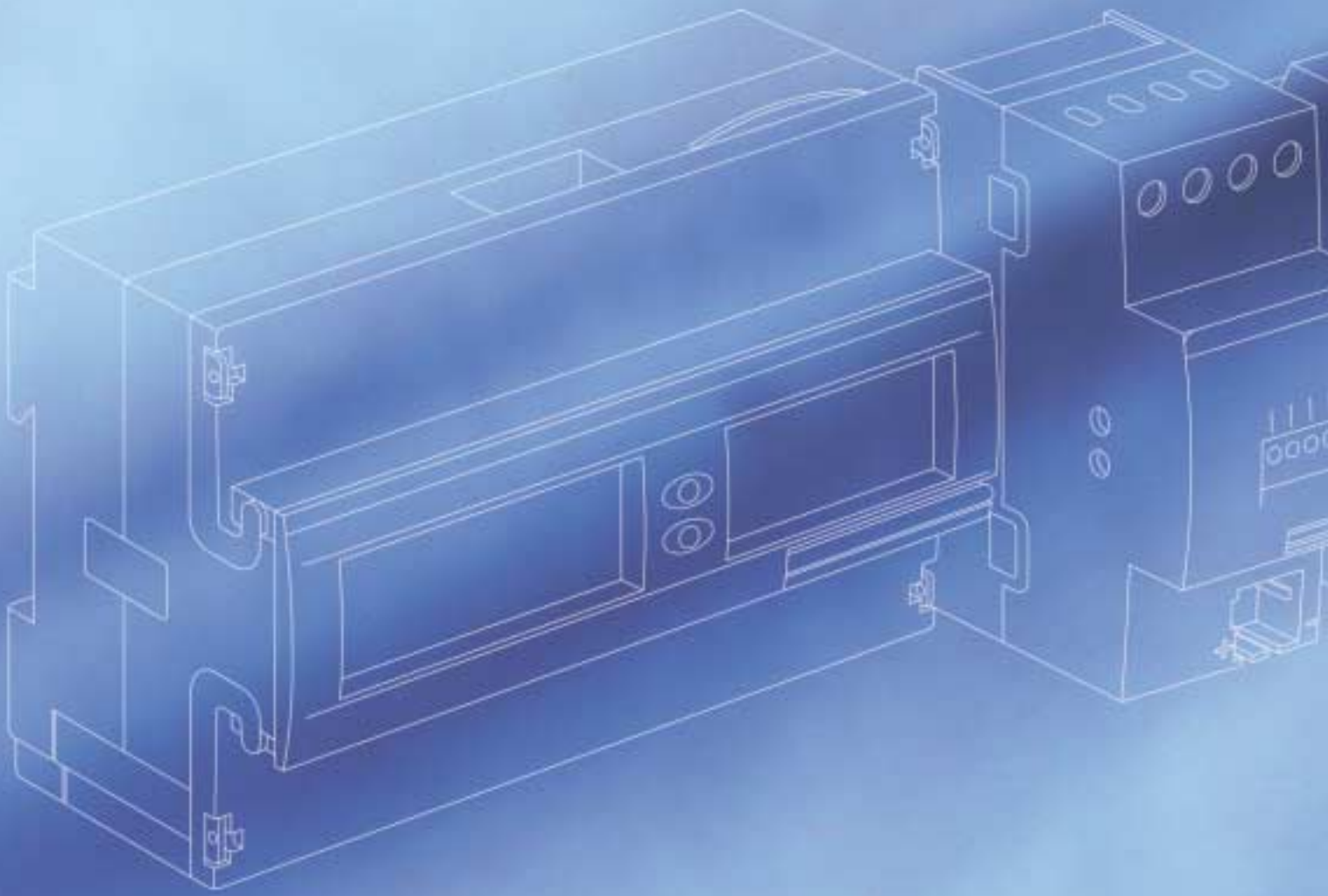
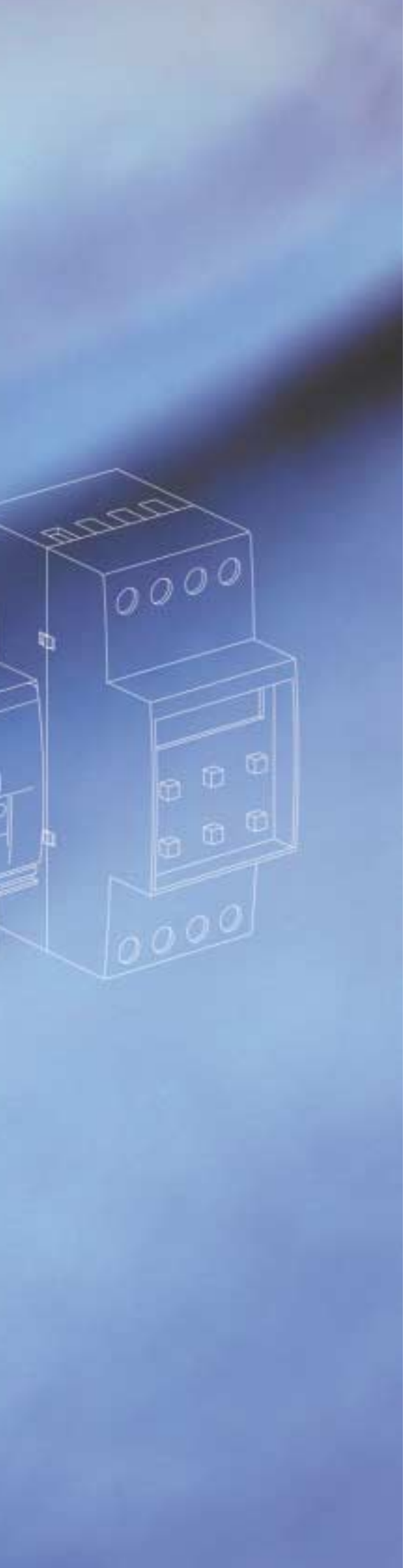
DELTAplus

DIN Rail Mounted electricity meters

Technical Documentation





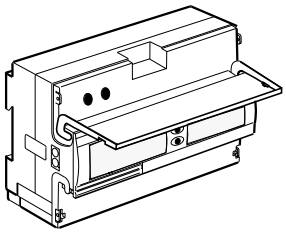
DELTAplus

Table of Contents

DELTAplus

DELTAplus

General Description



The DELTAplus Meter is an electronic electricity meter for DIN rail mounting in distribution boards or small enclosures. The meter is designed according to ABB's ProM standard.

Features

The DELTAplus Meter is easy to read with its LCD (Liquid Crystal Display) with 7 mm high digits and several symbols.
The meter has a polarity independent, solid state (semiconductor) relay that generates pulses proportionally to the measured energy.
A red LED (Light Emitting Diode) flashes proportionally to the energy measured. The DELTAplus Meter can be equipped with inputs or outputs for control and alarm handling as well as pulse counting. The meter is equipped with unique instrumentation functions enabling it to read the essential electrical units.

Communication

DELTAplus Meters with integrated EIB, M-bus or LON-bus communication, are easy to read remotely in a cost-effective way without conversions via traditional pulsed output. The DELTAplus meter is also equiped with an IR output that can be connected to the ABB Serial Communication Adapter.

Programming

Selection of the information in the LCD-display and programming of the DELTAplus Meter is performed via two programming buttons. These buttons can be sealed.

Installation check

An installation check that controls the installation runs all the time on all DELTAplus Meters.

Primary measurement function

The DELTAplus Meter offers a primary measurement function when connected to external voltage (VT) or current (CT) transformers. The VT and CT transformer ratios, can easily be set with the two programming buttons. This function enables the real energy consumtion to be displayed.

Type Approved

All DELTAplus Meters are type approved according to the international standards IEC61036 (for active energy) and IEC 61268 (for reactive energy). These standards cover all technical aspects, climate conditions, electromagnetic compatibility (EMC), electrical and mechanical requirements, and accuracy. The DELTAplus meter carries approval from ie. PTB, NMI and the Swedish National Testing and Research Institute, as a revenue classified meter.

Instrumentation

There are instrumentation functions in DELTAplus meters which enable it to read essential electrical units. This means that the user can read out the following from the DELTAplus meters:
-Power in kW
-Current in A
-Voltage in V
-Frequency in Hz
-Power factor

DELTAplus
Assortment

DELTAplus type designation key

Pos	1	2	3	4	5	6-8
Basic						
Standard	D/S					
Measuring						
Active - CT/VT connected		A				
Active - direct connected		B				
Active & reactive - CT/VT connected		C				
Active & reactive - direct connected		D				
Communication						
Pulses, Ir-port			B			
Mbus, Ir-port			M			
Lon, Ir-port			L			
EIB, pulses, Ir-port			E			
Accuracy						
Class 1				1		
Class 2 (DB...And DD...types)				2		
Voltage						
1 x 57-288 V					1	
3 x 100-500 V					2	
3 x 57-288 / 100-500V					3	
Optional functionality						
See ”type” columns for last digits						xxx

DELTAplus, main data

-Fully conform to IEC61036 (active energy) and IEC61268 (reactive energy)

-Direct connected	5(80)
-CT connected	1(6) can be used for transformers
-CT-VT ratios	programmable (up to 999 999)
-Accuracy	class 1 and 2
-Tariff	2 or 4
-Communication	pulse and/or serial
-Installation check	automatic
-Instrumentation	yes
-Display	7 digits
-IR output	yes
-Operating temperature	-40 C to +55 C

DIRECT Connected meters

Pulse/IR communication

VOLTAGE	TYPE	ARTICLE No.	ABB ID	MEASURING	CLASS	TARIFFS	I/O	ADD.PULSE OUTPUT
3x57-288/	DBB 23000	0980800	2CMA180800R1000	Active	2			
100-500	DBB 23001	0980811	2CMA180811R1000	Active	2	2		
	DBB 23002	0980813	2CMA180813R1000	Active	2	4		
	DBB 13000	0980801	2CMA180801R1000	Active	1			
	DBB 13001	0980812	2CMA180812R1000	Active	1	2		
	DDB 13000	0980810	2CMA180810R1000	Active & Reactive	1			
3x100-500	DBB 22000	0980802	2CMA180802R1000	Active	2			
	DBB 22001	0980815	2CMA180815R1000	Active	2	2		
	DBB 22002	0980803	2CMA180803R1000	Active	2	4		
1x57-288	DBB 21000	0980804	2CMA180804R1000	Active	2			
	DBB 21001	0980816	2CMA180816R1000	Active	2	2		
	DBB 21002	0980817	2CMA180817R1000	Active	1	2		
	DBB 11001	0980818	2CMA180818R1000	Active	1	2		

For other types, please contact Customer service

DELTAplus
Assortment
Direct connected meters

1

M-bus communication

VOLTAGE	TYPE	ARTICLE No.	ABB ID	MEASURING	CLASS	TARIFFS	I/O	ADD.PULSE OUTPUT
3x57-288/	DBM 23000	0980840	2CMA180840R1000	Active	2			
100-500	DBM 23001	0980850	2CMA180850R1000	Active	2	2		
	DBM 23002	0980851	2CMA180851R1000	Active	2	4		
	DBM 23070	0980852	2CMA180852R1000	Active	2			1
	DBM 23020	0980841	2CMA180841R1000	Active	2		2	
3x100-500	DBM 22000	0980842	2CMA180842R1000	Active	2			
	DBM 22001	0980853	2CMA180853R1000	Active	2	2		
	DBM 22002	0980854	2CMA180854R1000	Active	2	4		
1x57-288	DBM 21000	0980843	2CMA180843R1000	Active	2			

LON-bus communication

VOLTAGE	TYPE	ARTICLE No.	ABB ID	MEASURING	CLASS	TARIFFS	I/O	ADD.PULSE OUTPUT
3x57-28 /	DBL 23000	0980820	2CMA180820R1000	Active	2			
100-500	DBL 23003	0980829	2CMA180829R1000	Active	2	2		
	DBL 23004	0980830	2CMA180830R1000	Active	2	4		
	DBL 23070	0980821	2CMA180821R1000	Active	2			1
3x100-500	DBL 22000	0980822	2CMA180822R1000	Active	2			
	DBL 22003	0980831	2CMA180831R1000	Active	2	2		
	DBL 22004	0980832	2CMA180832R1000	Active	2	4		
1x57-288	DBL 21000	0980833	2CMA180833R1000	Active	2			

EIB communication

VOLTAGE	TYPE	ARTICLE No.	ABB ID	MEASURING	CLASS	TARIFFS	I/O	ADD.PULSE OUTPUT
3x57-288/	SBE 23000	99839053	2CMA139053R1000	Active	2			
100-500	SBE 23004	99839055	2CMA139055R1000	Active	2	4		
	SBE 13000	99839049	2CMA139049R1000	Active	1			
3x100-500	SBE 22000	99839052	2CMA139052R1000	Active	2			
1x57-288	SBE 21000	99839051	2CMA139051R1000	Active	2			

For other types, please contact Customer service

DELTAplus
Assortment
Transformer connected meters

Pulse/IR communication

VOLTAGE	TYPE	ARTICLE No.	ABB ID	MEASURING	CLASS	TARIFFS	I/O	ADD.PULSE OUTPUT
3x57-288/	DAB 13000	0980806	2CMA180806R1000	Active	1			
100-500	DCB 13000	0980808	2CMA180808R1000	Active & Reactive	1			
	DAB 13001	0980870	2CMA180870R1000	Active	1	2		
	DCB 13001	0980872	2CMA180872R1000	Active & Reactive	1	2		
	DAB 13002	0980871	2CMA180871R1000	Active	1	4		
	DCB 13002	0980873	2CMA180873R1000	Active & Reactive	1	4		
3x100-500	DAB 12000	0980807	2CMA180807R1000	Active	1			
	DCB 12000	0980809	2CMA180809R1000	Active & Reactive	1			
1x57-288	DAB 11000	0980819	2CMA180819R1000	Active	1			

M-bus communication

VOLTAGE	TYPE	ARTICLE No.	ABB ID	MEASURING	CLASS	TARIFFS	I/O	ADD.PULSE OUTPUT
3x57-288/	DAM 13000	0980844	2CMA180844R1000	Active	1			
100-500	DCM 13000	0980847	2CMA180847R1000	Active & Reactive	1			
	DAM 13001	0980855	2CMA180855R1000	Active	1	2		
	DAM 13002	0980856	2CMA180856R1000	Active	1	4		
	DAM 13070	0980845	2CMA180845R1000	Active	1			1
	DCM 13070	0980848	2CMA180848R1000	Active & Reactive	1			1
3x100-500	DAM 12000	0980846	2CMA180846R1000	Active	1			

LON-bus communication

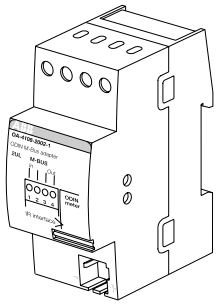
VOLTAGE	TYPE	ARTICLE No.	ABB ID	MEASURING	CLASS	TARIFFS	I/O	ADD.PULSE OUTPUT
3x57-288/	DAL 13000	0980823	2CMA180823R1000	Active	1			
100-500	DCL 13000	0980828	2CMA180828R1000	Active & Reactive	1			
	DAL 13003	0980834	2CMA180834R1000	Active	1	2		
	DAL 13004	0980835	2CMA180835R1000	Active	1	4		
	DAL 13070	0980824	2CMA180824R1000	Active	1			1
3x100-500	DAL 12000	0980825	2CMA180825R1000	Active	1			
	DCL 12000	0980836	2CMA180836R1000	Active & Reactive	1			
	DAL 12070	0980826	2CMA180826R1000	Active	1			1

EIB communication

VOLTAGE	TYPE	ARTICLE No.	ABB ID	MEASURING	CLASS	TARIFFS	I/O	ADD.PULSE OUTPUT
3x57-288/	SAE 13000	99839046	2CMA139046R1000	Active	1			
100-500	SCE 13000	99839056	2CMA139056R1000	Active & Reactive	1			
	SAE 13004	99839048	2CMA139048R1000	Active	1	4		
3x100-500	SAE 12000	99839045	2CMA139045R1000	Active	1			

For other types, please contact Customer service

1



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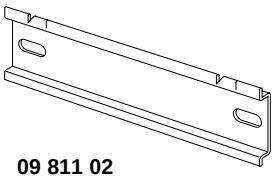

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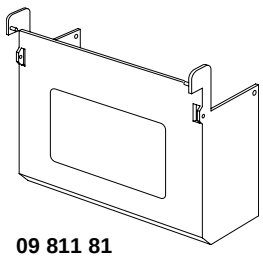

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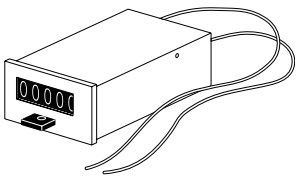

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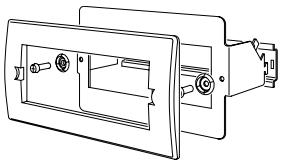

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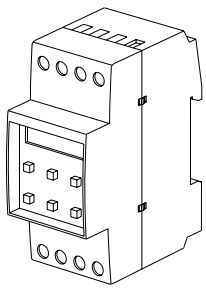

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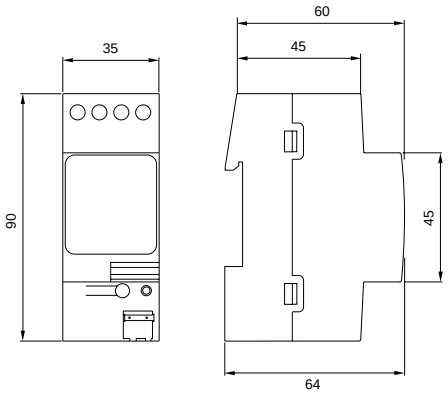
The table below, figures, and drawings describe the DELTAplus accessories.

ARTICLE No.	ABB ID	TYPE	APPLICATION	DRAWING
99 837 090	2CMA137090R1000	Serial Comm. Adapter	M-Bus	1
99 837 091	2CMA137091R1000	Serial Comm. Adapter	RS232	1
09 811 02	2CMA132540R1000	DIN-rail	Wall mounting	-
09 811 81	2CMA132633R1000	Long cover	Wall mounting	2
09 811 04	2CMA132541R1000	External counter	Panel mounting	3
09 811 84	2CMA132635R1000	Front mounting kit	Panel mounting	4
19 102 30	GHV210859R00224	Time switch clock for tariff control STT 227		-

D. 1



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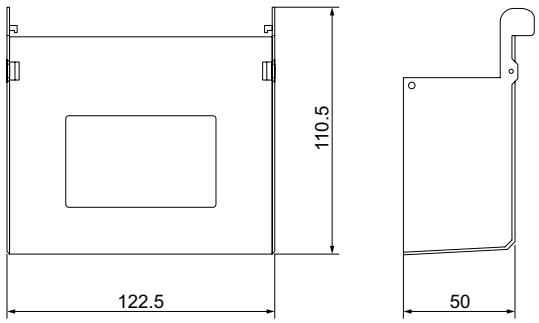

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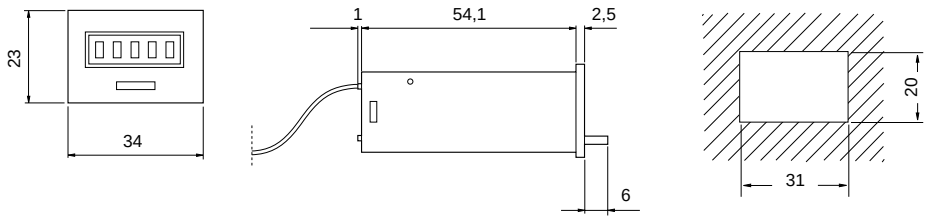

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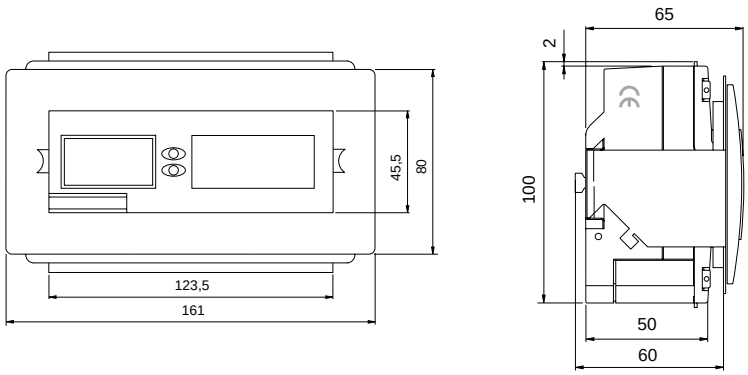


DELTAplus

Technical Data

	DIRECT CONNECTED METERS	TRANSFORMER-RATED METERS
VOLTAGE/CURRENT UNITS		
Voltage [V]	3 x 57-288 / 100-500 (4-wire) 3 x 100-500 (3-wire) 1 x 57-288 (Single phase)	3 x 57-288 / 100-500 (4-wire) 3 x 100-500 (3-wire) 1 x 57-288 (Single phase)
Voltage range	-20% to +15% of nominal voltage	-20% to +15% of nominal voltage
Power consumption of voltage circuits	< 3 VA, 2 W/phase	< 3 VA, 2 W/phase
Current [A]		
- base	5	1
- max	80	6
Starting current [mA]	< 20	< 2
Power consumption of current circuits	< 6 VA/phase	< 0.08 VA/phase
GENERAL DATA		
Frequency [Hz]	50/60 ± 5%	50/60 ± 5%
Standards	• IEC 61036 for active energy meters of class 1 and 2 • IEC 61268 for reactive energy meters of class 2 • Pulse output according to DIN 43864 (SO) IEC 62053-31	• IEC 61036 for active energy meters of class 1 and 2 • IEC 61268 for reactive energy meters of class 2 • Pulse output according to DIN 43864 (SO) IEC 62053-31
Display of energy	LCD with 7 digits, height 7 mm	LCD with 7 digits, height 7 mm
Accuracy	According to IEC 61036 Cl. 2 or Cl. 1	According to IEC 61036 Cl. 1
Voltage transformer ratio		1 - 9 999
Current transformer ratio		1 - 9 999
Maximum transformer ratio		CT x VT max = 999 999
Connection area [mm^2]:		
• Current terminals		0.5 - 10
• Voltage terminals	1.0 - 25	0.5 - 10
DIMENSIONS		
Width [mm]	122.5	122.5
Height [mm]	97	97
Weight [g]	337.5	303.5
DIN modules	7	7
ENVIRONMENT		
Resistance to heat and fire	According to IEC 60695-2-1: • Terminal 960 °C • Cover 650 °C	According to IEC 60695-2-1: • Terminal 960 °C • Cover 650 °C
Humidity	75% yearly average, 95% on 30 days/year	75% yearly average, 95% on 30 days/year
Protection against penetration of dust and water	According to IEC 60529: • IP20 on terminal block without protective enclosure	According to IEC 60529: • IP20 on terminal block without protective enclosure
Temperature range [°C]:		
•Operating	-40 to +55	-40 to +55
•Storing	-40 to +70	-40 to +70

2

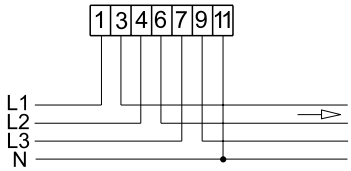
DELTAplus

Technical Data

	DIRECT CONNECTED METERS	TRANSFORMER-RATED METERS
PULSE OUTPUT		
Connection area [mm^2]	0 - 2.5 (For combined meters 0 - 0.5)	0 - 2.5 (For combined meters 0 - 0.5)
External pulse voltage [V]	0 - 247 AC/DC (polarity independent)	0 - 247 AC/DC (polarity independent)
Maximum current [mA]	0 - 100	0 - 100
Pulse length [ms]	100	100
Pulse frequency	Programmable	Programmable (primary registering)
VISIBLE PULSE INDICATOR		
Red LED with frequency [imp/kWh]	1000	5000 (secondary registering)
Pulse width [ms]	40	40
ELECTROMAGNETIC COMPATIBILITY (EMC)		
Impulse voltage test	6 kV 1.2/50µs (IEC 600-60)	6 kV 1.2/50µs (IEC 600-60)
Fast transient burst test [kV]	4 (IEC 61000-4-4)	4 (IEC 61000-4-4)
Radio frequency immunity	80 MHz - 1 GHz at 10 V/m (IEC61000-4-3)	80 MHz - 1 GHz at 10 V/m (IEC61000-4-3)
Immunity to conducted disturbance	150 kHz - 80 MHz (IEC61000-4-6)	150 kHz - 80 MHz (IEC61000-4-6)
Radio frequency emission	According to CISPR 22 class B	According to CISPR 22 class B
Electrostatic discharge (ESD) [kV]	15 (IEC 61000-4-2)	15 (IEC 61000-4-2)
MATERIAL		
Transparent front glass, bottom case, upper case and terminal cover	Polycarbonate	Polycarbonate
Terminal block	Glass-fibre reinforced polycarbonate	Glass-fibre reinforced polycarbonate
Protection class	II	II
Glow wire test	According to IEC 60 695-2-1	According to IEC 60 695-2-1
TARIFF INPUTS (OPTIONAL)		
Maximum voltage [V]	276 AC	276 AC
Maximum wire size [mm^2]	2.5	2.5
Input voltage range [V]	0 - 20 AC (“voltage off")	0 - 20 AC (“voltage off")
	57 - 276 AC ("voltage on")	57 - 276 AC ("voltage on")
Terminal wire area [mm^2]		
Lon and M-bus	0-2.5	0-2.5
EIB	0.5	0.5

DELTAplus

Wiring Diagrams and Pulses



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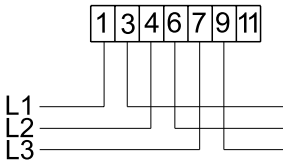

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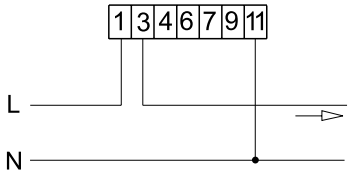

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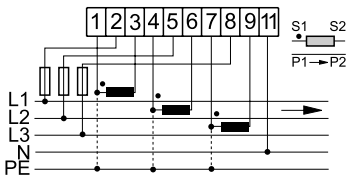
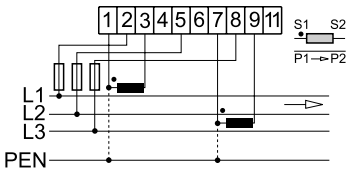
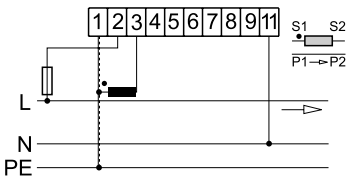


DAB13XXX



DAB12XXX



DAB11XXX

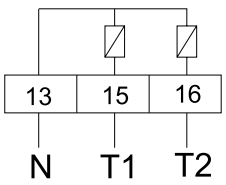


fig.1

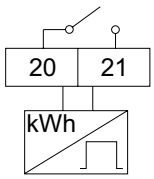


fig.2

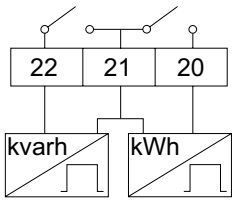


fig.3

Direct connected meters

Three phase system
With neutral conductor (see DBB23XXX)
Without neutral conductor (see DBB22XXX)
One phase system
With neutral conductor (see DBB21XXX)

Transformer rated meters

Three phase system
With neutral conductor (see DAB13XXX)
Without neutral conductor (see DAB12XXX)

One phase system
With neutral conductor (see DAB11XXX)

Tariff input
Tariff control by external power supply up to 230 V AC(see fig.1)
T1 = tariff input 1
T2 = tariff input 2

Pulse output

External power supply up to 247 V AC or DC.
Active energy meters (see fig.2)
Combined meters (see fig.3)

Tariff input

ACTIVE TARIFF	INPUT (T1)	INPUT (T2)
Tariff 1	0*	0
Tariff 2	1**	0
Tariff 3	0	1
Tariff 4	1	1

*0 means < 20V
**1 means > 57V - 276V

Pulse frequency

DIRECT CONNECTED METERS [IMP/KWH]	TRANSFORMER-RATED METERS [IMP/KWH PRIMARY REGISTERING]
	0.01
	0.1
1	1
10	10
100	100
500	500
640	640
1 000	1000
5 000	

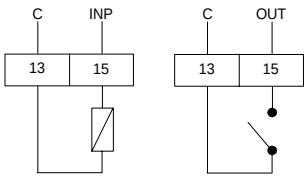
DELTAplus

with LON-bus and M-bus Communication

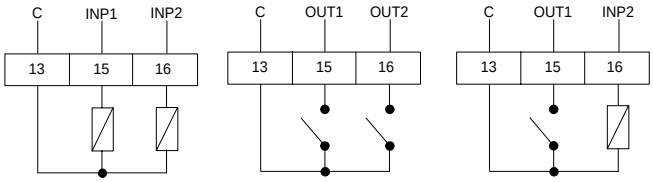
Inputs or Outputs (option)

The meter can be provided with inputs and outputs. The input can be used as a sabotage alarm or as a pulse counter, e.g., for a water meter. The output can be used as an ON and OFF function, for example to switch off the current by remote control. The inputs/outputs are of the opto-switch type and are galvanically isolated from other electronics in the meter. There are two input/output voltage variants; high and low, see technical data. Both variants are for AC/DC voltage and are polarity independent.

LON-bus



M-bus



Functions Inputs and Outputs

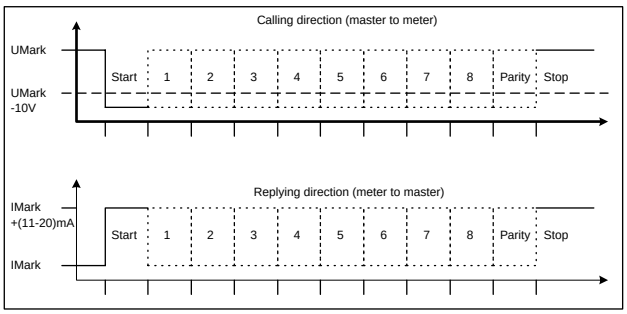
The input counts and stores pulses. The status can be read both via the bus and on the LCD display. The output can be controlled from a PC by switching ON and OFF and the status can be read at each transmission of data from the meter.

LON-bus Protocol

The software is compatible with LonMark 3.2 and uses the LonMark-profile Utility Data Logger 1.0. A description of network variables is noted in the DELTAplus User's Manual, which can be ordered from ABB.

M-bus Protocol

The protocol is based on international standard IEC 870. The bus system is adapted for remote reading of energy meters and works on the principle of master slave.

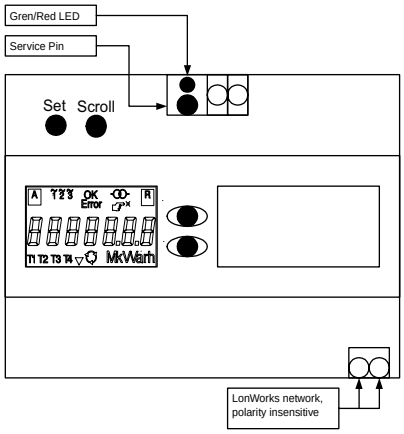


Technical Information

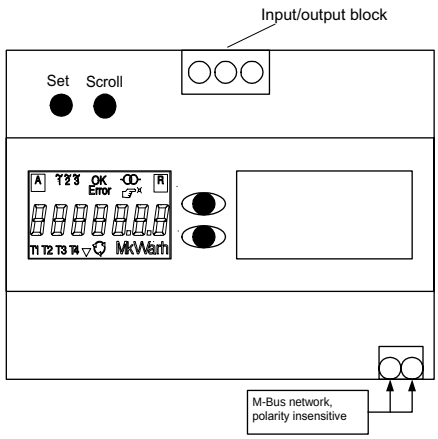
Operating and display elements: Service pin and LED. Bus interference: FTT-10A. Communication rate: 78 kbps.

A software clock is implemented in the Lon-interface to enable readings from the meter to be time-recorded. The clock is based on a timer in the Neuron and is to be set following a power failure. It copes with leap years but not daylight-saving time. The accuracy is ± 2 seconds per 24 hours.

Installation (LON-bus)



Installation (M-bus)



Instrumentation (Optional)

Read electrical units and functions, depending on type of DELTAplus meter.

DESCRIPTION
Active energy, total and per tariff
Reactive energy, total and per tariff
Transformer ratio
Status of inputs and outputs
Current and voltage per phase
Active power per phase and total
Reactive power per phase and total
Apparent power per phase and total
Power factor, line frequency
Status on installation check
Interruption counter for line voltage
Manufacturer and serial number

Technical data

INPUT	
Voltage range	0-40 V AC/DC 0-2 V no pulse count 4.5-40 V pulse count
Input resistance	8-13 kohm
Min. pulse length and pause	30 mS

OUPUT	
Voltage range	0-400 VDC, 0-282 V AC
Output resistance	12-36 ohm
Max. current	120 mA

DELTAplus

with EIB Communication

Additional EIB DELTAplus meter Features:

Integrated EIB communication interface

Remote reading of the following meter data:	Meter readings in Wh (varh) Current capacity W (var) Meter status and error information.
Control of the following meter functions:	Change of charges, synchronised inquiry of meter readings and Management of error information.
Network monitoring function:	Logging and display of up to 24 electrical measured variables.

Automatic check function for wiring with “installation self-test”.

Technical Data of EIB-Connection

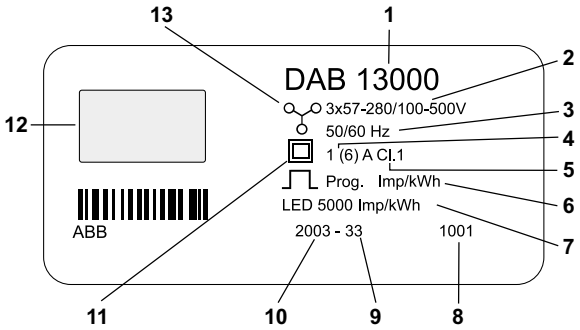
Network log:	ABB i-bus ® EIB (European Installation Bus)
ABB i-bus ® EIB connection:	Bus supply terminal at the front (top)
Number of participants:	Max. 64 per line (potential total of 14,000 participants)
Transmission medium:	Twisted pair, YCYM or J-Y(St)Y 2x2x0.8 mm
Line lengths:	Total length of single line ≤ 1,000 m -between two participants ≤ 700 m -between power supply and participant ≤ 350 m

For more technical details of the DELTAplus with EIB connection, please contact your local ABB EIB sales organisation.

DELTAplus

Symbols, Definitions and Dimensions

Type label



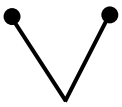
No.	SYMBOL	No.	SYMBOL
1.	Type designation	8	Serial number
2.	Voltage	9	Week of manufacture
3.	Frequency	10	Year of manufacture
4.	Nominal and max. current	11	Protective class
5.	Accuracy class	12	Approval symbols
6.	Pulse output frequency	13	Network type
7	LED frequency		

Symbols for electricity meters

Meters with 1 drive system

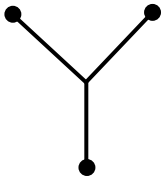
which have one current and one voltage coil (used for single phase 2-conductor circuits)

Meters with 2 drive systems



each with a voltage and current coil connected as per the two watt-meter method (used for the three phase 3-conductor circuits).

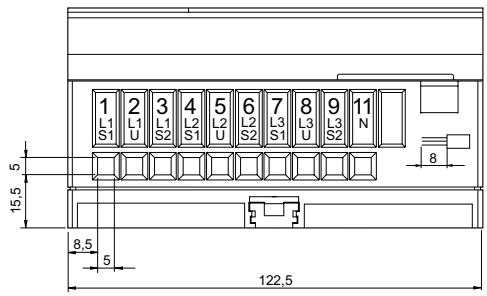
Meters with 3 drive systems



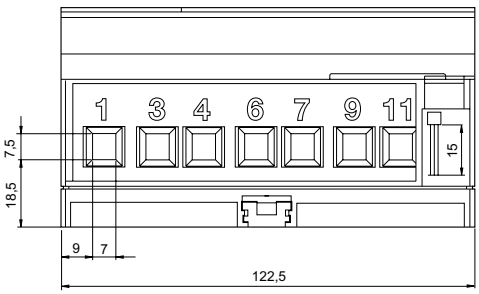
each with a voltage and current coil connected as per the three watt-meter method (used for the three phase 4-conductor circuits).

4

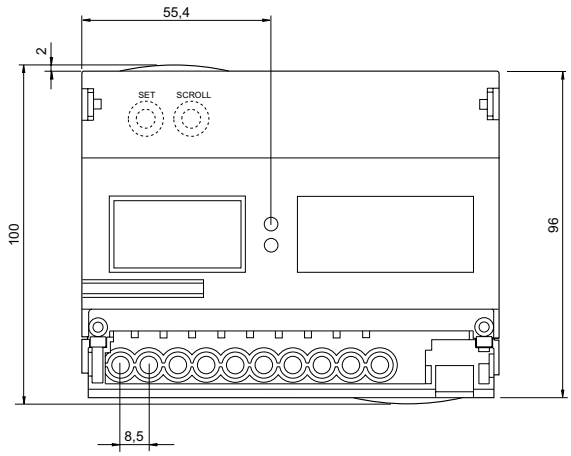
Terminal area, transformer-rated meter



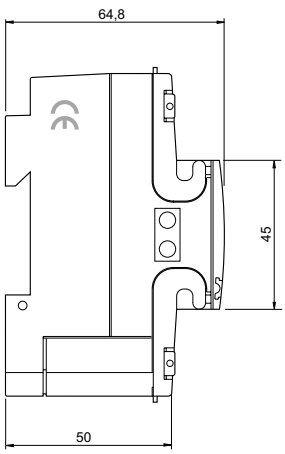
Terminal area, direct connected meter



Front view, all meters



Side view, all meters

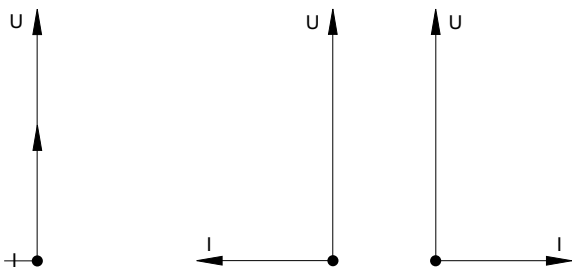


Introduction

In most cases, the three-watt meter method is used for power measurements in three phase systems with a current-carrying neutral conductor. Where metering is the basis for billing, this is a requirement.
High voltage installations often do not have any current-carrying neutral conductor, therefore the two-watt meter measurement method can be used. Both voltage and current transformers are commonly used. Single phase metering can be used if a three-phase load is balanced.
If the DELTAplus meter is directly connected to the mains, the device must be protected by fuses (the possibility to isolate the meter is recommended) on the incoming side.
In order to allow maintenance of DELTAplus Meters with current transformers connected, a short circuiting terminal block should be installed near the meter. The voltage supply to the meter must be protected by a max. 10A fuse.

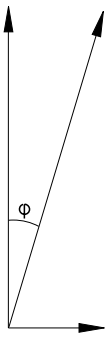
Active and Reactive Power

Active power is needed to perform work. However, consumer equipment often cause a phase shift between current and voltage as a result of the inductive nature of the load, for example in motor drives. The maximum permissable phase shift is governed by the terms of the consumers' contract with the electricity supplier. If the consumers exceed the specified maximum, they will be liable to an extra charge and would be well advised to install compensation equipment, usually in the form of capacitor banks. Thus it can be seen that the reactive component of the power also is of interest for measurement.



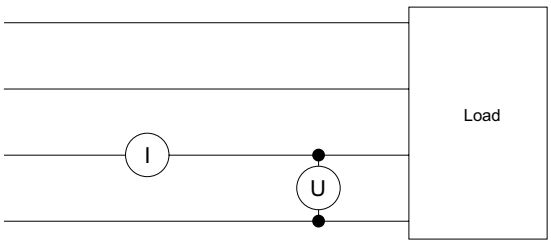
Resistive load | **Capacitive load** | **Inductive load**

Resistive loads cause no phase shifts.
Inductive loads cause a phase shift in one direction, while capacitive loads produce a phase shift in the opposite direction. As a result, inductive and capacitive loads can be used to compensate each other. The phase shift of the current compared to the voltage results in the power being divided into active and reactive components. The angle between the actual power vector and the active power component is described as phase displacement angle, often referred to as φ.



Methods of Measuring Power

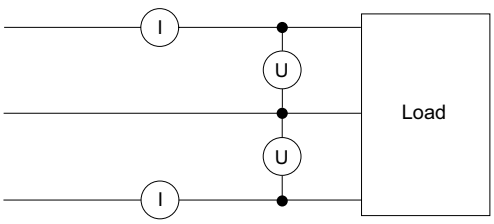
The single-watt meter method (single phase)



$P = 3 \times I_T \times U_T$

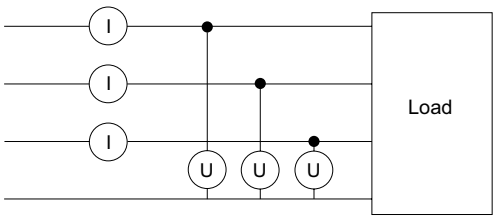
In three phase systems the single-watt meter method only gives correct results with a symetrical load on the phases. Since in practice perfectly balanced systems are very rare, this method should not be used for accurate measurements.

The two-watt meter method



The two-watt meter method is used in three phase systems without a neutral conductor, irrespective of the load symetrical or asymetrical.

The three-watt meter method



The three watt-meter method is usually used in three phase systems having a neutral conductor. This method can deal with asymetrical and symetrical loads.

5

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