring Transducers for Angle of Rotation and Position

KINAX series measuring transducers are suitable for acquiring angle of rotation and position.

Depending upon the utilized variant, they convert angle of rotation measuring ranges from 0 … 5 to 0 … 350 °, or strokes of 0 … 10 to 0 … 140 mm into a load-independent DC signal which is proportional to the measured value. 4 different housing types are available for various types of applications.

A capacitive sensing system is at the heart of all KINAX measuring transducers which functions like a differential capacitor. A differential capacitance is generated which has a linear relationship to rotary motion, and which controls downstream electronics.

Variant		KINAX Device Type				
		2W2	3W2	WT710	WT707	SR709
Panel-mount device		●	●			
Surface-mount device				●		
Surface-mount device with rugged design					●	
Position transmitter						●
Measuring range	0 … 10 or 0 … 350° rotation	●				
	0 … 5 to 0 … 270° rotation		●	●	●	
	0 … 10 to 0 … 140 mm stroke travel					●
Output signal [mA]	4 … 20, 2-wire connection	●				
	0 … 1 to 0/4 … 20 mA, 2, 3 or 4-wire connection		●	●	●	●
Supply power [V]	12 … 33 (12 … 30 Ex)	●	●	●	●	●
	24 … 60 / 85 … 230 DC/AC			●	●	●
Serial interface		●				
Housing diameter [mm]	48	●	●			
	80			●		
	102				●	
	105					●
Additional gearbox (optional)				●	●	

KINAX 2W2

Programmable measuring transducer for angle of rotation, panel-mount device

Measuring transducer with contactless, capacitive sensing system for acquiring the angular position of a shaft. A load-independent DC signal with a range of 4 to 20 mA is read out from the measurement output.

- Patented contactless capacitive system / wear-free
- Analog measuring method, practically infinite resolution
- Measuring range, direction of rotation, characteristics, reversing point and other additional functions can be programmed with a PC: facilitates planning and project work, short lead-times, minimal inventory
- Angle of rotation measuring range: 0 … 10 to 0 … 50 or 0 … 50 to 0 … 350°
- Measurement output (measuring/supply circuit) utilizes 2-wire connection (4 to 20 mA signal)
- Available with “intrinsically safe” explosion protection per EEx ia IIC T6, can be used in explosive atmospheres
- Measured value simulation and testing of the downstream chain of events is possible during installation.
- Acquires measured values / display of instantaneous values and graphic representation of the measured value at the monitor for long periods of time
- Setting and fine adjustment of the analog output, zero point and measuring span can be adjusted independent of each other
- Programmable output quantity characteristics: linear, as a characteristic V curve or as a freely selectable linearization curve
- Shaft can be rotated a full 360°
- Serial interface

Article Number	Mechanical Angle Range	Measuring Range	Reversing Point	Direction of Rotation	Output Quantity Characteristics
760-1111 100	50°	0 to 50°	55°	Clockwise	Linear
760-1211 100	350°	0 to 350°	355°	Clockwise	Linear

Order other variants with complete order code (760-.... ....) in accordance with the data sheet.

See pages 62 and 63 for configuration software and accessories.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
KINAX 2W2 with default configuration	760-1111 100 / 760-1211 100	2W2 Le

KINAX 3W2

Measuring transducer for angle of rotation, panel-mount device

Measuring transducer with contactless, capacitive sensing system for acquiring the angular position of a shaft. A load-independent DC signal with a range of 4 to 20 mA is made available at the measurement output.

- Patented contactless capacitive system / wear-free
- Analog measuring method, practically infinite resolution
- Angle of rotation measuring range: 0 … 5 to 0 … 270°
- Measurement output: 0 … 1 to 0/4 … 20 mA
- Available with “intrinsically safe” explosion protection per EEx ia IIC T6, can be used in explosive atmospheres
- Adjustable zero point and span
- Output quantity characteristics: linear or as a characteristic V curve
- Minimal torque: < 0.001 Ncm
- Drive shaft has no mechanical stops and can be infinitely rotated.
- Available as GL variant (Germanischer Lloyd) / suitable for use on ocean-going vessels

Article Number	Measuring Range, Angle	Variant	Direction of Rotation	Output Signal / Auxiliary Power 12 to 33 V DC
989 759	0 to 30°	Standard, drive shaft at front, 2 mm dia., 6 mm long	Clockwise	4 to 20 mA 2-wire connection or 0 to 20 mA 3 or 4-wire connection (selectable with potentiometer)
993 213	0 to 60°			
993 221	0 to 90°			
993 239	0 to 270°			

The output is trimmed to 4 to 20 mA for standard devices in combination with 2-wire connection.
Order other variants with complete order code (708-.... .... .) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
KINAX 3W2	989 759 … 993 239	57-3W2 Le

KINAX SR709

Position encoding measuring transducer, surface mount device

Measuring transducer for acquiring stroke travel at valves, butterfly valves, slides and other actuators. The transducer converts the measured quantity into a load-independent direct current which is proportional to the measured value.

- Patented contactless capacitive system / wear-free
- Analog measuring method, practically infinite resolution
- Stroke travel measuring range: 0 … 10 to 140 mm
- Measurement output: 0 … 1 to 0/4 … 20 mA / 2, 3 or 4-wire connection
- Available with “intrinsically safe” explosion protection per EEx ia IIC T6, can be used in explosive atmospheres
- Measuring range is adjusted by varying the leverage, fine adjustment with potentiometer / optimized adaptation of measuring spans to individual requirements

Article Number	Variant	Installation Position	Output Signal / Auxiliary Power 12 to 33 V DC
709-10DA 01	Standard with NAMUR mounting kit for actuators	Lever in neutral position (down): corresponds to 0/4 mA	4 to 20 mA 2-wire connection or 3 or 4-wire connection (selectable with potentiometer)

The output is trimmed to 4 to 20 mA for standard devices in combination with 2-wire connection.
Order other variants with complete order code (709-.... ..) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
KINAX SR709	709-10DA 01	SR 709 Le

KINAX WT707

Measuring transducer for angle of rotation, rugged design

Measuring transducer with contactless, capacitive sensing system for acquiring the angular position of a shaft. A load-independent DC signal with a range of 4 to 20 mA is read out at the measurement output. Due to its rugged design, it is used primarily in machinery manufacturing and shipbuilding.

- Patented contactless capacitive system / wear-free
- Analog measuring method, practically infinite resolution
- Angle of rotation measuring range:
  0 … 5 to 0 … 270° without gearbox
  0 … 10° through 0 … 1600 revolutions with gearbox
- Measurement output: 0 … 1 to 0/4 … 20 mA
  2, 3 or 4-wire connection
- Available with “intrinsically safe” explosion protection per EEx ia IIC T6, can be used in explosive atmospheres
- Measuring span adjustment with potentiometer / optimized adaptation to desired measuring ranges
- Output quantity characteristics: linear or as a characteristic V curve
- Drive shaft can be infinitely rotated: no damage occurs even if the upper limit value of the measuring range is exceeded.
- Surface mounting device in rugged housing: vibration and shock resistant, suitable for use in machinery manufacturing and shipbuilding
- Available as GL variant (Germanischer Lloyd) / suitable for use on ocean-going vessels

Article Number	Measuring Range, Angle	Variant	Direction of Rotation	Output Signal / Auxiliary Power 12 to 33 V DC
707-112D A150	0 to 30°	Standard with base (mounted), metal rear panel, 2 PG 11 packing glands	Clockwise	4 to 20 mA 2-wire connection or 0 to 20 mA 3 or 4-wire connection (selectable with potentiometer)
707-113D A150	0 to 60°			
707-114D A150	0 to 90°			
707-116D A150	0 to270°			

The output is trimmed to 4 to 20 mA for standard devices in combination with 2-wire connection.
Order other variants with complete order code (707-.... ....) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
KINAX WT707	707-112D A150 … 707-116D A150	WT 707 Le

KINAX WT710

Measuring transducer for angle of rotation, surface-mount device

Measuring transducer with contactless, capacitive sensing system for acquiring the angular position of a shaft. A load-independent DC signal with a range of 4 to 20 mA is read out at the measurement output. It is especially well suited for surface mounting to equipment and apparatus thanks to its compact design.

- Patented contactless capacitive system / wear-free
- Analog measuring method, practically infinite resolution
- Angle of rotation measuring range:
  0 … 5 to 0…270° without gearbox, 0 … 10° through 0 … 48 revolutions with gearbox
- Measurement output: 0 … 1 to 0/4 … 20 mA / 2, 3 or 4-wire connection
- Available with “intrinsically safe” explosion protection per EEx ia IIC T6, can be used in explosive atmospheres
- Measuring span adjustment with potentiometer / optimized adaptation to desired measuring ranges
- Output quantity characteristics: linear or as a characteristic V curve
- Minimal torque: < 0.001 Ncm
- Drive shaft has no mechanical stops: devices without additional gearbox can be infinitely rotated.

Article Number	Measuring Range, Angle	Variant	Direction of Rotation	Output Signal / Auxiliary Power 12 to 33 V DC
710-112D A0	0 to 30°	Standard with drive shaft: 2 mm dia.	Clockwise	4 to 20 mA 2-wire connection or 0 to 20 mA 3 or 4-wire connection (selectable with potentiometer)
710-113D A0	0 to 60°			
710-114D A0	0 to 90°			
710-116D A0	0 to 270°			

The output is trimmed to 4 to 20 mA for standard devices in combination with 2-wire connection.
Order other variants with complete order code (710-.... ....) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
KINAX WT710	710-112D A0 … 710-116D A0	WT 710 Le

SINEAX / SIRAX C402

Limit monitors

SINEAX C402

SIRAX C402

Limit monitor for monitoring limit values when performing measurements with standard current or voltage signals

- 2 limit contact devices
- 2 relay outputs, each equipped with one changeover contact
- Signal flow direction can be selected for relays and LEDs with jumpers
- Electrical isolation between measurement input, contact outputs and auxiliary power
- Power supply: integrated AC-DC power pack with large tolerance range
- SINEAX: S17 housing for top-hat rail or wall mounting
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Article Number	Standard Input Signals	Contact Outputs	Auxiliary Power
128 646	0 to 20 mA / 0 to 10 V 4 to 20 mA / 2 to 10 V ± 20 mA / ± 10 V	2 relay outputs each equipped with 1 changeover contact	24 to 60 V AC/DC
128 654			85 to 230 V AC/DC
129 024			24 to 60 V AC/DC
129 032			85 to 230 V AC/DC

Order other variants with complete order code in accordance with the data sheet.

Designation (standard devices)	Article Numbers / Features	Data Sheet No.
SINEAX C402	128 646 / 128 654	C 402-1/-4 Le
SIRAX C402	129 024 / 129 032	C 402-6 Le

SINEAX / SIRAX SV824

Isolating switch amplifier

SINEAX SV824

SIRAX SV824

Isolating switch amplifier for digital signal transmission from intrinsically safe control circuits in non intrinsically safe signal circuits

- Connection of NAMUR sensors, switching contacts, proximity switches
- Relay outputs
- Electrical isolation between input, output and auxiliary power
- Power supply: integrated AC-DC power pack with large tolerance range
- Switching status indicated with LEDs
- Monitoring for cable short-circuiting and cable interruption
- Reversible signal flow direction
- “Intrinsically safe” explosion protection per [EEx ia] IIC
- SINEAX: S17 housing for top-hat rail or wall mounting
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Article Number	Description	Auxiliary Power
133 992	2-channel isolation switch amplifier, signal inputs with intrinsically safe explosion protection per [EEx ia] IIC	24 to 60 V AC/DC
134 007		85 to110 V DC/230 V AC
130 162		24 to 60 V AC/DC
130 170		85 to 110 V DC / 230 V AC

Order other variants with complete order code in accordance with the data sheet.

Designation (standard devices)	Article Numbers / Features	Data Sheet No.
SINEAX SV824	133 992 / 134 007	SV 824-1 Le
SIRAX SV824	130 162 / 130 170	SV 824-6 Le

SIRAX SD810

Valve control module

Valve control module for intrinsically safe solenoid valves (e.g. HERION, LUCIFER, SEITZ and BÜRKERT), and for supplying power to alarm indicators or signal lamps in explosive atmospheres

- Input: activation of the output via logic inputs and contact input
- Electrical isolation between input, output and auxiliary power
- Power supply: integrated AC-DC power pack with large tolerance range
- Indication of valve control with yellow LED
- Supply power monitoring with green LED
- B17 housing for plug-in installation to BP 902 rack

Article Number	Description	Output	Auxiliary Power
120 460	Single-channel valve control module, output with "intrinsically safe" explosion protection per EEx ib IIC	14.0 V DC, I = 59 mA	24 to 60 V AC/DC
125 080		14.0 V DC, I = 59 mA	85 to 110 V DC / 230 V AC
125 098		18.0 V DC, I = 29 mA	24 to 60 V AC/DC
125 105		18.0 V DC, I = 29 mA	85 to 110 V DC / 230 V AC

Order other variants with complete order code in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SIRAX SD810	120 460 … 125 105	SD 810-6 Le

SINEAX/EURAX/SIRAX B811

Power pack with additional functions

Power pack for supplying power to 2-wire measuring transducers with DC auxiliary power, and for 1:1 transmission of the measuring signal, electrically isolated from the measurement output. Conversion to another signal range is also possible, for example 0 to 5 mA or 1 to 5 V (signal converter). Certain variants of the B 811 are FSK compatible (frequency shift keying). They are used for dialog-capable "intelligent" measuring transducers with FSK technology and HART or a company-specific protocol.

- Hand-held FSK compatible terminal can be connected to separate terminals / allows for interaction with "intelligent" measuring transducers with 2-wire connection which utilize FSK technology and HART or a company-specific protocol
- Electrical isolation between measuring/supply circuit, output and auxiliary power
- Power supply: integrated AC-DC power pack with large tolerance range
- Monitors measuring/supply circuit for cable interruptions and short-circuits / indicates errors with a red LED, relay and/or a failure signal
- SINEAX: S17 housing for top-hat rail or wall mounting
- EURAX: plug-in module for 19" rack
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Article Number	Variant	Supply Voltage	Output	Auxiliary Power
126 856	Standard	24 V DC	0 to 20 mA	85 to 230 V AC/DC
126 864			4 to 20 mA	
811-22A0 0000			0 to 20 mA	
811-22B0 0000			4 to 20 mA	
107 400	Measuring/supply circuit intrinsically safe per EEx ia IIC	16.9 V DC	4 to 20 mA	85 to 110 V DC / 230 V AC
125 212			4 to 20 mA	
811-24B0 0000			4 to 20 mA	

Order other variants with complete order code in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX B811	126 856 / 126 864 / 107 400	B 811-1 Le
EURAX B811	811-22A0 0000 / -22B0 0000 / -24B0 0000	B 811-2 Le
SIRAX B811	125 212	B 811-6 Le

SINEAX B840

Power pack

Power pack for supplying power to 2-wire measuring transducers with DC auxiliary power

- 4 measuring/supply circuits: 4 to20 mA, 24 V DC
- Electrical isolation between auxiliary power and measuring/supply circuit
- Values at supply outputs are monitored with green LEDs.
- P13/70 housing for top-hat rail mounting

Article Number	Description	Auxiliary Power
147 464	4 supply outputs: 24 V DC ± 7%	24 V AC
147 472		115 V AC
147 480		230 V AC

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX B840	147 464 / 147 472 / 147 480	B 840 Le

SINEAX/SIRAX TI807

Passive DC signal isolator

SINEAX TI807-5
in N17 Housing

SINEAX TI807-1
in S17 Housing

SIRAX TI807-6
in B17 Housing

Signal isolator for electrically isolating an analog DC signal within a range of 0(4) to 20 mA, and for converting it to a current signal (0(4) to 20 mA) or a voltage signal (0(2) to 10 V) depending upon the utilized device variant. Functions as a passive isolator without external supply power and draws its minimal energy requirements from the DC signal.

- Electrical isolation of the analog DC signal (0(4) to 20 mA): prevents the formation of parasitic voltages and currents / eliminates grounding problems with interconnected and intermeshed signal lines.
- Highly accurate: fulfills the isolation function with practically no transmission errors.
- No auxiliary power terminals: eliminates the need to lay and connect power supply lines, well suited for subsequent retrofitting to signal circuits.
- SINEAX: N17 housing for top-hat rail mounting
- SINEAX: S17 housing for top-hat rail or wall mounting
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Article Number	Number of Isolating Points	Input 0/4 to 20 mA	Output 0/4 to 20 mA	Housing
999 154	1	Not intrinsically safe	Not intrinsically safe	N 17
999 196	1	Intrinsically safe	Not intrinsically safe	N 17
999 170	1	Not intrinsically safe	Intrinsically safe	N 17
995 061	2	Not intrinsically safe	Not intrinsically safe	S 17
996 936	3	Not intrinsically safe	Not intrinsically safe	S 17
973 950	2	Not intrinsically safe	Not intrinsically safe	B 17
108 044	3	Not intrinsically safe	Not intrinsically safe	B 17
108 119	2	Intrinsically safe	Not intrinsically safe	B 17
108 127	3	Intrinsically safe	Not intrinsically safe	B 17
108 078	2	Not intrinsically safe	Intrinsically safe	B 17
108 068	3	Not intrinsically safe	Intrinsically safe	B 17

Order other variants with complete order code in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX TI807-5	999 154 … 999 170	TI 807-5/-1 Le
SINEAX TI807-1	995 061 … 996 936	TI 807-5/-1 Le
SIRAX TI807-6	973 950 … 108 068	TI 807-6 Le

SINEAX / SIRAX SI815

Passive DC signal isolator with auxiliary power transmission, FSK compatible

SINEAX SI815-5
in N17 Housing

SINEAX SI815-1
in S17 Housing

SIRAX SI815-6
in B17 Housing

Signal isolator for electrically isolating the 4 to 20 mA measuring/supply circuit of a measuring transducer with 2-wire connection. The device fulfils two functions simultaneously. It provides for electrical isolation and it transmits the supply power component of the signal, i.e. auxiliary power, to the measuring transducer without feeding anything to the circuit itself. Accordingly, the isolator does not include any auxiliary power terminals.

Certain variants of the SINEAX SI 815 are FSK compatible (frequency shift keying). They are used for dialog-capable "intelligent" measuring transducers with FSK technology and HART or a company-specific protocol.

- Electrical isolation between input and output: prevents the formation of parasitic voltages and currents and eliminates grounding problems with interconnected and intermeshed signal lines.
- The input signal corresponds to the output signal: 4 to 20 mA
- Transmits auxiliary power to measuring transducers with 2-wire connection / simple, low-cost instrumentation
- No auxiliary power terminals: eliminates the need to lay and connect power supply lines.
- Suitable for the transmission of the 4 to 20 mA analog signal which is superimposed over a frequency modulated digital signal (FSK compatible) / allows for interaction with "intelligent" measuring transducers with 2-wire connection which utilize FSK technology and the HART or a company-specific protocol.
- SINEAX: N17 housing for top-hat rail mounting
- SINEAX: S17 housing for top-hat rail or wall mounting
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Article Number	Variant (N17 Housing)	FSK Compatibility
999 279	Standard version (non Ex version) Input signal: 4 to 20 mA Output signal: 4 to 20 mA with 1 isolating and transmission channel	not FSK compatible
999 295		FSK compatible
999 310	[EEx ia] IIC variant Input signal: 4 to 20 mA, not intrinsically safe Output signal: 4 to 20 mA, intrinsically safe with 1 isolating and transmission channel	not FSK compatible
999 336		FSK compatible

Order signal isolator in S17 or B17 housing with 2 channels with complete order code (815-.... .).

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX SI815-5	999 279 … 999 336	SI 815-5/-1Le
SINEAX SI815-1	815-1... .	SI 815-5/-1Le
SIRAX SI815-6	815-6... .	SI 815-6 Le

SINEAX 2I1

Passive DC signal isolator

Signal isolator for electrically isolating an analog DC signal within a range of 0(4) to 20 mA.

Functions as a passive isolator without external supply power and draws its minimal energy requirements from the DC signal.

- Electrically isolates an analog DC signal from 0(4) to 20 mA / prevents the formation of parasitic voltages and currents / eliminates grounding problems with interconnected and intermeshed signal lines.
- Highly accurate: fulfills the isolation function with practically no transmission errors.
- No auxiliary power terminals: eliminates the need to lay and connect power supply lines, well suited for subsequent retrofitting to signal circuits.
- N-type rail mount housing for G rail per EN 50 035-G32, or top-hat rail per EN 50 082

Order signal isolators with complete order code (880-5... .) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX 2I1	880-5... .	84/89-2I1 Le

SINEAX TI816

Passive DC signal isolator

Signal isolator for electrically isolating an analog DC signal within a range of 0(4) to 20 mA, and for converting it to a current signal (0(4) to 20 mA) or a voltage signal (0(2) to 10 V) depending upon the utilized device variant. Functions as a passive isolator without external supply power and draws its minimal energy requirements from the DC signal.

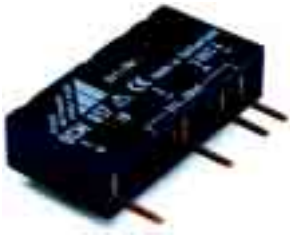
- Electrical isolation of the analog DC signal (0(4) to 20 mA): prevents the formation of parasitic voltages and currents and eliminates grounding problems with interconnected and intermeshed signal lines.
- Highly accurate: fulfills the isolation function with practically no transmission errors.
- No auxiliary power terminals: eliminates the need to lay and connect power supply lines, well suited for subsequent retrofitting to signal circuits.
- Small and compact for optimized space utilization
- N12 type rail mount housing for G rail per EN 50 035 – G32, or top-hat rail per EN 50 082

Article Number	Number of Isolating Points	Input	Output	Housing
990 722	1	0/4 to 20 mA	0/4 to 20 mA	N 12
994 089	1	0/4 to 20 mA	0/2 to 10 V	N 12

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX TI816	990 722 / 994 089	TI 816-5 Le

DCM817

Passive DC signal isolator



Signal isolator for electrically isolating and analog DC signal from 0(4) to 20 mA.
It functions as a passive isolator without external supply power and draws its minimal energy requirements from the DC signal.

- Electrical isolation of the analog DC signal (0(4) to 20 mA) / prevents the formation of parasitic voltages and currents / eliminates grounding problems with interconnected and intermeshed signal lines
- Highly accurate / fulfills the isolation function with practically no transmission errors
- No auxiliary power terminals / eliminates the need to lay and connect power supply lines / well suited for subsequent retrofitting to signal circuits
- Modular design / wide variety of applications / compact dimensions / space-saving

Article Number	Number of Isolating Points	Input/Output 0/4 to 20 mA	Connectors	Housing
988 719	1	Not intrinsically safe	Angled pins	Module
988 727	1	Not intrinsically safe	Straight pins	Module

This product may not be sold in the German sales territory!

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
DCM817	988 719 / 988 727	DCM 817 Le

SINEAX / SIRAX TV808-11 / -61

Unipolar / bipolar isolating amplifier, single-channel, Ex or non-Ex input

SINEAX TV808-11
in S17 Housing

SIRAX TV808-61
in B17 Housing

Isolating amplifier for electrical isolation of DC signals. Processing of unipolar, bipolar and live-zero signals. Load boosting and signal conversion option.

- Electrical isolation between input, output and auxiliary power: prevents measurement value distortion caused by potential transfer.
- Flexible: inputs and outputs can be configured with jumpers
- SINEAX: S17 housing for top-hat rail or wall mounting
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Article Number	Variant	Input/Output	Auxiliary Power	Housing
124 404	Non-Ex version	0 to 20 mA 4 to 20 mA ± 20 mA 2 to 10 V ± 10 V 0 to 10 V	24 to 60 V AC/DC	S17
124 412			85 to 230 V AC/DC	
124 438	Intrinsically safe input signal		24 to 60 V AC/DC	
124 420			85 to 110 V DC / 230 V AC	
125 139	Non-Ex version		24 to 60 V AC/DC	B17
125 147			85 to 230 V AC/DC	
125 155	Intrinsically safe input signal		24 to 60 V AC/DC	
125 163			85 to 110 V DC / 230 V AC	

Order other variants with complete order code in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX 808-1111 / SINEAX 808-1121	124 404 / 124 412	TV 808-11 Le
SINEAX 808-1131 / SINEAX 808-1141	124 438 / 124 420	
SIRAX 808-6111 / SIRAX 808-6121	125 139 / 125 147	TV 808-61 Le
SIRAX 808-6131 / SIRAX 808-6141	125 155 / 125 163	

SINEAX / SIRAX TV808-115 / -615

Unipolar / bipolar isolating amplifier, single-channel, Ex or non-Ex output, FSK compatible

SINEAX TV808-115
in S17 Housing

SIRAX TV808-615
in B17 Housing

Isolating amplifier for electrical isolation of DC signals. FSK compatible TV 808-115/116 variants with intrinsically safe output are especially well suited for controlling intelligent I-P converters in explosive atmospheres. The HART bypass allows for transmission of bidirectional FSK signals based on the HART protocol.

- Electrical isolation between input, output and auxiliary power: prevents measurement value distortion caused by potential transfer.
- Hand-held FSK compatible terminal can be connected to separate terminals: allows for interaction with “intelligent” measuring transducers with 2-wire connection which utilize FSK technology and HART or a company-specific protocol.
- SINEAX: S17 housing for top-hat rail or wall mounting
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Article Number	Variant	Input/Output	Auxiliary Power	Housing
134 263	Non-Ex version, FSK compatible	4 to 20 mA	24 to 60 V AC/DC	S17
134 289			85 to 230 V AC/DC	
134 271	Intrinsically safe output signal, FSK compatible		24 to 60 V AC/DC	
134 297			85 to 230 V AC/DC	
134 346	Non-Ex version, FSK compatible		24 to 60 V AC/DC	B17
134 362			85 to 230 V AC/DC	
134 354	Intrinsically safe output signal, FSK compatible		24 to 60 V AC/DC	
134 370			85 to 110 V DC / 230 V AC	

Order other variants with complete order code in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX 808-1174 1A / SINEAX 808-1184 1A	134 263 / 134 289	TV 808-115/6/7/8 Le
SINEAX 808-1154 1A / SINEAX 808-1164 1A	134 271 / 134 297	
SIRAX 808-6174 1A / SIRAX 808-6184 1A	134 346 / 134 362	TV 808-615/6/7/8 Le
SIRAX 808-6154 1A / SIRAX 808-6164 1A	134 354 / 134 370	

SINEAX / SIRAX TV808-12/-62

Unipolar / bipolar isolating amplifier, non-Ex version

SINEAX TV808-12
in S17 Housing

SIRAX TV808-62
in B17 Housing

Isolating amplifier for electrical isolation of DC signals. Processing of unipolar, bipolar and live-zero signals, load boosting and signal conversion option.

A variant with one input and two outputs allows for splitting of the input signal into two electrically isolated output signals.

- Electrical isolation between inputs, outputs and auxiliary power: prevents measurement value distortion caused by potential transfer.
- Flexible: more than 250 different input and output combinations, can be configured with jumpers / minimal inventory
- Supply power monitoring with green LED
- SINEAX: S17 housing for top-hat rail or wall mounting
- SIRAX: B17 housing for plug-in installation to BP 902 rack

Article Number	Variant	Inputs/Outputs	Auxiliary Power	Housing
128 802	Inputs 1 and 2 outputs 1 and 2	0 to 20 mA	24 to 60 V AC/DC	S17
128 810			85 to 230 V AC/DC	
128 828	Input 1 and outputs 1 and 2		24 to 60 V AC/DC	
128 836			85 to 230 V AC/DC	
128 927	Inputs 1 and 2 outputs 1 and 2		24 to 60 V AC/DC	B17
128 935			85 to 230 V AC/DC	
128 943	Input 1 and outputs 1 and 2		24 to 60 V AC/DC	
128 951			85 to 230 V AC/DC	

Order other variants with complete order code in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX 808-1212 / SINEAX 808-1222	128 802 / 128 810	TV 808-12 Le
SINEAX 808-1213 / SINEAX 808-1223	128 828 / 128 836	
SIRAX 808-6212 / SIRAX 808-6222	128 927 / 128 935	TV 808-62 Le
SIRAX 808-6213 / SIRAX 808-6223	128 943 / 128 951	

SINEAX TV809

Programmable isolating amplifier

Isolating amplifier for electrical isolation of DC signals. Processing of unipolar, bipolar and live-zero signals, load boosting and signal conversion option.

Available with optional limit contact for monitoring the measured quantity.

- Measurement input, measurement output and limit value functions can be programmed with a PC
- Measurement output programmable within arrange of ± 20 mA or ± 10 V
- Input voltage to ± 1000 V
- Response characteristics can be scaled as desired, with reversal as well
- Input signal linearization is possible
- Measured values can be queried online and output can be PC controlled
- Auxiliary power monitoring and limit value indication with green LED
- Available as standard or Ex variant
- Serial interface
- P12 housing for top-hat rail mounting

Article Number	Variant / Measurement Input (without limit value signaling)	Screw-Type Terminal Clamps	Auxiliary Power
147 258	Standard variant (non Ex version), input signal programmable within a range of ± 1000 V or ± 100 mA or ± 1.5 mA	non-pluggable	24 to 60 V AC/DC
147 266			85 to 230 V AC/DC
147 274		pluggable	24 to 60 V AC/DC
147 282			85 to 110 V DC / 230 V AC
147 646	[EEx ia] IIC variants, input signal programmable within a range of ± 30 V (max. span: 30 V) or ± 100 mA or ± 1.5 mA	non-pluggable	24 to 60 V AC/DC
147 654			85 to 110 V DC / 230 V AC
147 662		pluggable	24 to 60 V AC/DC
147 670			85 to 110 V DC / 230 V AC

Order other variants with complete order code (809-.... ..) in accordance with the data sheet.
See data sheet for default configuration.

See pages 62 and 63 for configuration software and accessories.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX TV809	147 258 … 147 670	TV 809 Le

SINEAX TV819

Unipolar / bipolar isolating amplifier

Isolating amplifier for electrical isolation of DC signals. Processing of unipolar, bipolar and live-zero signals, load boosting and signal conversion option.

- Electrical isolation between input, output and auxiliary power
- Flexible: more than 250 different input and output combinations, can be configured with jumpers
- Supply power monitoring with green LED
- P12 housing for top-hat rail mounting

Article Number	Variant		Screw-Type Terminal Clamps	Auxiliary Power
	Input	Output		
146 838	4 to 20 mA	4 to 20 mA	non-pluggable	24 to 60 V AC/DC
146 846				85 to 230 V AC/DC
146 854			pluggable	24 to 60 V AC/DC
146 862				85 to 230 V AC/DC

Order other variants with complete order code (819-.... ...) in accordance with the data sheet.

Designation (standard devices)	Article Numbers/Features	Data Sheet No.
SINEAX TV819	146 838 … 146 862	TV 819 Le

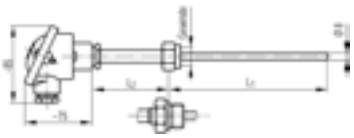
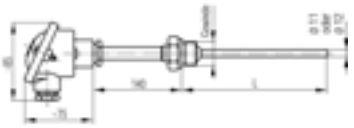
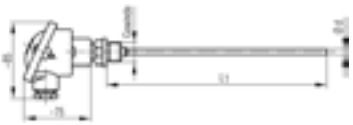
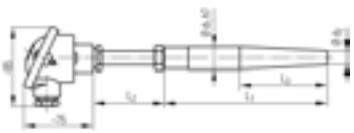
Thermocouples

GMCtherm types 240 through 261

GMCtherm thermocouples are used in practically all areas of industry. They also offer diverse options for use in motors, transformers, turbines, robots, piping systems, tanks, flue gas ducts, ovens and hardening baths.

- Measuring-insert variants with ceramic and steel protective tubes, including mounting and installation fixtures
- Special variants with noble-metal protective tube for glass melts
- Installation lengths from 160 to 2000 mm
- Temperature range from –200 to 1800 °C
- Optionally available with integrated 2-wire measuring transducer
- Available as standard or Ex variant

Thermocouple Characteristic Values

Type	Sketch	Variant	Thermo-couple [1]	Dimensions [mm]	Protective Tube Material	Working Temperature [°C] [2]	Process Interface
240		Standard Ex [3]	L J K	L = 100 to 500	1.4571	to +800	None, 15 mm stop flange or adjustable fitting
244		Standard	L J K S	L = 500 to 2000	1.4749 1.4762	to +1000	None, 22 mm stop flange or adjustable fitting
248		Standard Ex [3]	L J K	L_1 = 100 to 1110 L_2 = 140	1.4571	to +800	Sleeve nut (or threaded union) M20x1.5, G½ M18x1.5, M27x2, G¾
254		Standard Ex [3]	L J K	L_1 = 160 to 400 L_2 = 140	1.4571	to +800	Fixed fitting M20x1.5, G½A M27x2, G¾A
256		Standard	L J K	L_1 = 100 to1000 d = 3 to14	1.4571	–200 to +600	Fixed fitting M20x1.5, G½A
257		Standard Ex [3]	L J K	Dimension L1: L3, d1 and d2 per DIN 43 772 (weld-in protective tube, e.g. type D4) L1 = 200, L3 = 65, d1 = 24, d2 = 12.5, L2 = 140	1.4571 1.7335	to +800	Weld-in
260		Standard	L J K	L = 100 to 2000	1.4571	to +800	For laboratory use or installation into protective fixtures
261		Standard Ex [3]	L J K	L = 100 to 2000	1.4571	to +800	For laboratory use

Other dimensions and materials upon request

[1] Standard values for L per DIN 43 710, for J, K and S per DIN EN 60 584
[2] Working temperature depends upon thermocouple and protective tube material.
[3] BUZ type terminal housing for Ex version

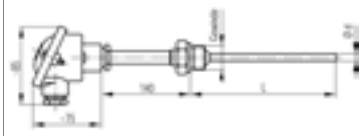
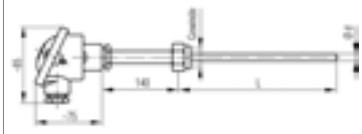
Sheathed Thermocouples

GMCtherm types 270 through 285

Flexible temperature sensors for use at difficult to access measuring points and where high mechanical stressing occurs

- Also available as measuring insert, and with protective tube and mounting fixture
- Diameters: 0.5 to 6 mm
- Temperature range: –200 to 1200 °C (types K and J)
- Optionally available with integrated 2-wire measuring transducer
- Available as standard or Ex variant

Sheathed Thermocouple Characteristic Values

Type	Sketch	Variant	Thermo-couple [1]	Dimensions [mm]	Protective Tube Material	Working Temperature [°C] [2]	Process Interface
270		Standard Ex [3)]	L J K	1.5 dia.: L max. 30000 2.0 dia.: L max. 40000 3.0 dia.: L max. 40000 4.5 dia.: L max. 18000 6.0 dia.: L max. 10000	1.4541 1.4571 1.4841 2.4816	-200 to +1000	Fixed fitting M20x1.5, G½A
271		Standard Ex [3]					Sleeve nut M20x1.5, G½A
272		Standard Ex [3]		Dimensions L_1, L_2, d_1 and d_2 per DIN 43 772 (weld-in protective tube, e.g. type D4) L_1 = 200, L_3 = 65 d_1 = 24, d_2 = 12.5 L_2 = 140	1.4571 1.7335	-200 to +800	Weld-in protective tube
273		Standard Ex [3]		1.5 dia.: L max. 30000 2.0 dia.: L max. 40000 3.0 dia.: L max. 40000 4.5 dia.: L max. 18000 6.0 dia.: L max. 10000	1.4541 1.4571 1.4841 2.4816	-200 to +1000	None, solder-on or adjustable fitting
282		Standard					None, solder-on or adjustable fitting Push-in connector upon request
285		Standard					None (for installation into protective fixtures or for laboratory use), solder-on or adjustable fitting

Other dimensions and materials upon request

[1] Standard values for L per DIN 43 710, for J, K and S per DIN EN 60 584
[2] Working temperature depends upon thermocouple and protective tube material.
[3] Type BUZ terminal housing for Ex version
Other variants upon request

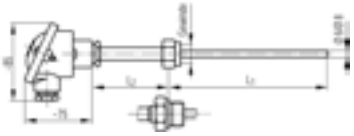
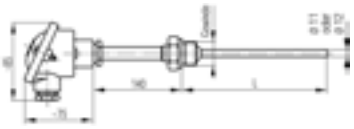
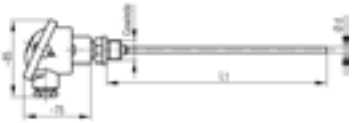
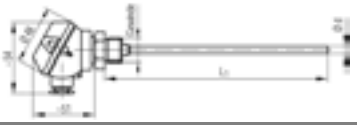
Resistance Thermometers

GMCtherm types 340 through 373

Temperature measurement in liquids and gases in tanks, piping systems and apparatus. Temperature measurements at surfaces, encapsulated miniature sensors with and without connector cable, variants for various climatic categories

- Measuring inserts and complete thermometers in standard fixtures and special variants with custom tolerances
- Diameters from 3 to 24 mm
- Temperature range: –200 to 600 °C
- Optionally available with integrated 2-wire measuring transducer
- Available as standard or Ex variant

Resistance Thermometer Characteristic Values

Type	Sketch	Variant	Sensor [1]	Dimensions [mm]	Protective Tube Material	Working Temperature [°C] [2]	Process Interface
340		Standard Ex [3]	Pt 100, Pt 500, Pt 1000 or as requested, single or double, accuracy class A, B or as requested, 2, 3 or 4-wire connection, various temperature ranges	L = 500 to 2000	1.4571	–200 to +600	None, 15 mm stop flange or adjustable fitting
348		Standard Ex [3]		L_1 = 100 to 1150 L_2 = 140			Sleeve nut (or threaded union) M20x1.5, G½ M18x1.5, M27x2, G¾
354		Standard Ex [3]		L_1 = 160 to 400 L_2 = 140			Fixed fitting M20x1.5, G½A, M27x2, G¾A
357		Standard Ex [3]		Dimensions L_1, L_3, d_1 and d_2 per DIN 43 772 (weld-in protective tubes, e.g. type D4) L_1 = 200, L_3 = 65 d_1 = 24, d_2 = 12.5 L_2 = 140			Weld-in
360		Standard		L = 100 to 2000			For laboratory use or installation into protective fixtures
361		Standard Ex [3]					For laboratory use
372		Standard Ex [3]		L_1 = 100 to 1000 d = 3 to 14			Fixed fitting M20x1.5, G½A
373		Standard					

Other dimensions and materials upon request

[1] Standard values for L per DIN 43 710, for J, K and S per DIN EN 60 584
[2] Working temperature depends upon thermocouple and protective tube material.
[3] Type BUZ terminal housing for Ex version

SIRAX BP902

Equipment rack for SIRAX plug-in modules

SIRAX BP 902-111/211

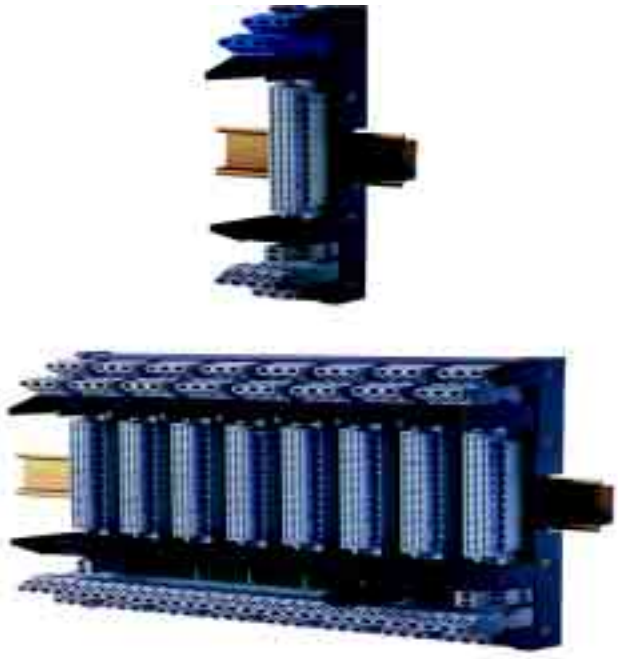
Equipment rack with space for 1 or 8 SIRAX plug-in modules.
Establishes connections between inserted plug-in modules and external terminals, which are in turn connected at the field and process control levels.

- Equipment rack with 1 or 8 slots
- For installation of Ex and non-Ex SIRAX modules
- With coding device for prevention of incorrect insertion
- For mounting to 35 mm top-hat rail per EN 50 022

Article Number	Variant	Number of Slots	Electrical Connections
120 038	Standard	1	Screw terminals
120 054		8	
120 046	[EEx ia] IIC	1	
120 062		8	

Designation	Article Numbers/Features	Data Sheet No.
SIRAX BP902-111 / SIRAX BP902-181	120 038 / 120 054	BP 902 Le
SIRAX BP902-211 / SIRAX BP902-281	120 045 / 120 062	

SIRAX BP 902-181/281



19" Rack

Component parts for BT901 19" rack

Our full spectrum of component parts for 19" racks including blanking plates, mating-plug mounting kits, mating plugs for voltage and current, plug coding accessories, multi-plugs and sockets, clamping parts and terminals can be found in our price list, as well as in data sheet number BT 901 Ld.

Configuration Software

Configuration software on CD ROM

Measuring transducers can be freely configured with this software.

V600, VC 600, V600 plus:

- Query the configuration stored at the measuring transducer and print it out in report form.
- Query and visualize electrical terminal assignments (for measured quantity, output signal, contact output and auxiliary power).
- Simulate measured value, underflow, overflow and sensor failure, and control corresponding output signal characteristics.
- Adjust zero-point and measuring span.
- Display the current measured value at the monitor.

V600 plus:

- Visualize, save and print out measured values.
- Activate password protection.

TV800 plus:

- Measurement input (current, voltage, measuring range), measurement output (current, voltage, output range) and relay functions can be programmed with a PC.
- Programmable input filter
- Response characteristics can be scaled as desired, with reversal as well.
- Input signal linearization is possible.
- Measured values can be queried online and output can be PC controlled.
- Limit values can be set at the relay (optional).

DME4, M560:

- Read out measuring transducers and print reports.
- Display all measurable quantities.
- Simulation of analog outputs (RS 232)
- Print serial plates.
- Display: analog output values, measured bus values from the addressed transducer
- Switching options: frequency measurement via the current or the voltage path
- Slave pointer reset option for output quantities and measured bus quantities (RS 485)
- Selection of measured quantities from up to 4 internal meters
- Password protection for selected functions
- Programming files can be archived
- Read-out and display of programming parameters for the connected transducer, or the addressed device with RS 485

M560:

- Visualization of measured values in recorder format with subsequent analysis mode (data file can also be imported to Excel)
- Measured value display at the monitor
- Graphic representation of response characteristics for each output

Software	For Following Devices:	Required Operating System
M 1000	SINEAX M 1000	Windows 3.1x, 95, 98, ME, NT, 2000 or XP
DME 4	SINEAX/EURAX DME 4xx	Windows 3.1x, 95, 98, ME, NT, 2000 or XP
M 560	SINEAX M 563	Windows 3.1x, 95, 98, ME, NT, 2000 or XP
V 600	SINEAX/ EURAX VC 603/V 604/ SIRAX V 644	DOS
VC 600	SINEAX/ EURAX VC 603, V 604/ SIRAX V 644	Windows 3.1x, 95, 98, ME, NT, 2000 or XP
V 600 *plus*	SINEAX VK 616, VK 626, V 608,V 624	Windows 95, 98, ME, NT, 2000 or XP
TV 800 *plus*	SINEAX TV 809	Windows 95, 98, ME, NT, 2000 or XP
2W2	KINAX 2W2	Windows 95, 98, ME, NT, 2000 or XP

Designation	Article Numbers/Features	Data Sheet No.
Configuration software	146 557	–

METRAwin 10/DME440, 401

Analysis software

Special software for the analysis of measured values which can be queried via the RS 485 MODBUS interface.

- Simultaneously acquires up to 10 measured values, can be queried from selected measuring transducers, with date and time, minimum and maximum values can be reported as well.
- Continuous recording of up to 4 measured values (y/t graph)
- Digital display of up to 4 measured values, can be switched to analog pointer display
- Freely selectable sampling interval for acquiring measured values
- Measured values can be printed in tables or as characteristic curves
- Recorded values can be exported to other Windows programs and saved
- Simple, clear-cut parameters configuration
- Recordings can be saved and analyzed at a later point in time
- Selected values can be saved for frequently used configurations

Designation	Article Numbers/Features	Data Sheet No.
METRAwin 10/DME440, 401 software	128 373	–

PK610, PRKAB600/560, RS232

Programming cables and auxiliary cables

Programming cables are used in combination with PC software and a PC in order to program measuring transducers. Data are transmitted in half-duplex mode.

- Programming is possible with or without auxiliary power terminals at the measuring transducer.
- Programming for standard and Ex variant measuring transducers

Type	For the Following Devices						Article Number
	VK616 2W2	V608 V624	VC603 V604 V644	TV809	M563	DME4	
Programming Cable							
PK 610(Ex)	●	●					137 887
PRKAB 600 (Ex)			●	●			147 787
PRKAB 560 (NEx)				●	●		147 779
RS 232						●	980 179
Auxiliary Cable							
1.5 m	●						141 440
2.0 m		●					141 416
1.5 m			●				988 058
1.5 m				●	●		143 587

Designation	Article Numbers/Features	Data Sheet No.
PK610(Ex) programming cable	137 887	PK 610 Le
PRKAB600 (Ex) programming cable	147 787	PRKAB 600 Le
PRKAB560 (NEx) programming cable	147 779	–
RS 232 programming cable	980 179	–
Auxiliary Cable	141 440	–
Auxiliary cable	141 416	–
Auxiliary cable	988 058	–
Auxiliary cable	143 587	–

Operating Instructions

Operating instructions for programming cables

Designation	Article Number	Data Sheet No.
Operating instructions for PK610 (Ex) programming cable	141 987	–
Operating instructions for PRKAB600 (Ex) programming cable	991 259	–
Operating instructions for PRKAB560 (NEx) programming cable	146 599	–

Controllers and Control Systems – Overview

												
Series	Analog Controllers		Replacements for Analog Controllers, 96 x 96			Compact Controllers						Controller Module
Designation (type)	GTR0212	GTR0214	R2080	R2100	R2180	R2300	R2400	R2600	R2601	R2900	R0300	R6000
Replacement for			GTR0208	GTR0210	GTR0218							
Dimensions (mm) Height	96	96	96	96	96	24	48	96	48	96	96	160
Width	48	48	96	96	96	48	48	48	96	96	96	110
Depth	200	200	50	50/70	50	102	118	109	109	50/70	169	50
Control panel mounting	●	●	●	●	●	●	●	●	●	●	●	
Top-hat rail												●
Channels	1	1	1	1	1	1	1	1	1	1	2/4	8
2-step controller	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	●	●
3-step controller	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	●	●
Continuous-action controller	–	–	–	–	–	–	❍	❍	❍	❍	❍	❍
Step-action controller	–	–	–	–	–	–	❍	❍	❍	❍	●	●
Hot runner controller	–	–	–	–	–	–	–	–	–	–	●	●
Differential/slave controller	–	–	–	–	–	–	–	❍	❍	❍	–	●
Cascade controller	–	–	–	–	–	–	–	–	–	–	–	●
Input:												
Thermocouple	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	●
Pt 100	❍	❍	❍	❍	❍	●	❍	❍	❍	❍	❍	●
Standard signal	❍	❍	–	❍	–	●	❍	❍	❍	❍	❍	–
Output:												
Relay	❍	❍	❍	❍	❍	❍	●	●	●	❍	❍	–
Transistor	❍	❍	❍	❍	❍	❍	●	●	●	❍	❍	●
Alarms	❍	❍	❍	❍	❍	1	1	2	2	2	❍	●
Self-tuning	–	–	●	●	●	●	●	●	●	●	❍	●
Setpoint 2	–	–	–	–	–	–	●	●	●	●	●	●
Heating current monitoring	❍	❍	❍	❍	❍	–	●	●	●	●	–	●
Interface:												
Auxiliary power, V AC	110 120 220 240	110 120 220 240	110/240 110/220	110 120 220 240	110 120 230 240	100 to 240	24 115 230	24 115 230	24 115 230	110 to 230	24 110 230	–
Auxiliary power, V DC	–	–	–	–	–	24	24	24	24	–	–	24
Special features:												
Heating circuit monitoring							●	●	●	●		●
Ramp function						●	●	●	●	●		●
RS 232								❍	❍	❍	❍	●
RS 485								❍	❍	❍	❍	❍
Profibus DP								❍ Gateway		❍		❍
CAN / CANOpen												❍
DeviceNet												❍
MODBUS												❍
Ethernet												❍

● † default
❍ † order option

GTR0212

Compact analog controller, 48 x 96 mm, display for system deviation

The single-channel temperature controller is suitable for use in machinery and equipment manufacturing. The setpoint is adjusted with knurled knobs and is displayed in digital format.

The controller is equipped with the following features depending upon the ordered configuration:

- Two or three-step controller with PDPI control response
- Long (TV = 12 ... 120 s), medium (TV = 6 ... 75 ms) or short (TV = 1.2 ... 15 s) time response
- Max or Max-Min limit contact (with 2-step controllers only)
- Analog display of system deviation
- Electronic setpoint limiting
- Heating current limit value monitoring with displays and optocoupler outputs
- Switching output: relay (2 A / 250 V) or transistor (24 V / 10 mA)
- Switching status indicated with LED
- Manual deactivation of control outputs
- Sensor input for type J and K thermocouples, or Pt 100 (2-wire), or 5 mA / 20 mA direct current
- Auxiliary power: 110 V AC, 120 V AC, 220 V AC, 240 V AC
- Installation depth: 200 mm

Order desired variants with complete order code (GTR 0212 .. .. ..) in accordance with the price list.

Designation	Article Numbers/Features	Data Sheet No.
GTR0212	GTR0212	–

GTR0214

Compact analog controller, 48 x 96 mm, digital display for actual value

The single-channel temperature controller is suitable for use in machinery and equipment manufacturing. The setpoint is adjusted with knurled knobs and is displayed in digital format.

The controller is equipped with the following features depending upon the ordered configuration:

- Two or three-step controller with PDPI control response
- Long (TV = 12 ... 120 s), medium (TV = 6 ... 75 ms) or short (TV = 1.2 ... 15 s) time response
- Max or Max-Min limit contact (with 2-step controllers only)
- Digital display for actual value
- Heating current limit value monitoring with displays and optocoupler outputs
- Switching output: relay (2 A /250 V) or transistor (24 V / 10 mA)
- Switching status indicated with LED
- Manual deactivation of control outputs
- Sensor input for type J and K thermocouples, or Pt 100 (2-wire)
- Auxiliary power: 110 V AC, 120 V AC, 220 V AC, 240 V AC
- Installation depth: 200 mm

Order desired variants with complete order code (GTR 0214 .. .. ..) in accordance with the price list.

Designation	Article Numbers/Features	Data Sheet No.
GTR0214	GTR0214	–

R2080 / R2100 / R2180

Compact controller, 96 x 96 mm, with digital display for actual value and heating current

The R 2080, R 2100 and R 2180 temperature controllers replace the GTR 0208, GTR 0210 and GTR 0218 analog controllers, and assure long-term fulfillment of guarantee obligations in machinery and equipment manufacturing. Design, features, connection designations and controller performance have all been retained, allowing for extremely easy change-over to the new models which are described in a special set of operating instructions. Use of the most up-to-date technologies assures excellent ease of operation and display convenience, exemplary control quality, minimal wear and tear and ideal suitability for harsh environments.

- Harmonic-free PDPI control algorithm
- Self-tuning for ideal control parameters
- Digital displays for actual value and setpoint (manipulating factor, heating current)
- Setpoint can be keyed in
- Control outputs can be deactivated with a single keystroke
- R 2080: programmable limit values and setpoint limiting
- R 2100: programmable limit values
- R 2180: programmable limit value
- Sensor error display
- Heating current acquired via an external transformer
- IP 65 protection at front panel
- Extremely small installation depth of only 50 or 70 mm for R 2100 with limit contacts

R2080 order features:

- Two-step controller, two-step controller with limit contact, three-step controller without feedback loop with 1 or 2 limit contacts
- Medium (TV ~ 50 s) or short time response (TV ~ 25 s)
- Type L, J, K, R and S thermocouple, and Pt 100 (2-wire) measuring ranges
- 1st switching output: relay or transistor
- Auxiliary power: 110 / 220 V AC, 110 / 240 V AC

R2100 order features:

- Two-step or three-step controller
- Long (TV = 12 ... 120 s), medium (TV = 6 ... 75 s) or short (TV = 1 ... 15 s) time response
- Type L, J, K, R and S thermocouple, Pt 100 (2-wire) or direct current (5 mA, 20 mA) measuring ranges
- 1st switching output: relay or transistor
- 2 limit contacts (Min / Max)
- Open-circuit sensor fuse, direct and reverse-acting
- Auxiliary power: 110 V AC, 120 V AC, 220 V AC, 240 V AC

R2180 order features:

- Two-step controller, two-step controller with limit contact, three-step controller
- Long (TV = 12 ... 120 s), medium (TV = 6 ... 75 s) or short (TV = 1.2 ... 15 s) time response
- Type L, J, K, R and S thermocouple or Pt 100 (2/3-wire) measuring ranges
- 1st switching output: relay or transistor
- Auxiliary power: 110 V AC, 120 V AC, 220 V AC, 240 V AC

Accessories for R2080, R2100 and R2180:
Current transformer for acquiring heating current, top-hat rail mounting
3 inputs: article number GTZ4121000R0001
4 inputs: article number GTZ4121000R0002
Accessories for R2100 and R2180:
AW 10 balancing resistor for Pt 100 with 2-wire connection: article number GTY2560 003 R01

Order desired variants with complete order code (R2080 / R2100 / R2180 .. .. ..) in accordance with the data sheet.

Designation	Article Numbers/Features	Data Sheet No.
R2080	R2080	3-349-216-03
R2100	R2100	3-349-217-03
R2180	R2180	3-349-218-03

R 2300

Compact controller, 48 x 24 mm

The R2300 ultra-compact digital controller offers top functionality and flexibility. It is used primarily for controlling, displaying and monitoring temperatures in very small machines, devices and laboratory instruments, which are also used in harsh environments (IP 65). Control parameters are readily determined by means of self-tuning, and are used as the basis for the selected PID or PI algorithm.

- Two or three-step controller
- Universal input for thermocouples, Pt 100 and linear signals (mV, mA)
- Universal alarm monitoring with actuation suppression
- Heating circuit monitoring
- Setpoint ramps for increases and decreases
- Soft start function
- Order options for outputs and auxiliary power:
- 2 relay outputs, 1 relay output and 1 logic output or 2 logic outputs
- Auxiliary power: 100 to 240 V AC, 24 V AC / DC

Features:

A1: two or three-step controller, 2 relay outputs, A2: two or three-step controller, 1 relay output and 1 transistor output, C1: auxiliary power 100 to 240 VAC

Order other variants with complete order code (R 2300 .. .. ..) in accordance with the data sheet.

Article Number (standard devices)	Article Numbers/Features	Data Sheet No.
R 2300-V001	R2300A1C1	3-349-200-03
R 2300-V002	R2300A1C1	3-349-200-03

R2400 / R2600 / R2601

Compact controller: 48 x 48 mm, 48 x 96 mm, 96 x 48 mm

Digital control with analog operation: all parameters can be easily adjusted with a rotary knob. Especially positive feedback is being received for typical applications in machinery and equipment manufacturing. Even the basic version of the single-channel temperature controller with high performance PDPI algorithm and self-tuning offers exceptional functionality. The number of required variants is thus minimized, inventory costs are reduced and service calls are simplified.

The following functions can be activated or changed via software or DIP switch settings:

- Digital displays for actual value, as well as setpoint, manipulating factor and heating current
- Keys for manual operation
- Relay or transistor output
- 2nd setpoint with external activation
- Rising or falling setpoint ramp
- Regulated temperature becomes active in the event of sensor failure
- Heat circuit and heat current monitoring
- One limit contact with absolute / relative monitoring, actuation suppression, NC / NO contact
- Adapted for export markets: 230 V / 110 V, degrees Celsius / Fahrenheit

The controller is equipped with the following features depending upon the ordered configuration:

- Two and three-step controller, step-action controller, continuous action controller
- Type J, L, K, B, S, R and N thermocouple, and Pt 100 (2/3-wire) sensor input, or standard signals: 0/2 to 10 V and 0/4 to 20 mA
- Auxiliary power: 24 VAC, 24 VDC, 110 VAC/230 VAC
- R 2600/R 2601: RS232/RS485 communications interface

Features:

A1: three-step controller, 2 relay and 2 transistor outputs, A2: two-step controller, 1 relay and 1 transistor output, B1: thermocouple, C1: 230 V AC

Order other variants with complete order code (R2400/R2600/R2601 .. .. ..) in accordance with the data sheet.

Article Number (standard devices)	Article Numbers/Features	Data Sheet No.
R2400-V002	R2400A1B1C1	3-348-827-03
R2400-V001	R2400A2B1C1	3-348-827-03
R2400-V005	R2600A1B1C1	3-348-827-03
R2400-V006	R2600A2B1C1	3-348-827-03

Accessories:

- Current transformer for acquiring heating current, top-hat rail mounting
  GTZ 4121 000 R0001: 3 inputs (one 3-phase consumer or 3 single-phase AC consumers)
  GTZ 0501 000 E0001: 4 inputs (one 3-phase consumer + 1 single-phase AC consumers or 4 single-phase AC consumers)
- GTZ 0501 000 E0001: 48 x 96 mm blanking plate for control panel cutout
- R101A: Profibus interface for R2600, R2601 (connection of up to 31 controllers)
- R101C: Interbus S gateway for R2600, R2601 (connection of up to 31 controllers)
- Z220A: METRAwin 10 Software for R2600 and R2601 (programming, configuration and visualization software)

R2900

Compact controller, 96 x 96 mm

The R2900 temperature controller offers top functionality and flexibility with a minimal installation depth. The harmonic-free PDPI control algorithm ensures best possible results, and its control parameters are specified by means of self-tuning. IP 65 protection allows for use in harsh environments. Primary applications include temperature control in plastics processing and packaging machines, oven manufacturing and food processing.

- Digital displays for actual value, as well as setpoint, manipulating factor and heating current
- Keys for manual operation
- 2nd setpoint with external activation
- Rising or falling setpoint ramp
- Regulated temperature becomes active in the event of sensor failure
- Heat circuit and heat current monitoring
- Adapted for export markets: 230 V / 110 V, degrees Celsius / Fahrenheit

Order features:
Two-step, three-step, step-action and continuous action controller
Differential and follow-up control with second input
Sensor input: type J, L, K, B, S, R and N thermocouple and
Pt 100 (2/3-wire) or standard signals 0/2 to 10 V and 0/4 to 20 mA
Relay or transistor output
2 limit contacts with absolute / relative monitoring
Actuation suppression, NO / NC contact
RS 232 / RS 485 communications interface
Auxiliary power: 110 to 230 V AC, 24 V DC

Order desired variants with complete order code (R2900 .. .. ..) in accordance with the data sheet.

Designation	Article Numbers/Features	Data Sheet No.
R2900	R2900	3-349-202-03

GTR0300

Compact controller, 96 x 96 mm, 2/4-channel

The R0300 multi-channel controller with DDC algorithm is suitable for temperature control systems for injection molding, extruding, textruding, packaging and film blowing machines, and heating furnaces.

The standard version includes the following functions:

- Digital displays for actual value and setpoint
- 2-color bar graph display for system deviation
- Differential and follow-up control with 2-channel controllers only
- 2nd setpoint with external activation
- Regulated temperature becomes active in the event of sensor failure

The controller is equipped with the following features depending upon the ordered configuration:

- 2 or 4 control channels
- Two and three-step controller, step-action controller, continuous action controller, hot runner controller
- Actuating circuit for hot runner
- Relay or transistor output, self-tuning
- Two limit contacts: Min and Max, absolute / relative, NO / NC contact
- Sensor input: type J, L, K, S and R thermocouple or Pt 100 (2/3-wire) or standard signals 0/2 to 10 V and 0/4 to 20 mA
- RS 485 / TTY communications interface (20 mA)
- Auxiliary power: 24 V AC, 110 V AC, 120 V AC, 220 V AC, 230 V AC, 240 V AC

Order desired variants with complete order code (GTR0300 .. .. ..) in accordance with the data sheet.

Designation	Article Numbers/Features	Data Sheet No.
GTR0300	GTR0300	2-4.2-401.01

R6000

8-channel controller with rail mount housing

PROFIBUS

ETHERNET

MODBUS

DeviceNet

CAN/CANOpen

Temperature controller for machines and equipment with centralized control and display concept. Connection to a central controller via various fieldbus interfaces or with integrated service interface. Applications include plastic processing machines, semiconductor manufacturing processes, oven manufacturing, textile machinery, climate and environmental technology, packaging machines, food processing and process engineering.

The standard version includes the following functions:

- Extremely short cycle time: 100 ms for all 8 control zones
- Two and three-step controller, step-action controller, continuous action controller
- Harmonic-free PDPI controller, limit transducer, cyclic duration controller
- Fixed value, cascade, differential controller
- Hot runner control, water cooling
- Control parameter adaptation can be started at any time
- 2nd set of parameters
- Setpoint ramp
- Feed-forward control for the avoidance of overshooting and undershooting
- Control zones can be assigned to groups
- All zones can be deactivated as desired with internal or external signal
- Actual value management by groups for the avoidance of thermal stressing
- Absolute / relative limit value monitoring, actuation suppression, NO / NC contact
- 8 sensor inputs for thermocouples or Pt 100 can be configured individually per software
- Monitoring for sensor failure, cable interruption, polarity reversal and short-circuiting
- Regulated temperature becomes active in the event of sensor failure
- Resistant to interference caused by leakage current at thermocouples
- 16 binary inputs / outputs with short-circuit detection and self-restoring overload protection
- Inputs / outputs can be freely assigned to controller states, functions and channels
- Heating circuit monitoring without additional transformer
- Voltage-compensated heating current monitoring with external standard transformer
- Remote diagnosis with numerous monitoring functions
- RS 232 service interface for configuration and data exchange with free software
- 24 V DC power supply

Options:

- Additional 4 binary inputs / outputs or 4 continuous outputs
- Profibus DP, CAN CANOpen, CAN DeviceNet, RS 485 MODBUS, RS 485 EN 60870, Ethernet
- Screw-type or clamp-type terminal blocks

Accessories:

- Z306A remote cold junction (screw-type terminal block and temperature sensor)
- RS 232C interface cable (GTZ3241000R0001), 2 m long, connects PC to R6000
- Operating instructions: German Z307A, English Z307B, French Z307C, Italian Z307D

Features:
A0: 16 digital inputs / outputs
F2: Profibus DP

Order other variants with complete order code (R6000 .. .. ..) in accordance with the data sheet.

Article Number (standard devices)	Article Numbers/Features	Data Sheet No.
R6000-V001	R6000A0F2	3-349-157-03

Pro-face GP2301

Control terminal for R6000 with STN color display: 320x240 pixels and 64 colors

MODBUS

The control terminal is connected to the R6000 via the Modbus and the standard version displays actual value, setpoint, on-time, on-off and status.
Setpoints can be entered and all parameters can be configured using the touch-screen.

- 5.7" (14.5 cm) graphic control terminal
- STN color display: 320 x 240 pixels and 64 colors
- Touch-screen
- IP 65 protection
- Modbus

Standard version:

- For connection to a controller
- Separate menus for each control loop for the display and setup of control parameters, controller function and configuration, temperature parameters and status messages
- Separate menu for display and setup of the output configuration
- Overview display for all 8 control loops including actual vale, setpoint, on-time, on-off and status
- Trend display for all 8 control loops including a bar graph for system deviation and on-time, and a numeric display for actual value and setpoint

Options:

- Customer-specific adaptation of the standard variant
- GP-PRO/PBII developmental software for the creation of individualized applications

Designation	Article Numbers/Features	Data Sheet No.
Control terminal for R6000	Pro-face GP2301	–

ESA VT505W

Control terminal for R6000 with STN graphics display: 4 blue tones

MODBUS

The control terminal is connected to the R6000 via the Modbus and the standard version displays actual value, setpoint, and status.
The setpoint is entered at the touch-screen. The R6000 device and parameters configuration is entered via the integrated service interface using the configuration tool during initial start-up.

- 5.6" (14.2 cm) graphic control terminal
- STN graphics display: 320x240 pixels, 4 blue tones
- Touch-screen
- IP 65 protection
- Modbus

Standard version:

- For connection to a controller
- Overview display for all 8 control loops including actual value and setpoint
- Separate display for each control loop including actual value, setpoint, on-time, alarm status, manual / automatic operating mode and bar graph for setpoint and actual value

Options:

- Customer-specific adaptation of the standard variant
- VTWIN developmental software for the creation of individualized applications

Designation	Article Numbers/Features	Data Sheet No.
Control terminal for R6000	ESA VT505W	–

Service, DKD Calibration Laboratory

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- **Assures** traceability of measured quantities to SI units
- **Calibration** of working standards, as well as on-site calibration stations and test equipment monitoring

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- Calibration of measuring instruments and calibrators:
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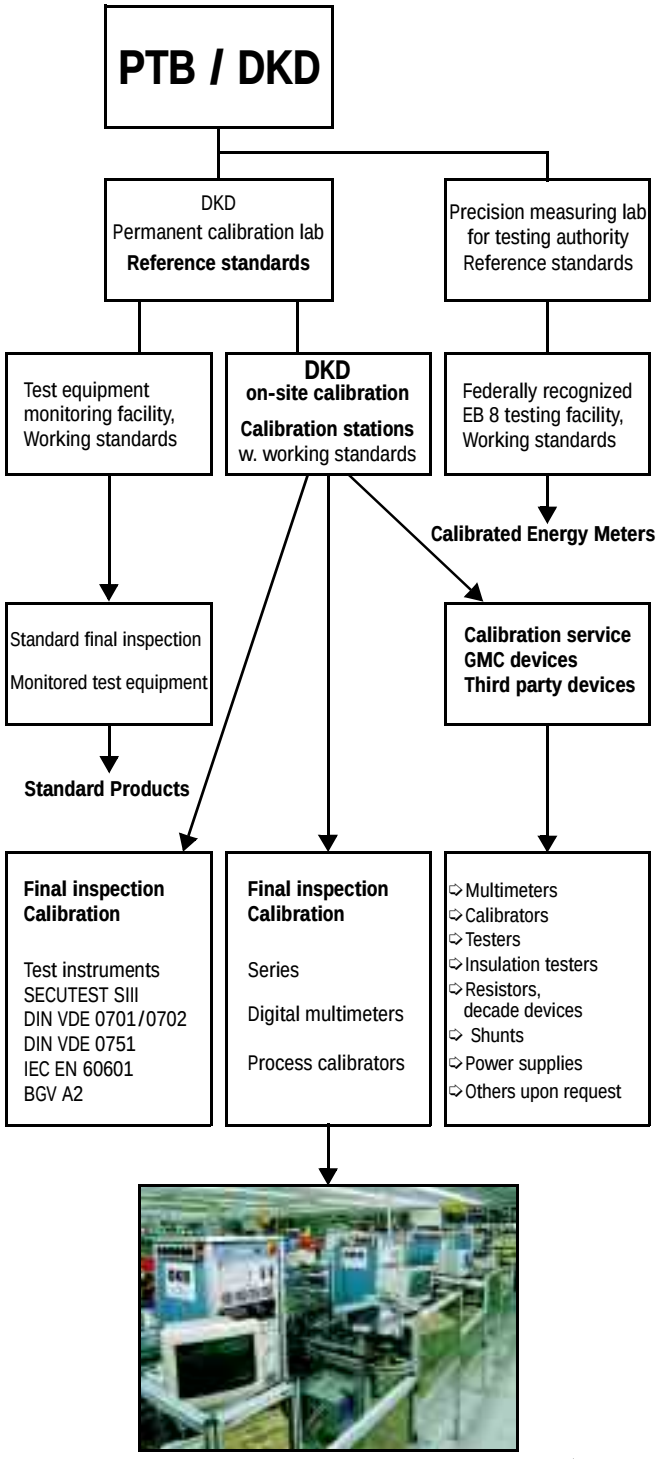
- Calibration of special measuring equipment, for example:
  – Shunts by means of current-voltage method
  – High-value resistance, 30 GΩ with U_M = 5000 V

Accredited Quantities

Calibration of Measuring Instruments	Smallest Specifiable Measuring Uncertainty	
	To	Relative
Direct voltage	1100 V	6.3×10^{-6}
Fixed value for artifact calibration	10 V	1.5×10^{-6}
Direct current value	11 A	5.3×10^{-5}
Ohmic resistance	100 MΩ	3×10^{-6}
High value ohmic resistance	30 GΩ / 1000 V	60×10^{-6}
Alternating voltage	1100 V / 100 kHz	1.2×10^{-4}
Alternating current value	11 A / 10 kHz	3×10^{-4}
Fixed value capacitance	2.8 nF ... 30 mF	3×10^{-3}
Frequency	1 MHz	5×10^{-6}
Temperature indication, resistance thermometers	850 °C	2×10^{-5}
Temperature indication, thermocouples	2000 °C	2×10^{-3}
Calibration of Power Supplies		
Direct voltage	1100 V 10000 V	5.3×10^{-6} 3.5×10^{-3}
Direct current value	11 A	1.3×10^{-5}
Ohmic resistance	200 MΩ	11×10^{-6}
High value ohmic resistance	30 GΩ / 1000 V	60×10^{-6}
Alternating voltage	1100 V / 300 kHz 10000 V / 50 Hz	45×10^{-6} 4.5×10^{-3}
Alternating current value	11 A / 10 kHz	1×10^{-4}
AC active power	500 V / 20 A	2×10^{-4}
AC apparent power	500 V / 20 A	2×10^{-4}
DC power	1000 V / 11 A	1×10^{-4}
Fixed value capacitance	2.8 nF ... 30 mF	3.5×10^{-3}
Frequency	1 MHz	3×10^{-6}

Standards Hierarchy



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Measurements for testing safety measures in power installations per DIN VDE 0100/0105, BGV A2	GTT1210	2 days
Efficient periodic testing of electrical equipment according to requirements set forth by BGV A2	GTT 1211	2 days
Periodic testing of electrical equipment by “trained persons” according to requirements set forth by BGV A2	GTT 1212	1 day
Safety tests for medical devices with SECUTEST S III and SECUTEST 0751/601 test instruments	GTT 1213	1 day
Safety tests for electrically operated hospital beds	GTT 1214	1 day
Measurements for testing electrical equipment at machinery per DIN VDE 0113 (EN 60204)	GTT 1215	1 day
Measuring with Multimeters		
Safe, efficient measurements in hazardous environments and recording with category IV multimeters (METRA*Hit* 22-29 + METRAwin 10 software)	GTT 1219	1 day
Software for SECUTEST and PROFITEST Test Instruments		
PS3 user software in combination with SECUTEST 0701/0702 S II und SECUTEST S III test instruments – basic training plus entry, documentation and management of test and device data for electrical devices (test management)	GTT1224A	1 day
PS3 user software in combination with PRO*Fi*TEST 0100S II and PRO*Fi*TEST C test instruments – basic training plus entry, documentation and management of test and device data for electrical devices (test management)	GTT 1224B	1 day
PS3 user software in combination with the PROFITEST 0204 test instrument – basic training plus entry, documentation and management of test and device data for electrical devices (test and repair management)	GTT 1224C	1 day
PS3 user software in combination with PRO*Fi*TEST 0100S II, SECUTEST 0701/0702 S II, SECUTEST S III and PROFITEST 0204 test instruments – basic training plus entry, documentation and management of test and device data for electrical devices (test management)	GTT 1226	1 day
Power Disturbance Analysis		
Power disturbance analysis, as well as power and energy analysis with the Mavowatt 45 and Metrawin 45 software	GTT 1641	2 days
Power disturbance analysis, as well as power and energy analysis with the Mavolog 10	GTT 1642	1 day
Control Technology		
Digital controllers, designs and applications	GTT 1440	1 day
Measuring Transducers, Multifunctional Power Meters		
Safe efficient measurement of heavy current quantities in the fields of energy distribution, monitoring, regulation and energy control technology – basic introduction, introduction to fieldbus technology (MODBUS, LON, PROFIBUS)	GTT 1510	1 day
Energy Measuring Technology		
The ECS energy control system, installation and configuration	GTT 1612	1 day
Explosion Protection		
Explosion protection based upon intrinsically safe measuring and control equipment per RL 94/9/EG (ATEX) and revised standards	GTT 1050	1 day

Index: Designations / Standard Models

Index: Article Numbers / Features

Measuring Technology – Universal	Voltage Quality – Energy – Power Field Measuring Systems, Cable Detection Devices Resistance Thermometers / Clip-On Measuring Instruments Digital Multimeters Analog Multimeters Multimeter Accessories Calibrators Temperature Measuring Instruments
Test Technology – Electrical	Testing Electrical Installations & Equip. (permanently installed) Testing Electrical Devices (portable) Testing Electrical Machinery Earthing, Insulation, Low-Resistance Workshop Test Panels AS Interface Test Instruments
Measuring Technology – Industrial	Measuring Transducers for Universal Use Measuring Transducers for Electrical Quantities Temperature Measuring Transmitters Measuring Transducers for Angle of Rotation DC Signal Isolators, Isolating Transformers Power Packs, Mounting Racks Isolating Switch Amplifiers, Isolating Amplifiers Valve Control Modules, Limit Value Indicators Ex-i Equipment
Energy Management	Energy Meters, Summators, Additional Components Power – Energy – Voltage Quality ECS – Energy Control System Energy Management – Engineering Competent Project Management Partner
Power Supplies	Laboratory Power Supplies, OEM Power Supplies
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International Sales

BELGIUM
SA GMC-Instruments Belgium NV
63 Chemin des deux Maisons, b.4
Tweehuizenweg 63, b.4
Buxelles B-1200 Brussel
Phone +32 2 762 9276
Fax +32 2 762 6176
e-mail: info@be.gmc-instruments.com

CZECH REPUBLIC
GMC - měřicí technika s.r.o.
Fügnerova 1a
CZ-67801 Blansko

Phone +420 506 410 905
Fax +420 506 410 907
e-mail: info@cz.gmc-instruments.com

FRANCE
GMC-Instruments France S.A.
5, rue Pasteur
F-91349 Massy Cedex

Phone +33 1 6920 8949
Fax +33 1 6920 5492
e-mail: info@fr.gmc-instruments.com

GREAT BRITAIN
GMC-Instruments (UK) Ltd.
Priest House, Priest Street
GB-Cradley Heath B64 6JN

Phone +44 1 384 63 8822
Fax +44 1 384 63 9168
e-mail: info@uk.gmc-instruments.com

ITALY
GMC-Instruments Italia S.r.l.
Via Carlo Cattaneo, 9
I-20035 Lissone (MI)

Phone +39 39 245 9080
Fax +39 39 245 9088
e-mail: info@it.gmc-instruments.com

NETHERLANDS
GMC-Instruments Nederland B.V.
Daggeldersweg 18
NL-3449 AH Woerden

Phone +31 3484 211 55
Fax +31 3484 225 28
e-mail: info@nl.gmc-instruments.com

SPAIN
Electromediciones Kainos, S.A.
Poligon Industrial Est, Energía, 56
E-08940 Cornellá de Llobregat
Barcelona
Phone +34 934 742 333
Fax +34 934 743 470
e-mail: info@es.gmc-instruments.com

SWITZERLAND
GMC-Instruments Schweiz AG
Glattalstrasse 63
CH-8052 Zürich

Phone +41 1 302 3535
Fax +41 1 302 1749
e-mail: info@ch.gmc-instruments.com

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German Sales
GMC-Instruments Deutschland GmbH
Thomas-Mann-Str. 16 - 20
90471 Nürnberg, Germany
Phone: +49 (0) 9 11 86 02–111
Fax: +49 (0) 9 11 86 02–777
e-mail: info@gmc-instruments.com
http://www.gmc-instruments.com

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